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SCIENCE PRACTICE PAPER

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**CBSE-SCIENCE
PRACTICE PAPER 01**

General Instructions :

- This question paper consists of 39 questions in 5 sections.
- All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- Section A consists of 20 objective type questions carrying 1 mark each.
- Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
- Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
- Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
- Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

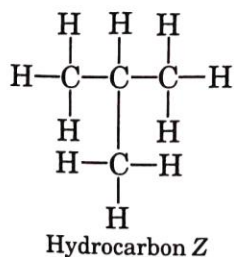
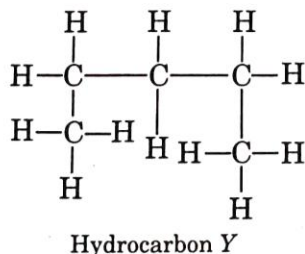
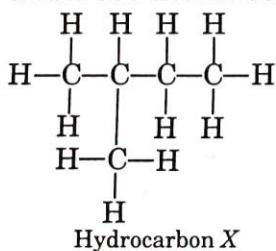
Time : 3 hrs.

Max. Marks : 80

SECTION-A

Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.

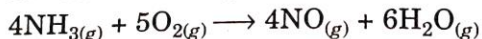
1. The structures of three hydrocarbons, X, Y and Z are shown below :



Which of the statements about X, Y and Z are correct?

- X and Y are isomers.
 - X and Y have the same percentage composition by mass.
 - Y is the isomer of alkane having formula, C_5H_{12} .
 - Z has the same boiling point as *n*-butane.
- (a) (i), (ii) and (iii) only (b) (ii) and (iv) only
(c) (i) and (iv) only (d) (i), (iii) and (iv) only
2. Identify the unsaturated compounds from the following :
- (i) propane (ii) propene
(iii) propyne (iv) chloropropane
(a) (i) and (ii) only (b) (ii) and (iv) only
(c) (iii) and (iv) only (d) (ii) and (iii) only
3. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A' the pink colour disappears. Which of the given statements is true for solution 'A' and 'B'?
- (a) A is strongly basic and B is a weak base.
(b) A is strongly acidic and B is a weak acid.
(c) A has pH greater than 7 and B has pH less than 7.
(d) A has pH less than 7 and B has pH greater than 7.
4. Which one of the following processes involve chemical reaction?
- (a) Filling packets or chips with nitrogen
(b) Sublimation of dry ice
(c) Electrolysis of water
(d) None of the above

5. The following reaction is an example of a



- (i) displacement reaction
- (ii) combination reaction
- (iii) redox reaction
- (iv) neutralisation reaction
- (a) (i) and (iv) only
- (b) (ii) and (iii) only
- (c) (i) and (iii) only
- (d) (iii) and (iv) only.

6. Match column I and column II and select the correct option.

Column I
(Alloy)

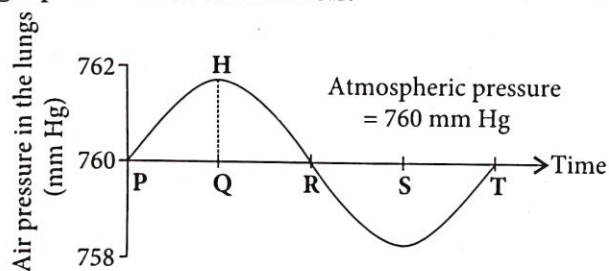
Column II
(Composition)

- | | |
|--------------------|------------------------------|
| P. Brass | 1. Tin and lead |
| Q. Bronze | 2. Copper and zinc |
| R. Solder | 3. Copper and tin |
| S. Stainless steel | 4. Iron, chromium and nickel |
- (a) P-2, Q-3, R-1, S-4 (b) P-3, Q-4, R-1, S-2
 (c) P-1, Q-2, R-3, S-4 (d) P-4, Q-1, R-3, S-2

7. Which covalent molecule contains the structure where the central atom is bonded to four other atoms by covalent bonds?

- | | |
|------------|--------------------|
| 1. Diamond | 2. Graphite |
| 3. Methane | 4. Silicon dioxide |
- (a) 1 and 2 (b) 2 and 4
 (c) 3 and 4 (d) 1, 3 and 4

8. Which of the following regions in the given graph indicates inhalation?



- (a) P to Q (b) R to S
 (c) P to R (d) R to T

9. Transpiration will be faster when the day is

- (a) hot, humid and windy
- (b) hot, dry and windy
- (c) cold, humid and windy
- (d) hot, humid and no wind.

10. In a plant, smooth seeds (S) are dominant over wrinkled seeds(s) and green seeds (G) are dominant over orange seeds (g). A plant homozygous for smooth and green seeds is

crossed with a plant having wrinkled and orange seeds. The F_1 offsprings are self-crossed to produce F_2 generation. If a total of 144 offspring are produced, how many plants are expected to be having wrinkled and green seeds in F_2 generation, according to a typical Mendelian cross?

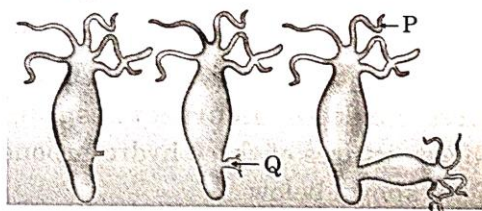
- (a) 9 (b) 18 (c) 27 (d) 81

11. What does the given experimental set-up prove?

- (a) Roots are positively phototropic while shoots are negatively phototropic.
- (b) Roots are positively geotropic while shoots are negatively geotropic.
- (c) Shoots are positively phototropic while roots are negatively phototropic.
- (d) Both (b) and (c)



12. Select the correct statement(s) regarding the given figure.



- (i) Part labelled as P is called pseudopodia.
 - (ii) Both P and Q take part in reproduction.
 - (iii) It is the only mode of reproduction in *Hydra*.
 - (iv) Part Q can detach from the parent body and become new independent individual.
- (a) (i), (iii) and (iv) (b) (i), (ii) and (iii)
 (c) Only (iv) (d) (i) and (iii)

13. If a wire of resistance R is melted and recast to half its length, the new resistance of the wire will be

- (a) $\frac{R}{4}$ (b) $\frac{R}{2}$ (c) R (d) $2R$

14. When a magnetic compass needle is carried nearby to a straight wire carrying current, then

- (I) the straight wire causes a noticeable deflection in the compass needle.
- (II) the alignment of the needle is tangential to an imaginary circle with straight wire as its centre and has a plane perpendicular to the wire.

- (a) (I) is correct.
 (b) (II) is correct.
 (c) both (I) and (II) are correct.
 (d) neither (I) nor (II) is correct.

15. Two resistances are connected in parallel and a current is sent through the combination. The current divides itself

- in the inverse ratio of resistance
- in the direct ratio of resistance
- equally in both the resistances
- in none of the above manner.

16. For a current in a long straight solenoid, N-pole and S-poles are created at the two ends. Among the following statements, the incorrect statement is

- the field lines inside the solenoid are in the form of straight lines which indicate that the magnetic field is the same at all points inside the solenoid.
- the strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the coil.
- the pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.
- the N- and S-poles exchange their positions when the direction of current through the solenoid is reversed.

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- Both A and R are true, and R is the correct explanation of A.
- Both A and R are true, and R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

17. **Assertion :** Reaction with NaHCO_3 can be used as a test to distinguish between alcohols and acids.

Reason : Both alcohols and acids give brisk effervescence with NaHCO_3 .

18. **Assertion :** Mendel successfully postulated laws of heredity.

Reason : Mendel recorded and analysed results of breeding experiments quantitatively.

19. **Assertion :** Gaseous exchange continues in the lungs without interruption even during expiration.

Reason : Residual volume of air can never be driven out by respiration.

20. **Assertion :** The magnetic field produced by a current carrying solenoid is independent of its length and cross sectional area.

Reason : The magnetic field inside the solenoid is uniform.

SECTION - B

Question No. 21 to 26 are very short answer questions

21. The pH of two solutions A and B are 2 and 4 respectively. Which one of them is more acidic? What is the ratio of H^+ ion concentration of the two solutions?

OR

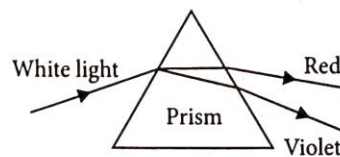
A compound P forms the enamel of teeth. It is the hardest substance of the body. It does not dissolve in water but gets corroded when the pH is lowered below 5.5.

- Identify the compound P.
 - How does it undergo damage due to eating chocolate and sweets? What should we do to prevent tooth decay?
22. Give reason, why :
- Reflex actions are also generally known as spinal reflexes?
 - Nervous system and endocrine system are often collectively known as neuroendocrine system ?

23. Discuss the components of the transport system in highly organised plants.

24. What is lymph? Write its important functions.

25. A student observes a phenomenon in the lab as a white light passes through a prism. Among many other colours, he observed the position of the colours red and violet.



What is the phenomenon called? What is the reason for the violet light to bend more than the red light?

OR

What is the angle of deviation for a ray suffering refraction through a prism?

26. What is ozone? How is it formed in the upper layers of the earth's atmosphere? How does ozone affect our ecosystem?

SECTION - C

Question No. 27 to 33 are short answer questions

27. (i) Which of the following will burn with a yellow flame : C_2H_5OH , C_2H_4 or C_2H_6 ?

(ii) Write a balanced chemical equation to show the burning of ethanol in oxygen.

(iii) Name an oxidising agent which can convert ethanol to ethanoic acid.

28. A white powder is added while baking cakes to make it soft and spongy. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.

29. (a) Name four types of metabolic wastes produced by humans.

(b) Name any two human excretory organs other than kidney and mention their functions.

OR

Draw a flow chart to show the breakdown of glucose by various pathways.

30. Draw ray diagrams for the following cases when a ray of light :

(i) passing through centre of curvature of a concave mirror is incident on it.

(ii) parallel to principal axis is incident on convex mirror.

(iii) is passing through focus of a concave mirror incident on it.

31. How will you use two identical glass prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw and label the ray diagram.

32. (a) State Right Hand Thumb rule to find the direction of the magnetic field around a current carrying straight conductor.

(b) How will the magnetic field be affected on:

(i) increasing the current through the conductor

(ii) reversing the direction of flow of current in the conductor?

33. (a) What is an ecosystem? List its two main components.

(b) We often use the word 'environment'. What does it mean?

SECTION - D

Question No. 34 to 36 are long answer questions.

34. (a) Aluminium is a reactive metal but still used for packing food articles. Why?

(b) Can rusting of iron take place in distilled water?

(c) Give one example each of the reaction involving combination of

(i) an element with another element

(ii) an element with a compound

(iii) a compound with another compound.

OR

(a) What is 'corrosion'? Why aluminium sheets do not corrode easily?

(b) How is corrosion different from rusting?

(c) Write the type of chemical reaction in the following :

(i) Reaction between an acid and a base

(ii) Rusting of iron.

35. (a) Give reasons for avoiding frequent pregnancies by women.

(b) Explain the following methods of contraception giving one example of each:

(i) Barrier method

(ii) Chemical method

(iii) Surgical method.

OR

Describe the structure of human male reproductive system with the help of a diagram. Write down the role of each part.

36. (a) Name two safety measures commonly used in an electric circuit and appliances.

(b) What precaution should be taken to avoid the overloading of domestic electric circuits?

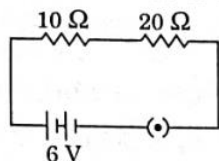
(c) What is the role of fuse, used in series with any electrical appliance? Why should a fuse with defined rating not be replaced by one with a larger rating?

(d) A circuit has a fuse of 5 A. What is the maximum number of 60 W (220 V) bulbs that can be safely used in the circuit?

OR

Derive the expression for the heat produced due to a current ' I ' flowing for a time interval ' t ' through a resistor ' R ' having a potential difference ' V ' across its ends. With which name is the relation known? How much heat will an instrument of 12 W produce in one minute if it is connected to a battery of 12 V?

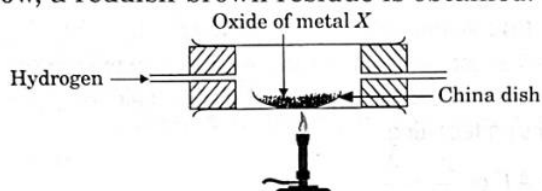
Study the following electric circuit and find (i) the current flowing in the circuit and (ii) the potential difference across $10\ \Omega$ resistor.



SECTION - E

Question No. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. When dry hydrogen is passed over a heated oxide of metal X using the apparatus shown below, a reddish-brown residue is obtained.



- Which metal could be present in the reddish-brown residue?
- Write the chemical reaction taking place in the above setup.
- Is the above reaction a redox process? If yes, then name the oxidising agent and reducing agent.

OR

- Give two other examples of redox reactions.
38. Mendel crossed tall and dwarf pea plants to study the inheritance of one gene. He crossed true breeding tall plants with true breeding dwarf plants to obtain plants of the first hybrid generation which is called the first filial progeny or F_1 . Mendel then self pollinated the heterozygous tall F_1 plants to obtain F_2 generation having homozygous tall, heterozygous tall and homozygous dwarf plants.

- Which two plants should be crossed if you want tall and dwarf pea plants in same proportions?
- If 'A' represents the dominant gene and 'a' represents its recessive allele, what would be the percentage of dominant phenotype in the first generation offspring when Aa is crossed with Aa?

OR

(b) On study of one gene inheritance pattern, state and explain the laws derived by Mendel.

39. The refraction of light on going from one medium to another takes place according to two laws which are known as the laws of refraction of light. These laws are

I. The ratio of sine of angle of incidence to the sine of angle of refraction is always constant for the pair of media in contact.

$$\frac{\sin i}{\sin r} = \mu = \text{constant}$$

This constant is called refractive index of the second medium with respect to the first medium. Refractive index is also defined as the ratio of speed of light in vacuum to the speed of light in medium.

II. The incident ray, refracted ray and normal all lie in the same plane.

This law is called Snell's law of refraction.

- When light travels from air to medium, the angle of incidence is 45° and angle of refraction is 30° . Find the refractive index of second medium with respect to the first medium.
- From air, water, glass and diamond in which medium, the speed of light is minimum. Why?
- If the refractive index of glass is 1.5 and speed of light in air is 3×10^8 m/s. Find the speed of light in glass.

OR

- Refractive index of a with respect to b is 2. Find the refractive index of b with respect to a.

ANSWERS

1. (a) : X and Y have the same molecular formula, C_5H_{12} but different structural formulae. X is a branched chain alkane $CH_3CH(CH_3)CH_2CH_2CH_3$ and Y is the straight chain alkane $CH_3CH_2CH_2CH_2CH_3$. Since X and Y have the same molecular formula, they must have the same percentage composition by mass. Y is n-pentane. It is a structural isomer of pentane having formula C_5H_{12} .

Z is 2-methylpropane. It is the isomer of butane. Isomers have different boiling points.

- (d) : Propene ($CH_3-CH=CH_2$) and propyne ($CH_3-C\equiv CH$) are unsaturated hydrocarbons.
- (c) : As the aqueous solution of 'A' turns phenolphthalein solution pink, hence 'A' is basic in nature. On adding an aqueous solution 'B' to it, the pink colour will disappear. Hence, 'B' is an acid.
- (c)

5. (c) : It is a displacement reaction since H of NH_3 is displaced by O. It is a redox reaction since NH_3 is oxidised to NO and O_2 is reduced to H_2O .

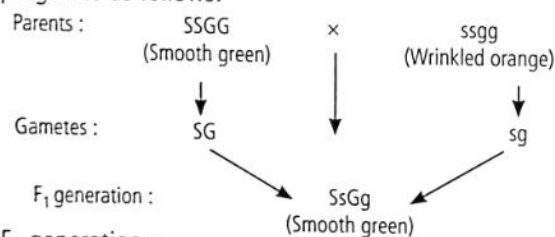
6. (a)

7. (d) : In graphite, each carbon atom is covalently bonded to three other carbon atoms.

8. (d) : Inspiration is defined as the process of entering of fresh air into lungs for gaseous exchange. In inspiration, the external intercostal muscles (muscles present in between ribs) contract and pull the ribcage upwards and outwards, away from the spinal column. At the same time, the diaphragm contracts and flattens pushing down the abdominal organs. These movements increase the volume of the thoracic cavity and therefore, decrease the air pressure in the lung. As the pressure outside the body is more, it causes flow of air rapidly into external nares.

9. (b) : Transpiration is the loss of water in the vapour form from the exposed parts of a plants. Rate of transpiration is inversely proportional to the relative humidity, i.e., the rate of transpiration is higher when relative humidity is lower and rate of transpiration is lower when relative humidity is higher. Rate of transpiration increases with an increase in temperature. The movement of air increases the rate of transpiration.

10. (c) : When a plant homozygous for smooth and green seeds is crossed with a plant having wrinkled and orange seeds and the F_1 produced is self pollinated to produce F_2 generation, four types of phenotypes are produced in their progenies as follows:



F_2 generation :

♂ \ ♀	SG	Sg	sG	sg
SG	SSGG Smooth green	SSGg Smooth green	SsGG Smooth green	SsGg Smooth green
Sg	SSGg Smooth green	SSgg Smooth orange	SsGg Smooth green	Ssgg Smooth orange
sG	SsGG Smooth green	SsGg Smooth green	ssGG Wrinkled green	ssGg Wrinkled green
sg	SsGg Smooth green	Ssgg Smooth orange	ssGg Wrinkled green	ssgg Wrinkled orange

Phenotypic ratio :

9 : 3 : 3 : 1
 Smooth green seeds : Wrinkled green seeds : Smooth orange seeds : Wrinkled orange seeds

If total number of offsprings are 144, then number of plants

having wrinkled and green seeds are $\frac{3}{16} \times 144 = 27$.

11. (d)

12. (c) : Part labelled as P is called tentacle which helps the organism *Hydra* during locomotion and part labelled as Q is called a bud. In *Hydra*, a bud develops as an outgrowth due to repeated cell division at one specific site which develops into tiny individuals and detach from the parent body on maturation and become new independent individuals. *Hydra* can also reproduce by the process of regeneration.

13. (a) : Volume of the wire does not change when the wire is melted and recasted. If l and A are the original length and area of cross-section and l' and A' are their corresponding values on recasting.

$$Al = A'l' \text{ or } \frac{l'}{l} = \frac{A}{A'}$$

$$\therefore \frac{l'}{l} = \frac{1}{2} \text{ (Given)}$$

$$\therefore \frac{A}{A'} = \frac{1}{2}$$

$$\text{New resistance, } R' = \frac{\rho l'}{A'}$$

$$\text{As } R = \frac{\rho l}{A}$$

$$\therefore \frac{R'}{R} = \frac{\rho l' / A'}{\rho l / A} = \left(\frac{l'}{l}\right) \left(\frac{A}{A'}\right) = \left(\frac{1}{2}\right) \left(\frac{1}{2}\right) = \frac{1}{4}$$

$$\text{or } R' = \frac{R}{4}$$

14. (c) : Both points are correct and these are the result of experiments done by Danish physicist Hans Christian Oersted in 1820.

15. (a) : When two resistors are connected in parallel, the current divides itself in the inverse ratio of resistance.

$$I_1 : I_2 :: \frac{V}{R_1} : \frac{V}{R_2}$$

$$I_1 : I_2 :: \frac{1}{R_1} : \frac{1}{R_2}$$

16. (c) : A current-carrying solenoid behaves like a bar magnet with fixed polarities at its ends.

17. (c) : Alcohols do not react with NaHCO_3 while acids reacts and gives brisk effervescence.

18. (a) : Mendel used a number of contrasting visible characters of garden peas, produced progeny from them,

calculated the percentage of tall or short progeny. He was the first person to make use of his knowledge of science and mathematics and keep a count of individuals exhibiting a particular trait in each generation. This helped him to arrive at the laws of inheritance/heredity.

19. (a) : It is because of the presence of residual volume of air in lungs that the gaseous exchange continues even during expiration. Residual volume is the volume of air (about 1.5 litres) that can never be driven out by respiration. Residual volume cannot be expelled out from the lungs, even after a maximum forceful expiration. In other words, although inspiration alternates with expiration, gaseous exchange normally continues in lungs without interruption during both phases.

20. (b)

21. pH of solution = 2 means $[H^+] = 10^{-2}$ M

pH of solution = 4 means $[H^+] = 10^{-4}$ M

As $10^{-2} > 10^{-4}$, solution A is more acidic than solution B.

$$\frac{[H^+] \text{ in solution A}}{[H^+] \text{ in solution B}} = \frac{10^{-2} \text{ M}}{10^{-4} \text{ M}} = 10^2$$

i.e., $[H^+]$ in solution A is 100 times more than that in solution B.

OR

(a) The compound P is calcium phosphate.

(b) Eating chocolates and sweets produce large amount of acid in the mouth which is not completely neutralised by the saliva produced in the mouth. Excess acid attacks the enamel and tooth decay starts as pH of the mouth falls below 5.5. The best way to prevent tooth decay is to clean the teeth by using toothpastes after eating food. Toothpastes neutralise the excess acid in the mouth.

22. (a) Reflex actions are involuntary actions and most of them involve spinal cord. Therefore, reflex actions are also generally known as spinal reflexes.

(b) Nervous system and endocrine system are often collectively known as neuroendocrine system because both the systems operate in a coordinated way on many occasions. Many important functions of the endocrine system are under the control of nervous system.

23. Transport system in highly organised plants consists of two main components - xylem and phloem.

(i) Xylem : It is responsible for transport of water and minerals and its components are - xylem vessels, xylem tracheids, xylem parenchyma and xylem fibres.

(ii) Phloem : It is responsible for transport of food substances and its components are - sieve tubes, companion cells, phloem parenchyma and phloem fibres.

24. Lymph is an extracellular, light-yellow coloured, mobile fluid connective tissue which drains into the lymphatic capillaries from the intercellular spaces. Composition of lymph or tissue fluid is the same as that of blood plasma but it lacks RBCs and large plasma proteins. Lymph performs

many functions such as carrying carbon dioxide and waste materials that diffuse from cells into the tissue fluid, destroying invading microbes with the help of leucocytes (WBCs) and transporting fatty acids and glycerol from small intestine to blood.

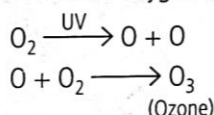
25. The phenomenon is called dispersion.

The speed of violet light inside the prism is slowest and that of red is highest. Hence, deviation of violet light is maximum and that of red is minimum.

OR

The angle between the extrapolated sections of the incident ray and the emergent ray during refraction through a prism is called the angle of deviation.

26. Ozone (O_3) is a molecule formed by three atoms of oxygen. It is formed in the stratosphere layer of atmosphere when high energy UV rays act on O_2 molecule splitting it into free oxygen (O) atoms. These atoms then combine with molecular oxygen (O_2) to form ozone (O_3).



Ozone shields the surface of the earth from UV radiations from the sun. The depletion of ozone layer will lead to global warming and some serious health issues such as damage of skin cells that leads to skin cancer, snow blindness or inflammation of cornea, increased fatality of young animals, mutations and reduced immunity.

27. (i) C_2H_4 will burn with a yellow flame.

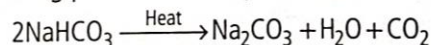
(ii) $CH_3CH_2OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$

(iii) Alkaline potassium permanganate.

28. The white powder added while baking cakes to make it soft and spongy is baking powder. Its main ingredients are sodium hydrogen carbonate and a mild edible acid like tartaric acid or citric acid.

$NaHCO_3$ decomposes to give out CO_2 which causes the cake to rise and makes it soft and spongy. The function of tartaric acid or citric acid is to neutralise sodium carbonate formed during heating which can otherwise make the cake bitter.

Reaction taking place when the powder is heated :



29. (a) Four types of metabolic wastes produced by human are urea, carbon dioxide, water and salts.

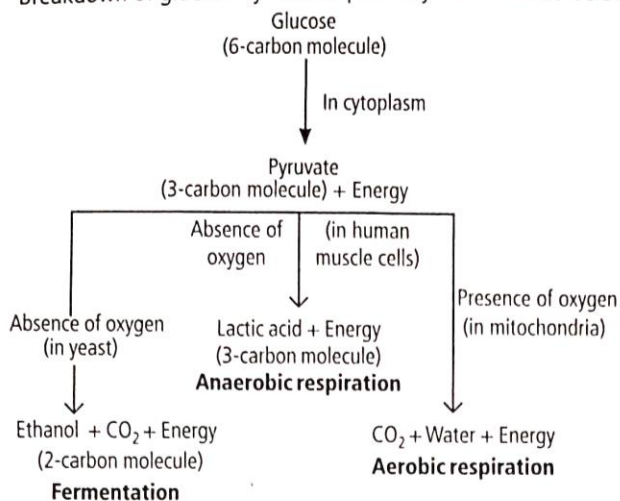
(b) Two human excretory organs other than kidneys are:

(i) Lungs : They help to eliminate carbon dioxide.

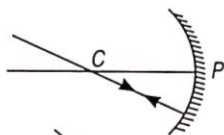
(ii) Liver : It is an excretory organ as it converts harmful amino acids to harmless urea and haemoglobin of worn out RBCs to bilirubin and biliverdin that can be excreted out of the body.

OR

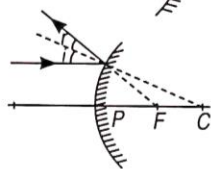
Breakdown of glucose by various pathways is shown as below:



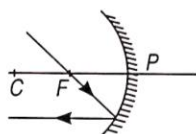
30. (i) Ray of light passing through centre of curvature of concave mirror, after reflection retraces its path.



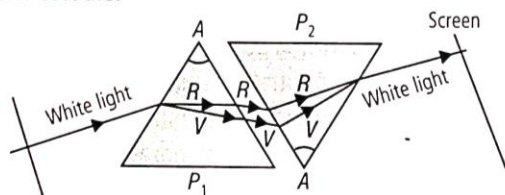
(ii) Ray of light parallel to the principal axis is incident on a convex mirror after reflection appear to diverge from the principal focus of a convex mirror.



(iii) Ray of light passing through focus of a concave mirror after reflection will emerge parallel to the principal axis



31. Newton was the first to use a glass prism to obtain the spectrum of a white light. He then placed a second identical prism in an inverted position with respect to the first prism. This allowed all the colours of the white light to pass through the second prism combining to form a white light emerging from the other side of the second prism. This made him believe that white light was composed of different colours.



32. (a) It states that you are holding a current carrying straight conductor in your right hand such that the thumb points towards the direction of current. Then your finger will wrap around the conductor in the direction of the field lines of the magnetic field.

- (b) (i) If the current is increased, the magnetic field strength also increases.
 (ii) If the direction of current is reversed, the direction of magnetic field also get reversed.

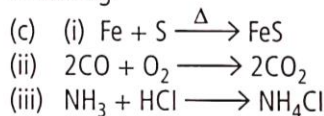
33. (a) An ecosystem is defined as a structural and functional unit of the biosphere. It comprises of living organisms and their non-living environment that interact by means of food chains and biogeochemical cycles resulting in energy-flow, biotic diversity and material cycling to form stable self-supporting system.

The two main components of ecosystem are :

- (i) Abiotic components – Non-living components of ecosystem, e.g., soil, water, air, light, etc.
 (ii) Biotic components – Living components of ecosystem, e.g., plants, animals and microbes.

(b) Environment can be defined as the physical or biological world where an organism lives. Literally speaking, an organism's immediate surrounding constitutes its environment which includes both biotic and abiotic components around him.

34. (a) From the position of the aluminium (Al) metal in the activity series, it seems to be quite reactive. However, it is not so reactive. Actually, when the metal is kept in air or oxygen for sometimes, it is converted into its oxide called aluminium oxide (Al₂O₃). This gets deposited at the surface of the metal as a thin coating. It is rather passive which means that it is not reactive. Therefore, the metal is used for packing food articles.
 (b) There is less chance of rusting in distilled water because it is free of ions. The presence of ions accelerates the process of rusting.



OR

(a) The process of slowly eating up of the metals due to attack of atmospheric gases such as oxygen, carbon dioxide, hydrogen sulphide, water vapour etc. on the surface of the metals so as to convert the metal into oxide, carbonate, sulphide etc. is known as corrosion.

Aluminium sheets do not corrode easily because in the presence of air, the surface of aluminium is covered with a protective layer of aluminium oxide.

(b) Corrosion refers to eating up of the metals due to attack of atmospheric gases on the surface of metals while rusting specifically refers to corrosion of iron in which iron metal reacts with air and moisture to form brownish powder called rust.

- (c) (i) Neutralisation reaction
 (ii) Oxidation - reduction reaction

35. (a) Having pregnancies too frequently and giving child birth at quick succession reduce mother's health and vitality and cause mental strain. Health of children is also affected due to nutritional deficiencies.

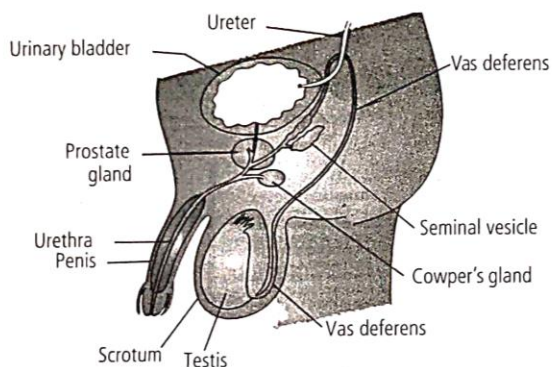
(b) (i) Barrier method: These are physical devices to prevent the entry of sperm into the female genital tract during copulation. They also protect against sexually transmitted diseases, e.g., condoms. Condoms are thin, strong rubber

sheaths used by man to cover the erect penis. It is simple but effective and widely used contraceptive that has no side effects. It checks pregnancy by preventing deposition of semen in the vagina.

- (ii) Chemical method: Some common chemicals like foam tablets, jellies, paste, creams and spermicides are used by females. These are placed in vagina. These chemicals adhere to the mucous membrane and immobilise and kill the sperms.
- (iii) Surgical method: Surgical methods include vasectomy and tubectomy. Vasectomy is a small surgical operation performed in males. It involves removal of a small portion of the sperm duct (or vas deferens) by surgical operation. The two cut ends are then ligated (tied) with threads and this prevents the sperms from coming out. Tubectomy is done in females where oviducts are cut and cut ends tied with threads and therefore, passage of ova is prevented.

OR

The diagrammatic representation of human male reproductive system (side view) is as follows:



Human male reproductive system consists of testes, scrotum, vas deferens, urethra and penis.

- (i) Testes : The human male possesses two testes, which are the primary reproductive organs, lying outside the abdominal cavity. The two testes are the male gonads, which are the sites where male gametes, i.e., sperms are produced. The testes also produce the male sex hormone-testosterone. The testes of man produce sperms from puberty onwards, throughout his life.
- (ii) Scrotum: The scrotum is a pouch of skin that hangs between the legs. It is divided internally into right and left scrotal sacs by a muscular partition. The two testes lie in respective scrotal sacs. The scrotum acts as a thermoregulator and provides an optimal temperature for the formation of sperms. The sperms develop at a temperature 2 – 2.5°C lower than the normal body temperature.
- (iii) Vas deferens : This is a straight tube, about 40 cm long, which carries the sperms to the seminal vesicles. The sperms are stored temporarily in the seminal vesicle, where mucus and a watery alkaline fluid containing the sugar-fructose, mix with the sperms.

- (iv) Urethra: It is about 20 cm long tube that arises from the urinary bladder to carry urine. It runs through the penis and opens to the outside through male genital pore. The contents of two seminal vesicles and sperms from vas deferens also join the urethra. Thus, urethra carries urine from the bladder, as well as sperms from the vasa deferentia, through the penis.
- (v) Penis: Penis is a long and thick muscular organ made up of mostly erectile tissue. At the time of sexual act, the erectile tissue gets filled with blood causing the penis to become erect. It is inserted into the vagina of the female where sperms are ejaculated for the purpose of reproduction.

36. (a) Fuse and the connection of earthing wire are the two safety measure commonly used in electric circuit and appliances.

- (b) Provide fuses/MCBs of proper rating.
- (c) Fuse, used in series with any electrical appliance protects it from short-circuiting and overloading. When suddenly high electric current flows through the circuit, the fuse melts due to Joule heating effect and breaks the circuit. If a fuse is replaced by one with larger ratings, fuse will not burn off for just high current for appliances and the appliances may get damaged.

(d) Suppose x bulbs can be used safely.

Power of 1 bulb = 60 W

So, Power of x bulbs, $P = 60 \times x$ watts

Potential difference, $V = 220$ V

Now, Power, $P = V \times I$

$60 \times x = 220 \times 5$

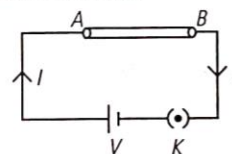
$$\Rightarrow x = \frac{220 \times 5}{60}$$

$\Rightarrow x = 18.33 \approx 18$

Thus, a maximum number of 18 bulbs can be used.

OR

Consider a wire AB having a resistance 'R' connected across the terminals of a cell. Let V be the potential difference applied by cell across the ends of a wire.



Let W be the work done in carrying the charge Q across the conductor, then

$$V = \frac{W}{Q} \text{ or } W = V \times Q \quad \dots(i)$$

but $Q = I \times t$

So, $W = V \times It \quad \dots(ii)$

This work done will appear in the form of heat produced in the wire i.e.,

$$H = VIt \quad \dots(iii)$$

So, $H = (IR) It = I^2 Rt \quad (\because V = IR)$

This is the expression for the heat produced in the wire. This is called Joule's law of heating.

Heat produced in one minute

$$H = P \times t \quad (\because P = I^2 R)$$

$$= 12 \times 60 = 720 \text{ J}$$

(i) The battery shown in the given circuit is of 6V.

$$V = 6 \text{ volts}$$

$$\text{Total resistance, } R = 30 \text{ ohms}$$

$$\text{Total current, } I = ?$$

$$R = \frac{V}{I}$$

$$30 I = 6$$

$$I = \frac{6}{30}$$

$$I = \frac{1}{5}$$

$$I = 0.2 \text{ ampere or } (0.2 \text{ A})$$

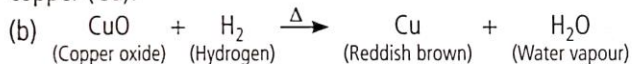
(ii) Potential difference across 10Ω is given by $V = IR$

$$\text{Here, } I = 0.2 \text{ A and } R = 10 \Omega$$

$$\therefore V = 10 \times 0.2$$

$$V = 2 \text{ volts}$$

37. (a) The reddish brown residue could be containing copper (Cu).



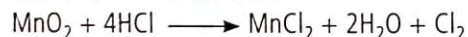
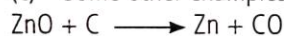
(c) The given reaction is a redox reaction.

Reducing agent - H_2

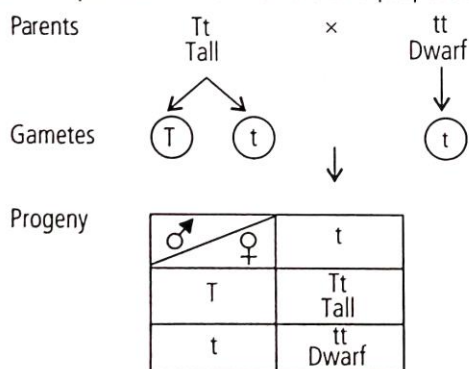
Oxidising agent - CuO

OR

(c) Some other examples of redox reactions are:



38. (a) When a cross is made between heterozygous tall and homozygous dwarf individuals, this is called a test cross. Tall and dwarf plants are obtained in same proportion.



Phenotypic ratio = 1 Tall : 1 Dwarf

(b) 'A' represents the dominant gene and 'a' represents its recessive allele. The most likely result in the first generation offspring when Aa is crossed with Aa is that the dominant and recessive phenotype will be 75%.

Parents: Aa × Aa

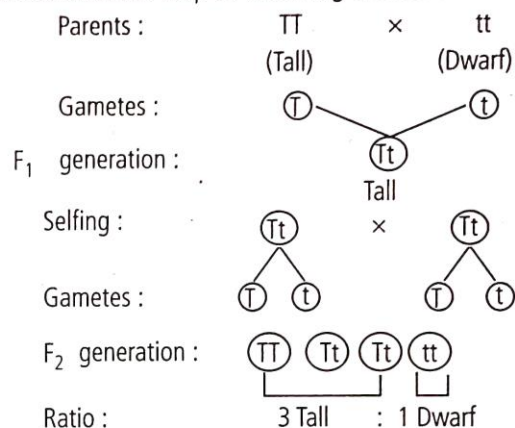
Gametes: A, a and A, a

F ₁	A	a
A	AA	Aa
a	Aa	aa

Hence, 75% dominant phenotype and 25% recessive phenotype.

OR

(b) In the situation discussed in the question the Mendel derived two different laws, i.e., law of dominance and law of segregation (or law of purity of gametes). This can be explained with the help of following crosses:



In F₁ hybrid, two dissimilar alleles are present for one character, i.e., height T is for tallness and t is for dwarfness, out of which only one allele called dominant allele expresses itself and the one which remains unexpressed is called recessive allele. This is called "law of dominance".

Also the two dissimilar alleles that remain together in a heterozygous individual do not get mixed up and keep their distinct identity. Hence, at the time of gamete formation they separate so that each gamete receives only one allele and is always pure which enables reappearance of recessive trait in F₂ progenies when the two recessive alleles come together. This is called "law of purity of gametes."

39. (a) As, ${}^1\mu^2 = \frac{\sin i}{\sin r}$

$$\frac{\sin 45^\circ}{\sin 30^\circ} = \frac{1/\sqrt{2}}{1/2} = 1.41$$

(b) As diamond has maximum value of refractive index, therefore it has minimum speed of light in medium.

(c) As, $\mu_{\text{glass}} = 1.5$, $c = 3 \times 10^8 \text{ m/s}$

$$\therefore \mu = \frac{c}{v} \text{ or } 1.5 = \frac{3 \times 10^8}{v}$$

$$v = 2 \times 10^8 \text{ m/s}$$

OR

(c) Given, refractive index of a with respect to b is ${}^b\mu_a = 2$
 \therefore Refractive index of b with respect to a is

$$\frac{1}{{}^b\mu_a} = {}^a\mu_b = \frac{1}{2} = 0.5$$

