

IDEAL MATHS COACHING CENTRE, 192, PWD Road, NAGERCOIL. 9843322969

SCIENCE (BIO)

LESSON 1. HEREDITY AND EVOLUTION

CLASS:X

Part A

1. Mendel observed 7 pairs of contrasting characters in *Pisum Sativum*. Which one of the following is not a part of that?

- (i) Tall and dwarf (ii) Yellow and green seed colour
(iii) Terminal and axial flower (iv) Smooth and rough stem

2. Primitive man evolved in-----

- (i) Africa (ii) America (iii) Australia (iv) India

3. Which of the following is inheritable?

- (i) An altered gene in sperm (ii) an altered gene in liver cells
(iii) an altered gene in skin cells (iv) an altered gene in udder cells.

4. The theory of Natural selection was proposed by-----

- (i) Charles Darwin (ii) Hugo de Vries (iii) Gregor Johann Mendel (iv) Jean Baptise Lamarck

5. Somatic gene therapy causes-----

- (i) Changes in sperm (ii) Changes in progeny (iii) changes in body cell (iv) changes in ovum

6. In a pea plant, the yellow colour of the seed dominates over the green colour. The genetic make up of the green colour of the seed can be shown as-----

- (i) GG (ii) Gg (iii) Yy (iv) yy

7. Some people can roll their tongue and this is a genetically controlled auto-somal dominant character. (Roller = RR/Rr; Non-roller = rr) A child who, can roll the tongue has one brother who is a non-roller and two sisters who are rollers. If both the parents are rollers, the genotypes of their parents would be-----

- (i) RR x RR (ii) Rr x Rr (iii) RR x rr (iv) rr x rr

8. Hydra, a multi-cellular invertebrate of phylum cnidaria (coelenterata) can give rise a new offspring by various methods. Choose the method by which the offspring are produced with significant variations.

- (i) Budding (ii) regeneration (iii) Sexual reproduction (iv) asexual reproduction

9. The following are the events in the formation of the first cloned animal the sheep Dolly.

- a) Removal of haploid nucleus from the ovum.
b) Implantation of ovum with diploid nucleus into the surrogate mother.
c) Collection of udder cell from the sheep.
d) Development of a young clone.

The correct sequential order of these events is-----

- (i) abcde (ii) cabed (iii) cadbe (iv) edcba

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10. The following are statements about stem cells:

- (a) There are unspecialised/undifferentiated cells.
- (b) They can be transformed into any type of body cell.
- (c) They can multiply rapidly to form a large number of similar types of cells.
- (d) They cannot transform into cardiac cells or nerve cells.
- (e) They are obtained from reproductive progeny only.

The correct statements are-----

- (i)a,b,c only (ii)c,d,e only (iii)a,c,e only (iv)b,c,e only

11. In persons suffering from insulin- dependent diabetes, ----- the cells of pancreas are degenerated

- (i)Alpha (ii)Beta (iii)Gamma (iv)Delta

12. Identical twins are born as a result of fertilization between-----

- (i)two eggs and two sperms (ii)two eggs and one sperm
(iii) one egg and one sperm (iv) one egg and two sperms.

13. Identify the incorrect statement about identical twins.

- (i) Developed from a single zygote. (ii)Always of the same sex
(iii) Look alike in many aspects (iv) Differ in their blood groups.

14. The correct statement about Neanderthal man is:

- (i)the first human like hominid. (ii) started agriculture
(iii)ate meat and walked erectly (iv)buried the dead

15. The inheritance of characteristics through generation is called "heredity". In Mental's Pisum sativum plant, the genetic material present is-----

- (i)DNA (ii)RNA (iii)Protein (iv)Cytoplasm

16. ----- is alternate expression of same gene.

- (i)Alleles (ii) Variation (iii) Speciation (iv)Gene, Allelomorph

17. -----worked out the first scientific experimental study on heredity.

- (i)Ian Wilmut (ii) Gregor Johann Mendel
(iii)Charles Darwin (iv)lamarck

18. Biotechnologically synthesized vitamin----- is used, to cure pernicious anaemia.

- (i)Vitamin A (ii) Vitamin B (iii)Vitamin B₁₂ (iv) Vitamin C

19. Diabetes is treated by the biotechnologically produced-----

- (i)Enzyme (ii) Insulin (iii)Vitamin (iv)Vaccine

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Part- B

1. Mendel has observed Tallness as a dominant character in the garden pea plant. Similarly, tongue rolling is a dominant character in man. In a group of 60 students, 45 can roll their tongue and 15 are non-rollers.

(i) In the above context, calculate the percentage of dominant and recessive characters.

Ans: Total No.of students =60

Tongue rollers=45

Non-rollers =15

Percentage of dominant characters (tongue rolling)

$$= \frac{45}{60} \times 100 = 75\%$$

Percentage of recessive characters (Non-rolling)

$$= \frac{15}{60} \times 100 = 25\%$$

Therefore, ratio of dominant and recessive characters = 3:1

2. The heritable characters are varying in different species and within the same species.

Name the variation in the following cases.

The eye colour among the human beings are varied as blue, black, brown, green, etc.,

(a) This is called as ----- variation

Ans: Intra specific.

The dentition in rabbit and elephant are not the same.

(b) This is called as ----- variation.

Ans: Inter generic

Explanation: Rabbit and elephant belong to different genera.

3. Sexually reproducing organisms produce offspring with marked significant and visible variation. Asexually reproducing offspring show minor variations.

(i) Do you agree with the above statements?

(ii) Among the following organism point out the asexually reproducing organism. (Cockroach, Euglena, Earthworm and Bird.)

Ans: (i) Yes. The statements are true. (ii) Euglena

4. Here are certain important hereditary jargons. Fill in the blanks by choosing a suitable one from the list given. (allele, Variation, speciation, gene, allelomorphs)

(i) -----are the factors which form the physical basis of inheritance.

(ii) ----- is the alternate forms of the same gene.

(iii) ----- are the expressions of contrasting pair of alleles.

Ans: (i) Genes (ii) Allele (iii) Allelomorphs

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5. A change that affects the body cell is not inherited. However, a change in the gamete is inherited. The effects of radiation at Hiroshima have been affecting generations. Analyze the above statements and give your interpretation.

Ans: A change that affects the body cell, for example, a scar produced in one's body, is not inherited to the next generation. But radiation effects of Hiroshima had altered the genes which pertains to the germ cells (or) gametes and since such changes are inheritable, they affect the progeny generation after generation. It resulted in the birth of children with deformities.

6. Sequentially arrange the different species of man from primitive to modern man. (Neanderthal man, Homohabilis, Homoerectus, Homosapiens)

Ans: Homohabilis → Homoerectus → Neanderthal man → Homosapiens

7. Bio-technology, the modern science in biology, has helped in producing different types of products. One of the following groups does not have a product of bio-technology. Pick out and give reasons.

- (i) Enzymes, organic acids, steroids, vaccines
- (ii) Vaccines, enzymes, antibiotics, inorganic acids
- (iii) Antibiotics, hormones, steroids, vaccines
- (iv) Steroids, enzymes, antibodies, vaccines

Ans: (iv)steroids, enzymes, antibodies, vaccines

Reason: Antibodies are produced against the germs by the white blood cells of organisms themselves. But rest of the products are prepared bio technologically.

8. What do you mean by phenotype and genotype of an individual? Explain.

Ans: Expression of morphological characters as tall or dwarf plant, violet or white flower is called phenotype. The expression of gene (or genetic make up) of an individual for a particular trait is called Genotype

9. What are variations? Mention their types.

Ans: Variation may be defined as differences in the characteristics among the individuals of the same species.

- (A) Intra specific variation or among the different genera.
- (B) Intergeneric variation or different species
- (C) Inter specific variation.

Types of Variations:

- (a) Somatic Variation- It pertains to body cells and it is not inherited.
- (b) Germinal Variation- It pertains to germ cells or gemetes and it is inheritable. It leads to specimen and evolution.

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10. Who proposed the theory of Natural selection? Mention the two principles of this theory.

Ans: Charles Darwin

- (i) Traits are inherited and breed true
- (ii) Variation occurs among offspring.

11. What are monoclonal antibodies? Mention its use.

Ans: These are the antibodies produced from cloned cells by hybridoma technology. Monoclonal antibodies are now used in treatment of cancer.

12. What is a clone? In what way is the cloning technique useful in the field of veterinary science?

Ans: A clone may be defined as an exact carbon copy or copies of a single genetical parent. The word 'clone' refers only to living species. If the cloning technique is applied to veterinary science, valuable animal could be cloned from desirable adult cells.

13. In dogs, the barking trait is dominant over the silent trait. Using punnet square , work out the possible puppies born to two barking parents with genotype(Rr).

Ans: F₁ parents – Barking trait x Barking trait

Gametes

Punnet square

		R	r
R		RR	Rr
R		Rr	Rr

Phenotypic Ratio- Barking trait. Silent trait

3 : 1

Genotypic ratio- RR Rr rr

1 2 1

(Barking trait similar (Barking trait similar (Silent trait similar

To pure breeding type) to F₁ hybrid) to pure breeding)

14. In Dr. Ian Wilmut's cloning experiment, did the new born 'dolly' resemble the udder cell donor Dorset white sheep or the surrogate mother sheep? Give reasons.

Ans: The new born "Dolly" resembled the donor white sheep named Finn Dortset.

Reaon: Since a clone is an exact carbon copy of a single generation parent, "Dolly" had inherited the characteristics of the genes present in the chromosomes of diploid nucleus (2n) transferred from the udder cell of Dorset.

15. The excessive use of pesticides has only resulted in the occurance of more resistant varieties of pests rather than their complete eradication. How can you link this with Darwin's theory of Natural selection and Evolution?

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Ans: Struggle for existence and survival of the fittest are the basic principles of Darwin's theory of natural selection. [The excessive use of pesticides in course of time must have caused more adaptive genetic variations in the pest progeny and nature might have selected only the fittest varieties(which are more resistant to pesticides) of pests to survive in their struggle)

For existence. Thus variation is the raw material for evolution of new species].

16. The first clinical gene therapy was given in 1990 to a four year old girl suffering from adenosine Deaminase Deficiency (ADA). Could you suggest a possible cure for such a disorder with a knowledge of gene therapy and its types?

Ans: Gene therapy is the means to treat or cure genetic diseases by using a normal gene to supplement or replace the defective gene.

Types: It may be of either

1. Somatic gene therapy if it is in body cell (or)
2. Germ line gene therapy if it is in gametes.

ADA is a genetic disorder in which the gene responsible for the production of an enzyme called Adenosine Deaminase is defective in certain children leading to its deficiency. Thus somatic gene therapy could be the possible treatment to replace the defective gene with a normal one.

17. Find the unmatched pairs:

Nif genes	Nitrogen Fixation
Tt	Alleles
Bio-chips	Biological computer manufacturing
Interferon	Antiproteins of bacteria
Stem cells	Unspecialized mass of cells

Ans: Interferon: Antiproteins of Bacteria

This is the only unmatched pair.

18. For the experimental research Dr.Ian Wilmut used the nucleus of the udder cell from a six year old Finn Dorset white sheep and preserved the diploid nucleus (2n). He took an ovum from the ovary of another sheep. The haploid ovum was removed. The diploid nucleus of the udder cell was injected into the enucleated ovum. Then the diploid nucleus ovum was implanted into the uterus of the surrogate mother sheep. The diploid ovum developed into a young one, named "Dolly".

(i) Why did Wilmut select the udder cell?

(ii) Define the terms haploid and diploid.

Ans: Since an ovum is haploid (n), it is not enough to develop into a normal embryo. So in cloning technique, the enucleated ovum was injected with an udder cell nucleus which had diploid numbers(2n) of chromosomes and it developed into a young clone.

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Haploid: The nucleus which contains single set of chromosomes(n) is said to be haploid. E.g. each human sperm/ovum has 23 chromosomes.

Diploid: The nucleus which contains the double sets of chromosomes ($2n$) which are found in pairs, is said to be diploid. e.g., each human somatic cell contains 46 chromosomes.

19. Match the following by identifying the pair:

(medicines, fuel, microbes, metabolism, organic acids)

i)vaccine (ii) natural gas (iii)citric acid (iv)monoclonal antibodies (v) vitamins

Ans:

(i)	Vaccine	Microbes
(ii)	Natural gas	Fuel
(iii)	Citric acid	Organic acids
(iv)	Monoclonal antibodies	Medicines
(v)	Vitamins	Metabolism

20. Mention the dominant and recessive traits observed by Mendel in the garden pea plant with respect to the seed and flower.

Ans:

	Dominant	Recessive
Seed shape	Round	Wrinkled
Seed colour	Yellow	Green
Flower colour	Violet	White
Flower position	Axillary	Terminal

21. Identical twins are syngenic with similar chromosomal contents. Natural clones are those who possess identical chromosomes. Fill up with the suitable word given in the brackets.

(a) Identical twins are-----

(Natural clones / induced clones)

(b) Identical twins are-----

(dissimilar to each other / similar to each other)

22. Do you agree with the statement given below. If not, give the correct statements.

(a) Variation may be defined as the affinities in the characteristics among the individual the species.

Variation may be defined as the differences in the characteristics among the individuals of the species.

(b) Evolution is a sudden development from the complex species to simple form do you agree with the above statements?

Evolution may be defined as a gradual development of more complex species from pre-existing simpler forms.

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23. Consider the following statements:

- (a) Somatic variation pertains to body cells and it is inherited.
- (b) The genotype of a character is influenced by factors called chromosomes.

Do you agree with the above statements? If not, give correct statements.

Ans: (a) Somatic variation pertains to body cells and it is not inherited.

(b) The genotype of a character is influenced by factors called genes.

24. Do you agree with the following statement? If not, give correct statements:

(a) Primitive man evolved in Australia

Ans: No. Primitive man evolved in Africa

(b) Between 7500 – 1000 years the modern Homosapiens arose.

Ans: The modern man Homo sapiens arose between 75,000 to 10,000 years.

24. Match the followings

- (a) Garden pea plant - Dolly
- (b) Mono hybrid cross - vaccine
- (c) Edward Jenner - 3:1
- (d) Dr. Ian Wilmut - Pisum sativum

Ans:

- (a) Garden pea plant - Pisum sativum
- (b) Mono hybrid cross - 3:1
- (c) Edward Jenner - Vaccine
- (d) Dr. Ian Wilmut - Dolly

Part C

1. Human evolution has a record of changes for the past 15 million years.

(i) Name the different species of mankind in chronological order from primitive to modern man.

- 15 million years ago - Gorilla and chimpanzees like hominids
- 3 to 4 million years ago - Homo habilis (Men like hominids)
- 1.5 million years ago - Homo erectus
- 1 million years ago - Neanderthal man
- During ice age - Archaic Homo sapiens
- Between 75,000 to 10,000 - Modern homo Sapiens

(ii) When were the primitive cavers developed.

The pre historic caves were developed about 18,000 years ago.

(iii) Narrate the life led by early man like hominids.

- (a) 3 to 4 million years ago, men like hominids walked into eastern Africa.
- (b) Hominids hunted with stone weapons but were mostly fruit eaters.

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(c) They were probably not taller than four feet but, walked upright in the grasslands of East Africa.

(d) These creatures were called the first human like being- the hominids (Homo habilis)

2. Describe in brief Mendel's monohybrid cross.

(i) Mendel selected the garden pea plant, Pisum sativum for his experiments. He selected tall and dwarf plants and allowed them to grow naturally. As pea plants produce seeds only by self pollination. He observed that tall plants produced always tall plants generation after generation under natural condition. Similarly, dwarf plants produced always dwarf plants generation after generation. Hence, he termed the tall and dwarf plants as wild types (or) pure breeding varieties.

	T	T
T	TT Tall	Tt Tall
T	Tt Tall	Tt Dwarf

(ii) Then he crossed a tall plant with a dwarf plant, produced progeny and calculated the percentage of tallness and dwarfness in subsequent generations. When a pure breeding tall plant was crossed with a pure breeding dwarf plant, all plants were tall in the first filial generation(F1)

(iii) When such a F1 tall plant was allowed to have self pollination, both the tall and dwarf plants appeared in second filial generation (F2) in the ratio of 3:1. This indicates that both tallness and dwarfness were inherited in the F1 plants but only tallness was expressed.

(iv) The first experiment of Mendel considering the inheritance of a single trait(height of the plant Tall/dwarf) is called Monohybrid Cross.

3. Find out Who I am?

(i) **I am an acid used as a preservative and I have a sour taste.**

(ii) **I am organic and present in citrus fruits and I give immunity.**

(iii) **I am cholesterol containing steroid obtained from bread mould. I am the steroid.**

(iv) **I am an enzyme and I cut DNA at specific sites.**

(v) **I am the paste enzyme that joins segments of DNA**

Ans: (i) Acetic acid(Vinegar)

(ii) Vitamin-C(Ascorbic acid)

(iv) prednisolone

(iv) Restriction endo nuclease

(v) DNA ligase

4. State whether true or false. Correct the statements that are false.

(i) **Variations give the organisms an individually of their own.** Ans: (i) True

(ii) **Charles Darwin postulated the use and disuse theory** Ans: (ii) False: Correct statement: Charles Darwin postulated the theory of natural selection (or) Jean Baptiste Lamarck postulated the use and disuse theory.

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(iii) To understand evolution, a branching diagram or a tree diagram is used to show the inferred evolution and the relationship among various biological species. Ans: (iii) True

Genetic engineering is the modification of the genetic information of living organisms by manipulation of DNA by adding, removing or repairing part of the DNA and changing the phenotype. Ans:(iv) True

5. Observe the flow chart of a monohybrid cross in a clitoria plant and write the answers for A, B, C, D:

Character: colour of the flower

Parents: Blue flowered x white flowered

BB ↓ bb

A

F1 Generation All are blue flowered with the genotype Bb

B

F2 Generation

Bb

Bb

Bb

Bb

The phenotypic ratio is

The genotypic ratio is

C

D

Answer :

BB ↓ bb

A

Bb

(Blue Flower)

F1 Generation All are blue flowered with the genotype Bb

B

Bb

x Bb

(Blue Flower)

(Blue Flower)

F2 Generation

BB

Bb

Bb

bb

Blue

Blue

Blue

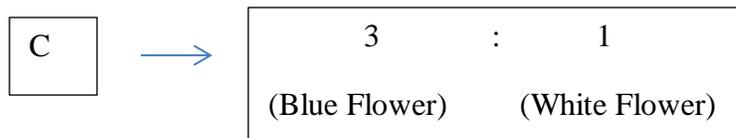
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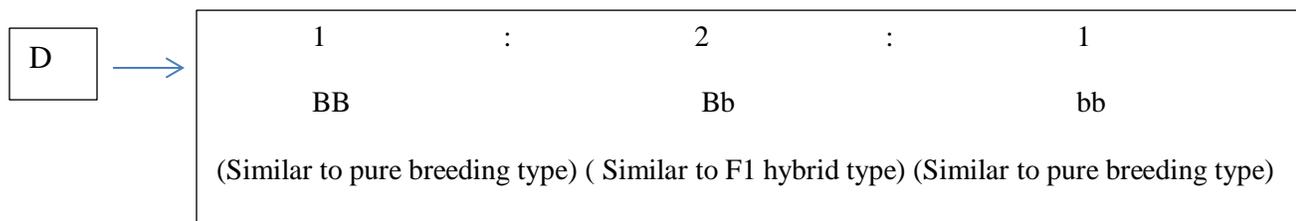
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The phenotypic ratio is



The genotypic ratio is



6. (a) What is Genetic engineering?

Genetic engineering is the modification of the genetic information of living organisms by manipulation of DNA by adding, removing or repairing part of genetic material (DNA) and changing the phenotype of the organism.

(b) What are the uses of Genetic engineering?

- (i) Understanding of the gene structure and function through basic research.
- (ii) Production of large quantities of insulin, interferon (Anti-Viral protein produced by virus infected cells) human growth hormones, proteins (polypeptides) and vaccines for foot and mouth disease of cattle (Komari- in tamil) etc.,
- (iii) This technique is also employed in the transfer of genes involved in Nitrogen Fixation (NiF-genes). This will help the cultivator to increase productivity.

(c) What are the uses of restriction endonucleases and DNA ligase? (or) write about the tools of genetic engineering?

- (i) Restriction enzymes or restriction endonucleases are molecular scissors which cut DNA specific sites.
- (ii) DNA ligases are the paste enzyme which helps to join the broken DNA fragments.

7. (a) What is Bio-sensor?

Bio-sensor is a device consisting of immobilized layer of biological material such as enzyme, antibody, hormone, nucleic acids, organelles or whole cells and its contact with a sensor. The sensor converts biological signals into an electrical signal. It is used in medicines and industry.

(b) State any four applications of Bio-sensor in medicines.

- (i) Blood glucose level can be detected
- (ii) Production of any toxin in the body due to infection can be detected.
- (iii) Pollution in drinking water can be monitored

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(iv) Odour, freshness and taste of food can be measured.

8. One of the most fascinating branches in applied embryology is stem cell culture.

(a) What are stem cells.

Stem cells are the most unspecialized mass of cells which have the potentially of growing and multiplying into enormous number of same type of cells by repeated mitosis and also which can be induced to become any other type of tissues.

(b) Name the two kinds of stem cells.

(i) Embryonic stem cells (ii) Adult or somatic stem cells

(c) Explain the two kinds of stem cells?

(i) The embryonic stem cells can be derived from early embryo which is developed by 'invitro fertilization'. Hollow blastula that is formed from Zygote.

(ii) Adult or somatic stem cells: Among the well differentiated tissues like epithelial, connective, muscular, vascular, supporting, nervous and reproductive tissues of higher animals and human beings, there are some undifferentiated cells and are considered as the adult or somatic stem cells. They can grow, multiply and can be differentiated into same type of tissues into which they are implanted. Bone marrow, embryos, amniotic fluid and umbilical cord are sources of adult stem cells.

(d) What are the important characteristics of stem cells.

Stem cells have two important characteristic features:

(i) They have the potentially of growing and multiplying into an enormous number of the same type of cells repeated mitosis.

(ii) They can be induced to become any other type of tissue with specific functions. i.e. they can be induced to become a cardiac muscle, beta cells of pancreas (which produces insulin), special neurons in brain etc

9. (a) Define bio chip and write the uses of Bio-chips.

Definition: Biochips are microchips which are developed by employing technique of bio technology.

Uses of Bio- chips:

(i) In future, biological computers will developed using Bio-chips.

(ii) Bio-chips will be useful in defence, medicine etc.,

9.(b) Write about science today gene therapy?

Definition: Gene therapy is the means to treat or even cure genetic and acquired diseases like cancer and AIDS by using normal gene to supplement or replace the defective gene.

Uses: It can be used to treat defects in somatic i.e., (body) or Gametic

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E.g. Insulin dependent diabetes is caused by the degeneration of beta cells due to a defective gene. When the defective gene is corrected with a new gene, the genetic defect developed is rectified and cured.

Types of Gene Therapy:**(i) Somatic gene therapy:**

The genome (gene set) of the recipient is changed. But this change is not passed along to the next generation.

(ii) Germ line gene therapy:

Egg and sperm of the parents are changed, for the purpose of passing the changes to the next generation.

10. Explain about the uses (Applications) of Biotechnology.**Definition:**

Biotechnology is the one contributed towards exploitation of biological organisms or biological processes through modern techniques which could be profitably used in medicine, agriculture, animal husbandry and environmental cleaning.

Application of Biotechnology:

- (i) **Brewing industry:** Fermentation in alcoholic beverages like beer, wine etc.,
- (ii) **Enzyme technology:** Enzymes are Bio-catalysts that speed up reaction in cells. They are more efficient in catalyzing industrially important reactions. E.g., in pharmaceutical industry.
- (iii) **Anti-Biotics:** Antibiotics are substances produced by some microbes that help in increasing the immunity to human beings which are toxic to other micro-organisms.
- (iv) **Organic acids:** Acetic acid is used for the production of vinegar.
- (v) **Vitamins:** Vitamins are chemical compounds present in natural food stuffs. They are very essential for energy transformation and regulation of metabolism.

11. Write about microbial products of everyday use.

- (i) **Vaccines:** Killed or live germs suspension which is employed to induce the production of antibodies and bring forth immunity.
- (ii) **Antibiotics:** Antibiotics are chemical substances derived from microbes like fungi, bacteria etc., employed to kill the infections germs and cure a disease.
- (iii) **Vitamin B₁₂:** Biotechnology synthesized vitamin B₁₂ is used to cure pernicious anaemia.
- (iv) **Enzymes:** Bio chemically significant enzymes are derived from microbes/ Ex. Amylase is derived from amyloproteins of bacteria.
- (v) **Insulin:** Diabetes is treated by the Biotechnologically produced insulin

12. Draw the mind map depicting the scope of Biotechnology.**Refer Textbook**

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13. Explain cloning in detail.

(a) **Definition:** Cloning is an experimental technique wherein a group of morphologically and genetically identical organisms are produced.

A clone may be defined as an exact carbon copy or copies of a single parent derived by asexual method and the word clone refers only to living species.

(b) **Cloning technique:** Dolly was a cloned sheep, named and developed by Dr. Ian Wilmut and his colleagues in Roselind Institute in Scotland in July 1996.

The scientists used nucleus of udder cell (somatic cell taken from mammary gland) from a six year old Finn Dorset white sheep.

The nucleus of the udder cell contains, diploid number ($2n$) of chromosomes with all the genes. Then they took an ovum from the ovary of another sheep. The haploid nucleus (n) in the ovum was removed.

The diploid nucleus of the udder cell was injected into the cytoplasm of the enucleated ovum. Then the ovum with the diploid nucleus, was implanted into the uterus of the surrogate mother sheep. Since the ovum had the diploid nucleus, it developed into a young clone.

(c) **Types of clones:**

Natural clones: The natural clones include identical twins.

Induced clones: The induced (artificial) clones are developed by nuclear transfer into the host cell.

(d) **Scope/Use of cloning:**

If the cloning technique is to be applied in veterinary science, valuable animals could be cloned from desirable adult cells.

14. Explain variation in detail.

(a) **Definition:** Variation may be defined as the differences in the characteristics among the individuals of the same species (intra specific variation) or among the different genera (intergeneric variation) or different species (Inter specific variation)

(b) **Types of variations:**

(i) Somatic variation- It pertains to body cells and it is not inherited.

(ii) Germinal variation- It pertains to germ cells or gametes and it is inheritable. It leads to speciation and evolution.

(c) **Significance of variation:**

- It is the source of raw material for evolution.
- Animals are able to adapt themselves to the changing environment,
- Organisms are better suited to face the struggle for existence.
- Variations give the organisms an individuality of their own.
- Without variation, there would be no science of heredity as all individuals of a race, would be identical in all aspects.

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SCIENCE (BIOLOGY)

LESSON:2 IMMUNE SYSTEM

CLASS:X

2.IMMUNE SYSTEM

Part A

1. Pick out the case of healthy state of an individual.

- (i) Mr. X is recovering from an infections disease.
- (ii) Mr. Y is taking insulin injection every day.
- (iii) Mrs. Z is very much depressed.
- (iv) Mr.K is attending to his duty and spends time joyfully

Ans: (iv) Mr.K is attending to his duty and spends time joyfully.

2. Which one of the following is not socially balanced?

- (i) He enjoys a birthday party.
- (ii) He behaves rudely over trivial matters.
- (iii) He adjusts well to the surrounding situation.
- (iv) He attends to his ailing mother at the hospital.

Ans: (ii) He behaves rudely over trivial matters.

3. ----- is a bacterial disease.

- (i)Meningitis
- (ii) Rabies
- (iii) Tetanus
- (iv)small pox

Ans: (iii) Tetanus

4. One of the following is transmitted through air. Find it out.

- (i)Tuberculosis
- (ii)Menigitis
- (iii) Typhoid
- (iv) Cholera

Ans: (i) Tuberculosis

5. The most serious form of malaria is caused by Plasmodium

- (i)Ovale
- (ii) malariae
- (iii) falciparum
- (iv) Vivax

Ans: (iii) falciparum

6. An example of protozoan infecting our intestine is-----

- (i) Plasmodium vivax
- (ii)entamoeba histolytica
- trypanosoma gambiense
- taeia solium

Ans;(ii)entamoeba histolytica

7. One of the means of indirect transmission of a disease is-----

- (i) Sneezing
- (ii) coughing
- (iii) through placenta
- (iv)using utensils of patients

Ans;(iv)using utensils of patients

8.When antibodies extracted from other animals are injected into your body, what kind of immunity do you gain?

- (i)Artificially active acquired immunity
- (ii)Artificially passive acquired immunity
- (iii)Naturally active acquired immunity
- (iv)Naturally passive acquired immunity

Ans;(ii)Artificially passive acquired immunity

9.The first vaccine injected into a just born baby is-----

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(i)Oral polio (ii)DPT (iii)DPTand Oral polio (iv)BCG

Ans;(iv)BCG

10.In order to lead a healthy life a person should enjoy physical ,mentel and social well-being. If a person lacks any one of them ,then that person is suffering from-----.

Ans:disease

11.A child eats food rich in carbohydrates and avoids protein in its diet. Which type of nutritional deficiency will affect that child?

(i)Kwashiorkar (ii)Nyctalopia (iii)Diabetas (iv)Down syndrome

Ans:(i)Kwashiorkar

12.Assertion(A)Expulsion of excess unused glucose in the blood through urine is observed in a Diabetic mellitus person.

Reason(R): insulin is not produced in sufficient quantity by pancreas.

(i)Both 'A' and 'R' are ture and 'R' explains 'A'.

(ii)Both 'A' and 'R'are ture but 'R' doesn't explain 'A'

(iii)Only 'A' is ture but 'R' is flase.

(iv)A is flase but 'R'is flase.

Ans:(i)Both 'A' and 'R' are ture and 'R' explains' A'.

13.Pick out a non-antigen. Entry of-----

(i)Germ (ii)Toxins of germs (iii)New forms of protein (iv)Mother's Milk

Ans:(iv)Mother's Milk

14.The viral disease is-----

(i)Rabies (ii)Cholera (iii)Malaria (iv)Typhoid

Ans:(i)Rabies

15.In the following Plasmodium which one cause malignant and fatel

(i)Plasmodium vivax

(ii)Plasmodium malariae

(iii)Plasmodium falciparum

(iv)Plasmodium ovale

Ans:(iii)Plasmodium falciparum

16.Pick out the protein deficiency disease

(i)Typoid

(ii)Malaria

(iii)Marasmus

(iv)AIDS

Ans:(iii)Marasmus

PART-B

1.Marasmus and Kwashiorkar are both protein deficiency defects.Marasmus us differs from Kwashiorkar in enlarged belly and swelling in the face . Are these symptoms for the above Disease correct? If not, correct it.

Answer: The above mentioned symptoms are not correct.

Reason: In Marasmus the child loses weight . suffers from severe diarrhoea and it appears as though bones are covered by skin . In Kwashiorkar, the child has an enlarged belly with swelling in the face and feet.

2.A list of disorders are given below. Pick out the odd one out and give reasons.(Thalassemia, haemophilia ,albinism, sickle cell anaemia)

Answer: Night blindness:Vitamin deficiency disease.

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Reason : Night blindness is caused due to lack of Vitamin-A in diet. But other diseases (Thalassemia, haemophilia, albinism and sickle cell anaemia) are hereditary diseases.

3. What are the symptoms of common cold?

i)----- ii)-----

1. Inflammation of upper respiratory passage - nasal epithelium.
2. Flow of mucous.
3. Headache , a slight rise in temperature, etc.

4. Difference between the diseases- night blindness and colour blindness.

S.No	Night Blindness	Colour Blindness
1.	Night blindness is a vitamin-A deficiency disease.	Colour Blindness is a Hereditary disease.
2.	The affected person is not able to see in the dark(or) even in a dim light.	The affected person is unable to distinguish red and green colours and their less bright shades.
3.	It is caused due to lack of vitamin –A in the diet.	It is caused due to the inheritance of recessive mutant genes on the x-chromosome.
4.	It is somewhat curable.	Since it is a genetic disorder, it is curable.

5. After observing dark patches with itching sensation on the skin of a student in a school hostel, the warden advises his room mates not to share towels, clothes and combs among themselves. Name the disease the student is suffering from and name the causative organisms.

Answer: Name of the disease : Ring worm

Causative organism : Three different genera of fungi namely

1. Epidermophyton
2. Microsporum and
3. Trichophyton

6. Name the vector host of the malarial parasites. Mention the species of malarial parasite which causes malignant and fatal malaria.

Answer: The vector host of the malarial parasite is female Anopheles mosquito.

Of the four species, Plasmodium falciparum causes malignant and fatal malaria.

7. Name the tests done for the diagnosis and confirmation of AIDS.

Answer: 1. Diagnostic Test for HIV

Enzyme Linked Immunosorbent Assay (ELISA)

2. Confirmative test for HIV

Western blot test.

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8. What is triple antigen? Name the three diseases which can be prevented by using it?

Answer:

*Triple antigen is a vaccine commonly referred to as DPT (Diphtheria, Pertussis, Tetanus vaccine)

*It is given to prevent Diphtherian, pertussis(whooping cough) and Tetaus.

9. Mention the type of immunity acquired by a baby through breastfeeding?

Answer: Naturally Passive Acquired Immunity

10. Study the following statements and state whether they are true or false.

1. Colour blindness is a genetic disorder, whereas night blindness is a nutritional disorder. 2. Pernicious anaemia is a nutritional deficiency disease, whereas sickle anemia is a genetic disease / disorder

3. Administering TT injection to an injured child is related to passive artificial immunity, whereas giving BCG vaccine is active artificial immunity.

4. Malaria is a bacterial disease, whereas ring worm is a viral disease.

Answer: 1. True 2. True 3. True 4. False

Correct statement: Malaria is a protozoan disease whereas ringworm is a fungal disease.

11. Ramya is suffering from bleeding gums and loosening teeth. On diagnosis, it is found to have been caused by vitamin deficiency.

Tell Ramya the vitamin that is lacking in her food and the names of deficiency disease she is suffering from.

(A) Vitamin (B) Deficiency disease
(C) Symptoms are given. Match B and C with A

A	B	C
vitamins	deficiency-diseases	symptoms
Vitamin A	Nyctalopia	Night blindness
Vitamin B ₁	scurvy	Nervous disorder
Vitamin C	Rickets	Bleeding gums
Vitamin D	Haemorrhage	Defective calcification of bones
Vitamin K	Beri-beri	Profuse loss of blood

Answer:

*Vitamin –C is lacking in Ramya's diet.

* Bleeding gums and loosening teeth are the symptoms of disease scurvy.

A	B	C
Vitamins	Deficiency-disease	symptoms
Vitamin A	Nyctalopia	Night blindness
Vitamin B ₁	Beri- beri	Nervous disorder
Vitamin C	scurvy	Bleeding gums
Vitamin D	Rickets	Defective calcification of bones
Vitamin K	Haemorrhage	Profuse loss of blood

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12.A health worker advises the people in a locality not to have tattooing done using common needles and to insist the barber to change the shaving razors/blades in the salon. Name the dreadful disease, the spreading of which can be prevented by following these measures.

Also mention other preventive measures that can be taken with regard to this disease.

Answer: AIDS (Acquired Immuno Deficiency Syndrome) is a dreadful disease that can be prevented by following the measures as advised by the health worker

Other preventive measures:

(i) Protected sexual behavior.

(ii) Safe sex practices.

(iii) Screening of blood for HIV before blood transfusion

((iv) Usage of disposable syringes in the hospitals.

13. Match the following :

List I	List II
A. Amoebiasis	I. Chills and high fever recurring for 3 or 4 days
B. Tuberculosis	II. Patches on skin and nails with itching sensation
C. Ringworm	III. Abdominal pain with blood and mucus in stools
D. Malaria	Persistent cough and loss of body weight

Answer :

List I (Disease)	List II (Symptoms)
A. Amoebiasis	III) Abdominal pain with blood and mucus in stools
B. Tuberculosis	IV) Persistent cough and loss of body weight
C. Ringworm	II) Patches on skin and nails with itching sensation
D. Malaria	I) Chills and high fever recurring for 3 to 4 days

14. List out diseases based on their mode of transmission (water borne, air borne, sexual contact)

(i) cholera (ii) typhoid (iii) tuberculosis (iv) leprosy (v) syphilis (vi) gonorrhoea
(vii) pneumonia (viii) common cold (ix) amoebic dysentery (x) AIDS

Answer:

Water borne diseases	Air borne diseases	Diseases spreading Through sexual contact
Cholera	Tuberculosis	Syphilis
Typhoid	Common cold	Gonorrhoea
Amoebic Dysentery	Pneumonia	AIDS
		Leprosy

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15.(i) Give any three examples for the most infectious disease in man and their causative agents.

(ii) To discover medicine for viral infected diseases like AIDS is more difficult than other diseases. Is the statement true or false ? Discuss.

Answer:

S.No	Disease	Causative agent
1	Influenza	A(H - N ₁)virus
2	Tuberculosis	Mycobacterium tuberculosis - bacterium
3	AIDS	HIV- virus

(ii) True. In the case of viral infected disease like AIDS, the genetic material of virus (HIV) integrates with the genome of the host cell and the host cell (i.e. CD4 plus T- helper cell). It is therefore very difficult to inhibit intracellular viral growth without serious damage to the host cell by any antiviral medicine.

16. A Student had an attack of measles and recovered from the infection. His science teacher said that he will not get that disease again in his lifetime. Is it true ? why?

Answer:

True. This is due to Naturally Active Acquired Immunity.

The antibodies produced in someone's body during the infection of measles virus, stay for a long time in his blood and they readily recognize and kill measles virus whenever they enter the body again. Owing to this Naturally Active Acquired Immunity, he will not get disease again in his lifetime.

17. Name the causative organism responsible for ring worm in humans? Mention the symptom of the infection.

Answer:

Three different genera of fungi namely, Epidermophyton microsporum and Trichophyton causes ringworm.

Symptoms: Fungi can live on the dead cells of epidermis, They can cause superficial infections in skin, hair, nails etc. form patches and cause itching.

18. Pick out the odd ones:

(i) AIDS : Retro virus, lymphocytes, BCG, ELISA

(ii) Bacterial disease : Rabies, cholera, common cold, influenza,

(iii) DPT vaccine: Diphtheria, tuberculosis, Pertussis Tetanus

(iv) Infective stage of plasmodium in human : Sporozites, Merozoites, trophozoites, gametocytes

(v) Mental imension : brightness of skin, normal metabolism, no black ring around eyes, knows his capacity.

Answer:

(i) BCG : BCG is a vaccine for tuberculosis

(ii) Rabies, Common cold and influenza – These are the viral diseases

(iii) Tuberculosis – It cannot be prevented by DPT vaccine.

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(iv) Merozoites, Trophozoites, and gametocytes – These are not the infective stages of plasmodium.

(v) Brightness of skin, normal metabolism, no black ring around eyes. These are not related to mental dimension of health.

19. In the manufacturing of anti-venom injection against snake bite, antibodies produced in the horse are being used. Mention the types of immunity involved.

Answer: Artificial Passive Acquired immunity

20. Say whether each of the following diseases is a metabolic disorder, a genetic disorder or a nutritional deficiency disease.

(i) thalassemia (ii) beri beri (iii) diabetes mellitus

(iv) bubble boy syndrome (v) scurvy (vi) marasmus (vii) obesity

(viii) Alzheimer's disease (ix) nyctalopia (x) haemophilia

Answer :

Metabolic disorder	Genetic disorder	Nutritional deficiency
Diabetes mellitus	Thalassemia	Beri beri
Obesity	Bubble boy syndrome	Scurvy
Alzheimer's disease	haemophilia	Marasmus, Nyctalopia

21. Find the correct statement (True or False):

(i) Tuberculosis is caused by Mycobacterium tuberculosis bacteria

(ii) Typhoid is caused by Trichophyton fungi

(iii) Malaria is caused by Plasmodium vivax

(iv) Influenza is caused by Entamoeba histolytica protozoan

Answer:

(i) True

(ii) False – correct statement Typhoid is caused by salmonella typhi bacterium

(iii) True

(iv) False – correct statement Influenza is caused by A(H₁-N₁) Virus

22. Malarial fever is not caused in a person immediately after introducing the sporozoites by an infected anopheles mosquito. why?

Answer:

When a person is bitten by an infected female anopheles mosquito, the sporozoites are introduced into the blood stream of man. They enter the liver cell to undergo various stages by asexual divisions called exo-erythrocytic cycle which last 7 or 17 days. During this period of incubation, parasites are not seen in the blood when blood test is taken and the patient may not have the symptoms of malaria until the parasites start erythrocytic cells in the RBC.

23. Name the stages of plasmodium

(i) introduced by an infected anopheles mosquito.

(ii) picked up by anopheles mosquito from an infected human being.

Answer: (i) The stage of plasmodium introduced by an infected female anopheles mosquito is sporozoites.

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(ii) The stage of plasmodium picked up by anopheles mosquito from the infected man is gametocytes.

Note:

When a person suffering from malaria is bitten by female anopheles mosquito, all the stages (namely merozoites, trophozoites, schizonts, male and female gametocytes) are picked up the stomach of a mosquito.

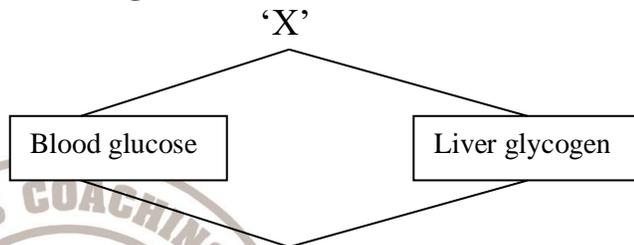
But except the gametocytes, all other are destroyed in the stomach.

24. Name two diseases that are transmitted by houseflies. Mention their causative pathogens.

Answer:

- (i) Typhoid - Salmonella typhi
 (ii) Amoebic dysentery - Entamoeba histolytica

25. Observe the following flow-chart



Mention the metabolic disorder ‘X’ and the causative factor from the option given below:

Disorder	Factor
a) Diabetes insipidus	Deficiency of ADH hormone
b) Diabetes mellitus	Deficiency of insulin hormone
c) coronary heart disease	Blockage of arteries supplying blood to heart muscles.
d) Renal failure	Failure of nephrons to filter the blood

Answer:

(b) Diabetes mellitus – Deficiency of insulin hormone

26. You suspect that your friend is suffering from common cold. What are the questions you will ask your friend to confirm the disease.

- (i) Do you have inflammation of upper respiratory passage?
 (ii) Do you have flow of mucous?
 (iii) Do you have headache and slight rise in temperature?

27. Match the following vitamins with deficiency diseases?

- | Vitamin | Deficiency diseases |
|-----------------------------|---------------------|
| (i) Vitamin A | - Scurvy |
| (ii) Vitamin B ₁ | - Rickets |
| (iii) Vitamin C | - Nyctalopia |
| (iv) Vitamin D | - Beri-beri |

Answer:

- | Vitamin | Deficiency diseases |
|---------------|---------------------|
| (i) Vitamin A | - Nyctalopia |

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- (ii) Vitamin B₁ - Beri-beri
 (iii) Vitamin C - Scurvy
 (iv) Vitamin D - Rickets

28. Match the vitamin with its deficiency disease:

	Vitamins	Deficiency diseases
(a)	Vitamins A	Rickets
(b)	Vitamin B ₅	Nyctalopia
(c)	Vitamin D	Haemorrhage
(d)	Vitamin K	Pellagra

Answer:

	Vitamins	Deficiency diseases
(a)	Vitamins A	Nyctalopia
(b)	Vitamins B ₅	Pellagra
(c)	Vitamins D	Rickets
(d)	Vitamins K	Haemorrhage

29. Correct the following sentence if it has any mistake. Fungi are green saprophytic or parasitic plants living on live and decaying organic matter or living organisms.

Fungi are non green saprophytic or parasitic plants living on dead and decaying organic matter or living organisms.

30. Match the disease and causative agents.

1. Influenza - Human rhino virus
 2. Common cold - H1N1 virus
 3. Tuber culosis - Microporum
 4. Ring worm - Mycobacterium

Answer: 1. Influenza - H1N1 virus

2. Common cold - Human rhino virus
 3. Tuber culosis - Mycobacterium
 4. Ring worm - Microporum

31. You suspect that your friend is suffering from Amoebic dysentery . What are the questions you will ask your friend to confirm the disease.

- (i) Do you have constipation , abdominal pain and cramps?
 (ii) Do you pass stools with excess mucous and blood clot?

32. Match:

Vitamins	Deficiency diseases	Symptoms
Vitamin B ₁	Scurvy	Nervous disorder
Vitamin C	Rickets	Bleeding Gum
Vitamin D	Haemorrhage	Defective calcification of bones
Vitamin K	Beri - Beri	Profuse loss of blood

Answer:

	Deficiency diseases	Symptoms
--	---------------------	----------

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Vitamins		
Vitamin B₁	Beri – Beri	Nervous disorder
Vitamin C	Scurvy	Bleeding Gum
Vitamin D	Rickets	Defective calcification of bones
Vitamin K	Haemorrhage	Profuse loss of blood

Part C**1. Kala has delivered a baby,****(i) Suggest the immunization schedule for the baby ,in the first six months.****(ii) What are the diseases that can be cured as per cured as per the schedule ?****(i)**

S.No	Age	Vaccine	Dosage
1.	New born	BCG	1 st dose
2.	15 days	Oral polio	1 st dose
3.	6 th week	DPT & Polio	1 st dose
4.	10 th week	DPT & Polio	2 nd dose
5.	14 th week	DPT & Polio	3 rd dose

(ii)

Vaccine	Diseases against which vaccine is given
BCG	Tuberculosis Vaccine
Oral polio	Polio
DPT	Diphtheria, Pertussis, Tetanus Vaccine(Triple antigen)

2. There is a widespread outbreak of malaria in your area?**(a) Suggest some controlling measures to the local authorities concerned.**

(i) Sanitary measures include ground fogging with disinfectants.

(ii) Closure of stagnant pools of water and covering ditches is suggested

(iii) Using mosquito nets and repellants also, will grossly lower the chance for infection

(iv) Windows and door frames can be fitted with mosquito entry preventing nets

(v) Larvivorous fish Gambusia can be introduced in water bodies and wells.

(b) Pick out the right symptom for malaria**(Chill and shiver and a rise in temperature / diarrhea)**

Chill and shiver and a rise in temperature

3. 15th October is observed as ‘ Handwashing Day’ .**(i) Tell your friend the effects of hand washing****(ii) How frequently do you wash your hands everyday and when?****Effects of Handwashing:**

i) Hand washing helps to prevent the transmission of disease causing germs as the sweat secreted in the palm region attracts microorganisms.

ii) Washing hands before taking food prevents the entry of germs into our mouth.

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- iii) Washing the interdigital spaces can avoid scabies.
- iv) Washing the fingertips and nails properly can avoid nail infection i.e. Chomycosis.
- v) Washing hands after giving hands with an infected person can prevent the germs.

Occasions for washing hands:

- i) **Everytime after voiding the bowels and bladder.**
- ii) **Before and after eating food.**
- iii) **After sneezing, coughing and blowing the nose.**
- iv) **After touching a wound in one's body or a patient and his belongings.**
- v) **After leaving the science laboratories**

4. List out the various diseases caused due to nutritional deficiency . Add a note on their symptoms.

Nutritional Deficiency Diseases: A diet which contains all essential nutrients in correct proportion, is indispensable for maintaining good health. Deficiency in certain food constituents causes various kinds of diseases. **Protein deficiency causes Marasmus and Kwashiorkar.** In **Marasmus**, the child loses weight and suffers severe diarrhoea and it will appear as though bones are covered by skin. In **Kwashiorkar**, the child develops an enlarged belly with face and feet swelling.

Vitamin	Deficiency	symptoms
Vitamin A	Nyctalopia	Night blindness
Vitamin D	Rickets	Defective calcification of bones
Vitamin E	Sterility	Inability to reproduce
Vitamin K	Haemorrhage	Profuse loss of blood
Vitamin B1	Beri-Beri	Nervous disorder
Vitamin B5	Pellagra	Dementia, dermatitis, diarrhoea
Vitamin B12	Pernicious anaemia	Destruction of RBC
Vitamin C	Scurvy	Bleeding gums and loosening of teeth

5. Write a detailed note on Malaria disease.

Causative agent: A tiny protozoan –Plasmodium is responsible for causing malaria. Four different species of Plasmodium namely, *P.vivax*, *P.malariae*, *P.falciparum* and *P.ovale* exist in India and cause malaria. Of these, the malaria, caused by Plasmodium falciparum is malignant and fatal.

Transmission

Through the vector - the female *Anopheles* mosquito.

Symptoms

i) Malaria is characterized by chills, shivering and rise in temperature. This is followed by perspiration and lowered body temperature. The patient would feel normal for some time but the fever would recur at regular intervals.

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ii) Successive attacks of malaria result in the distension of spleen and destruction of liver tissues.

Prevention and control:

- i) Sanitary measures include ground fogging with disinfectants.
- ii) Prevent water stagnation and cover ditches and drains.
- iii) Use mosquito nets and repellants.

What is immunity? Write a note on the various types of immunity.

Immunity: Immunity is the body's defence against or the specific resistance exhibited infectious organisms.

Natural or Innate Immunity: The **natural or innate immunity** enables an individual to develop resistance to the disease, to which, the particular species is immune.e.g. Plant diseases do not affect animals.

Acquired or Specific Immunity: The resistance against some infectious diseases developed by an individual during lifetime, on exposure to the infections is called **acquired or specific immunity**.

Active acquired immunity: This kind of immunity is developed by our body, during the first infection of any pathogen. The antibodies produced in the blood remain for a long period and kill the similar pathogens, whenever they enter the body.

- a) If the antibody production is stimulated naturally after recovery from a disease, it is called Naturally Active Acquired Immunity.
- b) If the antibody synthesis is stimulated by administration of vaccines or any other man-made methods, the immunity thus gained is called Artificially Active Acquired Immunity.

For example the polio drops

Passive Acquired Immunity: In this type of immunity, a ready-made antibody is introduced from outside, instead of stimulating the body to produce antibody with antigenic stimulus.

- a) If the readymade antibody is taken from the mother's blood into the foetus, it is called Naturally Passive Acquired Immunity.
- b) If the readymade antibody is given to an individual artificially, (produced in some other animal And extracted) it is called Artificial Passive Acquired Immunity. This immunity is not permanent.

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SCIENCE LESSON 3 STRUCTURE AND FUNCTIONS OF HUMAN BODY-ORGAN SYSTEMS CLASS:X

PART – A

1. Unipolar neurons are found in the _____
 a) Brain b) Spinal Cord
 c) Embryonic nervous tissue d) Adult nervous tissue
2. The sensory organs contain _____
 a) Unipolar neuron b) Bipolar neuron
 c) Multipolar neuron d) Medullated neuron
3. The part of brain which controls emotional reactions in our body is _____
 a) Cerebellum b) Cerebrum
 c) Thalamus d) Hypothalamus
4. One of the following is a part of the brain stem. Pick it out.
 a) Forebrain and midbrain b) Midbrain and hindbrain
 c) Forebrain and hindbrain d) Forebrain and spinal cord
5. Spinal nerves are _____
 a) sensory nerves b) motor nerves
 c) mixed nerves d) innervating the brain
6. An endocrine gland found in the neck is _____
 a) adrenal gland b) pituitary gland
 c) thyroid gland d) pancreas
7. An endocrine gland which is both exocrine and endocrine is the _____
 a) pancreas b) pituitary c) thyroid d) adrenal
8. Normal blood glucose level in 1 dl of blood is _____
 a) 80-100 mg/dl b) 80-120 mg/dl
 c) 80-150 mg/dl d) 70-120 mg/dl
9. The “T” lymphocytes are differentiated to resist infection in the _____
 a) parathyroid gland b) lymph gland
 c) thymus gland d) adrenal gland
10. In Meiosis-1, the pairing of homologous chromosomes take place during _____ stage.
 a) leptotene b) zygotenec) pachytene d) diplotene
11. The two systems of the human body which help in the control and co-ordination of metabolic activities are _____
 a) digestive and circulatory b) respiratory and circulatory
 c) excretory and skeletal d) nervous and endocrine
12. Neurotransmitters are released at the synapse by _____
 a) Tips of Dendrites b) Synaptic Knobs
 c) Organelles of Cyton d) Myelin sheath of Axon
13. The endocrine gland related to the immune system is _____
 a) Thyroid b) Thymus c) Adrenal d) Pineal
14. The hormone administered by doctors to a pregnant woman to help in childbirth during the time of natural delivery is _____
 a) Oestrogen b) Progesterone c) Insulin d) Relaxin
15. The important event of meiosis is the crossing over. It occurs during childbirth during the time of natural delivery is _____
 a) Leptotene b) Pachytene c) Diplotene d) Zygotene
16. Reduction division is the process by which gametes are produced. The cells in which reduction division take place are ____
 a) germinal epithelial cells b) the sensory epithelial cells
 c) cuboidal epithelial cells d) columnar epithelial cells
17. In Amoeba, the cell division takes place _____

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- a) involving changes in the chromatin reticulum
- b) without involving changes in the chromatin reticulum
- c) leading to reduction in the number of chromosomes
- d) without dividing the nucleus.

18. Pick out the item which has sequential arrangement.

- a) Zygotene → Leptotene → Pachytene → Diplotene → Diakinesis
- b) Diakinesis → Zygotene → Leptotene → Pachytene → Diplotene
- c) Laptotene → Zygotene → Pachytene → Diplotene → Diakinesis

19. Polio is a viral disease and the affected child suffers from physical disability of limbs. Which system of the body is mostly affected due to this infection?

- a) Nervous system
- b) Digestive system
- c) Respiratory system
- d) Excretory system

20. Blinking when a beam of light is suddenly focussed on the eyes and sudden withdrawal of hand upon touching a hot body are some of the examples of reflex actions. Which part of the central nervous system acts as the centre these actions?

- a) Forebrain
- b) Spinal cord
- c) Hindbrain
- d) Synapse

21. The following are the parts of a neuron:

- a) Axon
- b) Terminal branches
- c) Cyton
- d) Dendrites

The correct pathway of a nerve impulse through these parts are _____

- a) badc
- b) dcab
- c) bdac
- d) adbc

22. For minor surgeries in the body, doctors administer local anaesthesia to a part of the body so that the pain will not

be felt by the patient. At which part, do you think, the nerve impulse is being arrested due to the effect of anaesthesia?

- (i) at cyton
- (ii) at axon
- (iii) at synapse
- (iv) in the middle of axon

Answer: (iii) at synapse

23. Assertion (A): All spinal nerves are mixed nerves.

Reason (R): Each spinal nerve has a sensory root and a motor root.

- (i) Both 'A' and 'R' are true and 'R' explains 'A'
- (ii) Both 'A' and 'R' are true but 'R' doesn't explain 'A'.
- (iii) Only 'A' is true but 'R' is false.
- (iv) 'A' is false but 'R' is true.

PART - B

1. Name the two systems which help in the control and co-ordination of metabolic activities. Write any one difference between them.

Answer: (i) The nervous system

(ii) The endocrine system

SN	Nervous system	Endocrine system
1.	The nervous system provides an organized network of point-to-point connections for quicker coordination.	The endocrine system provides chemical integration of physiological processes to maintain homeostasis.
2.	Nervous co-ordination is carried out through billions of neurons.	Chemical co-ordination is carried out through hormones secreted into the blood.

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2. Differentiate medullated neurons from non-medullated neurons. Where are they found in the nervous system?

Sl.No	Medullated Neurons	Non-medullated neurons
1.	The axon of this neuron is enclosed by the white fatty myelin sheath.	The axon of this neuron is not enclosed by the myelin sheath.
2.	They are also known as myelinated (or) white neurons.	They are also known as non-myelinated (or) grey neurons.
	Location	Location
(i)	They are found in the white matter of our brain	They are found in the grey matter of our brain
(ii)	The outer region of spinal cord contains these neurons.	The inner region of spinal cord contains these neurons.

5. What are endocrine glands? Name the secretions of these glands. How do these secretions reach the target organs?

Answer: The endocrine glands are ductless glands (without ducts), secreting chemical substances called hormones are carried by the blood from the site of production to the site of action.

6. Name the following endocrine glands:

(i) The master of endocrine orchestra (ii) The dual gland

Answer: (i) Pituitary gland (ii) Pancreas.

7. Which hormone(s) is/are called (i) Personality hormone (ii) fight, flight and fright hormones.

Answer: (i) Thyroxine
(ii) Adrenaline (or) Epinephrine
Nor adrenaline (or) Nor epinephrine.
They are also called as emergency hormones.

8. Name the male and female sex hormones. List out their functions.

3. Name the part of the brain which regulates heart beat and respiration. Where is it located in the brain?

Answer: Medulla oblongata It is the posterior most part of the hind brain where it merges with the spinal cord.

4. What is corpora quadrigemina? Name of functions associated with it.

Answer: The dorsal portion of the midbrain consists of four hemispherical bodies called corpora quadrigemina which controls and regulates various visual reflexes and optical orientation.

S	Hormones	Functions
1	Male sex hormone - Testosterone (Androgen)	<ul style="list-style-type: none"> • Testosterone stimulates the growth of male reproductive system and the production of the sperms (male sex cells). • It determines the secondary sexual characters in male, such as growth of facial hairs, coarse voice, broadening of shoulder, etc.
2	Female sex hormone - (a) Oestrogen	<ul style="list-style-type: none"> • Oestrogen stimulates the growth of female reproductive system and the production of ovum (female sex cell)

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	<ul style="list-style-type: none"> It determines the secondary sexual characters in female, such as growth of public hair, soft voice, feminine body, etc.
(b) Progesterone	Progesterone maintains pregnancy and regulates menstrual cycle.
(c) Relaxin	Relaxin relaxes the muscles of the pelvic region at the time of child birth.

9. In which sub-stages of meiosis-I do the following events occur?

- pairing of homologous chromosomes
- terminalization
- crossing over
- formation of spindle apparatus.

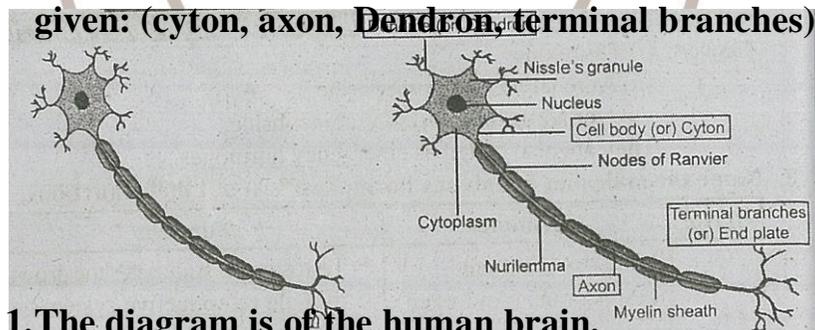
Answer: (i) Zygotene

(ii) Diplotene

(iii) Pachytene

(iv) Diakinesis

10. Copy the diagram and label any two parts in the group given: (cyton, axon, Dendron, terminal branches)

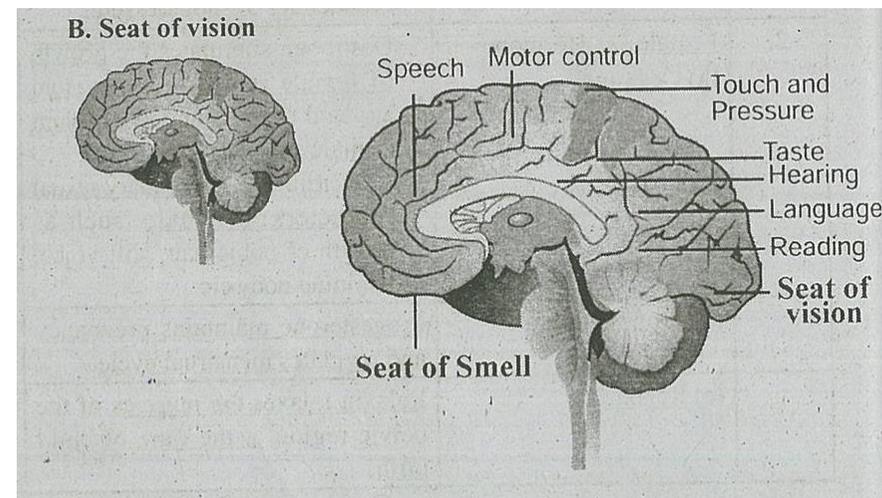


11. The diagram is of the human brain.

Shade the areas marked A and B in the parts of the brain, corresponding with the function.

A. Seat of smell

B. Seat of vision



12. On the basis of the function performed, pick out the right statements.

(i) Pituitary gland secretes hormones and enzymes.

(ii) Thyroid gland secretes thyroxine and insulin.

(iii) Leydig cells produce testosterone hormone.

(iv) Pancreas produces enzymes and hormones.

Answer: (iii) Leydig cells produce testosterone hormone.

(iv) Pancreas produces enzymes and hormones.

13. Correct the statements, if they are wrong.

(i) Alpha cells produce insulin and beta cells produce glucagon.

(ii) Cortisone suppresses the immune response.

(iii) Thymus gland is a lymphoid mass.

(iv) Ovary produces eggs and androgen.

Answer: (i) Alpha cells produce glucagon and beta cells produce insulin.

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- (ii) Ovary produces eggs: Oestrogen, Progesterone and Relaxin.

14. Here are a few statements about the endocrine system in man. State whether each of them is true or false. If the statement is false write the correct statement.

- (i) Endocrine system controls and co-ordinates the physical process of growth, reproduction and sustenance of life.
 (ii) Endocrine glands are duct bearing glands which secrete chemical substances called hormones.
 (iii) The pancreas is a dual gland.
 (iv) Malfunctioning of the thymus gland causes goitre.

Answer: (i) True

(ii) False

Correct statement: Endocrine glands are ductless glands which secrete chemical substances called hormones.

(iii) True

(iv) False

Correct statement: Malfunctioning of the thyroid gland causes goitre.

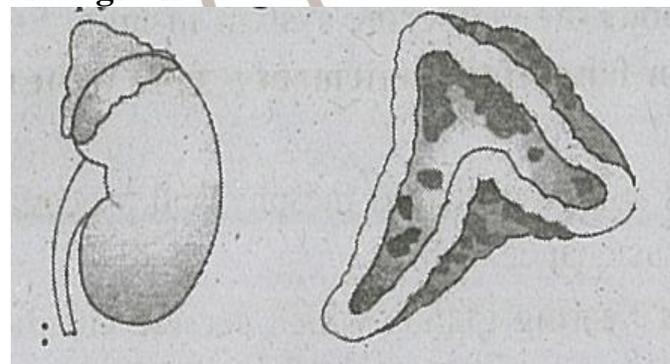
15. Copy and complete the following table:

	Hormones of adenohipophysis	Functions and malfunctions
1.	Somatotropic or growth hormone (STH or GH)	
2.		It stimulates the growth of thyroid gland and produces thyroxine

Answer:

	Hormones of adenohipophysis	Functions and malfunctions
1.	Somatotropic or growth hormone (STH or GH)	<ul style="list-style-type: none"> • It contributes growth in general. Malfunctions: <ul style="list-style-type: none"> • Less production in children - dwarfism with retarded growth • Excess production in children - gigantism with excess growth • Excess production in adolescents - acromegaly with large limbs and lower jaw
2.	Thyrotropic or Thyroid stimulating hormone (TSH)	It stimulates the growth of thyroid gland and produces thyroxine

16. Copy the diagram and label the parts with the help of the clues given



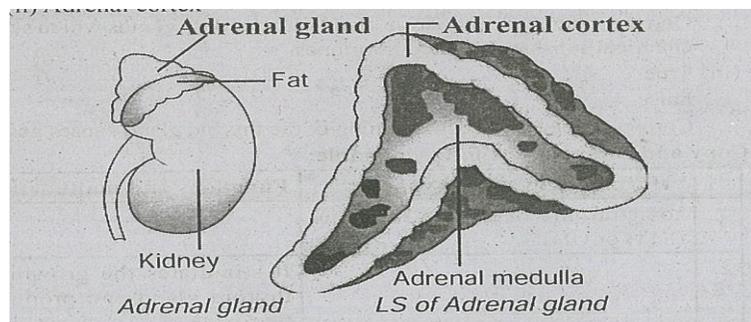
- (i) It is otherwise called supra renal gland.
 (ii) It secretes two hormones, namely aldosterone and cortisone.

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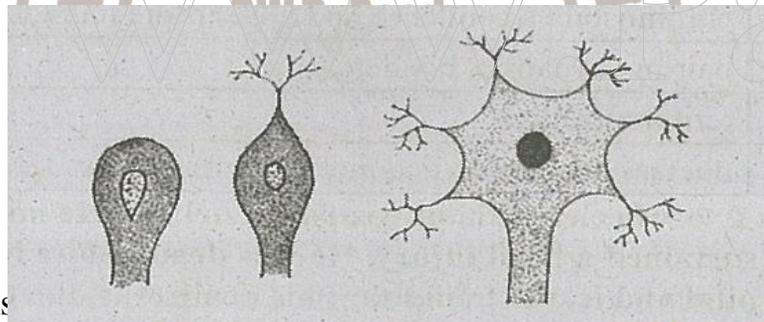
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Answer:

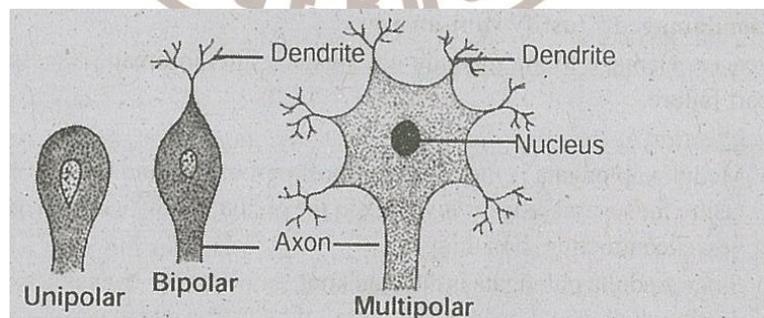
- (i) Adrenal gland
- (ii) Adrenal cortex



17. Copy and identify the types of neurons given below:



Ans



18. Here are some statements about meiosis. State whether each of them is true or false:

- i) It takes place in somatic cells.
- ii) Meiosis is also called reduction division.
- iii) Pairing of homologous chromosomes is called crossing over.
- iv) Meiosis leads to variations which form the raw material for evolution.

Answer:

- (i) False
Correct statement: It takes place in germinal epithelial cells.
- (ii) True
- (iii) False
Correct statement: Pairing of homologous chromosomes is called synapsis.
- (iv) True

19. Match the following:

A.	Leptotene	I.	Nuclear membrane and nucleolus disappear
B.	Zygotene	II.	Terminalization
C.	Diplotene	III.	Pairing, synapsis, bivalents
D.	Diskinesis	IV.	Chromosomes condense and appear like threads.

Answer:

A.	Leptotene	I.	Chromosomes condense and appear like threads.
B.	Zygotene	II.	Pairing, synapsis, bivalents
C.	Diplotene	III.	Terminalization

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D.	Diskineses	IV.	Nuclear membrane and nucleolus disappear
----	------------	-----	--

B.	Insulin	II.	Diabetes mellitus
C.	Oxytocin	III.	Contraction and relaxation of uterus
D.	Thymosine	IV.	Resist infection

20. A person was riding a two-wheeler without wearing a helmet. He met with an accident and sustained a head injury. He was dead before he was shifted to the hospital and it was found that his death was due to breathlessness and heart failure. Which part of his brain might have been damaged? Justify your answer.

Answer: Damage to the medulla oblongata results in breathlessness and heart failure.

Justification:

- Medulla oblongata is the posterior most part of the hind brain. It is the centre for several reflexes involved in the regulation of heart beat, blood vessel contraction, breathing etc.
- Since medulla oblongata is the vital knot, any injury to it results in brain death (which could have been averted if helmet is worn)

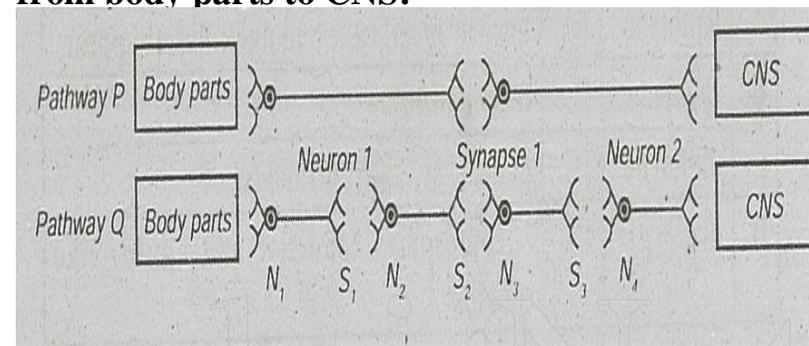
21. Match the following:

	List I		List II
A.	Vasopressin	I.	Resist infection
B.	Insulin	II.	Diabetes insipidus
C.	Oxytocin	III.	Diabetes mellitus
D.	Thymosine	IV.	Contraction and relaxation of uterus

Answer:

	List I		List II
A.	Vasopressin	I.	Diabetes insipidus

22. Observe the following diagrams that depict the transmission of nerve impulses through two pathways from body parts to CNS:



If all the nerves at both the places are similar in thickness and structure, through which pathway will the transmission of an impulse (of same threshold) be faster and why?

Answer: The transmission of impulse is faster through pathway 'P'

Reason: The pathway 'P' has only two neurons and one synapse in between CNS and body parts and so quick transmission is possible.

But pathway 'Q' has 4 neurons and 3 synapses in between and so transmission is slower.

23. Which gland is called the 'dual gland'? Why?

Answer: Pancreas is called a dual gland.

Reason: Pancreas plays a dual role both as exocrine and endocrine gland. The exocrine portion produces pancreatic juice (consisting of enzymes) to digest food.

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- The endocrine portion is called Islets of Langerhan and the α -cells of it secretes glucagon hormone and the β -cells of it secretes insulin and amylin. Insulin and glucagon regulate blood sugar level.

24.A 16 year old boy was brought to a doctor with a complaint of non-masculine features (lack of moustache / beard / gruff voice / broadening of shoulders etc). After keen examination, the doctor found that it was a hormonal disorder and the endocrine glands responsible were not functioning properly. Mention the glands and the hormone lacking in the boy.

Answer: Endocrine glands: Testes (Leydig cells of Testes)

Hormones: Testosterone (Androgen)

Reason: Since testosterone determines the secondary sexual characters in males such as the growth of facial hair, coarse voice, broadening of shoulder etc., the malfunctioning of the testes might be the cause of disorder in the boy.

25.Match the following glands with suitable hormone.

Glands	Hormone
(a) Adrenal cortex	(i) Insulin
(b) Neurohypophysis	(ii) Thyroxin
(c) Thyroid	(iii) Cortisone
(d) Islets of Langerhan	(iv) Oxytocin

Answer:

Glands	Hormone
(a) Adrenal cortex	Cortisone
(b) Neurohypophysis	Oxytocin
(c) Thyroid	Thyroxin
(d) Islets of Langerhan	Insulin

26.Consider the following statements:

Assertion (A): Pituitary gland is called as the conductor of endocrine orchestra.

Reason (R): Some of the endocrine glands are regulated by the pituitary gland.

Now select your answer according to the coding scheme given below:

- (A) (A) is correct and (R) is not giving correct reasoning
- (B) (A) is correct, but (R) is correct
- (C) (A) is wrong, but (R) is correct
- (D) Both (A) and (R) are correct.

Answer: (D) Both (A) and (R) are correct

27.What are the functions of cerebrum?

- (i) Cerebrum is the seat of consciousness, intelligence, memory, imagination and reasoning.
- (ii) It receives impulses from different parts of the body and initiates voluntary activities.
- (iii) Various functional areas of cerebrum are centre for hearing, seeing, tasting smelling, speaking language and so on.

28.Consider the following statements:

Assertion (A): Pituitary gland is called as the conductor of endocrine orchestra.

Reason (R): Some of the endocrine glands are regulated by the pituitary gland.

Now select your answer according to the coding scheme given below:

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- (A) Both (A) and (R) are correct and (R) is giving correct reasoning of (A)
 (B) (A) is correct, but (R) is wrong.
 (C) (A) is wrong, but (R) is correct.
 (D) (A) is correct, but (R) is not giving correct reasoning.

Answer:

Both (A) and (R) are correct and (R) is giving correct reasoning of (A).

29. Thyroid gland secretes a hormone called thyroxine.

Give any two functions of this hormone.

- (i) It increases the rate of metabolism.
- (ii) It stimulates a rise in the body temperature.
- (iii) It promotes growth and differentiation of tissues.
- (iv) Since it affects indirectly growth of the body, thyroxine is also called as personality hormone.

30. Match the following

- | | | |
|---------------------|---|--------------------------------------|
| (i) Fore brain | - | CNS, PNS and ANS |
| (ii) Mid brain | - | Pons, cerebellum & medulla oblongata |
| (iii) Hind brain | - | cerebrum, thalamus, hypothalamus |
| (iv) Nervous system | - | cerebral aqueduct |

Answer:

- | | | |
|---------------------|---|--------------------------------------|
| (i) Fore brain | - | cerebrum, thalamus, hypothalamus |
| (ii) Mid brain | - | cerebral aqueduct |
| (iii) Hind brain | - | Pons, cerebellum & medulla oblongata |
| (iv) Nervous system | - | CNS, PNS and ANS R |

31. Rahul forgets his answers, lacks intelligence lacks imagination and reasoning after met an accident. Which area affected to him?

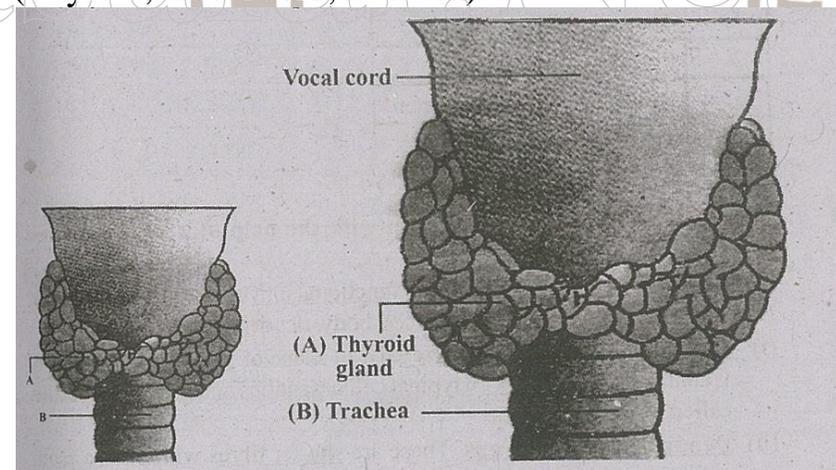
Motor areas of cerebrum might have been affected because it is the seat of consciousness, intelligence, memory, imagination and reasoning.

32. Raja's father suffers with diabetic suggest a way to control this problem.

- (i) To take insulin injection regularly as it promotes the uptake of glucose by the cells for tissue oxidation and also it favours conversion of glucose into glycogen and its storage in the liver and the muscles.
- (ii) To restrict the food which contains much carbohydrate.

33. Mark A and B in the given diagram

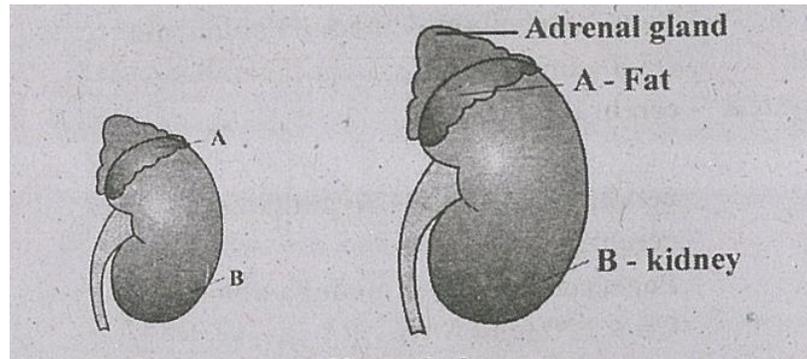
Copy the diagram and label the parts in the group given: (Thyroid, Vocal cord, Trachea)



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34. Draw the diagram given below and name the parts 'A' 'B'



35. Write functions of hypothalamus.

Hypothalamus lies at the base of the thalamus. It controls body temperature, urge to eat and drink, the regulation of sexual behavior and expresses emotional reactions like excitement, anger, fear, pleasure and motivation.

36. Match the following:

S.No.	Glands	Location
1.	Thyroid gland	Abdomen
2.	Pituitary gland	Thorax
3.	Pancreas	Head
4.	Thymus gland	Neck

Answer:

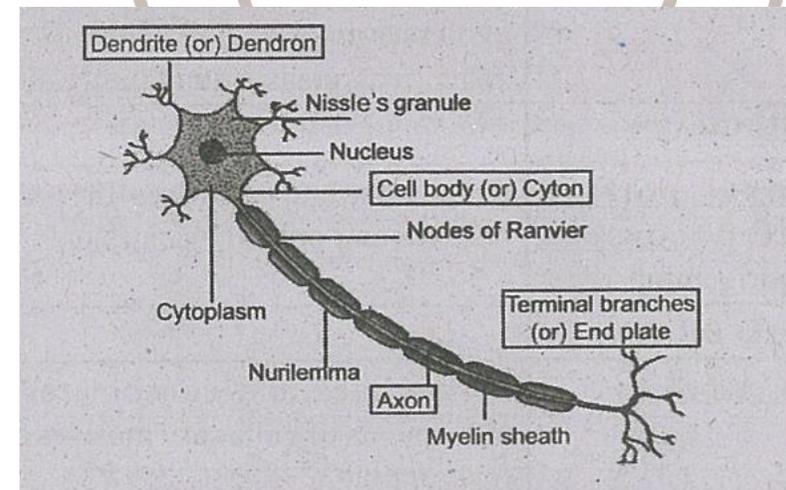
S.No.	Glands	Location
1.	Thyroid gland	Neck
2.	Pituitary gland	Head
3.	Pancreas	Abdomen
4.	Thymus gland	Thorax

Part – C

1. Describe the structure of a neuron with the help of a neat, labeled diagram.

Answer: Neuron is the structural and functional unit of the nervous system. It consists of 3 major parts namely cell body, dendrites and axon.

- Cell body (or) Cyton:** It is irregular in shape or polyhedral structure. It contains cytoplasm with typical cell organelles and granular bodies called Nissle's granules.
- Dendrites (or) Dendrons:** These are shorter fibres which arise from cell body with repeated branches. They transmit electrical impulses towards the cyton.
- Axon:** This a long fibre which arises from the cell body with a branched distal end. The distal branches terminate as bulb like structures called synaptic knob filled with chemicals called neurotransmitters.



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The cytoplasm of Axon is called Axoplasam. The axon is enclosed (except at the branched distal ends) by a membrane called Neurilemma. In myelinated neuron, an additional white fatty fibre called myelin sheath covers the neurilemma. Myelin sheath is not continuous and the gaps left by the myelin sheath are called Nodes of Ranvier. Over the myelin sheath are found certain cells called Schwann cells.

2. List out the various parts of the human brain and write a note on their functions.

Answer: The human brain is divided into three major parts namely (i) Fore brain, (ii) Mid brain and (iii) Hind brain.

The various parts of the brain and their respective functions are tabulated as under

S. No.	Parts of the brain	Functions
1.	Fore Brain	
	(a) Cerebrum	Cerebrum is the seat of consciousness, intelligence, memory, imagination and reasoning. It receives impulses from different parts of the body and initiates voluntary activities. Various functional areas of cerebrum are centre for hearing, seeing, tasting, smelling, speaking language and so on.
	(b) Thalamus	Thalamus is a major conducting centre for sensor and motor signaling.
	(c) Hypothalamus	Hypothalamus lies at the base of the thalamus. It controls body temperature,

		urge to eat and drink, the regulation of sexual behavior and expresses emotional reactions like excitement, anger, fear, pleasure and motivation.
2.	MID BRAIN	
	Dorsal portion called corpora quadrigemina	It controls and regulates the various visual reflexes and optical orientation.
3.	HIND BRAIN	
	(i) Cerebellum	It regulates and coordinates the group movements of voluntary muscles as in walking (or) running.
	(ii) Pons	<ul style="list-style-type: none"> • It relays the information from the cerebrum to cerebellum. • It also contains sleep centre and respiratory centre.
	(iii) Medulla oblongata (is known as vital knot)	<ul style="list-style-type: none"> • It acts as a co-ordination pathway for both ascending nerve tracts. • It is the centre for several reflexes involved in the regulation of heart beat, blood vessel contraction breathing etc.

3. Name the endocrine glands and their location in the human body. Describe any two of them in detail.

Sl. No	Endocrine gland	Location in human body
1.	Pituitary gland	Head (attached to the hypothalamus of brain)

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2.	Pineal gland	Head (Lies under the corpus callosum in the brain)
3.	Thyroid gland	Neck (one lobe on each of the larynx)
4.	Parathyroid gland	Neck (found within thyroid gland)
5.	Thymus gland	Thorax (present above the heart)
6.	Pancreas – Islets of langerhans	Abdomen
7.	Adrenal glands (Adrenal cortex and Adrenal medulla)	Abdomen (one on top of each kidney)
8.	Gonads (i) Testes in man (ii) Ovaries in woman	Abdomen

1. THYROID GLAND

Location: The bilobed thyroid gland is located in the neck, one lobe on each side of larynx.

Hormone: It secretes a hormone called thyroxine (an iodinated protein composed of amino acid, thyrosine and iodine)

Functions of thyroxine:

- It increases the rate of metabolism.
- It stimulates a rise in the body temperature.
- It promotes growth and differentiation of tissues.
- Since it affects indirectly growth of the body, thyroxine is also called as personality hormone.

Thyroid disorders

(i) Hypothyroidism – less secretion of thyroxine causes (a) simple goitre, (b) myxoedema and (c) cretinism

(a) Simple goitre – Thyroid gland bulges as a swelling in the neck in adults due to the deficiency of iodine in diet.

(b) Myxoedema – Low metabolic rate, loss of mental and physical vigour, increases in weight, thickening of skin, lowered heart beat, mental dullness etc are symptoms of myxoedema in adults.

(c) Cretinism – Stunted growth, retarded mental development, defective teeth, protrusion of tongue and loose skin are symptoms of cretinism in children.

(ii) Hyperthyroidism – The excess production of thyroxine causes Exophthalmic goitre or Grave's disease. The symptoms are: high metabolic rate, high blood pressure, high irritability, profuse sweating, loss of weight, fatigueness and protrusion of eyeballs.

2. **The Islets of Langerhans** Pancreas plays a dual role both as an exocrine and an endocrine gland. Endocrine portion is called Islets of Langerhans. It consists of two types of cells namely, alpha cells and beta cells. Alpha cells produce a hormone called glucagon and Beta cell produce insulin.

Insulin

- It promotes the uptake of glucose by the cells for tissue oxidation.
- It favours conversion of glucose into glycogen and its storage in the liver and the muscles.

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	e - I	<ul style="list-style-type: none"> Bivalents appear on the equator of the spindle 			<ul style="list-style-type: none"> The daughter chromosomes thus formed move towards the opposite poles.
3.	Anaphase - I	<ul style="list-style-type: none"> The spindle fibres contract pulling the chromatids of each chromosome. Each half set of chromosomes move to the opposite poles. 	4.	Telophase - II	<ul style="list-style-type: none"> The nuclear membrane and the nucleolus reappear. Thus two daughter nuclei are formed.
4.	Telophase - I	<ul style="list-style-type: none"> The spindle fibres disappear. At the poles, around each group of chromosomes, a nuclear membrane develops forming two daughter nuclei. 	5.	Cytokinesis - II	<ul style="list-style-type: none"> The cytoplasmic division takes place at right angles to the position of the nuclei. Four gametes are formed.
5.	Cytokinesis - I	<ul style="list-style-type: none"> At right angle to the position of the nuclei, the cytoplasmic constriction takes place dividing the cell into two daughter cells. 	<p style="text-align: center;">Significance of Meiosis</p> <p>(i) Haploid sex cells are produced in order to maintain constancy in the number of chromosomes of a species.</p> <p>(ii) Crossing over results in variation of genetic traits in the offspring.</p> <p>(iii) Variations form the raw material for evolution.</p> <p>5. Use words from the given list to complete the following paragraph. (The words may be used once / more than once / not at all).</p> <p>(Skull, Vertebral column, Pia mater, Arachnoid membrane, Brain, Spinal cord, Meninges, Dura mater)</p> <p>The central nervous system is covered by three protective coverings collectively called _____. The outermost cover lying below the _____ and _____ is double thick and is called _____. The innermost cover is a very thin delicate membrane and is closely stretched over the outer surface of _____ and _____ and is called _____.</p> <p>Answer:</p> <p>(i) Meninges</p> <p>(ii) Skull</p>		

MEIOSIS – II

It is similar to Mitosis and so it is called Meiotic Mitosis.

S. No.	STAGES	EVENTS
1.	Prophase - II	<ul style="list-style-type: none"> Bivalent chromosomes get shortened. Centrioles form asters and move to the poles. The nucleolus and the nuclear membrane disappear.
2.	Metaphase - II	<ul style="list-style-type: none"> Chromosomes are arranged at the equator of spindle fibres. The centromeres are attached with the spindle fibres.
3.	Anaphase - II	<ul style="list-style-type: none"> Centromeres divide into two and the two chromatids separate.

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SCIENCE LESSON 3 STRUCTURE AND FUNCTIONS OF HUMAN BODY-ORGAN SYSTEMS CLASS:X

- (iii) Vertebral column
- (iv) Duramater
- (v) Arachnoid membrane
- (vi) Brain
- (vii) Spinal Cord
- (viii) Piamater

6. Match these parts with their functions:

medulla oblongata, cerebellum, forebrain, thalamus, cerebral cortex, hind brain, pons, hypothalamus

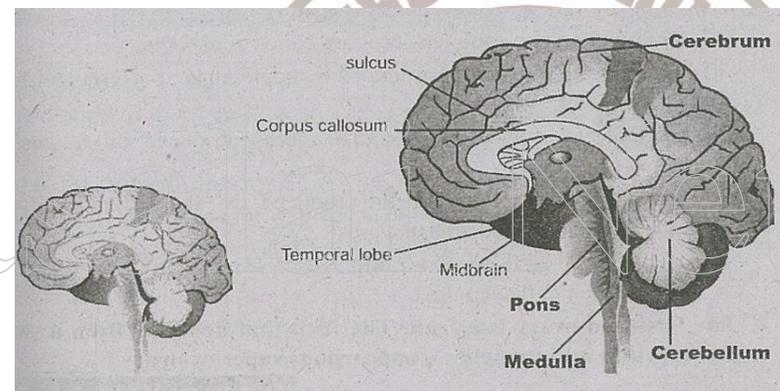
- (a) Sleep centre and respiratory centre
- (b) Several reflexes involved in the regulation of heart beat, blood vessel contraction, breathing etc.
- (c) Consists of cerebrum, thalamus and hypothalamus
- (d) Motor and sensory areas
- (e) A major conducting centre for sensory and motor signaling
- (f) Regulation of sexual behavior
- (g) Consists of pons, cerebellum and medulla oblongata
- (h) Co-ordinates the group movements of voluntary muscles, as in walking or running

Answer:

- (a) Pons
- (b) Medulla oblongata
- (c) Forebrain
- (d) Cerebral cortex
- (e) Thalamus
- (f) Hypothalamus
- (g) Hind brain
- (h) Cerebellum

7. Observe the diagram of the human brain and identify the areas mentioned:

- (i) The area responsible for consciousness, intelligence, memory, imagination and reasoning.
- (ii) The area responsible for regulation and co-ordination of group movements of voluntary muscles.
- (iii) The area responsible for sleeping and respiration.
- (iv) The area responsible for reflexes involved in the regulation of heart beat, blood vessel contraction, breathing etc.



- (iii) Pons
- (iv) Medulla Oblongata

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SCIENCE LESSON 4 REPRODUCTION IN PLANTS

1. The method of reproduction in unicellular organisms like amoeba and bacteria in which they split into two equal halves and produce new ones is called _____

- a) fragmentation b) binary fission
c) budding d) spore formation

2. In sexual reproduction of following plants, the first event involved in this is _____

- a) fertilization b) germination
c) regeneration d) pollination

3. Which of the following statement is true ?

- a) Thin/walled non-motile spores are called zoospores.
b) A motile asexual spore produced by some algae, bacteria and fungi are Akinetes.
c) **Uninucleate, non-motile, asexual spores produced by fungus are called conidia.**
d) Thick-walled vegetative cells produced by algae during adverse conditions are called aplanospores.

4. The fertilized ovary is a fruit. The fruit that develops from a single flower with multi carpellary, apocarpous superior ovary is _____

- a) **Aggregate fruit** b) Composite fruit
c) Simple fruit d) Multiple fruit

5. If a water soaked seed is pressed, a small drop of water comes out through the _____

- a) stomata b) lenticels c) **micropyle** d) radicle

6. The mango fruits is called a stone fruit because it has _____

- a) skinny epicarp b) stony mesocarp

c) fleshy endocarp d) **hard endocarp**

7. Pick out the wrong statement.

- a) In a dicot seed there is a short longitudinal whitish ridge called the raphae.
b) The minute opening in a dicot seed is known as micropyle.
c) **The rudimentary stem portion is known as radicle.**
d) The rudimentary root portion is called radicle.

8. Consider the following statement regarding the dispersal of fruits and seeds by wind and select the correct answer.

- a) Fruits and seeds are dispersed with a sudden jerk by an explosive mechanism.
b) **The fruits of tridax carry a persistent calyx modified into pappus.**
c) The fruits of xanthium have sharp pointed stiff hooks.
d) The mesocarp of coconut is fibrous.

9. The product of triple fusion which acts as nutritive tissue for the development of an embryo is _____

- a) zygote b) placenta c) scutellum d) **endosperm**

10. The disadvantage of self-pollination is _____

- a) There is no wastage to pollen grains
b) **The seeds are less in number**
c) Self-pollination is sure in bisexual flowers
d) Flowers need not depend on agents of pollination.

11. The flower is important to a plant because it helps in _____

- a) attracting b) production of nectar
c) pollination d) **sexual reproduction**

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SCIENCE LESSON 4 REPRODUCTION IN PLANTS

12. The essential organs of the flower are _____

- a) Calyx Corolla b) **Androecium and Gynoecium**
 c) Calyx and Androecium d) Corolla and Gynoecium

13. Cross pollination is important for producing _____

- a) new varieties of plants b) plants with better growth
 c) disease resistant plants d) **all of above**

14. Anemophily occurs in _____

- a) Vallisneria b) **Grass** c) Coconut d) Datura

15. Which of the following structure / arrangement favour entamophily ?

- a) Pollen grains with wings and feathery stigma
 b) **Colourful petals and nectar secretion**
 c) A bunch of flowers with less pollen
 d) Pollen grains with mucous covering.

16. Post-fertilization, the ovule changes into a / an _____

- a) **seed** b) fruit c) endosperm d) pericarp

17. Which of the following is correctly matched ?

- a) False fruit – mango b) Multiple fruit – apple
 c) **Aggregate fruit – polyalthia** d) Caryopsis - banana

18. Identify the mismatched pair.

- a) Legume – Dry dehiscent fruit
 b) Cypsela – Dry indehiscent fruit
 c) Pome – Fleshy fruit d) **Regma – Resembles legume**

19. A seed dispersed by wind is called _____

- a) Autochory b) **Anemochory** c) Hydrochory
 d) Zoochory

20. These are all schizocarpic fruit

- a) Legume, Follicle, Capsule b) Berry, Hesperidium, Pome
 c) **lometum, cremocarp, regma**

21. The integuments of the Ovule develop into

- a) Ovary b) **Seed Coat** c) Egg d) Seed

22. Which is the female reproductive part of a flower ?

- a) Calyx b) Corolla c) Androecium, d) **Gynoecium**

PART – B

1. Write any two differences between asexual and sexual modes of reproduction.

S. No	Asexual Reproduction in plants	Sexual Reproduction in plants
1	Asexual mode of reproduction takes place in lower group of organisms.	Sexual mode of reproduction takes place in higher group of organisms.
2	It takes place by means of spores.	It takes place by means of fusion of male gamete and female gamete
3	In lower plants like Algae, fungi etc. complex reproductive structures are not formed.	In higher plants like flowering plants. flowers are the special reproductive structures to carry out pollination, fertilization etc.

2. What is vegetative propagation? Mention the vegetative propagules in: i) Bryophyllum ii) Spirogyra

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SCIENCE LESSON 4 REPRODUCTION IN PLANTS

Vegetative propagation is the ability of multicellular plants to reproduce by bringing forth new plants from the existing vegetative structures without sexual reproduction.

(i) In Bryophyllum – Buds produced in the notches along the leaf margin.

(ii) In Spirogyra – Fragments of plant body.

3. Arrange the following events of sexual reproduction in plants in the correct sequential order:

Seed formation, pollination, dispersal of seeds, fertilization.

1	2	3	4
Pollination	Fertilization	Seed Formation	Dispersal of seeds

4. Define pollination.

The transfer of pollen grains from the anther to the stigma of the flower, is called Pollination. Pollen grains are transferred mainly by wind, water, insects and animals and they are called as pollinating agents.

5. Define fertilization.

The fusion of a male gamete with a female gamete (egg) is known as fertilization. The fertilized egg is known as zygote which develops into an embryo.

6. Name the agents of pollination in the following cases:

i) Bright coloured flowers with scent and nectar glands.

ii) No colour / scent / nectar but pollen grains are dry, light weight and powders. Stigma is feathery.

Also mention the plants in cases (i) & (ii).

(i)	Pollination by Insects is called	Pollination by insects – in beans, peas, drumstick.
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	entomophily.	
(ii)	Pollination by wind is called Anemophily.	Pollination in wind – in brass, pine, paddy.

7. Name the events (i) & (ii) and mention the nature of the nuclear structures formed at the end in the following cases:

(i) male gamete (n) + egg (n) = Zygote (2n)

(ii) male gamete (n) + secondary nucleus (2n) = Endosperm nucleus (3n),

(i) Fertilization – The nuclear structure (Zygote) formed by this process is diploid (2n) in nature and it develops into embryo.

(ii) Triple fusion – The nuclear structure (endosperm) formed by this process is Triploid (3n) in nature.

8. Differentiate dehiscent fruits and indehiscent fruits with suitable examples.

S. No	Dry Dehiscent fruits	Dry Indehiscent fruits
1	Dry dehiscent fruits split open at maturity to liberate the seeds.	Dry indehiscent fruits do not split open at maturity and the seeds are liberated by the decaying of pericarp.
2	These fruits are further divided into 3 types namely (i) Legume (Beans)	These fruits are further divided into 4 types namely (i) Achene (clematis) (ii) Caryopsis (Paddy)

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(ii) Follicle (Calotropis) and (iii) Capsule (cotton/lady's finger)	(iii) Cypsel (Tridax) (iv) Nut (cashew nut)
---	---

9. What are monocotyledons and dicotyledons? Give example.

On the basis of the number of cotyledons in the seeds, the angiosperms are divided as follows:

- (i) Mono cotyledons: Seeds with one cotyledon (seed leaf) are called mono cotyledone. e.g. Paddy, maize, wheat onion.
- (ii) Dicotyledons: Seeds with two cotyledons (speed leaf) are called Dicotyledons. e.g. Pea, beans, gram, castor.

10. Give suitable terms for the following methods of seed / fruit dispersal, with one example each: (i) by wind (ii) by water (iii) b y animals.

- (i) Dispersed of fruit / seeds by wind is called Anemochory e.g. Calotropin, morings.
- (ii) Dispersal of fruits/seeds by water is called Hydrochory e.g. Lotus, coconut.
- (iii) Dispersal of fruits by animals is called Zoochory e.g. Xanthium, Achyranthus

11. Give any two examples for each of the following cases where dispersal of fruits and sees take place (i) by birds (through excreta) (ii) by human beings.

- (i) Dispersal of seeds by birds (through excreta) e.g. Guava, tomato, neem, peepal etc.
- (ii) Dispersal of seeds by human beings.

e.g. Cinchona, Rubber, Eucalyptus.

12. What is double fertilization?

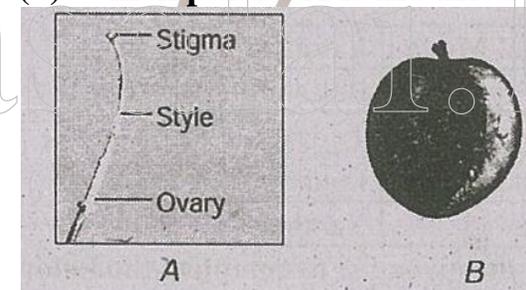
In angiosperms, the process involving the fusion of one male gamete with egg to produce a zygote (2n) and the fusion of another male gamete with the secondary nucleus to produce endosperm (3n). This process is known triple fusion.

13. What is triple fusion?

In Angiosperms during fertilization. one haploid male gamete (n) fuses with the secondary nucleus which is diploid (2n) in nature and results in the formation of a triploid primary endosperm (3n). This process is known triple fusion.

14. (a) Identify Fig. A and B

(b) Which part of A is modified into B.



(a) Fig 'A' shows the female parts of a flower i.e. gynoecium and 'B' is one type fruit.

(b) Ovary is modified into fruit (after fertilization)

15. The methods of reproduction and organisms are given below. Match the type of reproduction with the suitable organism.

Fission	Spirogyra	Yeast
Budding	Protozoans	Flatworms
Fragmentation	Bryophyllum	Acteria.

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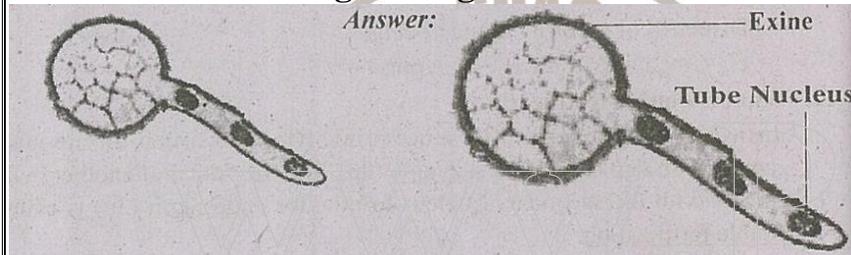
SCIENCE LESSON 4 REPRODUCTION IN PLANTS

Fission	Spirogyra	Yeast
Budding	Bryophyllum	Yeast
Fragmentation	Spirogyra	Flatworms

16. (i) Composite fruits are formed by all the flowers of____
 (ii) _____ fruit is developed form a single flower with a multicarpellary apocarpous superior ovary.

(i). Whole Inflorescence. (ii) Aggregate.

17. Draw the give diagram and label the following parts:



18. Match the following with respect to dispersal of fruits/seeds:

(a) Autochory	(I) Lotus
(b) Anemochory	(II) Xanthium
(c) Hydrochory	(III) Tridax
(d) Zoochory	(IV) Balsam

S.No	Dispersal Mode	Examples
1	Autochory	Balsam
2	Anemochory	Tridax
3	Hydrochory	Lotus
4	Zoochory	Xanthium

19. Use words from the given list to complete the following paragraph. (The words may be used once / more than once / not at all).

(seed, fruit, pollination, dispersal, germination, fertilization, flower, reproduction)

Ramu went to the field along with his father. He sowed mustard seeds in the soil. After a few days he observed the process of _____. The seeds grew into plans and produced _____. On maturity, these flowers produced pollen grains that were transferred to the stigma by _____. The male gametes fused with female during the process of _____.

1. Germination 2. Flower 3. Pollination 4. Fertilization
 20. Coconut seeds are dispersed by Hydrochory (dispersal by water). Mention the part of the fruit whose modification help in this mechanism.

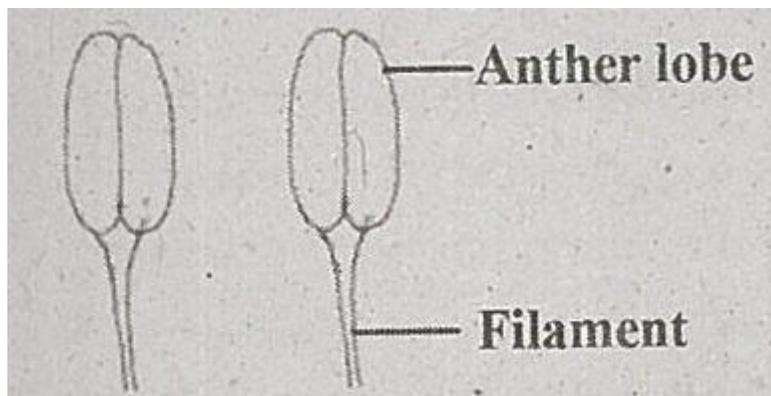
Fruits like coconut have outer coat that are modified to enable them to float (as they are water proof, salt resistant and buoyant).

The mesocarp of coconut is fibrous which is easily carried away by water currents.

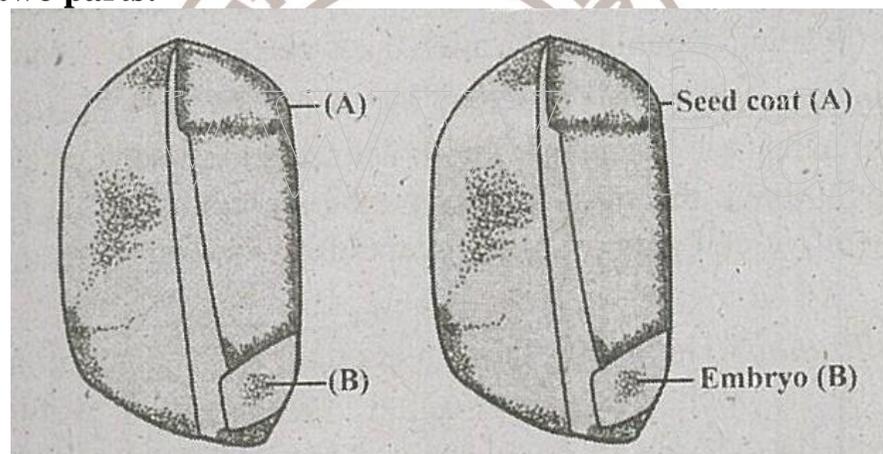
21. Draw and label any two parts of the anther.

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SCIENCE LESSON 4 REPRODUCTION IN PLANTS



22. Draw the given diagram of paddy seed and label any two parts:



23. In balsam plant the seeds fall off far away from the mother plant.

(a). Is the statement correct or incorrect?

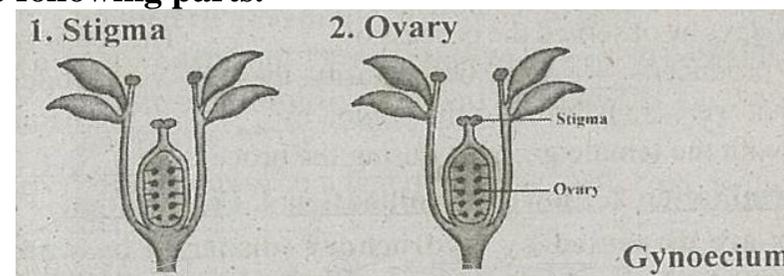
Yes, this statement is correct.

(b) Give reason. (i) Though there are no wing like structure (or) pappus hairs to disperse the seeds by wind, An active

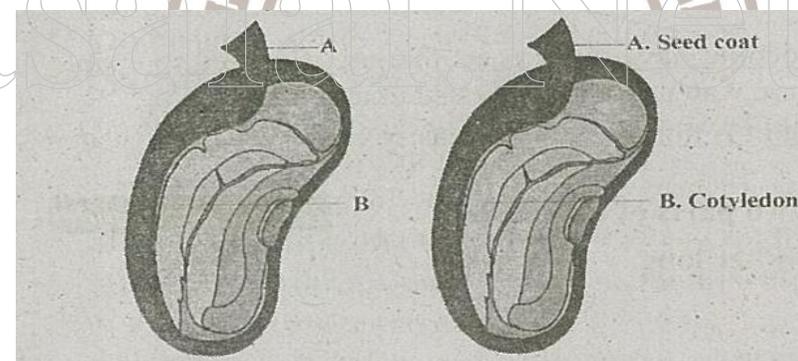
mechanism named Autochory enables the self dispersal of fruits and seeds in balsam plant.

(ii) The balsam fruit burst with a sudden jerk and disperse the seeds by an explosive mechanism.

24. This diagram shows the gynoecium of flower Label the following parts.



25. Label the parts A and B.



PART – B

- (i) Name the process by which a fruit is developed.
- (ii) Explain the development process in brief.
- (iii) Draw a neat, labeled diagram of that process.

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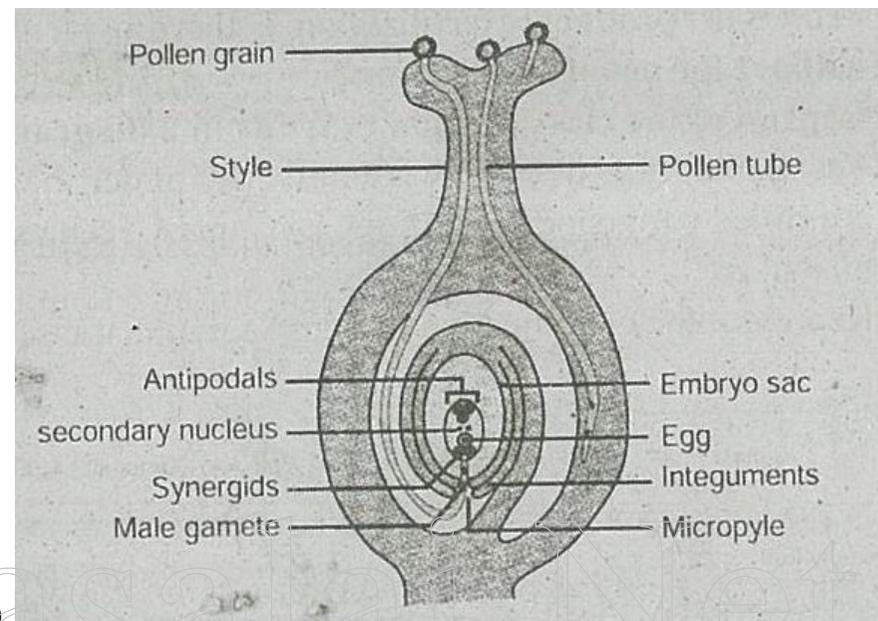
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Answer: (a) Fertilization Double fertilization takes place in higher plants in higher plants.

(b) Germination of pollen grains: As soon as the pollen grain falls on a suitable stigma, it starts germinating with its two cells. The vegetative cell develops through the style as a long tube known as pollen tube and the generative cell gets into the tube and divides into two male gametes.

Process of fertilization: The pollen tube enters the embryo sac through micropyle and bursts open releasing two gametes. One of these gametes fuses with the egg. The fusion of a male gamete with egg is known as fertilization. The fertilized egg is known as zygote which develops into embryo.

Double Fertilization: The other male gamete fuses with secondary nucleus and forms triploid endosperm nucleus. This is called triple fusion. The endosperm tissue formed is the nutritive tissue for the embryo. The process of fusion of male gamete with egg and the other gamete with secondary nucleus is known as double fertilization.



(c) 2. Write the two events involved in the sexual reproduction of following plant:

- Discuss the first event and write the types.
- Mention the advantages and the disadvantages of that event.

Answer: The sexual reproduction in flowering plants involves.

- Pollination
- Fertilization

(a) Pollination: Transfer of pollen grains from the anther to the stigma is called Pollination. Pollen grains are transferred mainly by wind, water and insects. They are called as pollinating agents.

Pollination is of two types. They are

- Self pollination
- Cross pollination

(b) Advantages of self pollination:

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- (i) Self pollination is certain in bisexual flowers.
- (ii) Flowers need not depend on agents of pollination.
- (iii) There is no wastage of pollen grains.

Disadvantages of self pollination:

- (i) The seeds are less in number.
- (ii) Endosperm is minute. Therefore, the seeds produce weak plants.
- (iii) New varieties of plants cannot be produced.

Advantages of cross pollination:

- (i) Cross pollination leads to the production of new varieties.
- (ii) More viable seeds are produced.

Disadvantages of cross pollination:

- (i) Cross pollination takes place by chance only.
- (ii) Flowers need to depend on agents.
- (iii) There is a lot of wastage of pollen grains.

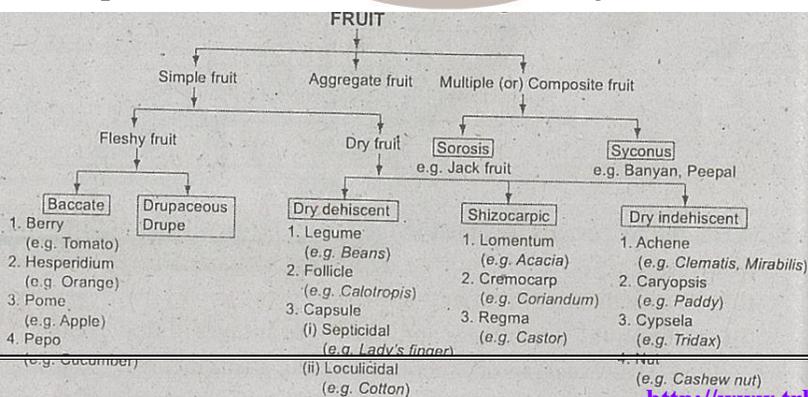
3. (i) Fruit is the product of fertilization. Is there any fruit which is formed without the act of fertilization?

(ii) Represent the classification of fruits in a diagrammatic sketch.

Answer: (i) Yes. Some fruits develop without the act of fertilization, such fruits are called parthenocarpic Fruits. Examples:

Seedless grapes, guava, mango etc.

(ii) Represent the classification of in a diagrammatic sketch.



4. Compare aggregate fruits with multiple fruits and give suitable examples:

Sl. No	Aggregate Fruit	Multiple or composite fruit
1.	It is developed from a single flower with multicarpellary, apocarpous and superior ovary.	It is formed by all the flowers of whole inflorescence and give a single fruit.
2.	It is not further divided into different types.	It is further divided into two different types namely Sorosis and Syconus.
3.	Each free carpel develops into a fruitlet. Hence, the aggregate fruit has a cluster of fruitlets attached to a common stalk (e.g) Polyalthia.	Sorosis: In jack fruit, the rachis (inflorescence axis) and other floral parts of the female inflorescence fuse together forming a composite fruit.
4.	In <i>Annona squamosa</i> (custard apple), the margin of the carpels are united and appears like a single fruit.	Syconus: (e.g) banyan, people, fig, etc. It is derived from a special type of inflorescence known as hypanthodium which has a fleshy receptacle.
5.	Generally the carpels are developed into edible parts in aggregate fruits.	In multiple fruits, the perianth which is bag like represents edible fruit e.g. jack fruit. (or) The receptacle becomes fleshy

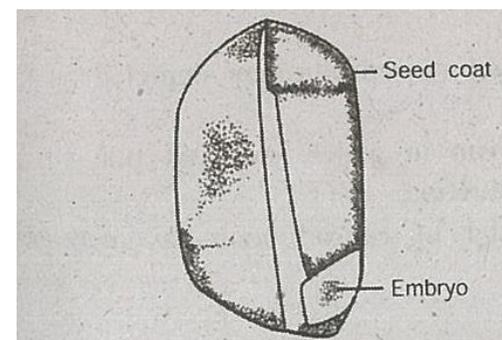
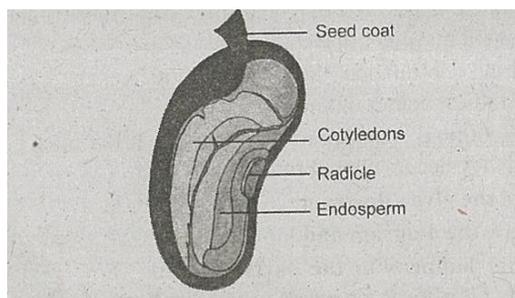
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SCIENCE LESSON 4 REPRODUCTION IN PLANTS

and juicy and forms the edible portion (e.g) banyan, peepal.

5. Describe the structure of dicot seed



Answer:

- In paddy, the so called seed is actually a fruit.
- It is a simple indehiscent one seeded fruit known as caryopsis.
- The seed coat is very thin.
- The fruit wall (Pericarp) is thin and fused with the seed coat.
- The fruit is covered by yellowish bract and bracteole called chaff.
- The embryo has a single cotyledon called scutellum and a short axis.
- The lower part of the axis is called radical and the upper part is called plumule.
- Radicle is covered by coleorrhiza (root sheath) and the plumule is covered by coleoptiles.
- During germination, the coleorrhiza pierces the base of the seed and the radical comes out next.

Structure of a dicot see (bean):

- The seed is bulky, oval and slightly indented on one side.
- There is short longitudinal, whitish ridge called the raphe.
- At one end of the raphe there is a minute opening known as germ pore or micropyle.
- The embryo is enclosed by the seed coat.
- It consists of cotyledons attached to the primary axis which has rudimentary root portion known as plumule.
- The tip of the radical projects outside and is nearer to the micropyle.
- The plumule is placed between the two cotyledons and consists of a short axis, and a small bud having two tiny folded leaves.

6. Describe the structure of a monocot seed (Paddy).

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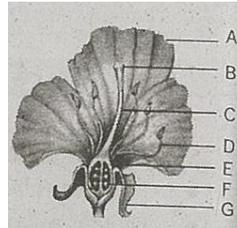
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- Adventitious roots are formed from the lower most nodes of the stem and they become the fibrous system later.

7. Observe the given diagram:

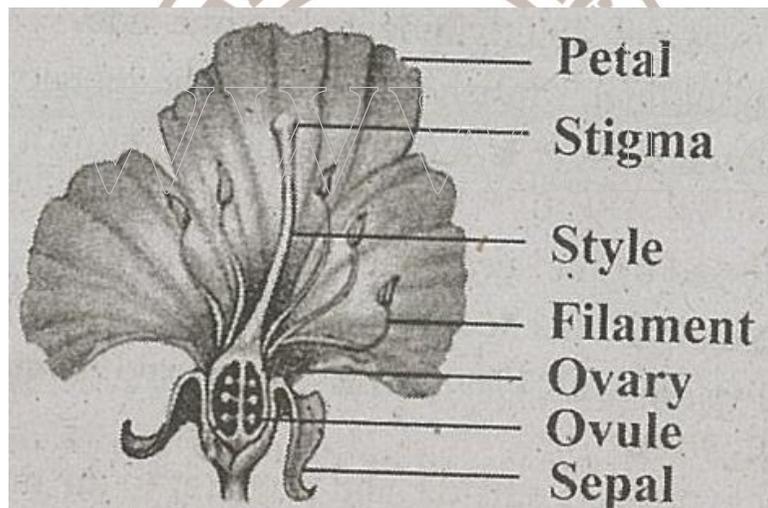
- Draw the diagram and label the parts.
- What happens to the parts labeled 'E' 'F', after the process of fertilization?



and

Answer:

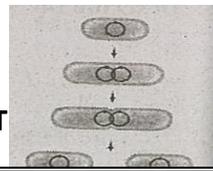
(i)



- Part – E is ovary and it develops into fruit after fertilization.
Part – F is ovule and it becomes the seed after fertilization.

8. Look at the diagram given below:

Answer the following:



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- Name the method of reproduction depicted here.
- Name an organism in which you find this method of reproduction.
- Does this method of reproduction favour variation?

Answer:

- Binary fission in bacteria
- Unicellular organisms like Bacteria and Amoeba.
- No. This method of reproduction does not favour variation.

9. Imagine you have a garden with the plants listed

below. A swarm of bees visit your garden. Do you think the bees will visit all the flowers? Name the flowers which you think the bees will be attracted to. Give reasons to substantiate your answer.

(Jasmine, Nerium, Gulmohar, Rose, Lotus, Corn, Sugarcane, Bamboo, Chrysanthemum, Dahlia, Grass, Cocount and Peas)

Answer: The bees are attracted to the following flowers

1. Jasmine, 2. Nerium, 3. Gulmohar, 4. Rose, 5. Lotus, 6. Chrysanthemum, 7. Dahlia, 8. Peas.

Reasons:

- The different colours of the flowers attract the bees and the cross pollination is facilitated in flowers such as Rose, Nerium, Lotus, Chrysanthemum, Gulmohar etc.

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- (ii) Based on the presence of UV, blue and green receptors in their eyes, bees are attracted mostly by yellow, white, blue and purple flowers.
- (iii) They are attracted by the large sized flowers like Lotus, Dahlia, Rose etc.
- (iv) Nectar rich flower such as Peas. Rose etc attract the bees.
- (v) Bees are attracted by the sweet smell of the flowers like Rose, Jasmine.
- (vi) Certain structural pattern of petals (single row of petals as in Dahlia, standard petals of peas, ray florets of chrysanthemum) attract the bees.

10. A farmer has two fields A and B. He cultivates peas (*Pisum sativum*) in both the fields. Field A is covered with nets to keep out birds and insects. Field B is left uncovered.

- (i) Name the type of pollination that would occur in field 'A' and field 'B'.
- (ii) Which of these fields will give a higher yield?
- (iii) To raise the next crop, from which field should the seeds be chosen by the farmer. Give reason to support your answer.

Answer:

- (i) In field A. Self pollination would occur (as it covered with nets) In field B, Cross pollination by insects (entomophily) would take place (as it is left uncovered).

- (ii) Field – B where cross pollination takes place, will give higher yield.
- (iii) Seeds can be chosen from field – B because of the following advantage.

Advantages:

1. The seeds produced as a result of cross pollination, develop and germinate properly and grow into better plants.
2. Cross pollination leads to the production of new desirable varieties.
3. The seeds thus produced are more viable.

11. Mango and Coconut are both drupes. The mesocarp of mango is edible, while it is not so in coconut. Based on this fact, answer the following:

- (i) Which part of the coconut is edible?
- (ii) Why does the coconut have a fibrous mesocarp?
- (iii) Can you mention any other use of the fibrous mesocarp?

Answer:

- (i) The endosperm tissue of coconut is edible.
- (ii) The mesocarp of coconut is fibrous in order to facilitate the dispersal of fruit by water (Hydrochory). It helps the fruit to float in water and to be easily carried away by water current.
- (iii) The fibrous mesocarp is the source of coir which is used in making Ropes, Mats, Carpets etc.

12. Group the Following under the given heads: (a) fruit (b) seed (c) neither fruit nor seed.

- tomato, cucumber, sprouted pulses, naked bean, grapes, celery, potato, sugarcane, apple, runner bean.

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Classification

Fruit	Seed	Neither fruit nor seed
1. Tomato	1. Sprouted	1. Celery
2. Cucumber	2. Naked Bean	2. Potato
3. Grapes		3. Sugarcane
4. Apple		
5. Runner Bean		

13. Ramu and Somu happened to observe Calotropis seeds floating in the air. They decided to follow a few of them till the seeds landed on the ground. They recorded their observations in a table as follows:

Distance travelled by seed in metre	Time taken in minutes
25	6
50	15
37	10
87	17
17	2

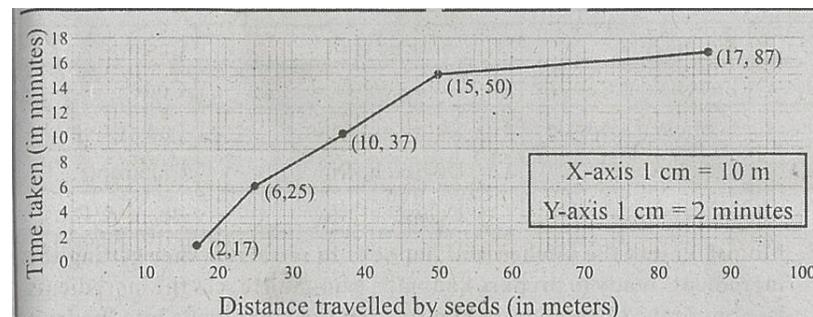
(i) Draw a graph for the above data taking Distance on 'X' axis and Time on 'Y' axis.

(ii) Is there any relationship between the distance travelled and the efficiency of dispersal?

(iii) State the inference you draw from the graph.

Answer:

(i) Seed dispersal graph



(ii) Yes, There is a clear relationship between the distance travelled and

the efficiency of the dispersal of seeds. More the distance travelled by seeds, more is the efficiency of dispersal.

(iii) Inference

1. The graph shows that the distance travelled by the seeds and the time taken by them are directly proportional.

2. The seed which landed on the shortest distance (17 metres in 2 minutes) might be heavy weighted seeds or they might have lesser feathery hairs.

3. The seed which travelled the farthest distance (87 metres in 17 minutes) might be with abundant feathery hairs (Which could have kept it floating in air for longer time)

4. Thus the less weighted seeds with abundant feathery hairs are dispersed efficiently.

14. Given below is a list of dry fruits. Assign the fruits to their relevant types. (Cotton, Tridax, Paddy, Castor, Coriander, Beans, Peas, Calotropis, Mirabilis, Cashew, Acacia, Lady's finger)

(i) Achene

(ii) Caryopsis

(iii) Cypsela

(iv) Nut

(v) Cremocarp

(vi) Lomentum

(vii) Regma

(viii) Loculicidal

(ix) Septicidal

Capsule

capsule

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(x) Follicle (xi) Legume

Classification of fruits

S. No	Type of fruit	Based on nature of pericarp	Example
1.	Achene	Dry indehiscent fruit	Mirabilis
2.	Caryopsis	Dry indehiscent fruit	Paddy
3.	Cypsela	Dry indehiscent fruit	Tridax
4.	Nut	Dry indehiscent fruit	Cashew
5.	Cremocarp	Schizocarpic fruit	Coriander
6.	Lomentum	Schizocarpic fruit	Acacia
7.	Regma	Schizocarpic fruit	Castor
8.	Loculicidal Capsule	Dry Dehiscent fruit	Cotton
9.	Septicidal Capsule	Dry Dehiscent Fruit	Lady's finger
10.	Follicle	Dry Dehiscent fruit	Calotropis
11.	Legume	Dry Dehiscent fruit	Beans & Peas

15. Monish enters the kitchen and happens to see his mother getting the ingredients ready to prepare kadamba sambar. He sees the ingredients laid out in the kitchen. Help him sort out the ingredients into the fruit types you have studied. (dhal, tamarind, brinjal, tomato, drumsticks, coriander, mustard, lady's finger, mango)

S. No	Example	Based on nature of pericarp	Type
1.	Dhal	Dry dehiscent fruit	Legume
2.	Tamarind	Schizocarpic fruit	Lomentum
3.	Brinjal	Fleshy fruit (Baccate)	Berry

4.	Tomato	Fleshy fruit (Baccate)	Berry
5.	Drum Stick	Dry dehiscent fruit	Septicidal Capsule
6.	Coriander	Schizocarpic fruit	Cremocarp
7.	Mustard	Dry Dehiscent fruit	Siliquea
8.	Lady's finger	Dry dehiscent fruit	Septicidal Capsule
9.	Mango	Fleshy fruit (Drupaceous)	Drupe

16. Name the parts of a dicot seed based on the given clues:

- Rudimentary root _____.
- Rudimentary shoot _____.
- Fleshy structure storing food for the embryo _____.
- The outer protective layer of a seed is _____.
- The minute opening seen in the seed coat is _____.

Answer:

- Radicle
- Plumule
- Cotyledon
- Seed coat
- Micropyle (or) Germ Pore

17. What are the types of pollination? Which among them is more advantageous? Why?

Answer: Types of Pollination

Pollination is of two types. They are: 1. Self pollination 2. Cross pollination

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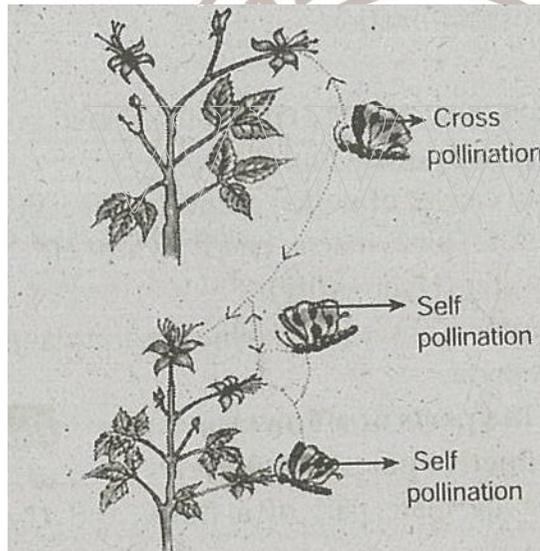
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Cross pollination (Allogamy)

The transfer of pollen grains of a flower to the stigma of another flower of a different plant of the same species is called cross pollination or allogamy. Cross pollination is more advantageous because of the following reasons.

Advantages of cross pollination

- (i) The seeds produced as a result of cross pollination, develop and germinate properly and grow into better plants, i.e. cross pollination leads to the production of new varieties.
- (ii) More viable seeds are produced.



18. What is self-pollination? Mention its merits and demerits.

Self Pollination (Autogamy)
Self pollination is also known as autogamy. The transfer of pollen grains from the another of a flower to the stigma of the same flower or another or another flower of the same plant is

known as self pollination.

Advantages of self pollination

- (i) Self pollination is certain in bisexual flower.
- (ii) Flowers do not depend on agents for pollination.
- (iii) There is no wastage of pollen grains.

Disadvantages of self pollination

- (i) The seeds are less in number.
- (ii) The endosperm is minute. Therefore, the seeds produce weak plants.
- (iii) New varieties of plants cannot be produced, resulting in the degradation of the plant.

19. What is known as pollination? List out biotic and abiotic factors which are involved in pollination?

(i) Pollination

The transfer of pollen grains from the another to stigma of a flower is called pollination. Pollen grains are transferred mainly by wind, water, insects and animals. They are called pollinating agents.

Biotic factors

Pollen grains are transferred by the following biotic factors namely.

- (i) Pollination by Insects (Entomophily). Insects such as butterflies, honey bees and wasps are the effective pollinators.
- (ii) Pollination by Birds (Ornithophily). Birds like humming bird, sun bird, flower peckers are effective cross pollinating agents.
- (iii) Pollination by Animals (Zoophily). Animals like squirrels, bats, ants etc carry out cross pollination.

Abiotic factors

The Non living things such as wind and water help in pollination.

- (i) Pollination by wind (Anemophily).

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Wind is the main carrier of pollen grains to effect cross pollination in plants such as grass, pine, maize, paddy, wheat etc.

- (ii) Pollination by water (Hydrophily).

Pollination by water is observed in some aquatic plants like Vallisneria, Hydrilla and Zosteria.

20. Calyx, Corolla are the parts of a flower.

- (a) Give the reproductive parts of a flower.

Androecium is the male part of a flower, and Gynoecium is the female part.

- (b) State the process involved in sexual reproduction.

The sexual reproduction in flowering plants involves

- (i) Pollination (ii) Fertilization

- (c) Fruit is a ripened ovary classify the following fruits.

- (i) Cotton/Lady's finger (ii) Paddy (iii) Castor

- (i) Cotton/Lady's finger - Dry dehiscent fruits

(Cotton-Loculicidal capsule Lady's finger-Septicidal capsule)

- (ii) Paddy - Dry indehiscent fruit

(Caryopsis)

- (iii) Castor - Schizocarpic fruit

(Regma)

21. (a) Define fertilization.

The fusion of a male gamete (pollen) with egg (ovule) is known as fertilization.

- (b) What are the post fertilization changes?

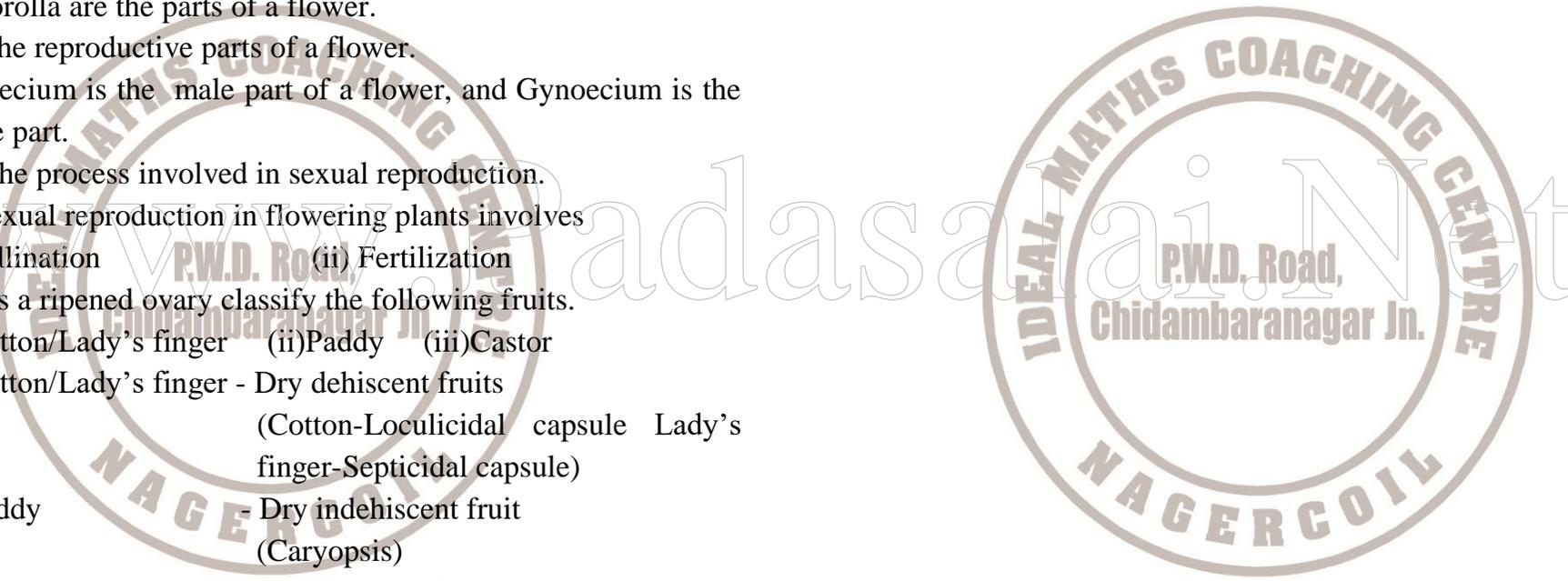
- (i) The ovule develops into seed.

- (ii) The integuments of the ovule develop into seed coats.

- (iii) The ovary enlarges and develops into fruit.

- (c) What are Parthenocarpic fruits?

Some fruits develop without the act of fertilization. Such fruits are called Parthenocarpic fruits. e.g. seedless grapes, guava, mango etc.



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SCIENCE

LESSON 9. SOLUTION

CLASS:X

One Marks

1. The process of food assimilation by man is in the form of **solution**.
2. **Blood, Lymph** are in the form of solution to decide the physiological activity of human beings.
3. A solution is a **homogeneous mixture** of two or more substances.
4. All solutions exist in **homogeneous** form.
5. If a solution contains two components, then it is called a **Binary solution**.
6. An example for a binary solution is **salt solution. (or) sugar solution**.
7. The component present in **lesser** amount by weight is called **solute**.
8. The component present in a **larger** amount by weight is called **solvent**.
9. A **solvent** is a dissolving medium.
10. Solute + solvent → **solution**.
11. Based on the **particle size** of the substance, the solution are divided into **3 types**.
12. **Sugar in water** is a example for True solutions.
13. Colloidal solutions is a **heterogeneous** mixture.
14. The substance distributed as particles is called **dispersed phase**.
15. The continuous phase in which the colloidal particles are dispersed is called **dispersion medium**.
16. Dispersed phase + Dispersion medium → **colloidal solution**
17. **Milk** is a example for colloidal solution.
18. Suspension is a **heterogeneous** mixture of small **insoluble** particles in a solvent.
19. An example for suspension is **chalk powder in water**.
20. In **suspension** the particles of **solid stay in clusters**.
21. The phenomenon by which **colloidal** particles **scatter light** is called **Tyndall effect**.
22. When sunlight passes through window of the class rooms its path is visible due to scattering of light. This is an example for **Tyndal effect**.
23. The phenomenon by which the colloidal particles are in continuous random motion is called **Brownian motion**.
24. Brownian motion is named in honour of **Robert Brown**.
25. An example for Brownian motion is the motion of the particles in **suspension of pollen grains in water**.
26. $1 \text{ \AA} = 10^{-10} \text{ m}$
27. **True** solution is **not visible** even under ultra microscope.
28. **Colloidal solution** scatters light.
29. The size of the particles of the True, colloidal & suspension solutions are respectively. **1 \AA to 10 \AA , 10 \AA to 2000 \AA , more than 2000 \AA**.
30. Based on the type of solvent solutions are classified into **2 types**.
31. The solution in which **water** acts as a solvent is called **aqueous solution**.
32. An example for aqueous solution is **sugar solution. (or) salt solution**.
33. The solution in which any liquid **other than water** acts as a solvent is called non **aqueous solution**.

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IDEAL MATHS COACHING CENTRE, 192, PWD Road, NAGERCOIL. 9843322969**SCIENCE****LESSON 9. SOLUTION****CLASS:X**

34. **Benzene (or) ether (or) CS₂** is the example for non aqueous solvent.
35. **Solution of sulphur in CS₂** is an example for non-aqueous solution.
36. Based on the amount of solute in the given solution, solutions are classified in to **3 types**.
37. **In the unsaturated solution**, addition of solute is possible till the solution reaches the point of saturation.
38. In saturated solution ***no more solute*** can be dissolved.
39. An example of saturated solution is saturated solution of **CO₂ in H₂O**.
40. In a saturated solution **36 g of NaCl** can be dissolved in 100 ml of water at room temperature.
41. In nature **Nitrogen in earth soil** is an example for saturated solution.
42. Based on the physical state of the solute and the solvent the solutions are of **9 types**.
43. An example for gas in solid is **cork**.
44. Smoke is an example for **solid in Gas**.
45. A solution containing **low concentration** of solute is known as dilute solution.
46. A solution containing **high concentration** of solute is known as concentrated solution.
47. Dilute and concentrated solutions are relative terms and they have only **quantitative** meaning.
48. An example of dehydrating agent is **anhydrous calcium chloride**. (absorbs moisture)
49. Solubility of a solid = $\frac{\text{Weight of solute}}{\text{Weight of solvent}} \times 100$
50. The solubility of ionic compounds NaBr, NaI, NaNO₃ are respectively **95g, 184g, 92g**.
51. **Temperature, Nature of solute (or) solvent & pressure** are affecting factors of solubility.
52. The increase in temperature, solubility **increases**.
53. In exothermic process, solubility **decreases** with increase in temperature.
54. Solubility of **KNO₃ increases** with the increase in temperature.
55. Solubility of **CaO decreases** with increase in temperature.
56. A polar compound dissolves in **polar** solvent.
57. A polar compound is **less soluble (or) insoluble** in a non polar solvent.
58. **Effect of pressure** is observed only in the case of gases.
59. **Water** is an example for polar solvent.
60. **Common salt** is an example for **Polar compound**.
61. An **increase** in pressure increases the solubility of a gases, given by Henry's law.
62. An example of effect of pressure is **CO₂ gas** is filled in soft drinks.
63. **Dust particles** scatter the light making the path of light visible in the room.
64. Robert Brown is a **biologist**.
65. Solubility of CuSO₄ in H₂O is **20.7grams at 20° C**.
66. **Helium – oxygen mixture** , used for deep sea diving.
67. Earth soil cannot store more **Nitrogen**.

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SCIENCE**LESSON 9. SOLUTION****CLASS:X**

1. A true solution is a homogeneous mixture of solute and solvent . Chalk powder in water is a heterogeneous mixture. Is it a true solution?

Answer: No. It is not a true solution. Chalk powder in water is a suspension.

2. Solution that contains water as the solvent is called aqueous solution. If carbon disulphide is a solvent in a solvent in a given solution, then the solution is called..... (aqueous solution, non-aqueous solution)

Answer: Non-aqueous solution

3. Solubility of common salt 100g water is 36g. If 20g of salt is dissolved in it how much is required to attain saturation.

Answer: 16g of salt is required to attain saturation.

4. If two liquids are mutually soluble, they are called----- liquids. (miscible, immiscible)

Answer: Miscible

5. When sunlight passes through window of the classroom its path is visible. This is due to Of light. (Reflection, scattering)

Answer: Scattering

6. The particles various forms are visible only under an ultra-microscope. A solution containing such particles is called----- (true solution, colloidal solution)

Answer: Colloidal solution

7. The number of compounds in a binary solution are is---- (one/two)

Answer: Two

8. The mixture of gases use by deep sea divers is (Helium-oxygen, Oxygen-Nitrogen, Helium-Neon, Neon-oxygen)

Answer: Helium-oxygen

9. Soil cannot store more nitrogen than it can hold. Hence earth soil is referred to be in a state of ----- (saturation, unsaturation)

Answer: Saturation

10. In an endothermic process, solubility increases with ----- temperature. (increases, decreases)

Answer: Increase

11. Aquatic species are more comfortable in cold water because-----

- (i) As the temperature decreases, the solubility of dissolved oxygen increases.
- (ii) As the temperature increases, the solubility of dissolved oxygen increases.
- (iii) As the temperature increases, the solubility of dissolved oxygen decreases.

Answer: (i) As the temperature decreases, the solubility of dissolved oxygen increases.

12. When sunlight passes through the window of your house, the dust particles scatter the light making the path of the light visible. This phenomenon is called as (Brownian motion, Tyndall effect, Raman Effect, Uniform motion)

Answer: Tyndall effect

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SCIENCE**LESSON 9. SOLUTION****CLASS:X**

13. ----- is opaque in nature. (Water, True solution, Colloids, Suspension)

Answer: Suspension

14. The size of particles in true solution is-----

(10Å to 1000Å , 1Å to 10Å , more than 1000Å , Less than 1000Å)

Answer: 1Å to 10Å

15. The solubility of Sodium Nitrate in water is-----(92g , 184g , 95g , 36g)

Answer: 92g

16. Which of the following is a true solution-----

(Milk, Salt in carbon di sulphide, Blood, Sugar solution)

Answer: Sugar solution.

Part-B

1. From the table given below, furnish your points of interference

Substance	Solubility at 25°C
NaCl	36g
NaBr	95g
NaI	184g

Answer:

• At 25°C , in each 100g of water, 36g of NaCl, 95g of NaBr and 184g of NaI are dissolved respectively so as to get their saturated solutions.

• The solubility of NaCl is the least and that of NaI is the most.

• Solubility is in the following order $\text{NaCl} < \text{NaBr} < \text{NaI}$

2. Distinguish between the saturated and unsaturated solutions using the data give below at a temperature of 25°C .

SNo	16g NaCl in 100g of Water	36g NaCl in 100g of water
1	16g NaCl in 100g of water is an unsaturated solution	36g NaCl in 100 g of water is a saturated solution at 25°C
2	At 25°C , it contains lesser amount of solute than the maximum amount that can be dissolved.	At 25°C , it contains the maximum amount of solute that can be dissolved.
3	20g of sugar can be further dissolved in this solution at 25°C	No more solute can be further dissolved at 25°C
4	This solution becomes, saturated if the required solute is added further.	This solution becomes supersaturated if the excess solute added, is dissolved by heating the solution.

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SCIENCE**LESSON 9. SOLUTION****CLASS:X****3. Differentiate true solution and colloidal solution and suspension**

Property	True solution	Colloidal solution	Suspension
Particle size in Å (1Å = 10 ⁻¹⁰ m)	1Å to 10Å	10Å to 2000Å	More than 2000Å
Appearance	Transparent	Translucent	Opaque
Visibility of particles	Not visible even under ultra microscope	Visible under ultra microscope	Visible to the naked eye
Nature	Homogeneous	Heterogeneous	Heterogeneous
Diffusion of particles	Diffuses rapidly	Diffuses slowly	Diffusion does not occur
Scattering effect	Does not scatter light	Scatters light	Does not scatter light

4. You have prepared a saturated solution of sugar. Is it possible to dissolve some more grams of sugar to this solution? Justify your stand.

Answer: **No.** it is not possible to dissolve some more grams of sugar in a saturated solution because the solution contains already the maximum amount of the solute it can hold at the temperature.

5. Find the concentration of solution in terms of weight percent if 20gms of common salt is dissolved in 50gm of water:

Weight of common salt (solute) = 20g

Weight of Water(solvent) = 50g

Weight percentage = $\frac{\text{Weight of the solute}}{\text{Weight of solute} + \text{Weight of solvent}} \times 100$

$$= \frac{20}{20 + 50} \times 100$$

$$= \frac{20}{70} \times 100 = \frac{200}{7}$$

$$= 28.57\% \quad (28.6\%)$$

6. Valli took some common salt, naphthalene balls, camphor, baking soda and washing soda. She attempted to dissolve these substances either in water or in acetone. Complete the table with the expected results.

Substance	Medium in which it dissolve	Reason
a. Common salt		
b. Naphthalene balls		
c. Camphor		
d. Baking soda		
e. Washing soda		

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	Substance	Medium in Which it is soluble	Reason
a	Common salt	Water	A polar compound (common salt) dissolves in a polar solvent(water)
b	Naphthalene balls	Acetone	A non polar compound (Naphthalene balls) dissolves in a non-polar solvent (Acetone)
c	Camphor	Acetone	A non polar compound (camphor) dissolves in a non polar solvent(Acetone)
d	Baking soda	Water	A polar compound (Baking soda) dissolves in a polar solvent(water)
e	Washing soda	Water	A polar compound (Washing soda) dissolves in a polar solvent(water)

7. (i) Which gas is dissolved in soft drinks?
(ii) What will you do increase the solubility of this gas?

Answer:

- (i) Carbondioxide (CO₂)
(ii) I will increase the pressure inside the bottle so as to increase the solubility of CO₂ gas.

8. Beaker A has sugar mixed with water and beaker B has starch dissolved in water:

- (i) Which solution will scatter light?
(ii) In which beaker does the Brownian movement take place?
(iii) Name the type of solution that beaker A and beaker B contain.
(iv) Which of the two solutions is homogeneous?
(v) Identify the beaker that has particles of size 10^Å to 2000^Å

Answer:

- (i) Beaker- B- having starch dissolved in water.
(ii) In Beaker-B
(iii) Beaker –A contains true solution
Beaker – B contains colloidal solution
(iv) Sugar solution in Beaker – A is homogeneous
(v) Beaker – B has colloidal solution with particles of size 10^Å to 2000^Å

9. Name the type of solution formed in the following cases:

- (i) 20g of NaCl in 100g of Water **Ans:** Unsaturated solution
(ii) 36g of NaCl in 100g of water **Ans:** Saturated solution
(iii) 45g of NaCl in 100g of water at 80°C. **Ans:** Supersaturated solution
(iv) Sulphur dissolved in CS₂. **Ans:** Non aqueous solution
(v) Nitrogen is soil. **Ans:**Saturated solution.

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SCIENCE**LESSON 9. SOLUTION****CLASS:X**

10. Give the dispersed phase and the dispersion medium in each of the following

a. Cheese**b. soda water****c. smoke**

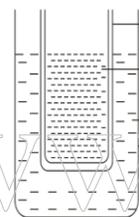
S.No	Example	Dispersed phase	Dispersed medium
1	Cheese	Liquid(Water)	Solid(solid particles of milk)
2	Soda water	Gas(CO ₂)	Liquid (Water)
3	Smoke	Solid(soot particles)	Gas(Air)

11. Radha prepared a solution which could be separated by filtration.

- Name the type of solution.
- Is the solution transparent or opaque?
- Mention the nature of the solution
- Mention the size of the solute particle.

Answer:

- Suspension
- Opaque
- Heterogeneous
- More than 2000Å



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12. In the above case, Sekar observed that the water turned sweeter after sometime. Explain the reason for the same.

Answer:

Sugar particles (which may range from 1Å to 10Å) diffuse easily into the beaker through the pores of the pot till the solution becomes homogeneous.

11. Beaker "A" has chalk powder mixed with water and beaker "B" has protein dissolved in water.

- Which solution shows Brownian movement?
- Identify the solution that has particle size greater than 2000Å
- Which beaker contains colloidal solution?
- Mention the size of the particle present in beaker B.
- Say whether colloidal solution is homogeneous or heterogeneous

Answer:

- Beaker – B (protein dissolve in water in a colloidal solution)
- Beaker- A (Chalk powder mixed with water is suspension)
- Beaker- B (Protein dissolved in water)
- Beaker- B with particles of size 10Å to 2000Å
- Colloidal solution is Heterogeneous

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SCIENCE**LESSON 9. SOLUTION****CLASS:X**

12. Justify the following statements with an explanation:

- (i) Solubility of calcium oxide decreases with increase in temperature.
- (ii) What happens to the solubility in exothermic process with regard to temperature.
- (iii) In endothermic process, solubility increases with increase in temperature
- (iv) At a given temperature, increase in pressure increases the solubility of the gas.

Answer:

- (i) Mixing calcium oxide (CaO) in water is an exothermic process and so the solubility of CaO decreases with increase in temperature.
- (ii) In exothermic processes, the solubility of a substance decreases with increase in temperature.
- (iii) Mixing KNO₃ in water is an endothermic process and so its solubility increases with increase in temperature.
- (iv) According to Henry's law, at a given temperature the mass of gas dissolve in a fixed value of liquid is directly proportional to the pressure gas on the surface of the liquid.

13. Pollen grains have ceaseless, zigzag, continuous random motion when taken in a beaker containing water. Name the phenomenon and give the reason.

The phenomenon by which the colloidal particles are in continuous random motion is called Brownian motion.

e.g. Robert Brown observed the motion of the pollen particles in a suspension of pollen grains in water

Reason: It is due to unequal collision of the molecules of the dispersion medium (water) on the dispersed particles (pollen grains).

14. 20g of common salt is dissolved in 60g of water. Find the concentration of the solution in terms of weight percentage?

Weight of common salt= 20g; weight of water =60g

$$\begin{aligned} \text{Weight percentage} &= \frac{\text{Weight of the solute}}{\text{Weight of solute} + \text{Weight of solvent}} \times 100 \\ &= \frac{20}{60 + 20} \times 100 = 25\% \end{aligned}$$

15. Take 10g of common salt and dissolve it in 40g of the water. Find the concentration of solution in terms of weight percent.

$$\begin{aligned} \text{Weight percentage} &= \frac{\text{Weight of the solute}}{\text{Weight of solute} + \text{Weight of solvent}} \times 100 \\ &= \frac{10}{10 + 40} \times 100 = 20\% \end{aligned}$$

16. Common salt dissolves in water easily. Give reason.

Answer: A polar compound dissolves in polar solvent easily. Therefore common salt dissolves in water easily because the salt is a polar compound and Water Is a polar solvent.

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SCIENCE**LESSON 9. SOLUTION****CLASS:X**

17. 2g Potassium sulphate was dissolved In 12.5ml water. On cooling the first crystals appeared at 60°C. what is the solubility of Potassium sulphate in water at 60°C.

Weight of 12.5ml of water =12.5g

Weight of Potassium sulphate =2g

Solubility of potassium sulphate = $\frac{\text{Weight of } K_2SO_4}{\text{Weight of solvent}} \times 100$

Weight of solvent

= $\frac{2}{12.5} \times 100 = 16.67\%$

12.5

18. Complete the following

Solute	Solvent	Example
Solid		Alloys
Solid	Liquid	
Solid	Gas	
Solid	Solid	

Solute	Solvent	Example
Solid	Solid	Alloys
Solid	Liquid	Sugar solution/Salt solution
Solid	Gas	Smoke
Solid	Solid	Cheese

19. Match the following

Solute- solvent

Examples

Solid -liquid

Milk

Liquid -liquid

Helium-Oxygen

Gas -gas

Sugar solutions

Solid -liquid

Alloys

Answers:

Solute - solvent

Examples

Solid -liquid

Alloys

Liquid -liquid

Milk

Gas -gas

Helium oxygen mixture

Solid -liquid

Sugar solutions

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SCIENCE**LESSON 9. SOLUTION****CLASS:X**

20. Solubility of KNO_3 increases with increase in temperature but the solubility of CaO decreases with increase in temperature. Give reasons.

Effect of temperature: In endothermic process, solubility increases with increase in temperature.

E.g., Solubility of KNO_3 increases with the increase in temperature.

In exothermic process, solubility decreases with increase in temperature. E.g., Solubility of CaO decreases with increase in temperature.

21. Match the solution with examples.

Solid in solid - Cloud

Solid in gas - Cheese

Liquid in gas - Alloys

Liquid in solid - Smoke

Answers:

Solid in solid - Alloys

Solid in gas - Smoke

Liquid in gas - Cloud

Liquid in solid - Cheese

22. When the sunlight passes through the window of the class room, the path of the light is visible. What is this effect called? Give reasons.

Answers: This effect is called Tyndall effect.

Reason: The dust particles present in air scatter light making the path of the light visible.

23. Define Solubility.

Solubility of a solute in a given solvent at a particular temperature is defined as the number of grams of solute necessary to saturate 100g of the solvent at that temperature.

For example: Solubility of CuSO_4 in H_2O is 20.7g at 20°C

24. State Henry's law

Increase in pressure increases the solubility of gases. At a given temperature, the mass of gas dissolved in a fixed volume of liquid is directly proportional to the pressure of the gas on the surface of the liquid. This is called Henry's law.

25. Why does a soda bottle release froth when it is opened?

An increase in pressure increases the solubility of a gas in a liquid according to Henry's law.

When the bottle is opened, the pressure of CO_2 filled in it decreases and so the solubility of CO_2 decreases and in turn its volume increases suddenly pushing the froth.

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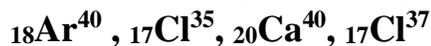
SCIENCE

LESSON 10. ATOMS AND MOLECULES

CLASS:X

Part A

1. From the given samples, form the pair of isobars:



Isotopes – ${}_{17}\text{Cl}^{35}$, ${}_{17}\text{Cl}^{37}$	Isobars- ${}_{18}\text{Ar}^{40}$, ${}_{20}\text{Ca}^{40}$
Same atomic number but different Mass number	Same mass number but different atomic number.

2. Molecular mass of nitrogen is 28. Its atomic mass is 14. Find the atomicity of nitrogen.

Molecular mass of nitrogen = 28g; Atomic mass of nitrogen = 14g

$$\text{Atomicity} = \frac{\text{Molecular mass}}{\text{Atomic mass}} = \frac{28\text{g}}{14\text{g}} = 2$$

$$\text{Atomicity of nitrogen} = 2$$

3. Gram molecular mass of oxygen is 32g. Density of oxygen is 1.429g/l. Find the gram molecular volume of oxygen.

Answer:

$$\text{GMV} = \frac{\text{Gram molecular mass}}{\text{Density of gas at STP}}$$

To find the value of GMV of oxygen

$$\frac{\text{GMM of O}_2}{\text{Density of O}_2} = \frac{32\text{g}}{1.429\text{g}} = 22.4 \text{ litre}$$

Therefore GMV = 22.4 litre at STP

4. 'Cl' represents Chlorine atom, 'Cl₂' represents Chlorine molecule. List out any two differences between atoms and molecules.

Answer:

ATOM	MOLECULE
An atom is the smallest particle of an element.	A molecule is the smallest particle of an element or a compound.
An atom is a non-bonded entity.	A molecule is a bonded entity.
An atom may or may not exist freely.	A molecule can exist freely.

5. Calculate the gram molecular mass of water from the values of gram atomic mass of hydrogen and oxygen. Gram atomic mass of hydrogen = 1g Gram atomic mass of oxygen = 16g

Answer: Gram molecular mass = sum of gram atomic mass of the elements

$$\begin{aligned} \text{Gram molecular mass of H}_2\text{O} &= 2(\text{H}) + 1(\text{O}) \\ &= 2 \times 1 + 1 \times 16 = 2 + 16 = 18\text{g} \end{aligned}$$

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LESSON 10. ATOMS AND MOLECULES

CLASS:X

6. One mole of any substance contains 6.023×10^{23} particles, If 3.0115×10^{23}

Answer: Number of particles in $\text{CO}_2 = 3.0115 \times 10^{23}$

$$\text{Number of moles} = \frac{\text{No. of molecules}}{\text{Avogadro Number}} = \frac{3.0115 \times 10^{23}}{6.023 \times 10^{23}} = 0.5 \text{ moles}$$

7. ----- have equal number of neutrons.

(i) Isobars (ii) Isotones (iii) Isotopes (iv) Mass number

Answer: (ii) isotones

8. Classify the following based on atomicity:

(i) Chlorine (ii) Neon (iii) Phosphorous (iv) Ozone

Answer:

S.No	Element	Atomicity	Classification
(i)	Chlorine	2	Diatomic molecule
(ii)	Neon	1	Monoatomic molecule
(iii)	Phosphorous	4	Polyatomic molecule
(iv)	Ozone	3	Triatomic molecule

9. Identify and correct the mistake in each of the following:

(i) The molar volume of gas at STP is 22.4 cm^3

(ii) $2 \times \text{R.M.M} = \text{V.D.}$

(iii) An atom cannot exist independently.

(iv) The ratio of atoms in a molecule may be integral or simple or may not be fixed.

(v) H_2O is a homo atomic molecule.

Answer:

(i) The molar volume of gas at STP is 22.4 litres.

(ii) $2 \times \text{Vapour Density (V.D)} = \text{Relative Molecular Mass (R.M.M)}$

(iii) An atom may (or) may not exist independently

(iv) The ratio of atoms in a molecule may be fixed and integral but may not be simple.

(v) H_2O is a hetero atomic molecule.

10. Give a single term substitute for each of the following:

(i) 6.023×10^{23} molecules

Ans: One Mole (Avogadro number)

(ii) 22.4 litres of gas at STP

Ans: Gram molar volume (GMV)

(iii) $1/2^{\text{th}}$ part of the mass of one atom of carbon

Ans: One atomic mass unit (1 amu)

(iv) The half of relative molecular mass

Ans: Vapour density (VD)

(v) Molecular mass/ atomic mass

Ans: Atomicity

11. Analyse the table and fill up the blanks

Gas	Number of moles	Mass of Gas
N_2	2 moles	-

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LESSON 10. ATOMS AND MOLECULES

CLASS:X

O ₂	-	320g
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Answer:

Gas	Number of moles	Mass of Gas
N ₂	2moles	56g
O ₂	10moles	320g

12. Analyse the table and fill in the blanks:

Gas	Atomic mass	Molecular mass	Atomicity
Ozone	16	48	-
Nitrogen	14	-	2

Answer:

Gas	Atomic mass	Molecular mass	Atomicity
Ozone	16	48	3
Nitrogen	14	28	2

13. Analyse the table and fill in the blanks:

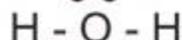
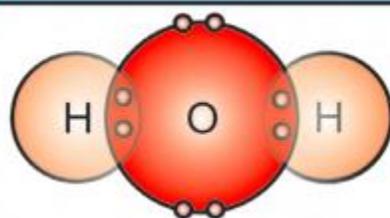
	Substance	Mass	No. of moles
(a)	Al	81g	-
(b)	Fe	-	0.5

Answer:

	Substance	Mass	No. of moles
(a)	Al	81g	3
(b)	Fe	28g	0.5

14. (i) Draw the molecule of water and name the elements

MOLECULE OF WATER



(ii) Name two examples for homoatomic molecules.

ii)(a) Hydrogen (H₂) (b) Oxygen (O₂)

15. Calculate the number of moles in 24.092×10^{22} molecules of water.

Number of mole = $\frac{\text{Number of molecules}}{\text{Avogadro Number}}$

Avogadro Number

$$= \frac{24.092 \times 10^{22}}{6.023 \times 10^{23}} = 0.4 \text{ moles}$$

$$6.023 \times 10^{23}$$

16. The value of Avogadro Number is-----(6.023×10^{22} , 6.023×10^{23} , 6.023×10^{-24} , 6.023×10^{24})

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LESSON 10. ATOMS AND MOLECULES

CLASS:X

Answer: 6.023×10^{23}

PART-B

1. Modern atomic theory takes up the wave concept, principle of uncertainty and other latest discoveries to give a clear cut picture about an atom. State the findings of modern atomic theory.

The findings of modern atomic theory are given as follows:

- (i) Atom is considered to be a divisible particle.
- (ii) Atoms of the same element may not be similar in all respects e.g: **Isotopes**($_{17}\text{Cl}^{35}$, $_{17}\text{Cl}^{37}$)
 - (iii) Atoms of different elements may be similar in some respects e.g: **Isobars**($_{18}\text{Ar}^{40}$, $_{20}\text{Ca}^{40}$)
 - (iv) Atom is the smallest particle which takes part in chemical reactions.
- (v) The ratio of atoms in a molecule may be fixed and integral but may not be simple. e.g: $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ is not a simple ratio (Sucrose)
- (vi) Atoms of one element can be changed into atoms of other element by **Transmutation.**
- (vii) The mass of an atom can be converted into energy. This is in accordance

with **Einstein's equation** $E=mc^2$

2. How will you establish the relation between vapour density and molecular mass of a gas by applying avogadro's law?

Answer:

(i) Relative Molecular Mass:

It is defined as the ratio of the mass of 1 molecule of the gas or vapour to the mass of 1 atom of hydrogen.

$$\text{Relative Molecular mass of a gas} = \frac{\text{Mass of 1 molecule of the gas or vapour}}{\text{Mass of 1 atom of Hydrogen}}$$

(ii) Vapour Density (V.D):

It is defined as the ratio of the mass of a certain volume of the gas or vapour to the mass of the same volume of hydrogen at the same temperature and pressure.

$$\text{V.D} = \frac{\text{Mass of 1 volume of gas or vapour}}{\text{Mass of 1 volume of hydrogen}}$$

Applying Avogadro's Law,

$$\text{V.D} = \frac{\text{Mass of 1 molecule of gas or vapour}}{\text{Mass of 1 molecule of hydrogen}}$$

Since hydrogen is diatomic,

$$\text{V.D} = \frac{\text{Mass of 1 molecule of gas or vapour}}{2 \times \text{Mass of 1 atom of hydrogen}}$$

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SCIENCE LESSON 10. ATOMS AND MOLECULES CLASS:X

2 XV.D=Mass of 1 molecule of gas or vapour

Mass of 1 atom of hydrogen

2 X V.D = relative molecular mass of a gas or vapour

2 X V.D =Relative molecular mass of a gas or vapour

3. Calculate the number of moles in:

(i) 12.046×10^{23} atoms of Copper

(ii) 27.95g of Iron

(iii) 1.51×10^{23} molecules of CO_2

Answer:

$$(a) \text{ No.of.moles} = \frac{\text{No.of atoms}}{\text{Avogadro number}} = \frac{12.046 \times 10^{23}}{6.023 \times 10^{23}} = 2 \text{ moles}$$

$$(b) \text{ No of moles} = \frac{\text{Mass}}{\text{Atomic mass}} = \frac{27.95}{55.9} = 0.5 \text{ moles}$$

$$(c) \text{ No.of moles} = \frac{\text{No.of molecules}}{\text{Avogadro number}} = \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}} = 0.25 \text{ moles}$$

4. Find the gram molecular mass of the following from the data given:

(i) H_2O (ii) CO_2 (iii) NaOH (iv) NO_2 (v) H_2SO_4

Element	Symbol	Atomic No	Mass No.
Hydrogen	H	1	1
Carbon	C	6	12
Oxygen	O	8	16
Nitrogen	N	7	14
Sodium	Na	11	23
Sulphur	S	16	32

Answer:

$$(i) \text{ Gram molecular mass of } \text{H}_2\text{O} = 2(\text{H}) + 1(\text{O}) \\ = 2(1\text{g}) + 1(16\text{g}) = 18\text{g}$$

$$(ii) \text{ Gram molecular mass of } \text{CO}_2 = 1(\text{C}) + 2(\text{O}) \\ = 1(12\text{g}) + 2(16\text{g}) \\ = 12\text{g} + 32\text{g} = 44\text{g}$$

$$(iii) \text{ Gram molecular mass of } \text{NaOH} = 1(\text{Na}) + 1(\text{O}) + 1(\text{H}) \\ = 1(23\text{g}) + 1(16\text{g}) + 1(1\text{g}) = 40\text{g}$$

$$(iv) \text{ Gram molecular mass of } \text{NO}_2 = 1(\text{N}) + 2(\text{O}) \\ = 1(14\text{g}) + 2(16\text{g}) \\ = 14\text{g} + 32\text{g} = 46\text{g}$$

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$$\begin{aligned} \text{(v) Gram molecular mass of } H_2SO_4 &= 2(H) + 1(S) + 4(O) \\ &= 2(1g) + 1(32g) + 4(16g) \\ &= 2g + 32g + 64g = 98g \end{aligned}$$

5. Complete the table given below:

Chlorine	Atomic mass	Molecular mass	Atomicity
Chlorine	35.5	71	-
Ozone	-	48	3
Sulphur	32	-	8

Answer:

Chlorine	Atomic mass	Molecular mass	Atomicity
Chlorine	35.5	71g	2
Ozone	16g	48 g	3
Sulphur	32	256g	8

6. Calculate the number of water molecules present in one drop of water which weighs 0.18g.

Answer: Given mass = 0.18g

Molecular mass $H_2O = 18g$

No. of particles = $\frac{\text{Avogadro Number} \times \text{Given mass}}{\text{Gram Molecular mass}}$

$$= \frac{6.023 \times 10^{23} \times 0.18g}{18g}$$

$$= 6.023 \times 10^{23} \times 10^{-2}$$

$$= 6.023 \times 10^{21} \text{ Molecules}$$

Therefore No. of water molecules in one drop = 6.023×10^{21} Molecules

7. Fill in the blanks using the given data: The formula of Calcium oxide is CaO. The atomic mass of Ca is 40, Oxygen is 16 and Carbon is 12.

(i) 1 mole of Ca(--g) and 1 mole of Oxygen atom (---g) combine to form ----mole of CaO (--g)

(ii) 1 mole of Ca (---g) and 1 mole of C(-----g) and 3 moles of Oxygen atom (-----g) combine to form 1 mole of $CaCO_3$ (-----g).

Answer:

(i) 1 mole of Ca(40g) and 1 mole of Oxygen atom (16g) combine to form 1 mole of CaO (56g)

(ii) 1 mole of Ca (40g) and 1 mole of C(12g) and 3 moles of Oxygen atom (48g) combine to form 1 mole of $CaCO_3$ (100g).

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LESSON 10. ATOMS AND MOLECULES

CLASS:X

8. How many grams are there in:

(i) 5moles of water

(ii) 2 moles of Ammonia

(iii) 2 moles of glucose

Answer:

(i) 5moles of water(H_2O) Molecular mass of H_2O = 18g

Mass=No.of moles x molecules

$$= 5 \times 18g=90g$$

(ii) 2moles of Ammonia (NH_3) Molecular mass of NH_3 =17g

Mass=No.of moles x molecules

$$= 2 \times 17g=34g$$

(iii) 2 moles of glucose($C_6H_{12}O_6$) Molecular mass of $C_6H_{12}O_6$ =180g

Mass=No.of moles x molecules

$$= 2 \times 180g=360g$$

9. Mole concept is introduced to express the quantity of a substance. If 90g of Water is taken in a beaker. Find the number of moles in it.

Mass of H_2O =90g

Molecular mass of water(H_2O):

Calculation:(2 x 1g) + 16g =18g

Molecular mass of water =18g

Number of moles= $\frac{\text{Mass}}{\text{Molecular Mass}}$ = $\frac{90}{18}$ = 5moles

10. (i) What are the differences between isotopes and isobars?

SNo	Isotopes	Isobars
1	Isotopes are the atoms of same element with same atomic number but different mass number	Isobars are the atoms of the different element with same mass number but different atomic number
2	Example Isotopes ($_{17}Cl^{35}$, $_{17}Cl^{37}$)	Example Isobars ($_{18}Ar^{40}$, $_{20}Ca^{40}$)

(ii) Complete the following:

2 x ----- = Relative molecular mass.

2 x Vapour density =Relative molecular mass.

(iii) Give examples for triatomic and polyatomic molecules.

Triatomic: Ozone(O_3) ; Polyatomic: Phosphorous (p_4), Sulphur (S_8)

11. Find the gram molecular mass of carbon di oxide{ where gram atomic mass of (carbon=12g, oxygen=16g)}

Gram molecular mass of $CO_2=(1 \times 12) + (2 \times 16)= 44g$

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LESSON 10. ATOMS AND MOLECULES

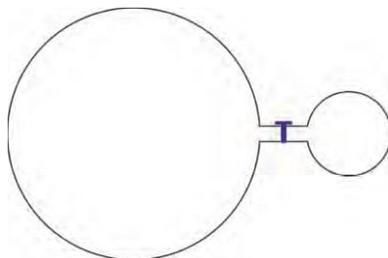
CLASS:X

PART-C

1. When ammonia reacts with hydrogen chloride gas, it produces white fumes of ammonium chloride. The volume occupied by NH_3 in glass bulb A is three times more than the volume occupied by HCl in glass bulb B at STP.

Capacity=67.2 litre

A (NH_3 gas)



Capacity=22.4 litre

B (1 mole of HCl gas)

- How many moles of ammonia are present in glass bulb A?
- How many grams of NH_4Cl will be formed when the stopper is opened?
(Atomic mass of $\text{N} = 14, \text{H} = 1, \text{Cl} = 35.5$)
- Which gas will remain after completion of the reaction?
- Write the chemical reaction involved in this process.

Answer:

(i) Volume occupied by 1 mole of $\text{NH}_3 = 22.4$ litre

No. of moles of $\text{NH}_3 = \frac{67.2 \text{ litre}}{22.4 \text{ litre}} = 3$ moles

ii) Gram Molecular mass of $\text{NH}_4\text{Cl} = 53.5$ g

$\text{NH}_4\text{Cl} = (1 \times 14) + (4 \times 1) + (1 \times 35.5)$
 $= 14 + 4 + 35.5 = 53.5$ g

iii) Ammonia (NH_3)

iv) $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$

2. Nitro glycerine is used as an explosive. The equation for the explosive reaction is



(Atomic mass of $\text{C} = 12, \text{H} = 1, \text{N} = 14, \text{O} = 16$)

- How many moles does the equation show for
(a) Nitroglycerine (b) gas molecules produced?
- How many moles of gas molecules are obtained from 1 mole of Nitroglycerine?
- What is the mass of 1 mole of nitroglycerine?

Answer:

(i) (a) 4 moles of nitroglycerine

(b) 19 moles of gas molecules

Gas molecules	CO_2	N_2	O_2	Total
No.	12	6	1	19

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LESSON 10. ATOMS AND MOLECULES

CLASS:X

ii) No of moles of gas obtained from 1 mole of Nitroglycerine

$$= \frac{19}{4} = 4.75 \text{ moles.}$$

4

(ii) Nitroglycerine



$$= (3 \times 12\text{g}) + (5 \times 1\text{g}) + [\text{NO}_3]_3$$

$$= (3 \times 12\text{g}) + (5 \times 1\text{g}) + [(3 \times 14\text{g}) + (9 \times 16\text{g})]$$

$$= 36\text{g} + 5\text{g} + [42\text{g} + 144\text{g}]$$

Therefore Mass of Nitroglycerine = **227g**

3. Sodium bi carbonate breaks down on heating:



(i) How many moles of sodium bi carbonate are there in the equation?

(ii) What is the mass of sodium bicarbonate used in this equation?

(iii) How many moles of carbon dioxide are there in the equation?

Answer:

(i) 2 Moles of NaHCO_3

(ii) Sodium bicarbonate = NaHCO_3

	Na	H	C	O
Atomic mass	23g	1g	12g	16g

$$= (1 \times 23\text{g}) + (1 \times 1\text{g}) + (1 \times 12\text{g}) + (3 \times 16\text{g})$$

$$= 23\text{g} + 1\text{g} + 12\text{g} + 48\text{g} = 84\text{g}$$

$$\text{mass of 1 NaHCO}_3 = \mathbf{84\text{g}}$$

Mass of sodium bicarbonate = Molecular mass x number of mole

$$= 2 \times 84\text{g} = 168\text{g.}$$

(iii) 1 Mole of CO_2

4. 40g of calcium was extracted from 56g of calcium oxide

(Atomic mass of Ca = 40, O=16)

(i) What mass of oxygen is there is 56g of Calcium oxide?

(ii) How many moles of oxygen atoms are there in this

(iii) How many moles of Calcium atoms are there in 40g of calcium?

(iv) What mass of calcium will be obtained from 1000g of calcium oxide?

Answer:

(i) Mass of Calcium oxide = 56g

Mass of Calcium extracted = 40g

Mass of Oxygen present in Calcium oxide = $56\text{g} - 40\text{g} = 16\text{g}$

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(ii) Mass of one mole of Oxygen = 16g

$$\begin{aligned} \text{No. of moles in 16g of O}_2 &= \frac{\text{Given mass}}{\text{Molecular mass}} \\ &= \frac{16\text{g}}{16\text{g}} = 1 \text{ mole} \end{aligned}$$

(iii) Mass of Calcium extracted = 40g

Atomic mass of Calcium = 40g

$$\begin{aligned} \text{No. of moles in 40g of Calcium} &= \frac{\text{Given mass}}{\text{Atomic mass}} \\ &= \frac{40\text{g}}{40\text{g}} = 1 \text{ moles} \end{aligned}$$

(iv) Mass of Calcium in 56g of Calcium oxide = 40g

$$\begin{aligned} \text{Mass of Calcium in 1000g Calcium oxide} &= \frac{40}{56} \times 1000 \\ &= 714.285 \text{ (or) } 714.29\text{g} \end{aligned}$$

5. How many grams are there in the following?

(i) 1mole of Chlorine molecule, Cl₂

(ii) 2moles of sulphur molecules, S₈

(iii) 4 moles of Ozone molecules, O₃

(iv) 2moles of nitrogen molecules, N₂

Answer

	Cl	S	O	N
Atomic mass	35.5	32	16	14

(i) Mass of Chlorine (Cl₂) = Molecular mass x No. of moles

$$= (2 \times 35.5) \times 1$$

$$= 71 \times 1 = 71\text{g}$$

(ii) Mass of Sulphur (S₈) = Molecular mass x No. of moles

$$= (8 \times 32) \times 2$$

$$= 256 \times 2 = 512\text{g}$$

(iii) Mass of Ozone (O₃) = Molecular mass x No. of moles

$$= (3 \times 16) \times 4$$

$$= 48 \times 4 = 192\text{g}$$

(iv) Mass of Nitrogen (N₂) = Molecular mass x No. of moles

$$= (2 \times 14) \times 2$$

$$= 28 \times 2 = 56\text{g}$$

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SCIENCE

LESSON 10. ATOMS AND MOLECULES

CLASS:X

6. Find how many moles of atoms are there in:

- (i) 2g of Nitrogen
- (ii) 23g of sodium
- (iii) 40g of Calcium
- (iv) 1.4g of Lithium
- (v) 32g of sulphur

Answer:

	N	Na	Ca	Li	S
Atomic mass	14	23	40	7	32

(i) No. of moles of Nitrogen = $\frac{\text{Mass}}{\text{Atomic mass}}$

$$= \frac{2\text{g}}{14\text{g}} = 0.143\text{mole}$$

(ii) No. of moles of Sodium = $\frac{\text{Mass}}{\text{Atomic mass}}$

$$= \frac{23\text{g}}{23\text{g}} = 1\text{mole}$$

(iii) No. of moles of Calcium = $\frac{\text{Mass}}{\text{Atomic mass}}$

$$= \frac{40\text{g}}{40\text{g}} = 1\text{mole}$$

(iv) No. of moles of Lithium = $\frac{\text{Mass}}{\text{Atomic mass}}$

$$= \frac{1.4\text{g}}{7\text{g}} = 0.2\text{mole}$$

(v) No. of moles of Sulphur = $\frac{\text{Mass}}{\text{Atomic mass}}$

$$= \frac{32\text{g}}{32\text{g}} = 1\text{mole}$$

IDEAL MATHS COACHING CENTRE, 192, PWD Road, NAGERCOIL. 9843322969**SCIENCE****LESSON 10. ATOMS AND MOLECULES****CLASS:X****7. Write applications of Avogadro's Law.**

- (i) It is used to determine the atomicity of gases.
- (ii) It is helpful in determining the molecular formula of gaseous compound.
- (iii) It establishes the relationship between the vapour density and molecular mass of a gas.
- (iv) It gives the value of molar volume of gases of STP.

Molar volume of a gas at STP=22.4 litre (or) 22400 cm³

- (v) It explains Gay Lussac's law effectively.

8. (a) Define relative atomic mass (Based on carbon scale)

Relative atomic mass of an element is the ratio of mass of one atom of element to the 1/2th part of mass of one atom of carbon.

$$\text{RAM} = \frac{\text{Mass of 1 atom of an element}}{1/12^{\text{th}} \text{ part of the mass of one atom of carbon}}$$

(b) Define Mole:

Mole is defined as the amount of substance that contains as many specified elementary particles as the number of atoms in 12g of carbon-12 isotope.

(c) What is the atomicity of oxygen?

$$\text{Atomicity of Oxygen} = \frac{\text{Molecular mass}}{\text{Atomic mass}} = \frac{32}{16} = 2$$

9. (a) When the mass of the substance is given:

$$\text{Number of moles} = \frac{\text{Given mass}}{\text{Atomic mass}} = \frac{81\text{g}}{27\text{g}} = 3 \text{ moles of aluminium}$$

b) Calculation of number of particles when the mass of the substance is given:

$$\text{Number of particles} = \frac{\text{Avogadro number} \times \text{given mass}}{\text{Gram molecular mass}}$$

Calculate the number of molecule in 11g of CO₂

$$\text{Solution: gram molecular mass of CO}_2 = 12\text{g} + (2 \times 16\text{g}) = 44\text{g}$$

$$\begin{aligned} \text{Number of molecules} &= \frac{6.023 \times 10^{23} \times 11\text{g}}{44\text{g}} \\ &= 1.51 \times 10^{23} \text{ molecules} \end{aligned}$$

Calculation of mass when number of particles of a substance is given:

$$\text{Mass of a Substance} = \frac{\text{gram molecular mass} \times \text{number of particles}}{6.023 \times 10^{23}}$$

(c) Calculate the mass of 18.069 x 10²³ molecules of SO₂

$$\text{Solution: Gram molecular mass SO}_2 = 32\text{g} + (2 \times 16\text{g}) = 64\text{g}$$

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$$\text{Mass of SO}_2 = \frac{64 \times 18.069 \times 10^{23}}{6.023 \times 10^{23}} = 192\text{g}$$

(d) Calculate the mass of glucose in 2×10^{24} molecules

Solution:

Gram molecular mass of glucose,

$$\text{C}_6\text{H}_{12}\text{O}_6 = (6 \times 12\text{g}) + (12 \times 1\text{g}) + (6 \times 16\text{g}) = 180\text{g}$$

$$\begin{aligned} \text{Mass of glucose} &= \frac{180 \times 2 \times 10^{24}}{6.023 \times 10^{23}} \\ &= 597.7\text{g} \end{aligned}$$

10. (a) **What are isotones?**

Isotones are the atoms of different elements with same number of neutrons.

Example: (${}_6\text{C}^{13}$, ${}_7\text{N}^{14}$)

(b) State Avogadro law:

Equal volumes of all gases under the same conditions of temperature and pressure contain an equal number of molecules.

(c) State Gay Lussac's law:

Whenever gases react, they do so in volumes which bear a simple ratio to one another and to the volumes of the gaseous products, provided all the volumes are measured under the same conditions of temperature and pressure.

Choose the correct answer

- Atom is derived from the Greek word-----
(a) **Atomos** (b) Atomos (c) Atomic (d) Atopheric
- modeled atoms as hard indivisible spheres.
(a) J.J. Thomson (b) Neil Bohr (c) **John Dalton** (d) Avogadro
- Atom is the smallest particle which takes part in----- reaction.
(a) Physical (b) **Chemical** (c) Spontaneous (d) Non-Spontaneous
- litres of any gas contains 6.023×10^{23} molecules.
(a) 22.24 (b) 22.04 (c) 22.42 (d) **22.40**
- Atoms of different elements with the same number of neutrons are called as-----
a) Isotopes (b) Isobars (c) **Isotones** (d) Isochores
- The atomicity of nitrogen and oxygen is -----
(a) **(2,2)** (b) (1,2) (c) (2,3) (d) (2,1)
- Gram molecular mass of O_2 is-----
(a) **32** (b) 23 (c) 33 (d) 20
- is a non-bonded entity.
(a) **Atom** (b) Molecule (c) Element (d) Compound
- Atomicity of Sulphur is-----
(a) 4 (b) 5 (c) 6 (d) **8**

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10. Amu is-----
 (a) **Atomic mass unit** (b) Atomic molecular unit (c) Atomic mass uses (d) Atomic mean unit
11. Atomos means-----
 (a) Divisible (b) **Indivisible** (c) Atomic (d) Atopheric
12. The uncertainty principle was given-----
 (a) De Broglie (b) Neil Bohr (c) **Heisenberg** (d) Avogadro
13. Atoms of the same element may not be similar in all respect. It is called as
 (a) Isobars (b) Isochore (c) **Isotopes** (d) Isotone
14. The molecular formula for sucrose is----- (a) $(C_{12}H_{20}O_{11})$ (b) $(C_{13}H_{20}O_{11})$
 (c) **$(C_{12}H_{22}O_{11})$** (d) $(C_{12}H_{22}O_8)$
15. The mass of an atom can be converted to-----
 (a) Volume (b) **Energy** (c) Weight (d) Nucleas
16. Relation between number of molecules and volume of gases was Given by-----
 (a) **Avogadro** (b) J.J. Thomson (c) John Dalton (d) Neil Bohr
17. ----- is the example for triatomic molecule
 (a) He (b) H_2 (c) **O_3** (d) P_4
18. Density of Oxygen is-----
 (a) 1.249 (b) 1.297 (c) **1.429** (d) 1.492
19. Atomicity of phosphorous is-----
 (a) 2 (b) 3 (c) **4** (d) 5
20. The maximum atomicity shown by carbon is -----
 (a) 4 (b) 6 (c) **60** (d) 180

1. Match the following:

- | | |
|---------------------------------------|----------------------------|
| i. Avogadro law | (a) Tri atomic |
| ii. NO | (b) Isotones |
| iii. ${}_6C^{13}, {}_7N^{14}$ | (c) $2 \times V.D$ |
| iv. Ozone | (d) Nitric oxide |
| v. Molecular mass | (e) Atomicity |
| vi. GMV | (f) Non-bonded |
| vii. Atom | (g) 44g |
| viii. Molecule | (h) 6.023×10^{23} |
| ix. CO_2 | (i) 22.4 litres |
| x. Avogadro number | (j) Exists freely |
| xi. Atom | (k) Isotopes |
| xii. ${}_{17}Cl^{35}, {}_{17}Cl^{37}$ | (l) $E=mc^2$ |
| xiii. Einstein's Equation | (m) Isobars |
| xiv. ${}_{18}Ar^{40}, {}_{20}Ca^{40}$ | (n) $C_{12}H_{22}O_{11}$ |
| xv. Sucrose | (o) Atomos |

Answer (i-e, ii-d, iii-b, iv-a, v-c, vi- I, vii-f, viii-j, ix- g, x-h, xi-o, xii-k, xiii-l, xiv-m, x-n)

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SCIENCE

LESSON 11 CHEMICAL REACTION

CLASS:X

Part A

1. $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$ The above reaction is an example of (i)Combination reaction (ii)Double displacement reaction (iii)Displacement reaction (iv)Decomposition reaction

Answer: (iii)Displacement reaction

2. A reddish brown coloured element 'X' on heating in air becomes black coloured compound 'Y'. X and Y are ----- and ----- (Cu, CuO/ Pb,PbO)

Answer: Cu/CuO

3. A student tests the pH of pure water using pH paper. It showed green colour. If a pH paper is used after adding lemon juice to water, what color will he observe? (Green/Red/Yellow)

Answer: Red

4. Chemical volcano is an example of ----- (Combination reaction/decomposition reaction)

Answer: decomposition reaction

5. When crystals of lead nitrate on heating strongly produces ----- gas and the colour of the gas is -----

Answer: Nitrogen dioxide (NO₂), Reddish brown

6. When aqueous solution of silver nitrate and sodium chloride are mixed, ----- precipitate is immediately formed. (White/yellow/red).

Answer: White

7. Aluminium can displace Zinc metal from aqueous solution of Zinc sulphate because----- (zinc is more reactive than aluminium/aluminium is more reactive than zinc).

Answer: Aluminium is more reactive than zinc.

8. To protect tooth decay, we are advised to brush our teeth regularly. The nature of the tooth paste commonly used is ----- in nature.

Answer: Basic

9. Vinegar is present in acetic acid. Curd contains----- (Lactic acid/ Tartaric acid)

Answer: Lactic acid

10. $pH = -\log_{10}[H^+]$. The pH of a solution containing hydrogen ion concentration of 0.001M solution is ----- (3/11/14)

Answer: 3

11. $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$ In this chemical reaction MnO₂ acts as MnO₂ (Reactant, product, Catalyst, Promoter)

Answer: Catalyst

12. For human blood the pH range is ----- to -----.

(4.5 – 6, 6.5-7.5, 7.35 -7.45, 4.4-5.5)

Answer: 7.35 – 7.45

13. Metal + Acid \longrightarrow Salt + -----.

(Oxygen, Water, Carbon, Hydrogen)

Answer: Hydrogen

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SCIENCE**LESSON 11 CHEMICAL REACTION****CLASS:X**

14. On heating the green colour copper carbonate changes into colour resulting in the formation of Copper oxide? (White, black, green, red)

Answer: Black

15. $\text{pH} + \text{pOH} = 14$, If the value of pOH of a substance is 3, its pH is (3, 11, 14, 1)

Answer: 11

Part B

1. What type of chemical reaction takes place when

(i) Limestone is heated? Explain

Decomposition reaction



Explanation: Since a single compound i.e. lime stone (CaCO_3) breaks down to produce two more substances namely CaO and CO_2 on heating, such a type of reaction is called decomposition reaction.

(ii) A Magnesium ribbon is burnt in air?

Combination reaction



2. The pH values of certain substances are give below?

	Substance	pH value
(i)	Human blood	7.4
(ii)	Baking soda	8.2
(iii)	Vinegar	2.5
(iv)	Household ammonia	12

Analyse the data in the above table and answer the following questions:

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(a) Which of the substances are acidic in nature?

Answer: (a) Vinegar.

(b) Which of the substances are basic in nature?

Answer: (b) Blood, baking soda, house hold ammonia.,

3. Why does the colour of Copper sulphate change when an iron nail is kept in it? Justify your Answer.

Blue colour of the Copper Sulphate solution changes in to green colour

(due to FeSO_4) and the iron nail acquires a brownish look. This change confirms that iron is more reactive than Copper and so iron displaces copper from CuSO_4 solute.



4. The hydroxyl ion concentration of a solution is 1.0×10^{-8} M. What is the pH of the solution?

Solution: $\text{pOH} = -\log_{10}[\text{OH}^-]$

$$\text{pOH} = -\log_{10}(1.0 \times 10^{-8})$$

$$\text{pOH} = -1 \times -8 = 8$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 8$$

$$\text{pH} = 6$$

5. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid is added to test tube A, while acetic acid is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube reaction occurs more vigorously and why?

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SCIENCE**LESSON 11 CHEMICAL REACTION****CLASS:X**

Answer: In test tube- 'A' the reaction occurs more vigorously

Reason: Hydrochloric acid is a strong mineral acid which is completely ionisable where as acetic acid is a weak organic acid which is partially ionisable.

6. Two acids 'A' and 'B' were kept in beakers, Acid 'A' undergoes partial dissociation in water whereas acid 'B' undergoes complete dissociation in water.

- Of the two acids 'A' and 'B', which is weak acid and which is strong acid?
- What is weak acid?
- What is strong acid?
- Give one example each.

Answer:

- Acid "A" is a weak acid.
Acid "B" is a strong acid.
- The acid which ionizes partially in water is a weak acid.
- The acid which ionizes completely in water in a strong acid.
- Weak acid – e.g. CH₃COOH(Acetic acid)
Strong acid – e.g.HCl (Hydrochloric acid)

7. Observe the given chemical change and answer the following:

- Identify 'A' and 'B'.
- Write the Commercial name of Calcium hydroxide.

(iii) Identify products 'C' and 'D', when HCl is allowed to react with calcium oxide.

(iv) Say whether calcium oxide is acidic or basic.

Answer:

- 'A' is CaCO₃(Calcium carbonate). 'B' is CO₂(Carbon-di-oxide)
- Slaked lime
- 'C' is CaCl₂ (Calcium chloride)
'D' is H₂O(Water)
- Calcium oxide is basic

Reason: Metal oxides when dissolved in water form bases.

8. Take copper nitrate in a test tube and heat it over the flame.

- What is the colour of cupric nitrate?
- What do you observe?
- Name the type of reaction that takes place.
- Write the balanced equation.

Answer:

- Deep blue colour
- Copper nitrate undergoes decomposition on heating and changes into copper oxide with the liberation of reddish brown gas (NO₂) And oxygen.
- Decomposition reaction



9. Identify the wrong statements and correct them.

- Sodium benzoate is used in food preservative.

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SCIENCE**LESSON 11 CHEMICAL REACTION****CLASS:X**

- (ii) Nitric acid is not used as fertilizer in agriculture.
- (iii) Sulphuric acid is called the king of chemicals.
- (iv) The pH of acid is greater than 7.
- (v) Acetic acid is used in aerated drinks.

Answer:

- (i) Correct statement
- (ii) Wrong statement

Corrected answer: Nitric acid is used in the production of Ammonium Nitrate which is used as a fertilizer in agriculture.

- (iii) Correct statement
- (iv) Wrong statement

Corrected answer: The pH of acid is lesser than 7.

- (v) Wrong statement

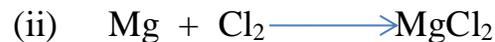
Corrected statement: Carbonic acid is used in aerated drinks.

10. Redox reactions are reactions during which electron transfer takes place. Here magnesium atom transfers two electrons one each to the two chlorine atoms.

- (i) What are the products of this reaction?
- (ii) Write the balanced equation for the complete reaction.
- (iii) Which element is being oxidized?
- (iv) Which element is being reduced?
- (v) Write the reduction part of the reaction.

Answer:

- (i) Magnesium ion (Mg^{2+}) and two chloride ions ($2Cl^-$)
(Formation of Magnesium chloride)



- (iii) Magnesium is oxidized.



(loss of electrons)

- (iv) Chlorine is reduced to $2Cl^-$



(gain of electron)

11. Suggest a reason for each observation given below.

- (i) In fireworks, powdered magnesium is used rather than magnesium ribbon.
- (ii) Zinc and dilute H_2SO_4 react much more quickly when a few drops of copper sulphate solutions are added.
- (iii) The reaction between magnesium carbonate and dilute hydrochloric acid speeds up when some concentrated HCl is added.

Answer:

- (i) Powdered Magnesium offers a large surface area for the reaction to occur at a faster rate.
- (ii) Copper sulphate acts a catalyst in the reaction (A catalyst speeds up the rate of reaction without itself undergoing any change in its mass and composition)
- (iii) The greater the concentration of the reactant, the greater is the rate of reaction and so concentrated HCl speeds up the reaction.

12. Sodium hydroxide and hydrochloric acid react as shown in this equation.

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- Which type of chemical reaction is this?
- The reaction is exothermic. Explain what that means.
- Differentiate exothermic reaction and endothermic reaction.
- What happens to the temperature of the solution as the chemicals react?

Answer:

- Neutralisation reaction.
- Since there is evolution of heat when sodium hydroxide reacts with hydrochloric acid, it is an exothermic reaction.
-

S.No	Exothermic reaction	Endothermic reaction
1	The chemical reaction which proceeds with the evolution of heat energy is called exothermic reaction.	The chemical reaction which proceeds with the absorption of heat energy is called endothermic reaction.
2	Example: $\text{N}_2 + 3\text{H}_2 \xrightarrow{+\text{Heat}} 3\text{NH}_3$	Example: $\text{NH}_3 + \text{Heat} \longrightarrow \text{N}_2 + 3\text{H}_2$

- In exothermic reaction, the temperature of the solution increases as the chemicals react.

13. Take two conical flasks.. Label them as I and II. Take a small amount of copper sulphate solution in the first conical flask. Take a small amount of granulated zinc in

the second conical flask. Allow the copper sulphate solution to react with the zinc.

- Name the type of reaction
- Say whether the metal zinc is more reactive or less reactive.
- Write the complete and balanced reaction.
- Say whether this change is reversible or irreversible.

Answer:

- The above reaction is an example for displacement reaction
- The metal zinc is more reactive than copper as it displaces Cu from

CuSO₄ solution



- The above mentioned reaction is irreversible because Cu is less reactive than Zn and so it cannot displace zinc from its salt(ZnSO₄).

14. Relate the information given in all the four columns of the table.

Compound	Chemical Formula	Chemical name	Use
1.Washing soda	CaOCl ₂	Calcium sulphate hemihydrate	For making statues
2.Baking soda	Na ₂ CO ₃	Sodium bicarbonate	Softening of hard water
3.Bleaching Powder	CaSO ₄ .1/2 H ₂ O	Sodium carbonate	For making cake

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4.Plaster of paris	NaHCO ₃	Calcium oxychloride	bleaching
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Answer:

Compound	Chemical Formula	Chemical name	Use
1.Washing soda	Na ₂ CO ₃	Sodium carbonate	Softening of hard water
2.Baking soda	NaHCO ₃	Sodium bi carbonate	For making cake
3.Bleaching Powder	CaOCl ₂	Calcium oxy chloride	Bleaching
4.Plaster of paris	CaSO ₄ .1/2 H ₂ O	Calcium sulphate hemihydrate	For making statues

15. When lead powder is added to copper chloride solution, a displacement reaction occurs and solid copper is formed.

- (i) Write the equation for the reaction.
 (ii) Why does the displacement reaction occur?

Answer:

(ii) A more reactive element displaces a less reactive element from its salt. Lead, being more reactive than copper, it displaces copper from copper chloride (CuCl₂) salt solution.

16. When zinc and copper (II) sulphate are together, the following redox reaction occurs:



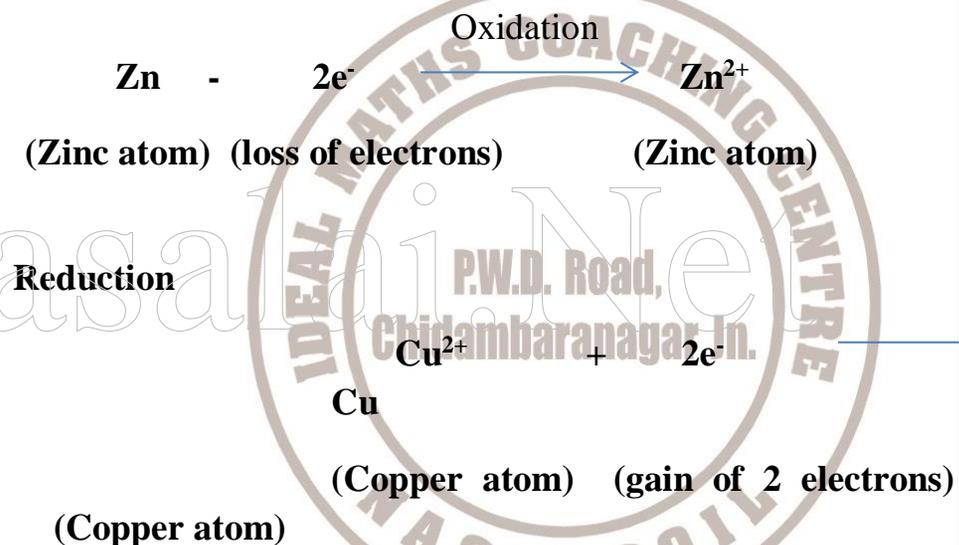
- (i) What does the word redox stands for?

- (ii) Show how electrons are transferred in the reaction.
 (iii) Write the ionic equation for the redox reaction.

Answer:

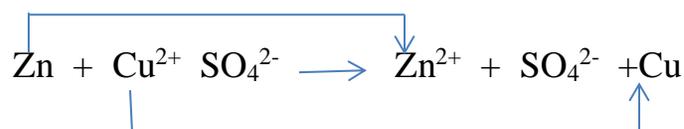
(i) A chemical reaction in which both oxidation and reduction takes place simultaneously is called redox reaction.

(ii) This reaction can be written in the form of ions as follows:



SO₄²⁻ is a very difficult to oxidise, so it remains unchanged.

- (iii) Loss of 2 electrons is Oxidation



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Gain of 2 electrons is Reduction

17. If a substance gains oxygen during a reaction, it is being oxidized, It is loses oxygen, it is being reduced. Oxidation and reduction always take place together, so that if one substance is oxidized, another is reduced. Using this idea, say which substance is oxidized and which substance is reduced in each reaction.



(s) (g) (s)



Answer:

(i) Mg is oxidized.

(ii) Zn is reduced and C is oxidized.

(iii) Fe is reduced and CO is oxidized.

(iv) Cr is reduced and Al is oxidized.

18. The hydrogen ion concentration of a solution 1×10^{-8} M

(i) What is the pH of the solution?

(ii) What is the pOH of the solution?

(iii) Is the given solution, acidic or basic?

Answer:

(i) $\text{pH} = -\log [\text{H}^+]$

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$$\text{pH} = -\log[1 \times 10^{-8}]$$

$$\text{pH} = -(\log_{10} 1 + \log_{10} 10^{-8})$$

$$= -(0 + \log_{10} 10^{-8})$$

$$= -(0 + 8)$$

$$= +8$$

$$\text{pH} = 8$$

$$(ii) \text{pH} + \text{pOH} = 14$$

$$\text{Therefore, pOH} = 14 - \text{pH}$$

$$= 14 - 8$$

$$\text{pOH} = 6$$

(iii) The given solution is basic in nature as the pH is greater than 7.

19. Read the redox reaction given below and answer the questions.



(a) Conversion of CuO in to Cu is called----- Reduction

(b) Conversion of H₂ in to H₂O is called-----Oxidation

20. The pH values of certain familiar substances are given below

Substance	pH value
House hold Ammonia	12
Water	7.0
Coffee	5.0
Lemon juice	2.4

Analyses the data in the above table and answer the following questions

(a) Which of the substances are acidic in nature?

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SCIENCE**LESSON 11 CHEMICAL REACTION****CLASS:X**

Coffee and lemon juice are acidic in nature.

(b) Which substances is basic in nature?

House hold ammonia is basic in nature.

21. (a) Identify the type of the following reaction to which it belongs:



Answer: Displacement reaction

(b) Can copper displace zinc or lead from their salt solutions? Give reason.

Answer: No, because copper is less reactive than zinc and lead.

22. The hydroxyl ion concentration of a solution is 1.0×10^{-9} M. What is the pH of the solution?

Solution:

$$\text{pOH} = -\log [\text{OH}^-]$$

$$\text{pOH} = -\log_{10}[1 \times 10^{-9}]$$

$$\text{pOH} = 9$$

$$\text{pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 9 = 5$$

23. Spot the error.

(i) A chemical reaction in which oxidation and reduction take place simultaneously is called double decomposition.

A chemical reaction in which oxidation and reduction take place simultaneously is called redox reaction.

(ii) $\text{Fe} + \text{CuSO}_4 \longrightarrow \text{Cu} + \text{FeSO}_4$, identify the type it belongs to,

Displacement reaction.

24. Match the following:

Source	Acid present
Lemon	- Lactic acid
Apple	- Tartaric acid
Grapes	- Citric acid
Curd	- Malic acid

Answer:

Source	Acid present
Lemon	- Citric acid
Apple	- Malic acid
Grapes	- Tartaric acid
Curd	- Lactic acid

25. Match the following:

- Displacement reaction** $-\text{CaCO}_3 \xrightarrow{\quad} \text{CaO} + \text{CO}_2$
- Double decomposition reaction** $-\text{H}_2\text{S} + \text{Cl}_2 \longrightarrow 2\text{HCl} + \text{S}$
- Decomposition reaction** $-2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$
- Combination reaction** $-\text{NaBr} + \text{AgNO}_3 \longrightarrow \text{AgBr} + \text{NaNO}_3$

Answer:

- Displacement reaction $-\text{H}_2\text{S} + \text{Cl}_2 \longrightarrow 2\text{HCl} + \text{S}$
- Double decomposition reaction $-\text{NaBr} + \text{AgNO}_3 \longrightarrow \text{AgBr} + \text{NaNO}_3$

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3. Decomposition reaction - $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
 4. Combination reaction - $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

26. Analyse the table and fill up the blanks

Indicator	Colour in acid	Colour in base
Litmus	-----	Red
Phenolphthalein	Colourless	-----

Answer:

Indicator	Colour in acid	Colour in base
Litmus	Red	Blue
Phenolphthalein	Colourless	Pink

27. The Hydroxyl ion Concentration of a solution is 1.0×10^{-4} M. Find the pH of the solution.

Solution:

$$\text{pOH} = -\log_{10}[\text{OH}^-]$$

$$\text{pOH} = -\log_{10}(1.0 \times 10^{-4})$$

$$\text{pOH} = 4$$

$$\text{Therefore, pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 4 = 10$$

28. The Hydroxyl ion Concentration of a solution is 0.001 M. What is the pH of the solution.

Solution:

$$\text{pH} = -\log_{10}[\text{H}^+]$$

$$\text{pH} = -\log_{10}(10^{-3})$$

$$= -(-3)\log_{10} 10$$

$$[\log 10=1]$$

$$\text{pH}=3$$

29. The Hydroxyl ion Concentration of a solution is 1.0×10^{-9} M. What is the pH of the solution? Predict Whether the given solution is acidic, basic or neutral

Solution:

$$\text{pH} = -\log_{10}[\text{H}^+]$$

$$\text{pH} = -\log_{10}(1.0 \times 10^{-9})$$

$$\text{pH} = -(\log_{10} 1.0 + \log_{10} 10^{-9}) \quad [\log_{10} 1 = 0] = -(0 - 9\log_{10} 10)$$

$$\text{pH} = -(0 - 9) = 9$$

$\text{pH} = 9$ (ie) $\text{pH} > 7$. Therefore the given solution is basic.

30. The Hydroxyl ion concentration of a solution is 0.001M. What is the pH of the solution?

Solution:

$$\text{pOH} = -\log_{10}[\text{OH}^-]$$

$$\text{pOH} = -\log_{10}(10^{-3})$$

$$\text{pOH} = 3$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{Therefore, pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 3 = 11$$

$$\text{pH} = 14 - 3 = 11$$

31. Write the uses of Baking soda (NaHCO_3).

Baking soda (NaHCO_3)

(i) It is used in making baking powder, Which is the mixture of baking soda and tartaric acid. Baking powder is used to make cake and bread soft and spongy.

(ii) It is an ingredient in antacid. Being alkaline, it neutralizes excess of acid in the stomach.

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Important Tables

S.No	Source	Acid present
1	Apple	Malic acid
2	Lemon	Citric acid
3	Grape	Tartaric acid
4	Tomato	Oxalic acid
5	Vinegar(food preservative)	Acetic acid
6	Curd	Lactic acid

S.No	Solution	pH value
1	Lemon juice	2.2 to 2.4
2	Tomato juice	4.1
3	Coffee	4.4 to 5.5
4	Human saliva	6.5 to 7.5
5	House hold ammonia	12.0
6	Pure rain water	7
7	Acid rain	<7

S.NO	pH in Human Body	pH value
1	Healthy human skin	4.5 to 6
2	Stomach fluid	2.0
3	Human blood	7.35 to 7.45
4	Ideal pH for blood	7.4
5	Normal saliva	6.5 to 7.5

6	pH prone to viral infections	6.5
7	pH prone to cancer	5.5
8	pH prone to tooth decay	5.5

S.No	Type of salt	Example
1	Normal salt	NaCl
2	Acid salt	NaHSO ₄
3	Basic salt	Pb(OH)Cl
4	Double salt	Potash alum

S.No	Type of salt	Formula
1	Washing soda	Na ₂ CO ₃
2	Baking Soda	NaHCO ₃
3	Bleaching powder	CaOCl ₂
4	Plaster of paris	CaSO ₄ .1/2 H ₂ O
5	Marble/Lime stone/stone	CaCO ₃
6	Burnt lime/Quick lime	CaO
7	Slaked lime	Ca(OH) ₂

11.CHEMICAL REACTIONS

One Mark

- Silver articles become tarnished due to the formation of **Ag₂S (Silver Sulphide)**.
- The chemical name of quick lime is **Calcium oxide (CaO)**.
- The chemical name of slaked lime is **Calcium hydroxide (Ca(OH)₂)**. (used for white washing)

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4. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$ this reaction is an example for **exothermic reaction.**
5. When lead nitrate reacts with potassium iodide the formation of yellow precipitate is **Lead iodide. (Both solutions are colour less)** ↑
6. $\text{CaCO}_3 + \text{dil. } 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ ↑
7. $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$
8. When CO_2 is passed through slaked lime, a milky white precipitate **CaCO₃ (Calcium Carbonate)** is formed.
9. The chemical name of marble is **CaCO₃ (Calcium Carbonate).** (shiny finish to the walls)
10. The substances taking part in the reaction are known as **reactants.**
11. All the chemical reactions are classified into **six broad** categories.
12. The chemical reaction in which two (or) more reactants form a single product is. Combination reaction. ($2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$)
13. New substances formed as a result of reaction are called **products.**
14. **Burning of Coal (Combustion of coal), combustion of hydrogen (formation of water)** is an example of combination reaction.
15. Burning of Mg ribbon is **combination** reaction.
16. $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$ CuCO_3 is **Green** colour and CuO is **black** colour..
17. In CuO (Copper II Oxide) Valency of Copper is **2.**
18. In Cu_2O (Copper I Oxide) Valency of Copper is **1.**
19. $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$ NO_2 gas is **reddish brown colour.**
20. **Decomposition of limestone** is an example of decomposition reaction.
21. All chemical changes are accompanied by **chemical reactions.**
22. **Decomposition of ammonium dichromate** is an example of Decomposition reaction. (green vapours)
23. Decomposition of ammonium dichromate is called **Chemical Volcano [(NH₄)₂Cr₂O₇]**
24. Copper Sulphate solution is **blue** colour and Ferrous Sulphate solution is **green** colour.
25. When a piece of Zinc is dipped in CuSO_4 solution, the colour changes from **blue to colourless.**
26. Copper is less reactive than **lead and zinc.**
27. $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
28. Any reaction that produces a precipitate is called **precipitation** reaction.
29. $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$ is an example of **displacement reaction.**
30. Single compound breaks down to produce two or more substances are called **decomposition reaction.**
31. A more reactive element displaces a less reactive element from its compound is called **displacement reaction.**
32. Series arrangement of metals in increasing order of their reactivity is called **reactivity series.**
33. The most reactive metal is **potassium**; where as less reactive metal is **platinum.**
34. **O₂** is the most essential element for sustaining life

Δ



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35. **Chemical changes** are more permanent than physical changes.
36. **Electroplating, ext. of metals** are based upon the redox reactions.
37. Barium Sulphate precipitate colour is **white** and **insoluble** in water.
38. $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$ is an example of double displacement reaction.
39. $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$ is an example of double decomposition reaction.
40. Any reaction in which exchange of ions between two reactants occur, leading to the formation of two different products are called **Double decomposition reaction (or) Double displacement reaction.**
41. $\text{CuSO}_4 + \text{H}_2\text{S} \rightarrow \text{CuS} + \text{H}_2\text{SO}_4$
42. Oxidation-reduction reaction is also known as **redox reaction.**
43. Oxidation reaction involves **addition of oxygen.**
44. Oxidation reaction involves **removal of hydrogen.**
45. Oxidation reaction involves **loss of oxygen. [LEO]**
46. Reduction reaction involves **addition of hydrogen.**
47. Reduction reaction involves **removal of oxygen.**
48. Reduction reaction involves **gain of electron. [GER]**
49. A chemical reaction in which oxidation and reduction take place simultaneously is called **redox reaction.**
50. Food stuffs, become stale, due to **oxidation.**
51. If hydrogen gas is passed over this black coloured copper (II) oxide (CuO) it turns brown colour.
52. $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$
53. $\text{H}_2\text{S} + \text{Cl}_2 \rightarrow 2\text{HCl} + \text{S}$ is an example of redox reaction.
54. $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ is an example of redox reaction.
55. The chemical reactions which proceed with the evolution of heat energy are called **exothermic** reaction. (Detergent dissolved in water)
56. $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3 + \text{Heat}$ is an example of exothermic reactions.
57. All combustion reactions are **exothermic reactions.**
58. The chemical reactions which proceed with the absorption of heat energy are called **endothermic reactions.** (Glucose is kept in our tongue)
59. $2\text{NH}_3 + \text{Heat} \rightarrow \text{N}_2 + 3\text{H}_2$ is an example of endothermic reactions.
60. Rate of the chemical reaction is defined as change in concentration of any one of the reactant or product per unit time.
61. -ve sign indicates **decrease in concentration of reactant.**
62. +ve sign indicates **increase in concentration of product.**
- $$\frac{\Delta d[\text{B}]}{dt} = \frac{\Delta d[\text{A}]}{dt}$$
63. $\text{A} \rightarrow \text{B}$ Rate of the reaction is (-) = (+) $\frac{d[\text{B}]}{dt} = \frac{d[\text{A}]}{dt}$
64. The reaction of Magnesium is faster with **HCl** comparing with acetic acid. (CH_3COOH)
65. **Hydrochloric acid** is stronger than acetic acid.
66. **Nature of the reactant** influences the rate of the reaction.
67. $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
68. **Manganese-di-oxide** (MnO_2) is an example for a catalyst.
69. Double displacement reaction is otherwise known as **Double decomposition reaction.**

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70. As the concentration of the reactants increases the rate of the reaction is **increases**.
71. Greater the surface area **faster** the rate of reaction.
72. Increase in the temperature **increase** the rate of reaction.
- Δ
73. $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$ ↑
74. A substance which alters the rate of the reaction without undergoing any change in mass and composition is known as **catalyst**.
75. The factors which affects the rate of the reaction is **Nature of the reactants, Concentration of the reactants, Surface area, temperature and catalyst**.
76. The acid secreted in the stomach of human is **hydrochloric acid**. (Stomachfluid)
77. In Latin, the word **Acidus** means sour taste.
78. Acid changes the colour of the litmus paper from **Blue to Red**.
79. In acidic medium phenolphthalein is **colourless**.
80. In acidic medium methyl orange gives **pink** colour.
81. In alkaline medium phenolphthalein gives **pink** colour.
82. In alkaline medium methyl orange gives **yellow** colour.
83. Tannic acid is present in **Tea**.
84. Malic acid is present in **Apple**.
85. Citric acid is present in **Lemon**.
86. Tartaric acid is present in **Grape**.
87. Oxalic acid is present in **Tomato**.
88. Acetic acid is present in **Vinegar**. (food preservative)
89. Lactic acid is present in **Curd & Milk**.
90. Formic acid is produced by **red ants**.
91. Acids are classified into **two** types based on their sources. (organic & In-organic)
92. Acids present in plants and animals are **organic acids**.
93. **HCOOH, CH₃COOH** is an example of organic acids.
94. **CH₃COOH** is a weak acid. (HCOOH)
95. **HCl** is a strong acid. (HNO₃, H₂SO₄, etc.,)
96. Acids from rocks and minerals are **inorganic acids**.
97. Inorganic acids are called as **mineral acids**.
98. Inorganic acids (or) mineral acids are called as **Hydracid (or) oxy acid**.
99. Basicity or an acid refers to number of **replaceable hydrogen** atoms in one molecule.
100. The basicity of hydro chloric acid is **1**.
101. The basicity of HNO₃ is **1**.
102. The basicity of H₂SO₄ is **2**.
103. The basicity of H₂CO₃ is **2**.
104. The basicity of H₂PO₃ (Sulphurous acid) is **2**.
105. The basicity of H₃PO₃ (orthophosphoric acid) is **3**.
106. Hydrogen gas burns with a **popping** sound.
107. Acid which gives one hydrogen ions per molecule of the acid in solution is called **monobasic acid**.
108. Acid which gives two hydrogen ions per molecule of the acid in solution is called **Dibasic acid**.
109. Acid which gives three hydrogen ions per molecule of the acid in solution is called Tribasic acid.
110. The basicity of CH₃COOH is **1**
111. Acids which ionise completely in water is called **strong acids**.
112. Acids which ionise partially in water is called **weak acids**.
113. Acids are classified into **three types** based on their basicity.
114. Acids are classified into **two** types based on ionization.
115. Acids are classified into **two** types based on their concentration.
116. Based on concentration depending on the **percentage (or) amount of acid** dissolved in water.
117. Acid having a relatively high percentage of acid in its aqueous solution is called **concentrated acids**.

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118. Acid having relatively low percentage of acid in aqueous solution is called **Dilute acid**.
119. The atmosphere of the planet venus is made of thick layer of **sulphuric acid**.
120. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ (**Displacement reaction**)
121. Limestone, chalk and marble are different physical forms of calcium carbonate.
122. Metal + dilute acid \rightarrow Salt + Hydrogen.
123. **P^H values** decides whether the solution is Acidic, Basic or Neutral.
124. **Cu, Ag** metals do not liberate hydrogen gas on reaction with acids.
125. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
126. $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$ (↑)
127. $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$ (↑)
128. Metal carbonate or metal bi carbonate + Acid \rightarrow **Salt + Water + Cabondioxide**.
129. $CuO + 2HCl \rightarrow CuCl_2 + H_2O$. In this reaction colour changes from **black to green**.
130. Metallic oxide + Acid \rightarrow **Salt + Water**.
131. An acid produces **hydrogen ions** in water.
132. Hydrogen ions cannot exist alone, but they exist in the form of **hydronium ions** (H_3O^+)
133. $HCl + H_2O \rightarrow H_3O^+ + Cl^-$
134. **Sulphuric acid** is called the "**King of Chemicals**"
135. **Sulphuric** acid is used in car battery.
136. **Nitric acid** is used in the production of (ammonium nitrate) – used as Fertilizer.
137. **HCl** is used as cleaning agent in toilet.
138. **Tartaric acid** is a constituent of baking powder.
139. **Benzoic acid (sodium benzoate)** is used in food preservation.
140. **Carbonic acid (H₂CO₃)** is used in aerated drinks.
141. Base is a substance which releases **hydroxide ions** when dissolved in water.
142. Base is **bitter** in taste.
143. Acid is **sour** in taste.
144. Base turn **red litmus to blue**.
145. Base is **soapy** to touch.
146. Washing soda, **caustic soda (NaOH) and caustic potash(KOH)** is an example of bases.
147. Bases are classified into **two** types based on ionisation.
148. Bases are classified into **three** types based on their acidity.
149. Bases are classified into **two** types based on the concentration.
150. Based on the concentration depending on the **percentage (or) amount of base** dissolved in water.
151. **NaOH, KOH** is a strong bases.
152. **NH₄OH, Ca(OH)₂** is a weak bases.
153. Bases which ionise completely in aqueous solution is called **strong base**.
154. Bases which ionises partially in aqueous solution is called **weak base**.
155. Base which ionises in water to give one hydroxide ion per molecule is called **Monoacidic base. (NaOH, KOH)**
156. Base which ionizes in water to give two hydroxide ions per molecule is called **Diacidic base. [Ca(OH)₂, Mg(OH)₂]**
157. Base which ionizes in water to give three hydroxide ions per molecule is called **Triacidic base. [Al(OH)₃]**
158. The acidity of NaOH & KOH is **1**.
159. The acidity of Ca(OH)₂ & Mg(OH)₂ is **2**.
160. The acidity of Al(OH)₃ & Fe(OH)₃ is **3**.
161. An alkali having a relatively high percentage of alkali in its aqueous solution is called **concentrated alkali**.
162. An alkali having a relatively low percentage of alkali in its aqueous solution is called **Dilute alkali**.
163. Bases which dissolve in water are called **alkalies**.

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164. All alkalies are **bases**, but not all bases are **alkalies**.
165. NaOH and KOH are **alkalies**.
166. Al(OH)₃, Zn(OH)₂ are **bases**.
167. Zn + 2NaOH ----**Na₂ZnO₂ + H₂** (sodium zincate)
168. Metal + base -----**Salt + hydrogen**
169. **Cu, Ag, Cr** metals do not react with sodium hydroxide.
170. Base + non metallic oxide ----- **Salt + water**.
171. 2NaOH + CO₂ -----**Na₂CO₃ + N₂O**.
172. When CO₂ is passed through lime water, turns **milky**.
173. Lemon juice changes the colour of the litmus paper from **blue to red**.
174. Washing soda solution changes the colour of the litmus paper from **Red to Blue**.
175. Soap solution changes the colour of the litmus paper from **red to blue**.
176. Soft drink changes the colour of the litmus paper from **blue to red**.
177. Lemon juice with phenolphthalein gives **colourless**.
178. Lemon juice with methyl orange gives **pink colour**.
179. Washing soda solution with phenolphthalein gives **pink colour**.
180. Washing soda solution with methyl orange gives **yellow colour**.
181. Soap solution with phenolphthalein gives **pink colour**.
182. Soap solution with methyl orange gives **yellow colour**.
183. Soft drink with phenolphthalein gives **colourless**.
184. Soft drinks with methyl orange gives **pink colour**.
185. NaOH + HCl **NaCl + H₂O**
186. Acid + Base **Salt + Water**.
187. **Sodium hydroxide** is used in manufacture of soap.
188. **Calcium hydroxide** is used in white washing the buildings.
189. **Magnesium hydroxide** is used as a medicine for stomach troubles.
190. **Ammonium hydroxide** is used to remove grease stains from clothes.
191. P^H = **-log₁₀ [H⁺]**, P^{OH} = -log₁₀ [OH⁻], P^H + P^{OH} = 14, P^H = 14 - P^{OH}.
192. P^H scale was introduced by **S.P.L.Sorenson**.
193. The P^H of neutral solution is **equal to 7**.
194. The P^H of acidic solution is **less than 7**.
195. The P^H of basic solution is **greater than 7**.
196. The hydrogen ion concentration of a solution 1.0 x 10⁻⁹ M then the solution is **basic**.
197. The hydrogen ion concentration of a solution 1.0 x 10⁻⁹ M then the P^H is **9**. (see the power of 10)
198. The hydrogen ion concentration of a solution is 0.001 M then the P^H is **3**. (count no.of zeros)
199. They hydroxyl ion concentration of a solution is 1.0 x 10⁻⁹ M then the P^H is **5**. (14-9)
200. The P^H of coffee is **4.4 - 5.5**.
201. The P^H of Human Saliva is **6.5 - 7.5**.
202. The P^H of house hold ammonia is **12.0**.
203. The P^H of Lemon juice is **2.2 -2.4**.
204. The P^H of Tomato juice is **4.1**.
205. Tooth pastes are generally **alkaline** in nature. (basic)
206. At P^H level **6.9** the body becomes prove to viral infections like colds, cough and flu.
207. Cancer cells thrive inside the body at a P^H of **5.5**.
208. The P^H of a normal, healthy, human skin is **4.5 to 6**.

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209. The P^H of stomach fluid is approximately 2.0 .
210. The P^H range of human blood is 7.35 – 7.45 .
211. The P^H of mouth falls below 5.5 the enamel gets corroded.
212. Citrus fruits require slightly alkaline soil.
213. Rice requires acidic soil.
214. Sugar cane requires neutral soil.
215. The P^H of rain water is approximately 7.
216. Rain water is polluted by SO_2 and NO_2 , acid rain occurs, bringing the P^H value down to 5.6.
217. Methanoic acid causing burning pain.
218. Methanoic acid is present in nettle plant.
219. Salts are classified into four types.
220. Normal salt is obtained by complete neutralization of an acid by a base.
221. Acid salts are derived by the partial replacement of hydrogen ions of an acid by a metal.
222. $NaHSO_4$, $NaHCO_3$ are acid salts.
223. Basic salts are derived by the partial replacement of hydroxide ions of a diacidic bas (or) triacidic base by an acid radical.
224. $Pb(OH)Cl$ is basic salt.
225. Double salts are formed by the combination of saturated solution of two simple salts in equimolar ratio followed by crystallization.
226. $NaCl$ is used in daily food and as preservative. (sodium chloride)
227. Na_2CO_3 (washing soda) is used in softening hard water. (sodium carbonate)
228. $NaHCO_3$ (Baking soda) is used in making baking powder.(sodium bicarbonate.)
229. Baking powder is the mixture of baking soda and tartaric acid.
230. $NaHCO_3$ is an ingredient in antacid.
231. Baking soda neutralizes excess of acid in the stomach.
232. The formula of bleaching powder is $CaO \cdot Cl_2$
233. The chemical name of bleaching powder Calciumoxy chloride.
234. Bleaching powder is used for bleaching cotton and linen in the textile industry.
235. The formula of plaster of Paris is $CaSO_4 \cdot \frac{1}{2} H_2O$.
236. The chemical name of plaster of Paris is Calcium Sulphate hemi hydrate.
237. Plaster of Paris is used for plastering fractured bones.
238. Plaster of Paris is used making caste for statues.
239. Acidity of base refers to number of replaceable hydroxide ions in one molecule of a base.
240. Salt can produce positive and negative ions when dissolved in water.
241. An example for vigorous volcano is Ammonium dichromate.
242. An example for silent volcano is Baking soda.
243. Metal carbonates, metal bicarbonates and metal oxides are basic.
244. Reaction between an acid and a base is called Neutralisation Reaction.

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SCIENCE(PHY) LESSON 15 LAWS OF MOTION AND GRAVITATION CLASS:X

PART-A

- The acceleration in a body is due to-----
(Balanced force, unbalanced force, Electrostatic force) **Answer: Un balanced force**
- The physical quantity which is equal to rate of change of momentum is
(displacement, acceleration, Force, impulse) **Answer: force**
- The momentum of a massive object at rest is -----
(very large, very small, zero, infinity) **Answer: Zero**
- The mass of a person is 50kg. The weight of that person on the surface of the earth will be---
(50N, 490N, 35N, 380N) **Answer: 490N**
- The freezing of biotechnology products like vaccines requires----- Freezing system.
(Helium, Nitrogen, Ammonia, Chlorine) **Answer: Nitrogen**
- Two objects of same mass, namely A and B hit a man with a speed of 20km/hr and 50km/hr respectively and comes to rest instantaneously. Which object will exert more force on that man? Justify your answer:
Answer: Object B having the speed of 50km/hr will exert more force on that man.
Reason: Momentum (p) is the combined effect of mass(m) and velocity(v) and in this case mass of objects 'A' 'B' remain the same. But the object 'B' has more velocity than the object 'A' and so the impact produced by it is greater than that of Object 'A'.
- An object (say with mass 5kg) is moving with a velocity of 20m/s. A force of 10N is acting in a direction perpendicular to its velocity. What will be the speed of the object after 10 seconds?
Answer: The speed remains the same i.e.20 m/s.
Reason: When a force of 10N as acting in a direction perpendicular (at 90°) to the direction of velocity of the object, the magnitude of force exerted is zero. Therefore there is no change in the speed of object.
Work done= Force X Displacement
 $W = F \cos 90^\circ \times s$ [Cos90°=0]
 $= F \times 0 \times s$; **W=0**
- Assertion(A):** Liquefied cryogenic gases are sprayed on electric cables in big cities.
Reason(R): Liquefied cryogenic gases prevent wastage of power.
(i) A is incorrect and R is correct (ii) A is correct and R is incorrect
(iii) Both A and R are incorrect (iv)A is correct and R supports A
Answer: (iv) A is correct and R supports A.
- The acceleration due to gravity on the surface of the earth will be maximum at ----- and minimum at-----
Answer: The acceleration due to gravity on the surface of the earth will be maximum of **poles** and minimum at **Equator**.
- If the radius of the earth is reduced to half of its present value, with no change in the mass, how will the acceleration due to gravity, be affected.
Answer: Acceleration due to gravity , $g = \frac{GM}{R^2}$
Where, M is the mass of the earth. R is the radius of the earth.

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When radius is reduced to half of its present value with no change in mass,

$$\text{Acceleration due to gravity is } g = \frac{GM}{\left(\frac{R}{2}\right)^2} = \frac{4GM}{R^2}$$

Hence acceleration due to gravity will be increased by four times.

11. Selvi placed her purse on the passenger's seat of her car when she drove to work. By the time she reached her office, her purse had fallen on the floor in front of the passenger's seat. Why did this happen? Explain.

Answer: This happened due to inertia of motion

Reason: The purse placed on the seat is in motion along with the car. When Selvi applies the brakes to stop the car, it stops but the purse tends to remain in the state of motion. This makes the purse to have fallen down from the seat.

12. Why does a fielder in the game of cricket pull his hands back when he catches a ball?

Answer: This is done to prevent injury to the hands (based on Newton's second law),

Reason: A fast moving cricket ball has a large momentum. If a cricket player catches the ball stretching his hands straight, its momentum is reduced to zero suddenly which in turn causes severe pain and injury.

Since impulse acting on a body is the product of force (F) and the time of contact Δt (Impulse = F x Δt), when the player moves back his hands on catching the ball, the time taken to reduce its momentum, is increased considerably. Thus, the increased time of contact ' Δt ' is helpful in reducing the force while catching the cricket ball and injury is averted.

13. Mass of an object is 10kg. What is its weight on the earth (Where $w = mg$, $g = 9.8 \text{ m/s}^2$)
(49N, 25N, 98N, 100N) **Answer: 98N**

14. Metals frozen to low temperature showed more resistance to wear. This is known as
(Cryogenic yielding, Cryogenic hardening, Cryogenic cooling, Cryogenic shaping)

Answer: Cryogenic hardening

15. The unit of weight is-----

(kg, g, Newton, ms^{-2}) **Answer: Newton**

16. Chandrayaan operated for ----- days in space.

(a)213 (b)321 (c)312 (d)231 **Answer: (c) 312**

PART B

1. Fill in the blanks:

(a) Force = Mass x Acceleration, then momentum -----

(b) Liquid hydrogen is for rocket, then----- for MRI.

(a) Force = Mass x Acceleration, then momentum Mass x Velocity

(b) Liquid hydrogen is for rocket, then **Liquid Helium** for MRI.

2. Correct the mistakes. If any in the following statements:

- (a) One newton is the force that produces an acceleration of 1 ms^{-2} in an object of 1gram mass.

(b) Action and reaction is always acting on the same body.

- (a) One newton is the force that produces an acceleration of 1 ms^{-2} in an object of 1 kilogram mass.

(b) Action and reaction is always acting on the **different** body.

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3. The important use of cryogenics is cryogenic fuels. What do you mean by cryogenic fuels.

- The word **cryogenic** terms from Greek and means “the production of freezing cold”.
- The fuels which are produced and stored in very low temperature i.e. below 123k, are called **cryogenic fuels** e.g., liquid hydrogen.

4. As a matter of convention, an anticlockwise moment is taken as----- and a clockwise moment is taken as----- **Answer: Positive, Negative**

5. A bullet of mass 20g moving with a speed of 75ms⁻¹ hits a fixed wooden plank and comes to rest after penetrating a distance of 5cm. What is the average resistive force exerted by the wooden plank on the bullet?

Mass of a bullet $m=20 \times 10^{-3}\text{kg}$

Initial velocity of the bullet $u =75\text{m/s}$

Distance covered by the bullet $s =5 \times 10^{-2}\text{m}$

Final velocity of the bullet $v =0$

The equation of motion $v^2 - u^2 = 2as$

$$a = \frac{v^2 - u^2}{2s} = \frac{0^2 - (75)^2}{2 \times 5 \times 10^{-2}} = \frac{75 \times 75}{10 \times 10^{-2}} = 56250 \text{ m/s}^2 \quad \text{Retardation } a = 56250 \text{ m/s}^2$$

Average resistive force $F=ma =20 \times 10^{-3} \times 56250 = 1125\text{kg m/s}^2$ (or) 1125N

Average resistive force=1125N

6. A shopping cart has a mass of 65kg. In order to accelerate the cart by 0.3ms⁻². What force would you exert on it?

Mass of cart $m= 65\text{kg}$

Acceleration of the cart $a =0.3 \text{ ms}^{-2}$. $\text{Kg} \times \text{m/s}^2 = \text{kg m/s}^2(\text{or}) \text{N}$

Force exerted on it $F = ma = 65 \times 0.3$; $F = 19.5 \text{ N}$

Force exerted on the cart = 19.5N

7. Why does a spanner have a long handle?

Moment of force (or) torque effect of force (T) which is equal to the product of force (F) and the perpendicular distance (d) between the line of action of force and the point rotation i.e. $T=F \times d$. The longer handle of the spanner, the longer is turning effect of force on the nut and therefore longer handle facilitates the easy tightening or loosening of the nut.

8. Why does a boxer always move along the direction of the punch of the opponent?

Ans: According to newton's second law, the rate of change of momentum takes place in the direction of applied force. Since impulse acting on a body is the product of force(F) and the time of contact (Δt) (Impulse = $F \times \Delta t$), when a boxer moves along the direction of punch opponent, the time of contact(Δt) of the punch is extended which in turn minimizes the effect of force exerted on him by the opponent.

9. The mats used in gyms and the padding used in sports uniforms are made up of soft substances. Why are rigid materials not used?

Answer: The padding used in sports uniform are made up of soft materials because they are flexible and compressable. This property increases the time of impact(Δt) due to any pressure or force or weight applied on the sportsman and this results in less impact on him. Similarly when a gym person exercises on a soft mat, the person feels some spring like effect under the

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feet which increases the time of contact (Δt) and minimizes the impact on the feet and ankles.

If the mats and paddings are rigid materials, the force (or) impact is directly transmitted to the person's body.

10. Write two principles that are used in rocket population.

(i) Law of conservation of momentum. (ii) Newton's third law of motion.

11. A 10 kg mass is suspended from a beam 1.2 m long. The beam is fixed to a wall. Find the magnitude and direction (clockwise or anticlockwise) of the resulting moment at point B.

Resulting moment of Force = Force x Perpendicular distance

$$\text{Force} = ma = 10 \times 9.8 \text{ kg ms}^{-2} = 98 \text{ N}$$

Perpendicular distance $d = 1.2 \text{ m}$

$$\text{Moment of Force (T)} = F \times d$$

$$= 98 \text{ N} \times 1.2 \text{ m} = 117.6 \text{ Nm}$$

Resulting moment of force at B = 117.6 Nm

Since the resulting moment of Force 'T' is of positive value (ie. 117.6 Nm),

It is anticlockwise.

12. If the force experienced by a body of unit mass is gravitational field strength, find the gravitational field strength the surface of the earth.

$$\text{Gravitational field strength on the surface of the earth} = g = \frac{GM}{R^2}$$

$$\text{Universal gravitational constant (G)} = 6.73 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$$

$$\text{Mass of the earth (M)} = 5.98 \times 10^{24} \text{ kg}$$

$$\text{Radius of the earth (R)} = 6.38 \times 10^6 \text{ m}$$

$$g = \frac{6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2} \times 5.98 \times 10^{24} \text{ kg}}{(6.38 \times 10^6 \text{ m})^2} = \frac{39.89 \times 10^{13}}{40.70 \times 10^{12}} = 0.98 \times 10^{-2} = 9.8 \text{ ms}^{-2}$$

13. If the density of the earth is doubled to that of its original value, the radius remaining the same, What will be the change in acceleration due to gravity?

$M = \text{Volume} \times \text{density}$

$$\text{Volume of sphere} = \frac{4}{3} \pi R^3 \quad \text{Acceleration due to gravity } g = \frac{GM}{R^2} \quad \text{-----(1)}$$

$$\text{If } \rho \text{ be the density, then the mass of the earth is } M = \frac{4}{3} \pi R^3 \rho \quad \text{-----(2)}$$

Substituting equation (2) in equation (1) we get

$$G = G \times \frac{4}{3} \pi \frac{R^3 \times \rho}{R^2} = \frac{4\pi}{3} GR\rho \quad \text{-----(3)}$$

If the density of the earth is doubled then

$$g' = \frac{4}{3} \pi GR \times 2\rho = \frac{8\pi}{3} GR\rho \quad \text{----- (4)}$$

$$\frac{g'}{g} = \frac{8\pi}{3} GR\rho \times \frac{3}{4\pi \times GR\rho} = 2$$

$$\frac{g'}{g} = 2 \quad g' = 2g$$

Hence, Acceleration due to gravity will be doubled.

14. Renu is standing in a dining line 6.38 x 10³ km from the centre of the earth. The mass of the earth is 6 x 10²⁴ kg.

(i) Find the acceleration due to gravity

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(ii) Will the value change after she finishes her lunch?

(i) Distance of Renu $R = 6.38 \times 10^3 \text{ km} = 6.38 \times 10^6 \text{ m}$

Mass of the earth $M = 6 \times 10^{24} \text{ kg}$.

Gravitational constant $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{Kg}^{-2}$

Acceleration due to gravity, $g = \frac{GM}{R^2}$

$$= \frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(6.38 \times 10^6)^2} = \frac{40.02 \times 10^{-11+24-12}}{6.38 \times 6.38}$$

$$= \frac{40.02}{40.704} \times 10 \text{ m/s}^2$$

$$= 0.9831 \times 10 = 9.831 \text{ m/s}^2$$

Acceleration due to gravity $= 9.831 \text{ m/s}^2$

(ii) Acceleration due to gravity is $g = \frac{GM}{R^2}$

The equation shows that acceleration due to gravity is independent of mass of the body on the surface of the earth. Hence after she finished her lunch acceleration due to gravity does not change.

15. If an angel visits an asteroid called B 612 which has a radius of 20 m and mass of 104 kg, What will be the acceleration due to gravity in B 612

Acceleration due to gravity $g = \frac{GM}{R^2}$

Radius of an asteroid is $R = 20 \text{ m}$; Mass of the asteroid is $M = 104 \text{ kg}$

Gravitational constant $= 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$

$$g = \frac{6.67 \times 10^{-11} \times 104}{20 \times 20}$$

$$= \frac{693.68}{400} \times 10^{-11} \text{ ms}^{-2} = 1.7342 \times 10^{-11} \text{ ms}^{-2}$$

Acceleration due to gravity in asteroid, B 612 as $1.7342 \times 10^{-11} \text{ m/s}^2$

16. A man of mass 'm' standing on a plank of mass 'M' which is placed on a smooth horizontal surface, is initially at rest. The man suddenly starts running on the plank with a speed of 'v' m/s with respect to the ground. Find the speed of the plank with respect to the ground.

Mass of a man = m ; Mass of a plank = M

The speed of man on the plank with respect to ground = $V \text{ m/s}$

The speed of plank only with respect to ground = V_1

The speed of man only relative to the ground = V_2

According to law of conservation of momentum

$$MV_1 + mV_2 = (M + m) V$$

$$MV_1 + mV_2 = 0$$

$$MV_1 = -mV_2; \quad V_1 = \left(\frac{-m}{M}\right) V_2$$

The velocity of the plank with respect to the ground $V_1 = \left(\frac{-m}{M}\right) V_2$

17. Two balls of masses in ratio 2:1 are dropped from the same height. Neglecting air resistance, find the ratio of

(i) The time taken for them to reach the ground.

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- (ii) The forces acting on them during motion
- (iii) Their velocities when they strike the ground
- (iv) Their acceleration when they strike the ground.

Ratio of masses = 2:1

- (i) In the absence of air, all bodies will reach the ground with same rate. Hence they reach the ground at the same time.

Ratio of their time to reach the ground = 1:1

- (i) Force acting on them is $F=mg$

Where m is the mass of the body g is acceleration due to gravity.

$$F_1 = m_1g; F_2 = m_2g \quad \therefore \frac{F_1}{F_2} = \frac{m_1}{m_2} = \frac{2}{1}; \text{Ratio of force} = 2:1$$

- (ii) We know that $v = u + at$

In this case, initial velocity $u=0$

Acceleration, $a = g$; Velocity, $v = gt$

When they strike the ground, velocity = gt

$$v_1 = gt_1; v_2 = gt_2; \frac{v_1}{v_2} = \frac{t_1}{t_2}$$

$$\text{Since } t_1 = t_2; \frac{v_1}{v_2} = \frac{1}{1}$$

$$v_1:v_2 = 1:1; \text{Ratio of velocities} = 1:1$$

- (iii) When they strike the ground, their acceleration will be same. So ratio of their acceleration is 1:1

18. An object of mass 1kg is dropped from a height of 20m. If hits the ground and rebounds with the same speed. Find the change in momentum (Take $g = 10 \text{ m/s}^2$)

Mass of an object $m = 1\text{kg}$

Height of the object $h = 20\text{m}$

Acceleration due to gravity $g = 10 \text{ m/s}^2$

Initial velocity(u) = 0 m/s

Final velocity(v) = 10m/s

Change in momentum $\Delta P = (\text{Final momentum} - \text{Initial momentum})$

$$= mv - mu = m(v-u) = 1\text{kg} (10\text{m/s} - 0 \text{ m/s})$$

$$= 10 \text{ kg m/s}$$

Change in momentum $\Delta P = 10\text{kg ms}^{-1}$

19. What will be the acceleration due to gravity on the surface of the moon, if its radius is $\frac{1}{4}$ th the radius of the earth and it mass is $\frac{1}{80}$ times the mass of the earth?

$m = \text{moon}$, $E = \text{earth}$, $R = \text{radius}$, $M = \text{mass}$, $R_m = \text{radius of moon}$, $M_m = \text{Mass of moon}$.

Given:

$$R_m = \frac{R_E}{4}; M_m = \frac{M_E}{80}$$

Therefore, acceleration due to gravity on the moon

$$g_m = \frac{GM_m}{(R_m)^2} = \frac{\frac{GM_E}{80}}{\left(\frac{R_E}{4}\right)^2}$$

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$$\begin{aligned}
 &= \frac{GM_E}{R^2_E} \times \frac{16}{80} = g \times \frac{16}{80} \\
 &= 9.8 \text{ m/s}^2 \times \frac{16}{80} = \frac{1}{5} \text{ m/s}^2 \\
 &= \mathbf{1.96 \text{ m/s}^2}
 \end{aligned}$$

Acceleration due to gravity on the surface of the moon = $\frac{1}{5}$ times

(i.e. 1.96 m/s^2) of acceleration due to gravity on the surface of earth.

20. A boy weighing 20kg is sitting at one end of a see-saw at a distance of 1.2m from the centre. Where should a man weighing 60kg sit on the see-saw, so that it stands balanced?

Mass of a boy, $m_1 = 20\text{kg}$

Distance of a boy from a centre = $d_1 = 1.2\text{m}$

Mass of a man $m_2 = 60\text{kg}$

Let the distance of the man from the centre be d_2

According to the principle of moments, when a see-saw is balanced.

$$\begin{aligned}
 F_1 \times d_1 &= F_2 \times d_2 \\
 m_1 a_1 \times d_1 &= m_2 a_2 \times d_2 \\
 20\text{kg} \times 1.2\text{m} &= 60\text{kg} \times d_2 ; \quad d_2 = \frac{20\text{kg} \times 1.2\text{m}}{60\text{kg}} \\
 &= \frac{24}{60} = \mathbf{0.4\text{m}}
 \end{aligned}$$

Then man weighing 60kg should sit at 0.4m from the centre.

21. A cart driver prods his horse to move forward. The horse refuses to budge and explains: "According to Newton's III Law, I am pulling the cart, with a certain force and the cart, in turn pulls me back with an equal amount of force. As they are equal in magnitude and act in opposite directions, they cancel each other." Do you agree with the explanation given by the horse? Support your answer with proper reasons.

Answer: No. I don't agree with the explanation given by the horse.

Explanation: It is not according to Newton's third law of motion. But according to Newton's First law, the cart can move only when the horse pulls the cart with an unbalanced force which is able to overcome the frictional force between the cart wheels and ground. Therefore, in this case, the pulling force exerted by the horse is not sufficient to overcome the opposing force of the cart.

22. Observe the diagram and Write the answer



(a) The resultant of these forces is -----

Answer: The resultant of these force is zero.

(b) Does the ball move?

No. The ball doesn't move . because balanced forces of equal magnitude 5N each act on it in opposite directions.

23. "When a gun is fired, it exerts forward forces on the bullet". Why does the gun recoil backwards?

Newton's third law of motion states that for every action there is an equal and opposite reaction. Moreover, the action and reaction always act on two different objects.

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When a gun is fired it exerts forward force on the bullet. The bullet exerts an equal and opposite reaction force on the gun. This results in the recoil of the gun.

24. Observe the figure and write the answer:

(a) The force which balance A exerts on balance B is called-----

(b) The force of balance B on balance A is called-----

(a) The force which balance A exerts on balance B is called action

(b) The force of balance B on balance A is called reaction.

25. Fill in the blanks:

The space station ----- and ----- have been monolithic. (Salyut, Mir, ISS, Skylab)

Answer: The space stations **Salyut** and **Skylab** have been monolithic

26. To every action there is equal and opposite reaction. Explain action and reaction with example.

When a gun is fired it exerts forward force on the bullet and this is the action. The bullet exerts an equal and opposite reaction force on the gun. This results in the recoil of the gun and this is the reaction. Since the gun has a much greater mass than the bullet, the acceleration of the gun is much less than the acceleration of the bullet.

27. A bullet of mass 15g is horizontally fired with velocity 100ms^{-1} from a pistol of mass 2kg. What is the recoil velocity of the pistol?

Mass of bullet, $m_1 = 15\text{g} = 0.015\text{kg}$

Mass of the pistol, $m_2 = 2\text{kg}$

Initial velocity of the bullet, $u_1 = 0$

Initial velocity of the pistol, $u_2 = 0$

Final velocity of the bullet, $v_1 = +100\text{ms}^{-1}$

Recoil velocity of the pistol = v

Total momentum of the pistol and bullet before fire, $= (0.015 \times 100 + 2 \times 0) \text{kg ms}^{-1}$

Total momentum of the pistol and bullet after fire,
 $= (0.015 \times 100 + 2 \times v) = (1.5 + 2v) \text{Kg ms}^{-1}$

According to the law of conservation of momentum,

Total momentum after fire = total momentum before fire

$$1.5 + 2v = 0; \quad 2v = -1.5; \quad v = -0.75 \text{ms}^{-1}$$

Negative sign indicates that the direction in which the pistol would recoil is opposite to that of the bullet, that is, right to left.

28. Odd one out.

(a) Newton meter, Kgms^{-1} , gravitation

(b) Momentum, force, acceleration, newton

Answer: (a) Gravitation, (b) newton

29. Spot the error in the given statements.

(a) Two equal and opposite forces whose lines of action do not coincide are said to constitute a moment in mechanics.

Two equal and opposite forces whose lines of action do not coincide are said to constitute a couple in mechanics.

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(b) One newton is the force that produces an acceleration of 1ms^{-2} in an object of 1 gram mass.

One newton is the force that produces an acceleration of 1ms^{-2} in an object 1kg mass.

30. Correct the mistakes if any in the following statements.

(a) One newton is the force that produces an acceleration of 1ms^{-2} in an object of 1 gram mass.

One newton is the force that produces an acceleration of 1ms^{-2} in an object of 1 kg mass.

(b) The physical quantity which is equal to the rate of change of momentum is impulse.

The physical quantity which is equal to the rate of change of momentum is Force.

31. From the following statements write down that which is not applicable to mass of an

object: a) It is a fundamental quantity. B) It is measured using physical balance

c) It is measured using spring balance.

Answer:(c) It is measured using spring balance.

32. The name of some organisations which are associated with Chandrayan-I mission are given below. But some of them are not. List out the wrong ones.

(ISRO, BARC, NASA, ESA, WHO, ONGC) **Answer:** BARC, WHO, ONGC

PART-C

1. (i) Space stations are used to study the effects of long-space flight on the human body.

Justify.

Space stations are used to study the effects of long-space flight on the human body. They provides platforms for greater number and length of scientific studies. Space stations MIR and ISS are of modular type which removes the need for a signal immensely powerful launch vehicle. These stations are also designed from the outset to have their supplies provided by logistical support launches.

Current and recent history space stations are designed for medium-term living in orbit, for periods of weeks, months or even years.

MIR and ISS space stations have various issues that limit their long-term habitability. They are

Limitations of space stations

- ❖ Very low recycling levels.
- ❖ Relatively high radiation levels
- ❖ Lack of gravity
- ❖ Problems causing discomfort and
- ❖ Long-term health effects.

- Future space habitats may attempt to address these issues and are intended for long-term occupation.

1. (ii) $F = G \frac{m_1 m_2}{d^2}$ is the mathematical form of Newton's law of gravitation. Give the statement of Newton's law of gravitation.

Every object in the universe attracts every other object with a force which is directly proportional to the product of their masses and inversely proportional to the square

of the distance between them. $F = G \frac{m_1 m_2}{d^2}$

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2. (i) Newton's first law of motion gives a qualitative definition of force. Justify.

(i) **Newton's first law of motion** is stated as, "An object remains in the state of rest or of uniform motion in a straight line unless compelled to change that state by an applied unbalanced force. This law is also known as Law of Inertia.

(ii) **Interpretation:**

(a) **Inertia of rest:** First part of the law states that an undisturbed object remains in the state of the rest unless it is compelled to change that by an external force. E.g. a book placed on the table lies there itself as long as some one moves it.

(b) **Inertia of motion:** The Second part of the law states that an object continues in its state of uniform motion in a straight line unless it is compelled to change that by an unbalanced force. E.g. Observations taken over many decades show that the motion of the stars is uniform and it will continue to be so. Hence, from the first law, we may qualitatively define force as the one which changes or tends to change the state of rest or of uniform motion of a body.

2 (ii) $10\text{m/s} \rightarrow 20\text{kg} \rightarrow 10\text{kg} \xrightarrow{F_1} 20\text{kg} \xleftarrow{F_2} 10\text{kg} \rightarrow 20\text{kg} \rightarrow 12\text{m/s}$ and $20\text{kg} \rightarrow 4\text{m/s}$

The figure represents two bodies of masses 10kg and 20kg, moving with an initial velocity 10ms^{-1} and 5ms^{-1} respectively. They collide with each other. After collision, they move with velocities 12ms^{-1} and 4ms^{-1} respectively. The time of collision is 2s. Now calculate F_1 and F_2 .

Mass of one body (m_1) = 10kg

Initial velocity of the body (u_1) = 10ms^{-1}

Final velocity of the body (v_1) = 12ms^{-1}

Time of collision (t) = 2s

Force (F_1) = ?

Mass of another body (m_2) = 20kg

Initial velocity (u_2) = 5ms^{-1}

Final velocity (v_2) = 4ms^{-1}

Time of collision (t) = 2s

Force (F_2) = ?

$$\text{Force (F}_1\text{)} = \frac{m_2 (v_2 - u_2)}{t} = \frac{20\text{kg} (4\text{ms}^{-1} - 5\text{ms}^{-1})}{2\text{s}} = \frac{20\text{kg} (-1\text{ms}^{-1})}{2\text{s}}$$

$$= \frac{-20\text{kg ms}^{-1}}{2\text{s}} = -10\text{kg ms}^{-2} \text{ (or) } -10\text{N}$$

$$\therefore F_1 = -10\text{N}$$

$$\text{Force (F}_2\text{)} = \frac{m_1 (v_1 - u_1)}{t} = \frac{10\text{kg} (12\text{ms}^{-1} - 10\text{ms}^{-1})}{2\text{s}} = \frac{10\text{kg} (2\text{ms}^{-1})}{2\text{s}}$$

$$= \frac{20\text{kg ms}^{-1}}{2\text{s}}$$

$$= 10\text{kg ms}^{-2} \text{ (or) } 10\text{N}$$

$$F_2 = 10\text{N}$$

$$-F_1 = F_2 \longrightarrow -10\text{N} = 10\text{N}$$

3. A 5N force acts on a 2.5kg mass at rest, making accelerate in a straight line.

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- (i) What is the acceleration of the mass?
 (ii) How long will take to move the mass through 20m?
 (iii) Find its velocity after 3 seconds.

Ans: Force $F = 5\text{N}$ (or) 5 kg ms^{-2} Mass $m = 2.5\text{ Kg}$

(i) Acceleration of the mass, $a = \frac{F}{M} = \frac{5\text{ kg ms}^{-2}}{2.5\text{ kg}} = 2\text{ms}^{-2}$

(ii) Distance, $s = 20\text{m}$

Acceleration $a = 2\text{ms}^{-2}$

Initial velocity $= 0\text{ms}^{-1}$

$$S = ut + \frac{1}{2} at^2$$

$$20 = 0 \times t + \frac{1}{2} \times 2t^2 = 0 + \frac{1}{2} \times 2t^2 \quad 20 = t^2$$

$$\therefore t = \sqrt{20} \quad t = 4.47\text{secs}$$

Time taken = 4.47 secs

(i) Initial velocity, $u = 0$

Acceleration, $a = 2\text{ms}^{-2}$

Final velocity, $v = u + at$

$$= 0 + (2\text{ms}^{-2} \times 3\text{s})$$

Final velocity = 6ms^{-1}

4. State the law of conservation of momentum. Two billion people jump above the earth's surface with a speed of 4m/s from the same spot. The mass of the earth is $6 \times 10^{24}\text{ kg}$. The average mass of one person is 60kg.

(i) What is the total momentum of all the people?

(ii) What will be the effect of this action on the earth?

Ans: Law of conservation of momentum states that in the absence of external unbalanced force, the total momentum of a system of objects remains unchanged.

Momentum = mass x velocity $P = m \times v$

Average mass of one person = 60kg

Number of people = Two billion = 2×10^9

Total mass of the people = $60\text{kg} \times 2 \times 10^9 = 120 \times 10^9\text{ kg}$

Velocity = 4 m/s

Momentum = mass x velocity

$$= 120 \times 10^9\text{kg} \times 4\text{ms}^{-1} = 480 \times 10^9\text{ kg ms}^{-1}$$

Total momentum = $480 \times 10^9\text{ kgms}^{-1}$

Total mass of the people = $60 \times 2 \times 10^9\text{ kg} = 120 \times 10^9\text{kg}$

Mass of the people = $1.2 \times 10^{11}\text{ kg}$

But, Mass of the earth = $6 \times 10^{24}\text{ kg}$

- (i) Thus the mass of the earth is much greater than the total mass of all the people and so the impact of jumping action of the people on earth is negligible.
 (ii) Moreover, since earth and people in it are considered as a system and no external unbalanced forces act on the system, the total momentum of the system remaining unchanged according to the law of conservation of momentum.

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SCIENCE(PHY) LESSON 15 LAWS OF MOTION AND GRAVITATION CLASS:X

5. State Newton's law of gravitation. Write an expression for acceleration due to gravity on the surface of the earth. If the ratio of acceleration due to gravity of two heavenly bodies is 1:4 and the ratio of their radii is 1:3, what will be the ratio of their masses?

Newton's law of gravitation states that every objects in the universe attracts every other object with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

$$F = \frac{Gm_1m_2}{d^2} \quad \text{Acceleration due to gravity } g = \frac{GM}{R^2}$$

Where, G is gravitational constant; M is the mass of the earth; R is the radius of the earth. Ratio of acceleration due to gravity of the heavenly bodies = 1:4

Ratio of radii of those heavenly bodies = 1:3

$$\text{Acceleration due to gravity is } g = \frac{GM}{R^2}; \quad g_1 = \frac{GM_1}{R_1^2}$$

$$M_1 = \frac{g_1 R_1^2}{G} \quad \text{----- (1)}$$

$$M_2 = \frac{g_2 R_2^2}{G} \quad \text{----- (2)}$$

Dividing Equation (1) by equation (2) we get,

$$\frac{M_1}{M_2} = \frac{g_1 R_1^2}{G} \times \frac{G}{g_2 R_2^2}$$

$$\frac{M_1}{M_2} = \frac{g_1 R_1^2}{g_2 R_2^2} \therefore \frac{g_1}{g_2} = \frac{1}{4} \text{ and } \frac{R_1}{R_2} = \frac{1}{3}$$

'g' values 1:4 'r' values 1:3

$$\therefore \frac{M_1}{M_2} = \frac{1}{4} \times \frac{(1)^2}{(3)^2} = \frac{1 \times 1}{4 \times 9} = \frac{1}{36}$$

$$\therefore M_1 : M_2 = 1 : 36; \quad \text{Ratio of their masses} = 1 : 36$$

6. A bomb of mass 3kg, initially at rest, explodes in to two parts of 2kg and 1g. The 2kg mass travels with a velocity of 3m/s. At what velocity will the 1kg mass travel?

Ans: Mass of a bomb M = 3kg
Initial velocity of the bomb U = 0 m/s
Mass of the first part m₁ = 2kg
Velocity of the first part v₁ = 3m/s
Mass of the second part m₂ = 1kg

Let the velocity of the second part be v₂ = ?

By the law of conservation of momentum:

$$mu = m_1v_1 + m_2v_2$$

$$3 \times 0 = (2 \times 3) + (1 \times v_2)$$

$$0 = 6 + v_2 \quad \mathbf{V_2 = - 6 \text{ m/s}}$$

Velocity of the 1kg mass = 6 m/s

The negative sign indicates that the part of the bomb having 1kg travels with the velocity of 6 m/s in the direction opposite to that of another part of bomb.

7. Two ice skaters of weight 60kg and 50 kg are holding the two ends of a rope. The rope is taut. The 60kg man pulls the rope with 20 N force.

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What will be the force exerted by the rope on the other person? What will be their respective acceleration?

Ans: Mass of first ice skater = 50kg
Mass of second ice skater = 60kg

Force applied by second ice skater = 20 N

When the rope is taut, the force exerted by the rope on the other person is 20N(or)20kg ms⁻²

Acceleration of first ice skater is $a = \frac{F}{M}$

$$a = \frac{20 \text{ kg ms}^{-2}}{50 \text{ kg}} = 0.4 \text{ ms}^{-2}$$

Acceleration of second ice skater is $a = \frac{F}{M}$

$$a = \frac{20 \text{ kg ms}^{-2}}{60 \text{ kg}} = 0.3 \text{ ms}^{-2}$$

8. (a) Place the following objects in the correct order from the lowest to the highest .

Aeroplane, Train, Bus, Car, Cycle. {Where: Momentum= mass x velocity; $p = mv$ }
Cycle, car, Bus, Train , Aeroplane.

8. (b) Which object has more momentum: a car travelling at 10km/hr or a baseball pitched at 150 km/hr? Explain your answer:

- Car has more momentum than baseball.
- Momentum is the product of mass and velocity. Though the ball has more velocity, it has very less mass compared to car.

8.(c) Newton's third law of motion: For every action there is an equal and opposite reaction. Explain this law, using one illustration.

Newton's third law: For every action there is an equal and opposite reaction. **Illustration:**

When a gun is fired it exerts forward force on the bullet. The bullet exerts an equal and opposite reaction force on the gun. This results in the recoil of the gun. Since the gun has a much greater mass than the bullet, the acceleration of the gun is much less than the acceleration of the bullet.

9. (a) Newton's first law of motion gives a qualitative definition of force. Justify.

(i) **Newton's first law of motion** is stated as, " An object remains in the state of rest or of uniform motion in a straight line unless compelled to changes that state by an applied unbalanced force. This law is also known as Law of Inertia.

(ii) Interpretation:

(a) Inertia of rest: First part of the law states that an undisturbed object remains in the state of rest unless it is compelled to change that by an external force. E.g. a book placed on the table lies there itself as long as some one moves it.

(b) Inertia of motion: The second part of the law states that an object continues in its state of uniform motion in a straight line unless it is compelled to change that by an unbalanced force. E.g. observations taken over many decades show that the motion of the stars is uniform and it will continue to be so. Hence, from the first law, we may qualitatively define force as the one which changes or tends to change the state of rest or of uniform motion of a body.

9. (b) Which would require a greater force for accelerating a 2kg of mass at 4ms⁻² or a 3kg of mass at 2ms⁻².

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$$m_1 = 2\text{kg}; \quad a_1 = 4\text{ms}^{-2}$$

$$m_2 = 3\text{kg}; \quad a_2 = 2\text{ms}^{-2}$$

Force $F=ma$

$$F_1 = m_1a_1 = 2\text{kg} \times 4\text{ms}^{-2} = 8\text{N}$$

$$F_2 = m_2a_2 = 3\text{kg} \times 2\text{ms}^{-2} = 6\text{N}$$

$$F_1 > F_2$$

Thus, accelerating a 2kg mass at 4ms^{-2} would require a greater force.

10.(a) Tabulate the difference between mass and weight.

	Mass	Weight
1	Fundamental quantity	Derived quantity
2	It is the amount of matter contained in a body	It is the gravitational pull acting on the body.
3	Its unit is kilogram	It is measured in newton
4	Remains the same	Varies from place to place
5	It is measured using physical balance.	It is measured using spring balance

(b) What are the uses of cryogenic techniques?

Definition: The word cryogenic terms from Greek and means “ the production of freezing cold”.

- (i) **Rocket:** Cryogenic fuels mainly liquid hydrogen has been used as rocket fuel.
- (ii) **Magnetic Resonance Imaging (MRI) :** MRI is used to scan inner organs of human body by penetrating very intense magnetic field.
- (iii) **Power transmission in big cities:** It is difficult to transmit power by over head cables in cities. So underground cables are used. But underground cables get heated and the resistance of the wire increases leading to wastage of power. Liquefied gases are sprayed on the cables to keep them cool and reduce their resistance.
- (iv) **Food Freezing:** Cryogenic gases are used in transportation of large masses of frozen food, when very large quantity of food must be transported to regions like war field, earthquake hit regions etc. they must be stored for.
- (v) **Vaccines:** The freezing of biotechnology products like vaccines require nitrogen freezing systems.

11. (a) Explain inertia with example.

In ability of a body to change its state of rest or of uniform motion by itself is called inertia.

Example: Inertia of rest.

When we are standing in a bus which begins to move suddenly. Now we tend to fall backwards. This is because a sudden start of the bus brings motion to the bus as well as to our feet in contact with the floor of the bus. But the rest of our body opposes this motion because of its inertia.

11.b) Explain Newton's second law of motion with an example.

Newton's second law of motion states that the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force.

Example: A car with a dead battery is to be pushed along a straight road to give it a speed of 1ms^{-1} which is sufficient to start its engine. If one or two persons give a sudden push to it, it hardly starts.. But a continues push over it sometime results in a gradual acceleration of the car is

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not only determined by the magnitude of the force, but also by the time during which the force is exerted.

Conclusion: The force necessary to change the momentum of the object depends on the time rate at which the momentum is changed.

12.(a) Explain Newton's first law of motion with a suitable example.

Newton's first law: An object remains in the state of rest or of uniform motion in a straight line unless compelled to change that state by an applied unbalanced force.

This law is also known as Law of Inertia.

Example: Inertia of rest.

When we are standing in a bus which begins to move suddenly. Now we tend to fall backwards. This is because a sudden start of the bus brings motion to the bus as well as to our feet in contact with the floor of the bus. But the rest of our body opposes this motion because of its inertia.

Example: Inertia of motion.

While travelling in a motor car, we tend to remain at rest with respect to the seat until the driver applies a braking force to stop the motor car. With the application of brakes, the car slows down but our body tends to continue in the same state of motion because of inertia of motion.

(b) **Mir and ISS space stations have various issues that limit their long-term habitability. Justify it.**

Mir and ISS space stations have been designed for medium-term living in orbit, for periods of weeks, months or even years because of various issues that limit their long-term habitability.

- (i) Such as very low recycling rates.
- (ii) Relatively high radiation levels and a lack of gravity, and
- (iii) Some of these problems cause discomfort and long term health effects.

13.(a) $F = G \frac{m_1 m_2}{d^2}$ is the mathematical form of Newton's law of gravitation. Give the statement of Newton's law of gravitation. Give the statement of Newton's law of gravitation.

Every object in the universe attracts every other object with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

$$F = G \frac{m_1 m_2}{d^2}$$

13 . (b) **Chandrayaan achieved 95% of its planned objectives. Justify it.**

Achievements of Chandrayaan:

- (i) The discovery of wide spread presence of water molecules in lunar soil.
- (ii) Chandrayaan's Moon Mineralogy Mapper has confirmed that moon was once completely molten.
- (iii) The terrain mapping camera TMC on board Chandrayaan -1 has recorded images of the landing site of US space craft Apollo-15, Apollo-11.
- (iv) It has provided high-resolution spectral data on the mineralogy of the moon.
- (v) More than 40000 images have been transmitted by Chandrayaan camera in 75 days.
- (vi) Chandrayaan beamed back its first images of the earth in its entirety.

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14. The second law of motion gives us a method the force acting on an object as a product of its mass and acceleration. A) State Newton's second law b) Derive $F = ma$

(a) The second law of motion states that the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force.

(b) Suppose an object of mass 'm' is moving along a straight line with a initial velocity 'u'. It is uniformly accelerated to velocity 'v' in time 't' by the application of constant force, 'F' throughout the time 't'

Initial momentum of the object = mu

Final momentum of the object = mv

The change in momentum = mv - mu = m(v - u) ----- (1)

Rate of change of momentum = $\frac{\text{Change of momentum}}{\text{time}}$
 $= \frac{m(v-u)}{t}$ ----- (2)

According to Newton's law of motion, this is nothing but applied force,

Therefore the applied force, $F \propto \frac{m(v-u)}{t} \rightarrow F = \frac{K m (v-u)}{t}$

But the acceleration, $\alpha = \frac{v-u}{t}$ (which is the rate of change of velocity).

The applied force, $F \propto ma$ **$F = K ma$** ----- (3)

'K' is known as the constant of proportionality. The SI unit of mass and acceleration are kg and ms^{-2} respectively.

The unit of force is so chosen that the value of the constant 'K' becomes one.

Therefore, **$F = ma$** ----- (4)

14.(a) Deduce the formula to calculate acceleration due to gravity at surface of the earth.

(b) Calculate the mass of the earth.

(a) Consider a body of mass 'm' on the surface of the earth as shown in figure.

Its distance from the Centre of the earth is R (radius of the earth)

The gravitational force experienced by the body is **$F = \frac{GMm}{R^2}$**

Where M is the mass of the earth.

From Newton's second law of motion, Force, $F = mg$

Equating the above two forces, $F = \frac{GMm}{R^2} = mg$

$g = \frac{GMm}{R^2} \times \frac{1}{m}$ Therefore, **$g = \frac{GM}{R^2}$**

This equation shows that 'g' is independent of the mass of the body 'm' but, it varies with the distance from the Centre of the earth. If the earth is assumed to be a sphere of radius

R, the value of 'g' on the surface of the earth is given by, **$g = \frac{GM}{R^2}$**

(b) Answer: Mass of earth

From the expression **$g = \frac{GM}{R^2}$** the mass of the earth can be calculated as follows: **$M = \frac{gR^2}{G}$**

$$M = \frac{9.8 \times (6.38 \times 10^6)^2}{6.67 \times 10^{-11}}$$

$$M = 5.98 \times 10^{24} \text{kg.}$$