Sample Paper 12

Class X 2022-23

Science (086)

Time: 3 Hours **Max. Marks: 80**

General Instructions:

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

SECTION - A **20 MARKS**

(Select and write one most appropriate option out of the four options given for each of the questions 1-20.)

1. Risha went to her grandfather's village, where she saw food cooking on a wooden challah as shown in the picture.

She noticed that the base of the cooking pot has sooty deposits. The reason for the utensils getting black at the bottom:

(a) Unsaturated hydrocarbons due to complete combustion

(b) Unsaturated hydrocarbons, as sooty deposits represent unburnt hydrocarbons

(c) Saturated hydrocarbons due to complete combustion

(d) Saturated hydrocarbons, as sooty deposits represent unburnt hydrocarbons 1

2. A student put some pieces of lead metal in the green coloured solution of copper chloride and observed the reaction that took place as shown in the figure. The colour of the solution changes.

Identify the type of reaction that took place in the test tube and the colour change.

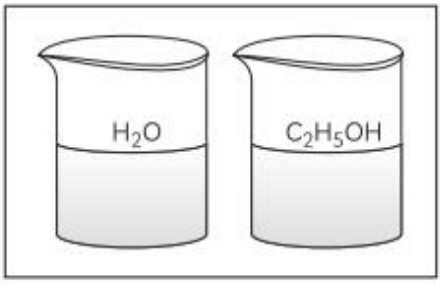
(a) Decomposition reaction, colour changes to blue

(b) Displacement reaction, solution becomes colourless

(c) Double displacement reaction, colour changes to white

(d) Displacement reaction, colour changes to blue 1

3. Ashima went to Canada with her father in winters, where they found that in car radiator, a mixture of the compounds shown in the image below is used instead of water only. She was curious to know the reason for this.



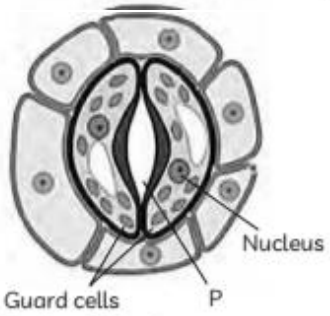
The reason for using a mixture of ethanol and water in car radiator is:

(a) Ethanol is added to water to lower the freezing point of water.
(b) Ethanol is added to water to increase the freezing point of water.
(c) The mixture is cheaper than other products
(d) None of the above 1

4. Raju used to believe that when we eat food, it goes to stomach and there the digestion starts. But his teacher told him that digestion of food starts in the mouth. Which of the following enzyme-substrate combination is present in the mouth?

(a) Salivary amylase-proteins
(b) Lipase-carbohydrates
(c) Salivary amylase-carbohydrates
(d) Salivary amylase-lipids 1

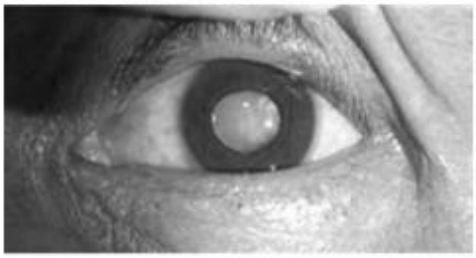
5. Riya marked a structure as 'P' in the figure of stomata as shown in the following figure:



Which of the following processes cannot occur if the structure 'P' is blocked?

(a) Transpiration and photosynthesis
(b) Transpiration and respiration
(c) Transpiration, respiration and photosynthesis
(d) Transportation and photosynthesis 1

6. The following picture shows a medical condition known as cataract.



The possible cause of cataract is:

(a) excessive curvature of eye lens
(b) elongated eyeball
(c) weakened ciliary muscles
(d) opaque eye lens 1

7. Sonal's mother went to a jeweller with a 20g bar of 24 carat gold and asked him to make jewellery out of it for Sonam's marriage. But the jeweller refused and said that pure gold cannot be used to make jewellery. He said that 18 carat or 22 carat gold is used for making jewellery. Why can't 24 carat gold be used for making jewellery?

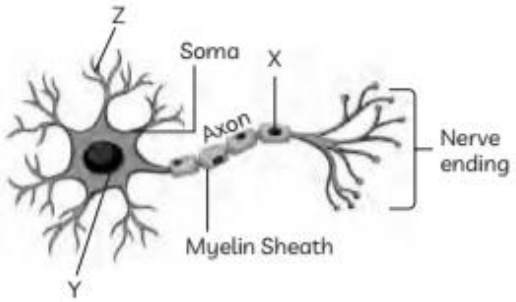
(a) It is very soft
(b) It does not bend easily
(c) It is very hard
(d) It retain its shape 1

8. Reema's mother bought some pickles from the market and asked Reema to store it in the kitchen. Reema stored the pickles in a copper container.

Pickles are usually destroyed by fungal effects. How can this be reduced?

(a) By storing them in glass containers and placing them in sunlight.
(b) By keeping them in air tight containers.
(c) By storing them in iron jars.
(d) By keeping them in moist and cold conditions. 1

9. Identify the structures 'X', 'Y' and 'Z' in the figure.



	X	Y	Z
(a)	Schwann cell	Dendrite	Nucleus
(b)	Dendrite	Schwann cell	Nucleus

	X	Y	Z
(c)	Nucleus	Dendrite	Schwann cell
(d)	Schwann cell	Nucleus	Dendrite

1

10. Human males have 23 pairs of chromosomes in their cells and females also have 23 pairs of chromosomes. But when these combine or after fusion, why don't an offspring have 46 pairs of chromosomes?

(a) Mitosis occurs during gamete formation which halves the chromosome.
(b) Mitosis occurs in zygote which reduces chromosome number.
(c) Mitosis occurs during gamete formation.
(d) Mitosis in zygote reduceds chromosome number. 1

11. Dentist uses mirror to see inside patient's mouth which is different from the one used at homes. Which mirror was used by dentist?

(a) Concave (b) Convex
(c) Plano-convex (d) Diverging 1

12. A student is performing an experiment in a chemistry lab. He takes an element 'X' and allow its reaction with oxygen. The compound formed has a high melting point. This compound is also soluble in water as shown in the following image:

The element 'X' is likely to be:

(a) Calcium (b) Carbon
(c) Iron (d) Silicon 1

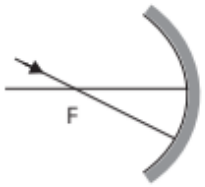
13. In a house hold connection, two bulbs of 80w and 40w are connected in series. If the current flowing through 80w bulb is 1A, then find out the current that flows through 40w bulb.

(a) 1 mA (b) 1 A
(c) 10 A (d) 100 mA 1

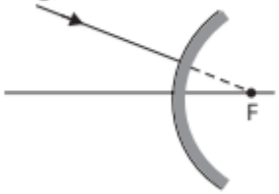
14. Ravi saw her mother dumping the kitchen wastes in the soil, which disappeared after some days. So, he also placed his old plastic bottle and a broken cup inside the soil, thinking that it will also disappear. But he saw that it remained there only even after a week. What is the reason for this?

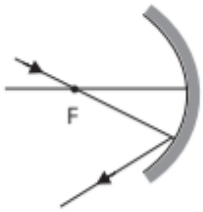
(a) They were non-recyclable
(b) They were biodegradable
(c) They were non-biodegradable
(d) They were a mix of biodegradable and non-biodegradable 1

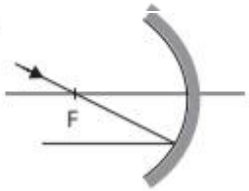
15. The diagram shows how a light beam strikes a concave or convex mirror.

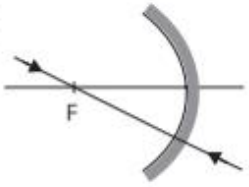


Which of the following shows the path of this ray, after reflection?

(a)


(b)


(c)


(d)


1

16. Rakhi used to store curd in a brass jar as shown in the image, but it corroides the metal and produced toxins.

Which acid is present in curd?

(a) Acetic acid (b) Formic acid

(c) Lactic acid (d) Citric acid 1

Q. no 17 to 20 are Assertion - Reasoning based questions.

These consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true and R is not the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

17. Assertion (A): A blue-green solution is obtained from a reaction between copper oxide and dilute hydrochloric acid.

Reason (R): This happens due to formation of copper (II) chloride. 1

18. Assertion (A): Nerve conduction is the one-way conduction.

Reason (R): Nerve impulse is transmitted from dendrite terminals to axon terminals. 1

19. Assertion (A): The centre of curvature is not a part of the mirror and it lies outside the reflecting surface of mirror.

Reason (R): The reflecting surface of a spherical mirror is not a part of a sphere having a centre. 1

20. Assertion (A): Lemon pickle can be stored in Aluminium vessel.

Reason (R): Aluminium metal reacts with acid present in lemon to produce hydrogen gas which cause food spoilage. 1

SECTION - B

12 MARKS

(Q. no. 21 to 26 are very short answer questions.)

21. Aaliya felt painful contraction of muscles in her legs while sleeping. As the frequency of these painful muscular contractions increased, she consulted a doctor. Doctor told her that these are muscular cramps and can be cured. What could be the reason of these cramps? 2

22. A student takes some syrupy liquid in a test tube and dilute it with water. But by mistake, she added water quickly to the tube and the tube immediately cracked and the liquid which spilled, produced blisters on her skin. What could be the reason for this?

OR

For testing a liquid "X," a cloth strip dipped in onion juice is used. The odour of the liquid "X" changes. Onion juice is a type of what kind of indicator? Blue litmus turns the liquid X red. What will the liquid X observe when it reacts with the granulated zinc? Write the chemical equation for the reaction involved. 2

23. A teacher told students that "A trait may be inherited, but may not be expressed", this statement confused the students as they believed that inherited traits are always expressed. Justify the statement of teacher with reason. 2

24. Give reasons for the following:

(A) Ammeter is connected in series to the electric circuit and not in parallel.

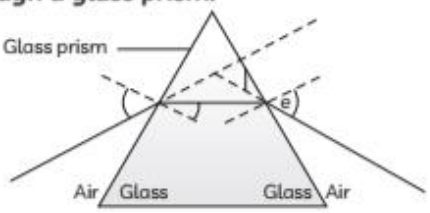
(B) The ends of the connecting wires are cleaned before connecting them in a circuit.

OR

(A) How should two resistors with resistances $R_1\Omega$ and $R_2\Omega$ be connected to an emf V volts battery to ensure that the least amount of power is used?

(B) You have four resistors, each measuring 8Ω. Describe the connection you would make for these resistors to have an effective resistance of 8Ω. 2

25. The following figure shows refraction through a glass prism:



Label angle of deviation, angle of emergence, emergent ray, incident ray, refracted ray and normal in the given figure. 2

26. Give one word for the following:

(A) Phenomenon where individuals of a species exhibit differences in characteristics.

(B) Part of DNA providing information for a protein.

(C) Formation of new species due to gradual change over long period of time.

(D) Recessive genes are expressed only in which condition. 2

SECTION - C

21 MARKS

(Q.no. 27 to 33 are short answer questions.)

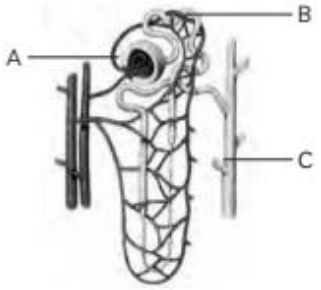
27. Addition of pure ghee in food items like parantha, laddoo, halwa, etc. make them more tempting. People usually get attracted to foods mainly due to smell of pure ghee. When Vanaspati oil reacts with hydrogen, it gets converted to Vanaspati ghee.

(A) What do we call this reaction? Which catalyst is used in this reaction?

(B) Write chemical equation for the above-mentioned reaction.

(C) Why this reaction of vegetable oil said to be an addition reaction? 3

28. Given below is the diagram of a nephron.



Identify the parts A, B and C and also write what happens in these parts during urine formation. 3

29. The given picture shows the uses of a white powder by artist and doctors, which can be use be as plaster for supporting fractured bones, making statues, etc.

Answer the following questions:

(A) Name the white powder used in the above given picture and also write its chemical formula.

(B) How does this white powder get hardened and what it is called?

(C) Write the balanced chemical equation for the formation of this white powder. 3

30. Draw a well labelled diagram of female reproductive system. Identify and label the following more previous page:

(A) Part producing female gamete or ovum

(B) Funnel shaped structures serving as the site of fertilization

(C) Part where embryo develops

OR

Identify and explain the method through which *Planaria* reproduces. When compared to reproduction, how is this process different? 3

31. Rajni was travelling to Kanpur via train. On her way, on a railway station, she saw some men joining the railway tracks as shown in the image:

Answer the following questions:

(A) Identify the compounds used for joining the railway tracks.

(B) What is the name of this reaction?

(C) Write the chemical equation for the above chemical reaction. 3

32. An electric egg boiler of 100Ω, an electric heater of resistance 150Ω and an iron of resistance 450Ω are connected in parallel to a 220V source. What is the resistance of an electric toaster connected to the same source that consumes as much as current as all three appliances? Also calculate the current flowing through it.

OR

(A) Calculate the resistance of a metal wire of length 4 m and area of cross section 1.5×10^{-7} m^2, if the resistivity of the metal is 2.6×10^{-5} Ω-m.

(B) Calculate the resistivity of the material of a wire of length 2 m, radius 0.01 cm and resistance 30 ohms. 3

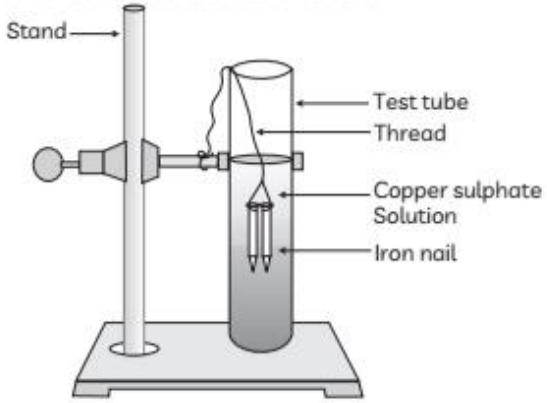
33. Enlist the properties of magnetic field lines. 3

SECTION - D

15 MARKS

(Q.no. 34 to 36 are long answer questions.)

34. **An experimental set-up was placed in the laboratory by the teacher for class X students as shown in figure (a) in which iron nails are placed in the copper sulphate solution, to record the observations. After few hours, the students noticed the changes as shown in figure (b). The teacher guided them to write the observations.**



(a)

(b)

Answer the following questions based on the observations:

(A) Students noticed the change in colour of copper sulphate solution. What is the change and why it happened?

(B) Which type of chemical reaction is taking place in the given figure and why?

(C) If copper nails are placed in ferrous sulphate solution, will the same reaction take place?

OR

'P' and 'Q' ore samples were taken. Ore 'P' releases CO_2 when heated, whereas ore 'Q' releases SO_2. What procedures will you follow to transform them into the appropriate metals? Also define the first step used during extraction of ore 'Q'. 5

35. **(A) Reeta was curious to know about solar furnaces. She asked the following questions to her teacher - Which type of mirrors are used in the design of solar furnaces? How high temperature is achieved by this device? Help to answer these questions.**

(B) What are the characteristics of the images formed by convex mirrors? Draw ray diagram in support of your answer.

OR

For each possible position of an object in the case of a concave mirror, draw ray diagrams.

5

36. **(A) Different hormones and secreted by different glands. Which hormones are secreted by thyroid, parathyroid and pancreas? Also mention functions of each hormone.**

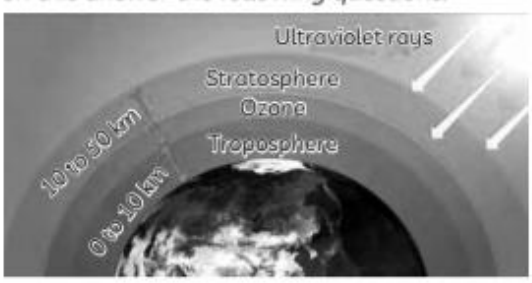
(B) Write the functions of a part of the hind brain - cerebellum. 5

SECTION - E

12 MARKS

(Q.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. *The following image shows the earth's atmosphere and its layers, and how it is protected from harmful UV radiations. Based on this answer the following questions:*



(A) One of the most serious issues is depletion of ozone layer in today's world. Which is the most important chemical responsible for depletion of ozone layer?

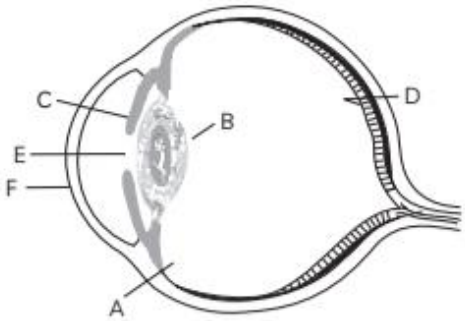
(B) The surface of the earth is protected from ultraviolet radiations by the ozone layer present high up in the atmosphere. Justify the statement.

OR

(B) Depletion of ozone layer results in many side effects. Write the effects of ozone layer depletion.

38. *The eye of a person is a remarkable organ. Our vision is a complex system with many intricate parts that all work together to produce a final product that almost everyone uses heavily on a daily basis. Despite the fact that we value our vision the most among all of our senses, surprisingly few people are aware of how our eyes function. When we look in the mirror, we can distinguish between the parts of the eye that are on the outside and those that are on the inside or farther away.*

The given picture is of a human eye. Based on the diagram given below answer the following questions:



4

(A) Name the part labelled as A and B in the figure given above.

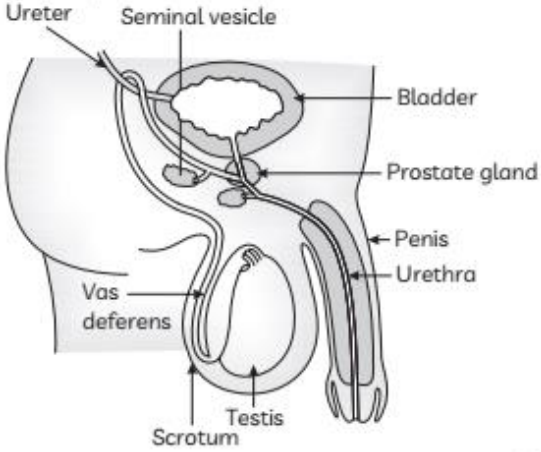
(B) Which part of the eye is responsible for the colour of the eye?

(C) Identity and write the function of part 'D'.

OR

(C) Name the part of eye that controlls the amount of light entering the eye. The front transparent part of the sclera is labelled by which part ?

39. *Sohan was studying about human male reproductive system and came across the following diagram. This system consists of different parts..*



Human-male reproductive system 4

(A) Name the male hormone responsible for male characteristics.

(B) The male reproductive system consists of a prostate, a pair of bulbourethral glands, a pair of seminal vesicles, accessory ducts, a pair of testes, and penis-shaped external genitalia. Where is this system located?

(C) What is the reason for location of Testes outside the abdominal cavity?

OR

(C) Sperms or spermatozoa are contained in sperm or seminal fluid, which is an organic fluid. What is the nature of semen?

SOLUTION

SAMPLE PAPER - 3

SECTION - A

1. *(b) Unsaturated hydrocarbons, as sooty deposits represent unburnt hydrocarbons*

Explanation: The utensils have black sooty deposits due to unburnt hydrocarbons. Saturated hydrocarbons burn completely and leave no residue whereas unsaturated hydrocarbons burn partially and thus leave residues.

2. *(b) Displacement reaction, solution becomes colourless*

Explanation: When lead metal is placed in a solution of copper chloride, the green colour of copper chloride solution fades and becomes colourless due to formation of lead chloride. The lead metal is more reactive than copper, therefore, lead displaces copper from copper chloride solution. This is called displacement reaction.

$$Pb + CuCl_2 \longrightarrow PbCl_2 + Cu$$

3. *(a) Ethanol is added to water to lower the freezing point of water.*

Explanation: A mixture of alcohol and water is used instead of water in car radiators in cold climate because in winters, in countries like Canada, temperature goes below 0°C, and

at this temperature water freezes. Therefore, ethanol is added to water to lower the freezing point of water.

4. *(c) Salivary amylase-carbohydrates*

Explanation: The process of digestion starts in the mouth, when we start chewing the food. The salivary gland produces saliva that moistens the food and allow it to easily pass through the oesophagus. Saliva also contains the enzyme salivary amylase (ptyalin) which digests carbohydrates present in the food.

5. *(c) Transpiration, respiration and photosynthesis*

Explanation: Structure marked as 'P' is stamatal pore. Once the guard cell is fully inflated, the pressure inside creates a pore that lets gas and water move back and forth. It aids in respiration and transpiration in this way. To carry out photosynthesis, a plant needs carbon dioxide from the surrounding atmosphere to enter the leaf. By diffusing through tiny pores called stomata, this is accomplished. Therefore, if stomata are blocked, transpiration, photosynthesis, and respiration will not take place.

6. *(d) Opaque eye lens*

Explanation: During old age, the crystalline lens of some people become hazy or even opaque due to formation of a membrane over the eye lens.

Related Theory

The defect cataract, can be corrected by surgically removing the opaque membrane present over the eye lens.

7. *(a) It is very soft*

Explanation: 24 carat gold cannot be used for making ornaments as it is very soft and easily bendable. In order to make jewellery, the metal should retain its shape and should not bend easily. Therefore, pure gold is mixed with other metals like copper and silver to strengthen it to make ornaments.

Caution

Students should know that gold is an alloy or combination of metals which we buy. The carat number indicates the purity or fineness of gold in jewellery. 18 or 22 carat gold is an alloy of gold with copper or silver.

8. *(a) By storing them in glass containers and placing them in sunlight*

Explanation: Sunlight increases the temperature of stored pickles and thus fungal effect can be minimized.

Iron jars will react with the acid present in pickles and destroy it.

Moist and cold conditions will favour fungal growth.

Caution

Students should know that the toxic compounds produced by reaction between acids and copper can cause food poisoning. Acids also reacts with metals to produce hydrogen gas, which spoils the food. The metals like copper get corroded by acetic acid, formic acid present in pickles.

9. *(a) X : Schwann cell; Y : Nucleus; Z : Dendrite*

Explanation: Structure 'X' is Schwann cell.

Structure 'Y' is Nucleus.

Structure 'Z' is Dendrite.

10. *(a) Meiosis occurs during gamete which halves the humber of chromosomes.*

Explanation: Males as well as females have 23 pairs of chromosomes in every cell but the gamete (sperm and ovum), is formed by meiotic cell division (reductional division) and thus contain only half the number of chromosomes i.e., 23 chromosomes in male sperm and 23 chromosomes in female egg. Therefore, after fusion the zygote will have 46 chromosomes *i.e.*, 23 pairs of chromosomes.

Related Theory

Fertilization is the fusion of haploid sperm and egg which leads to an offspring with 23 pairs of chromosomes.

Caution

Students should remember that meiosis or reduction division is the process of cell division in which the chromosome number is halved. It occurs only in gametes in humans. While mitosis occurs in somatic cells and the chromosome number remain same after division.

11. *(a) Concave*

Explanation: The dentist used a concave mirror to look inside the mouth of Gungun. Concave mirrors are used by dentist to see clear and enlarged images of the teeth, so that any damage or infection can be seen clearly.

Related Theory

Concave mirrors are converging mirrors that form a virtual, erect and enlarged image.

12. *(a) Calcium*

Explanation: Oxygen and calcium react to form calcium oxide.

$$\underset{\text{Calcium}}{Ca_{(s)}} + \underset{\text{Oxygen}}{O_{2(g)}} \longrightarrow \underset{\text{Calcium oxide}}{CaO_{(s)}}$$

An ionic compound is calcium oxide. Due to the potent electrostatic attraction between ions, it has a high melting point. In water, calcium oxide dissolves and transforms into calcium hydroxide, as illustrated below.

$$\underset{\text{Calcium oxide}}{CaO_{(aq)}} + \underset{\text{Water}}{H_2O_{(l)}} \longrightarrow \underset{\text{Calcium hydroxide}}{Ca(OH)_{2(aq)}}$$

Related Theory

- *Carbon and oxygen react to create a gas that is unable to have a high melting point.*

$$\underset{\text{Carbon}}{C_{(g)}} + \underset{\text{Oxygen}}{O_{2(g)}} \longrightarrow \underset{\text{Carbon dioxide}}{CO_{2(g)}}$$

- *Monoxide and dioxide, which have a high melting point but are insoluble in water, are created when silicon reacts with oxygen.*

$$\underset{\text{Silicon}}{Si_{(s)}} + \underset{\text{Oxygen}}{O_{2(g)}} \longrightarrow \underset{\text{Silica}}{SiO_{2(s)}}$$

- *Iron (II) oxide, which is insoluble in water, is created when iron and oxygen react.*

$$\underset{\text{Iron}}{2Fe_{(s)}} + \underset{\text{Oxygen}}{O_{2(g)}} \longrightarrow \underset{\text{Iron (II) oxde}}{FeO_{(s)}}$$

13. *(b) 1 A*

Explanation: The current that flows through 40W bulb will be 1 Ampere. This is because the bulbs are connected in a series combination, and in a series combination the current is the same in every part of the circuit as current does not change in series combination, therefore, both the bulbs get equal amount of current.

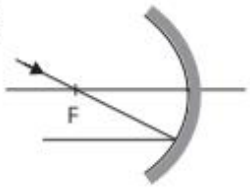
14. *(c) They were non-biodegradable.*

Explanation: The kitchen waste includes fruits and vegetable peels, tea bags, paper, etc. which are biodegradable substances and are decomposed by microorganisms, whereas plastic and glass which Ravi kept, were non-biodegradable substances and cannot be acted upon by microorganisms.

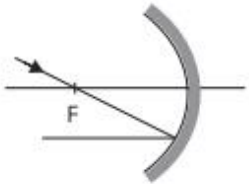
Related Theory

- *Biodegradable wastes are those that are degraded and decomposed by microbes and thus do not accumulate in the environment and cause pollution. For example: paper, wood, fruit and vegetable peels, etc.*
  Non-biodegradable wastes are those that are not degraded and decomposed by microbes and they accumulate in the environment and cause pollution. For example: plastic, metals, glass, etc.

15. *(c)*



Explanation: The correct path of the ray is shown in figure.



16. *(c) Lactic acid*

Explanation: The curd contains bacteria – *Lactobacillus* that produces lactic acid.

17. *(a) Both A and R are true and R is the correct explanation of A.*

Explanation: The reaction between copper chloride and dilute hydrochloric acid produces a blue-green solution due to formation of copper chloride which is blue green in colour.

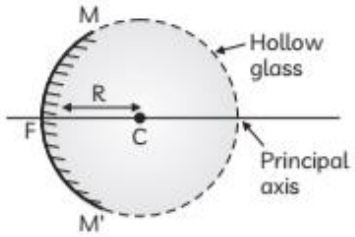
$$CuO_{(s)} + HCl_{(aq)} \longrightarrow CuCl_{2(s)} + H_2O_{(l)}$$

18. *(c) A is true but R is false.*

Explanation: Nerve impulse only travels in one direction. Nerve impulse is always transmitted across a synapse, *i.e.*, from axon terminals of one neuron to dendrites of the next neuron, but it never occurs in reverse direction. Neurotransmitter is only released at the axon terminal and not at the dendrite terminal.

19. *(c) A is true but R is false.*

Explanation: The centre of curvature does not lie on the reflecting surface of the mirror because it lies on the principal axis outside the mirror. The mirror is obtained by cutting a part of a sphere. Therefore, the reflecting surface is actually a part of that sphere. The sphere has a centre and this centre corresponds to the centre of curvature of the mirror.



20. *(d) A is false but R is true.*

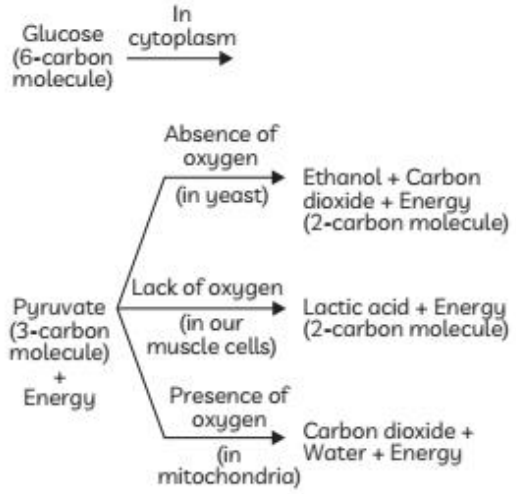
Explanation: Since aluminium being a metal reacts with citric acid present in lemon, it produces hydrogen gas which spoils food and can cause food poisoning. Therefore, lemon pickle should not be stored in aluminium vessel.

SECTION - B

21. Muscular cramps are caused due to lack of oxygen in our muscle cells. In the absence of oxygen, the pyruvate gets converted into lactic acid. This lactic acid gets accumulated in the muscles and cause muscular cramps.

Related Theory

- *Under aerobic conditions, pyruvate gets converted into carbon dioxide and water. Whereas in anaerobic conditions pyruvic acid gets converted into lactic acid.*



22. The syrupy liquid in the test tube could be conc. H_2SO_4(sulphuric acid) or conc. HCl, having great affinity for water and addition of water to an acid is a highly exothermic reaction, that results in excessive local heating of test tube and thus, cracking of the tube and spilling of acid that produced blisters.

Related Theory

The process of mixing an acid or base with water is called dilution, that results in decrease in the concentration of ions (H_3O^+/OH^-) per unit volume.

OR

Onion juice is olfactory indicator. One type of odour is produced by olfactory indicators in acidic media while a different odour is produced in basic media. It is an acidic solution because the liquid "X" turns litmus red instead of blue.

Acids create hydrogen gas when they react with active metals like zinc, magnesium, etc. An example of this reaction is:

$$Zn_{(s)} + \text{dil.}H_2SO_{4(aq)} \longrightarrow ZnSO_4 + H_{2(g)}$$

23. In experiments conducted by Mendel with pea plants, he cross bred a tall pea plant with dwarf pea plant, he found that in first (F_1) generation all plants were tall. No dwarf plants were obtained in F_1 generation. However, in second (F_2) generation, both tall and dwarf plants were obtained in the ratio of 3 : 1. In F_2 generation, both traits of tallness and dwarfness were inherited where tallness is dominant and dwarfness is recessive. Reappearance of dwarf character in F_2 generation proves that the dwarf trait was inherited but not expressed in the F_1 generation.

Related Theory

Phenotype of parents: Pure Tall × Pure Dwarf

Genotype: TT × tt

Gametes: T, t

F_1 generation: Tt — Hybrid tall

Selfing of F_1 hybrid: Tt × Tt

Gametes: T, t × T, t

F_2 generation:

♀ \ ♂	T	t
T	TT Tall	Tt Tall
t	Tt Tall	tt Dwarf

Phenotypic ratio = 3 : 1 (3 tall : 1 dwarf)

Genotypic ratio = 1 : 2 : 1 (1 pure tall : 2 hybrid tall : 1 pure dwarf)

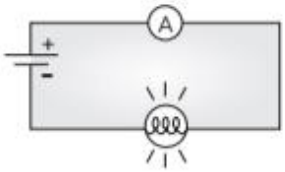
24. (A) Ammeter is not connected in parallel to the electric circuit, because connecting it in parallel the net resistance of the circuit decreases. As a result, more current will be drawn from the battery which can damage the ammeter. Also, ammeter itself has very low internal resistance.

(B) The ends of the connecting wires are cleaned before connecting them in a circuit, in order to remove the insulating layer, if present, otherwise current will not flow properly.

Related Theory

Ammeter is the instrument to measure the electric current in a circuit and is always connected in series in a circuit through which the current is to be measured.

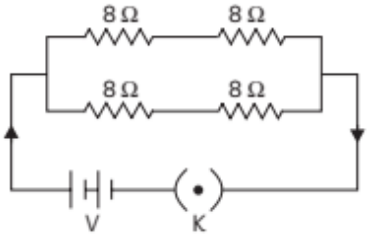
Following figure shows a typical electric circuit, comprising of a battery, an electric bulb and ammeter connected in series.



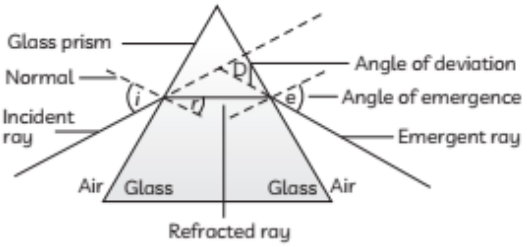
OR

(A) The two resistors are connected in series because power consumption is at its lowest when the circuit's current is at its lowest.

(B) If you have four 8 Ω resistors and their combined effective resistance is also 8 Ω, you should connect the two 8 Ω resistors in series. Right now, you have pair of two 16 resistors (8 Ω + 8 Ω). You will have a net resistance of 8 Ω if you connect these resistors in parallel.



25. The labeling are as following:

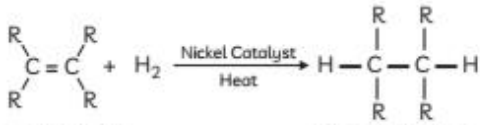


26. (A) Variations
(B) Gene
(C) Speciation
(D) Homozygous

SECTION - C

27. (A) The reaction in which Vanaspati oil reacts with hydrogen and gets converted to Vanaspati ghee is called as Hydrogenation. Nickel or palladium is used as a catalyst in this reaction.

(B)



Vegetable oil
Unsaturated fat

Vegetable ghee
Saturated fat

(C) Hydrogenation is termed as an addition reaction because hydrogen is added to unsaturated hydrocarbons in the presence of catalysts such as nickel or palladium to form saturated hydrocarbons.

28. The parts of the nephron are:

Parts	Name	Role in urine formation
A	Bowman's capsule	Nitrogenous wastes, glucose, water, amino acid filter from blood into bowman's capsule
B	Tubular part of nephron	Useful substances from the filtrate are reabsorbed back by capillaries from the tubular part
C	Collecting duct	Urea, extra water and salts are secreted into the tubule which opens up into the collecting duct

29. (A) The white powder is plaster of Paris or calcium sulphate hemihydrate,

$$CaSO_4.\frac{1}{2}H_2O.$$

(B) Plaster of Paris on mixing with water, changes to a hard solid mass known as gypsum.

$$CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O \longrightarrow CaSO_4.2H_2O$$

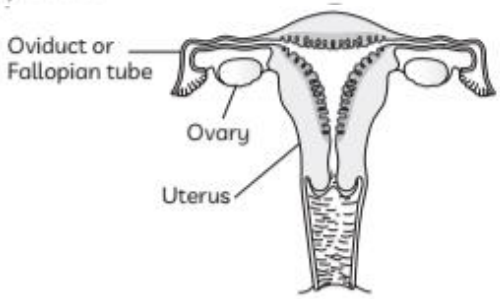
(Plaster of Paris) (Gypsum)

(C) Formation of plaster of Paris: By heating gypsum at 373K -

$$CaSO_4.2H_2O \xrightarrow{373K} CaSO_4.\frac{1}{2}H_2O + \frac{3}{2}H_2O$$

Gypsum Plaster of Paris

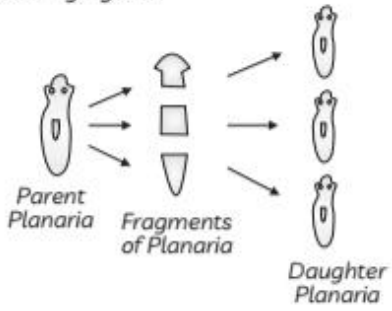
30. (A) Ovary
(B) Fallopian tube
(C) Uterus



Human-female reproductive system

OR

Planaria has a strong capacity for regeneration. Each body part of a *Planaria* can regenerate into a complete *Planaria* by growing all the missing parts if the *Planaria* is ever cut into several pieces. This is depicted in the following figure:



A new organism is created during the reproduction process from the full parent organism. However, a piece of the original parent body grows into a new individual during fragmentation.

31. (A) The compound used for joining railway tracks is aluminium and iron (III) oxide (Fe_2O_3).

(B) The reaction is called as thermite reaction. It is a highly exothermic reaction between a metal and metal oxide. In this, the aluminium acts as a reducing agent, that reduces iron oxide to produce molten iron and aluminium oxide, which is used to weld railway track.

(C) Chemical equation for thermite reaction is:

$$2Al_{(s)} + Fe_2O_{3(s)} \longrightarrow Al_2O_{3(s)} + 2Fe_{(s)} + \text{heat}$$

32. Let the resistance of the electric egg boiler, electric heater and an iron be R_1, R_2 and R_3 respectively.

So, $R_1 = 100\Omega$

$R_2 = 150\Omega$

$R_3 = 450\Omega$

Since the three appliances are connected in parallel, the resistance of an electric toaster connected to the same source should be equal to the equivalent resistance of the three appliances in parallel.

Therefore, equivalent resistance is given by:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{100} + \frac{1}{150} + \frac{1}{450}$$

$$= \frac{9+15+2}{900}$$

$$= \frac{26}{900}$$

$$R_{eq} = \frac{900}{26} = 34.62 \text{ Ohm}$$

Therefore, the resistance of an electric toaster connected to the same source is 34.62 Ohm.

Current through the toaster is calculated using Ohm's law,

$$V = IR$$

Or, $$I = \frac{V}{R} = \frac{220}{34.62} = 6.35A$$

OR

(A) For the given metal wire,

length, $l = 4$ m

area of cross-section, $A = 1.5 \times 10^{-7}$ m^2

resistivity of the metal, $\rho = 2.6 \times 10^{-5}\ \Omega$ m

Since, resistance,

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

So $$R = 2.6 \times 10^{-5} \times \frac{4}{1.5\times10^{-7}}$$

$$= 6.9 \times 10^2\ \Omega$$

(B) We are given,

the length of wire, $l = 1$ m

radius of wire, $r = 0.01$ cm $= 1 \times 10^{-4}$ m

resistance, $R = 20\Omega$.

As we know,

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

where is resistivity of the material of the wire

$$R = \rho\frac{l}{\pi r^2}$$

$$20 = \rho\frac{1}{\pi\times(10^{-4})^2}$$

$$20 = \frac{\rho}{\pi\times10^{-8}}$$

$$\rho = 20 \times \pi \times 10^{-8}$$

$$= 20 \times 3.14 \times 10^{-8}$$

$$= 62.8 \times 10^{-8}\ \Omega - m$$

$$= 6.28 \times 10^{-7}\ \Omega - m.$$

33. The characteristics of magnetic field lines are:

(1) Two magnetic lines never intersect each other.

(2) Magnetic field lines are always arranged in the form of closed concentric circles outside the magnet and their direction is from North to South pole.

(3) Inside the magnet, they are uniform, straight and move from South to North pole. Near the poles, they are denser and stronger, whereas weaker when wider apart.

SECTION - D

34. (A) The colour of the copper sulphate solution changes from blue to light green or colourless, because iron being more reactive than copper displaces copper from copper sulphate solution and forms ferrous sulphate solution (green). Copper gets deposited on iron nail.

$$Fe_{(s)} + CuSO_{4(aq)} \longrightarrow FeSO_{4(aq)} + Cu_{(s)}$$

(B) It is a single displacement reaction because iron displaces copper from copper sulphate solution.

(C) No reaction will take place in this case, as copper is less reactive than iron so it is unable to displace it from ferrous sulphate

solution. Therefore, there will not be any change in the test tube.

OR

Ore 'P' gives CO_2 on heating hence it is a carbonate ore.

Steps involved in extraction of ore 'P':

(i) Calcination: The ore is heated below its melting point either in absence of air or in limited supply to obtain a metal oxide

$$PCO_3 \rightarrow PO + CO_2$$

(ii) Reduction

The metal oxide is reduced with coke to obtain metal.

$$PO + C \rightarrow P + CO$$

Ore 'Q' is a sulphide ore.

Steps involved in the extraction of element 'Q':

(i) Roasting: Roasting is a process of metallurgy where ore is converted into its oxide by heating it below its melting point in the presence of excess air.

(ii) Reduction: The metal oxide is reduced to metal by carbon

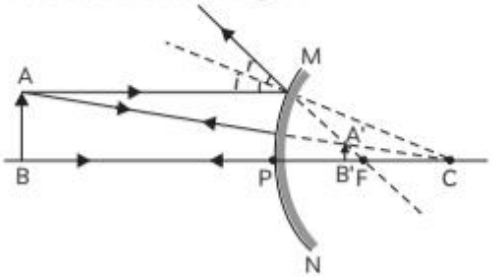
$$QO + C \rightarrow Q + CO$$

The first step used during the extraction of ore 'Q' is roasting. Ore is heated below its melting point in the presence of extra air during a metallurgical process that turns it into its oxide. Moisture and non-metallic impurities are released as volatile gases during roasting. Roasting is a solid-gas thermal reaction that includes pyrohydrolysis, oxidation, reduction, sulfation, and chlorination.

35. (A) The type of mirrors that are used in the designing of solar furnaces are concave mirrors.

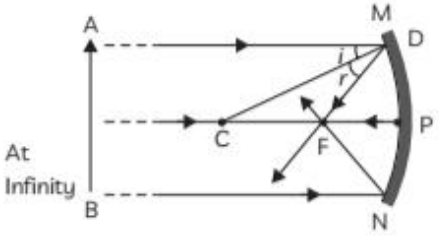
High temperature is achieved by this device by placing a solar furnace at the focus of a large concave mirror, it focuses a parallel beam of light on the furnace. Therefore, a high temperature is attained at the point after some time.

(B) Convex mirrors always form diminished, virtual and erect images.

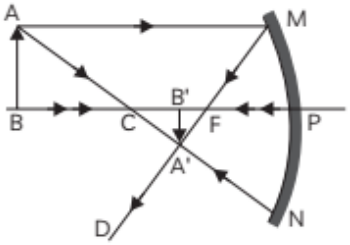


OR

(i)



(ii)



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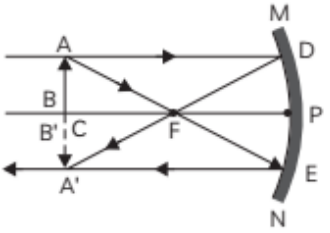

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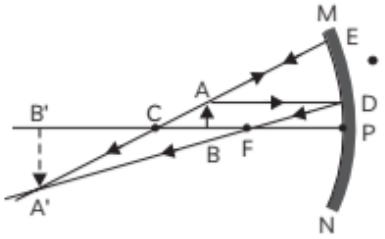
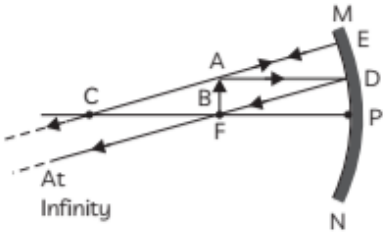
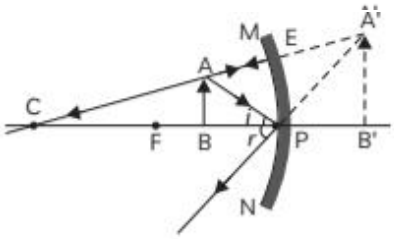


(v)



(vi)



36. (A) Thyroid secretes thyroxin.

Function: It plays an important role in the regulation of the basal metabolic rate.

Parathyroid secretes Parathyroid hormone (PTH, also known as parathormone). Function: The maintenance of the parathyroid hormone is necessary for the proper operation of the nervous and muscular systems. It regulates the levels of calcium and potassium in the blood.

Pancreas secrete insulin and glucagon. Function of insulin: Insulin is essential for maintaining the homeostasis of blood glucose levels.

Function of glucagon: It aids in keeping blood sugar levels normal.

(B) One of the important parts of hind brain is cerebellum that controls and coordinates the movements of our body and helps in adjusting the posture. It functions even when the person is asleep.

SECTION - E

37. (A) Chlorofluorocarbons (CFCs) is the most important chemical responsible for depletion of ozone layer. The ozone gets depleted by gaseous CFCs when they slowly rise into the stratosphere, they get broken down by strong ultraviolet radiation, release chlorine atoms, and then react with ozone molecules.

(B) The formation of ozone takes place when high energy UV radiations act on oxygen molecules (O_2) and split it into oxygen atoms (O), that combines with the oxygen molecules to form ozone (O_3). Therefore, ozone protects earth from harmful UV radiations.

OR

(B) The environment is negatively impacted by the ozone layer's depletion. As the ozone layer thins, people will be directly exposed to the sun's harmful ultraviolet radiation. Humans may experience severe health problems as a result, including skin conditions, cancer, sunburns, cataracts, rapid ageing, and weakened immune systems.

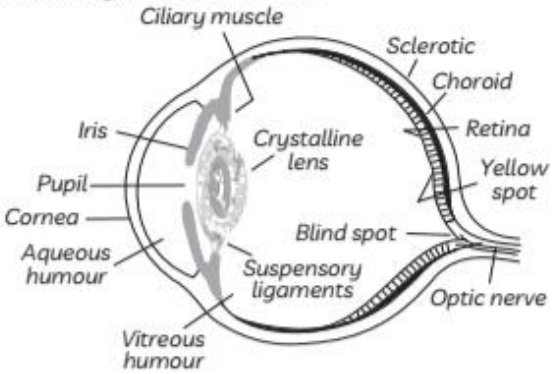
⚠ Caution

➥ *Students usually don't know that depletion of ozone layer causes harm to plants also. Strong ultraviolet rays may prevent plants from growing, flowering, or performing photosynthesis. The harmful effects of the ultraviolet rays must also be endured by the forests.*

38. (A) Part labelled 'A' and 'B' is vitreous humour and crystalline lens respectively.

⚠ Caution

➥ *Students usually get confused with the structure of human eye and mark wrong answer. Structure of human eye is as shown below:*



(B) The part labelled 'C' *i.e.*, Iris is responsible for the colour of the eye.

(C) The part labelled 'D' is retina. It is a light sensitive screen which captures the light rays focused by the lens and sends impulses to the brain via the optic nerue.

OR

(C) The part labelled 'E' is pupil. It opens and closes to control and regulate the amount of light.

The part labelled 'F' *i.e.* cornea covers the front transparent part of the sclera. This membrane is quite thin. It refracts the light entering the eye like a lens.

39. (A) The sex hormone testosterone has vital functions in the body. It is believed to control a man's libido, bone mass, fat distribution, muscle mass and strength, as well as the creation of sperm and red blood cells.

⚠ Caution

➥ *Students usually don't know that testosterone is also produced in females. Although small amounts are also produced by the adrenal glands in both sexes, testosterone is primarily produced by the gonads (by the Leydig cells in the testes in men and by the ovaries in women). Men have much higher levels of it than women do.*

(B) The male reproductive system is located in the pelvis region. It includes a pair of testes along with accessory ducts, glands and the accessory or external genitalia.

(C) Testes (the site of spermatogenesis) are located outside the abdominal cavity because the process of spermatogenesis requires a lower temperature (2°C to 2.5°C) than the body. The scrotum or scrotal sac is the name of the pouch.

OR

(C) Human zygote is a diploid cell having $2n$ number of chromosomes, formed by the fusion of human sperm and human egg. Thus, human zygote has 46 chromosomes, whereas human sperm (male gamete) formed by reduction division/meiosis, have only 23 chromosomes. Therefore, the ratio will be 2 : 1.