Sample Paper 17

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.

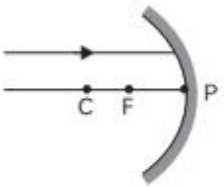
SECTION - A **20 MARKS**

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

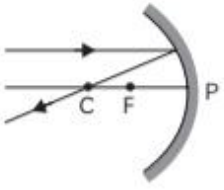
1. How does the metallic character vary across the period?
(a) Increases
(b) Decreases
(c) Remains same
(d) First decreases then increases 1

2. A yellow powder X gives a pungent smell if left open in air. It is prepared by the reaction of dry compound Y with chlorine gas. It is used for disinfecting drinking water. Identify X and Y.
(a) X – Ca $(OH)_2$, Y – CaO
(b) X – $CaOCl_2$, Y – $Ca(OH)_2$
(c) X – $Ca(OH)_2$, Y – $CaOCl_2$
(d) X – $Ca(OH)_2$, Y – $Ca(OCl)_2$ 1

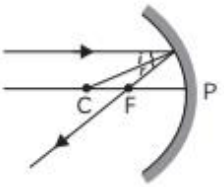
3. The ray diagram below for the ray of light incident on a concave mirror as shown in figure.



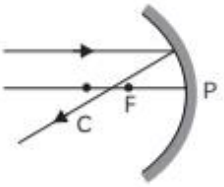
Which of the following represents the complete ray diagram?
(a)



(b)

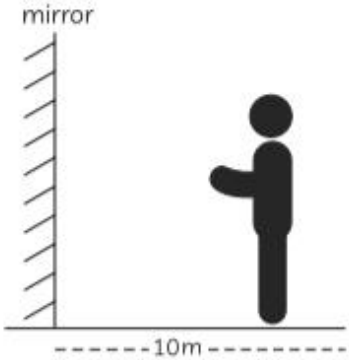


(c)



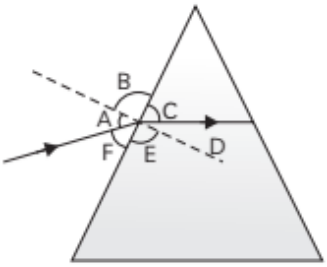
(d) All of these 1

4. A man stands in front of a large plane mirror as shown in the figure. How far must he walk before he is 5 m away from his image?



(a) 7.5 m (b) 8.5 m
(c) 7.5 cm (d) 7 m 1

5. A light ray striking a glass prism is depicted in the figure.



The image has labels indicating the different angles. Which angle, in turn, displays the angles of incidence and refraction?

(a) A and D (b) B and E

(c) C and F (d) D and F 1

6. Identify the method in which glucose is oxidized to provide energy in various organisms.

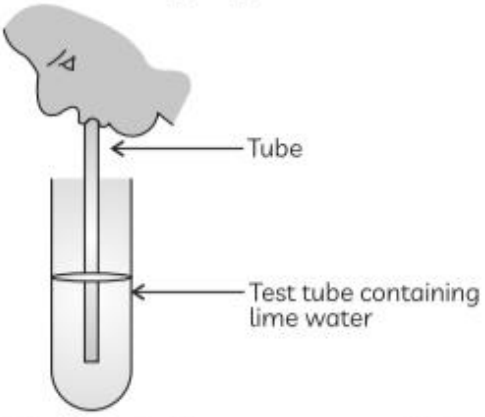
(a) Anaerobic respiration

(b) Fermentation

(c) Aerobic respiration

(d) All of these 1

7. Observe the figure given below :



Why does the lime water turn milky?

(a) CO_2 is released (b) CO_2 is consumed

(c) H_2 is released (d) H_2 is consumed 1

8. How is the opening and closing of stomatal pore regulated in plants?

(a) It is a function of guard cells.

(b) It is a function of cytoplasm.

(c) It is a function of chloroplast.

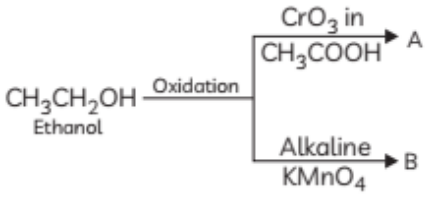
(d) It depends on sunlight. 1

9. Electrical resistivity of a material is defined as the electrical resistance of a conductor having:

	Cross sectional area	Length
(a)	1 m^2	1 cm
(b)	1 m^2	1 m
(c)	1 cm^2	1 m
(d)	100 m^2	1 m

1

10. Identify A and B:



(a) A-CH_3CHO, Ethanal, B-CH_3COOH Ethanoic acid

(b) A-CH_3COOH, Ethanoic acid B-CH_3CHO Ethanal

(c) A-CH_3CHO, Ethanal B-$CO_2 + H_2O$

(d) A-CH_3COOH, Ethanoic acid B-$CO_2 + H_2O$ 1

11. Many people in a village had growing swollen necks, which was a problem for the hilly area's inhabitants.

A doctor came to the village, carefully listened to the residents' problems, and gave them the advice to substitute iodized salt for regular salt in their food. The issue was largely resolved within a few months.

What was the cause of the swollen neck of people in the village?

(a) Efficiency of parathyroid hormone.

(b) Deficiency of thyroxine hormone.

(c) Increased concentration of thyroxine hormone.

(d) Deficiency of parathyroid hormone 1

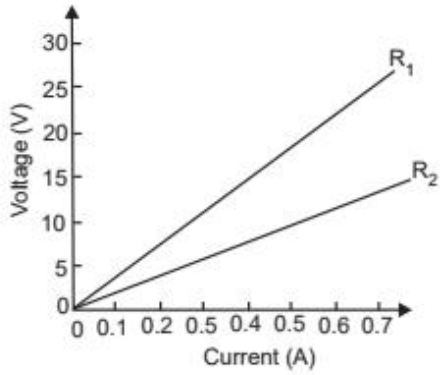
12. What kind of substances are introduced in the food chain by biological magnification?

(a) Harmful (b) Non-toxic

(c) Harmless (d) Harmful and toxic

1

13. Study the VI graph of two resistors R_1 and R_2 given below and answer the questions below:



After studying the graph, a student writes the following statements:

(I) Resistance of a conductor is the slope of VI graph.

(II) Resistance of a conductor does not depend on slope of VI graph.

(III) $R_1 > R_2$, as slope of VI graph is greater for R_1.

(IV) $R_2 > R_1$ as slope of VI graph is greater for R_2.

Choose from the following which of the following would be the correct statement(s).

(a) Only (I) (b) Only (II)

(c) Both (I) and (III) (d) Both (I) and (IV) 1

14. An old person complained of acute pain in stomach. Doctor gave a medicine as shown in the following image and he got immediate relief.

Which of the following statement is correct?

(a) Antacid is basic in nature.

(b) Antacid neutralities acid in stomach.

(c) Both (a) and (b).

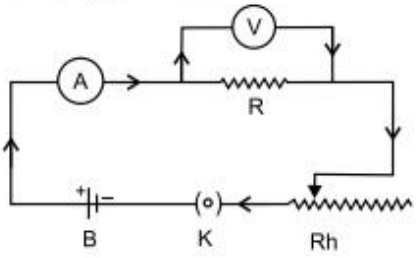
(d) Antacid is acidic in nature. 1

15. An unknown resistor has 5 mA current flowing through it when 10 volts are applied to it. For the same resistor, the application of 20 volts will result in the current flow of:

(a) 2 mA (b) 5 mA

(c) 10 mA (d) 50 mA 1

16. A student connected a simple circuit for verifying Ohm's law.



(I) Reading of an ammeter connected in the circuit becomes half when resistance is doubled.

(II) Reading of an ammeter connected in the circuit becomes double when resistance is halved.

(III) Reading of an ammeter connected in the circuit becomes half when voltage is doubled.

(IV) Reading of an ammeter connected in the circuit becomes half when voltage is halved.

Select the incorrect statement:

(a) Only (I) (b) Only (II)

(c) Only (III) (d) Both (II) and (III) 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): Adrenaline hormone secreted by adrenal gland is called an emergency hormone.

Reason (R): Adrenaline hormone is secreted in response to fear, anger joy, cold and emotional stress. 1

18. Assertion (A): New combination of traits are observed in F_2 offspring when tall plants with round seeds are crossed with short plants with wrinkled seeds.

Reason (R): Tallness and round seed are both dominant traits. 1

19. Assertion (A): Food chain is a part of food web.

Reason (R): Food chain helps in stabilising the populations of endangered species 1

20. Assertion (A): If the length of the conductor is doubled, the area of cross-section becomes half.

Reason (R): The resistance will be doubled

1

SECTION - B

12 MARKS

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

21. Answer the following:

(A) Show the formation of Na_2O and MgO by the transfer of electrons.

(B) What are the ions present in these compounds? 2

22. What are covalent bonds? Write the type of bond present in N_2 molecule. 2

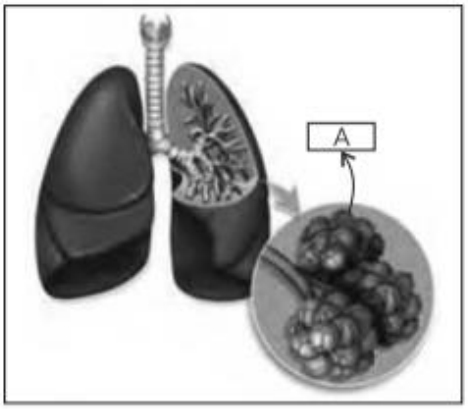
23. What are the methods used by plants to get rid of excretory products?

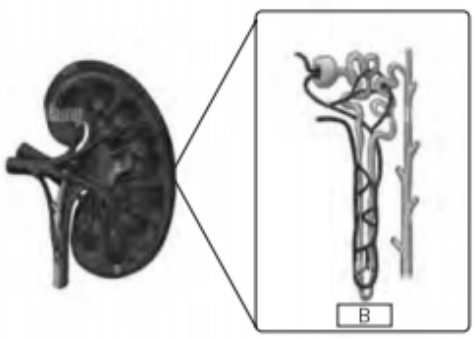
OR

Major amount of water is selectively reabsorbed by the tubular part of nephron in humans. What are the factors on which the amount of water reabsorbed depends?

2

24. Compare the following structures marked as 'A' and 'B' as shown in figure with respect to their structure.





2

25. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located? 2

26. Two resistors with resistance 5 Ohm and 10 Ohm respectively are to be connected to a battery of 6 V so as to obtain:

(A) Minimum current flowing

(B) Maximum current flowing

(i) How will you connect the resistors in each case?

(ii) Calculate the strength of total current in the circuit in the two cases.

OR

A piece of wire of resistance 20 Ohms is drawn out so that its length is increased to twice of its original length. Calculate the resistance of the wire in the new situation.

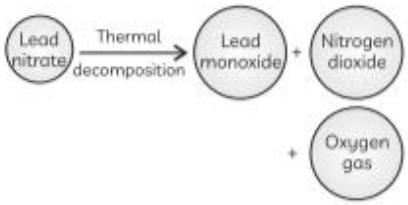
2

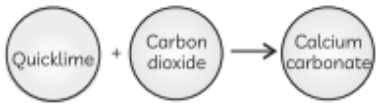
SECTION - C

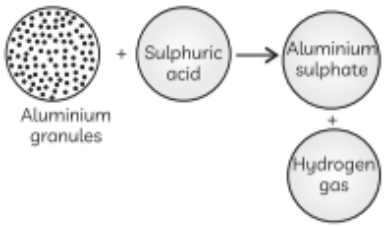
21 MARKS

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

27. Translate the following statements into chemical equations and balance them (if needed):

(A) 

(B) 

(C) 

3

28. (A) Rahul used to eat lot of sweets. As a result his teeth started damaging so early. How is tooth decay related to pH? 3

(B) What is the change in colour of pH paper dipped in a solution having a pH = 13?

OR

How can tooth decay be prevented ? 3

29. An alkali metal A gives a compound B (molecular mass = 40) on reacting with water. The compound B gives a soluble compound C on treatment with aluminium oxide. Identify A, B and C and give the reactions involved. 3

30. Answer the following:

(A) Mention the adaptations of leaf for photosynthesis.

(B) Why does absorption of digested food occur mainly in small intestine? 3

31. Explain how DNA copying is an essential part of the process of reproduction? What are the advantages of sexual reproduction over asexual reproduction?

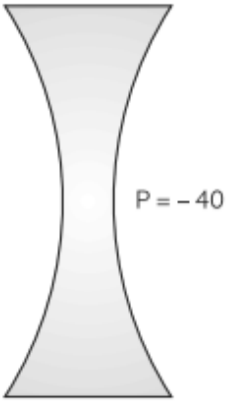
OR

Answer the following:

(A) How will you differentiate between pollination and fertilization?

(B) Neha's doctor suggested her to use copper-T as she do not want to have a child. If she is using a copper T, will it help her in protecting from sexually transmitted diseases.

32. (A) What is the focal length of the given lens ?



(B) An object is kept at a distance of 100 cm from the above lens. Calculate the image distance and the magnification 3

33. Ozone therapy is a controversial alternative medical practice that uses ozone gas to fight disease. Aditya asked his mother whether this ozone therapy is legal to be used. His mother explained that in 2019, the Food and Drug Administation (FDA) warned against using this therapy because there is not enough evidence to conclude that it is safe for medical use. They say that it has no known useful application in supportive or preventive medicine. It is a toxic and harmful air pollution on ground level.

Why is damage to the ozone layer is a cause for concern? What steps are being taken to limit this damage? 3

SECTION - D

15 MARKS

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

34. A given organic solid's melting point was to be ascertained by Ritesh. He did this by putting H_2SO_4 in a bath. He lost focus and started to act a little carelessly as he glanced at the thermometer. He was covered in sulfuric acid after the boiling beaker fell. He had hand and clothing burns that were very bad.

(A) What caused Ritesh to have an accident?

(B) Why did he suffer from severe burns to his hands?

(C) What precautions must be followed while working in a lab? 5

35. Answer the following:

(A) Draw a diagram of its longitudinal section showing the process of germination of pollen on stigma and label the following on it:

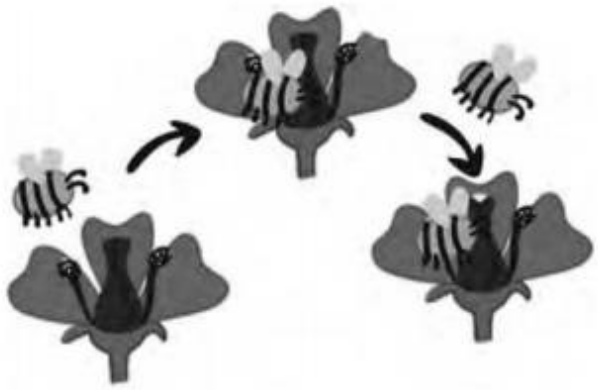
(i) Male germ cell

(ii) Female germ cell

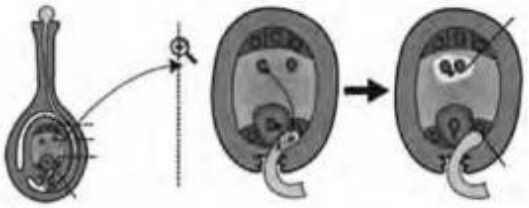
(iii) Ovary

(iv) Pollen tube

(B) Observe the given figures :



(i)



(ii)

Process (i) may occur without process (ii) but process (ii) will not take place without Process (i). Give reasons.

OR

(A) Give an example of bisexual flower. What is its female reproductive part known as?

(B) Draw a labelled diagram of the longitudinal section of a flower. 5

36. **What is a solenoid? How does a solenoid behave like a magnet? Can you determine the north and south poles of a current–carrying solenoid with the help of a bar magnet? Explain.**

OR

(A) When is the force experienced by a current carrying conductor placed in a magnetic field largest?

(B) Name two devices that use current carrying conductors and magnetic fields.

(C) State the rule to determine the direction of a:

(i) magnetic field produced around a straight conductor carrying current.

(ii) Force experienced by a current carrying straight conductor placed in a field, which is perpendicular to it. 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 chart explains the dihybrid cross in detail between one pea plant with yellow and round seeds and the other pea plant having green and wrinkled seeds. Analyse it and answer the following questions:*

P generation

YYRR (yellow and round) X yyrr (green and wrinkled)

F_1 generation

YyRr (yellow and round)

YyRr X YyRr

F_2 generation

	YR	Yr	yR	yr
YR	YYRR	YYRr	YyRR	YyRr
Yr	YYRr	YYrr	YyRr	Yyrr
yR	YyRR	YyRr	yyRR	yyRr
yr	YyRr	Yyrr	yyRr	yyrr

(A) After studying the above cross, a student noted down the following observations regarding progeny of F_2 generation. What is the ratio obtained in F_2 generation ?

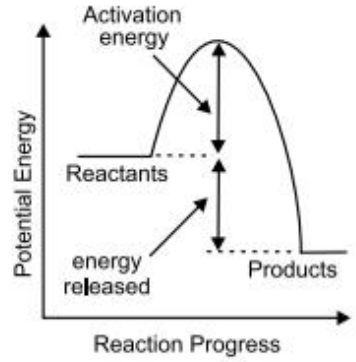
(B) In the F_2 generation of a cross, it was observed that the phenotypic ratio of progeny having different traits is 485 : 165 out of 650 observations. What type of cross is this? Explain.

OR

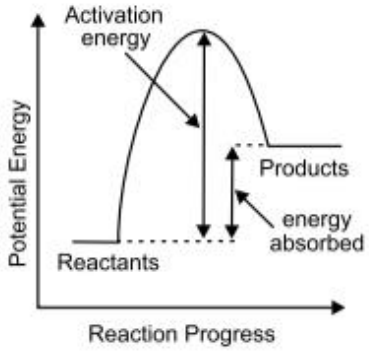
(B) A cross between the purple flowers of pea plant (PP) and white flowers (pp) resulted in all F_1 progeny that had purple flowers. Why ?

38. *Whenever a chemical reaction takes place, the bonds present in the reactions break and new bonds are formed in the products. Energy is needed to break the bonds in the reactants. While it is released when new bonds are formed resulting in the formation of products. The two values of energies are normally not equal. Hence, an energy change takes place in a chemical reaction.*

The graph below shows the energy changes taking place in exothermic and endothermic reactions:



Exothermic reaction



Endothermic reaction

4

(A) What is the name given to chemical reactions where more energy is needed to break the bonds as compared to energy released during bond formation?

(B) When an exothermic reaction takes place, the reaction mixture gives out heat. Why?

(C) Which of the following are exothermic processes? Explain.

(I) Reaction of water with quick lime

(II) Dilution of an acid

(III) Evaporation of water

(IV) Sublimation of camphor (crystals)

OR

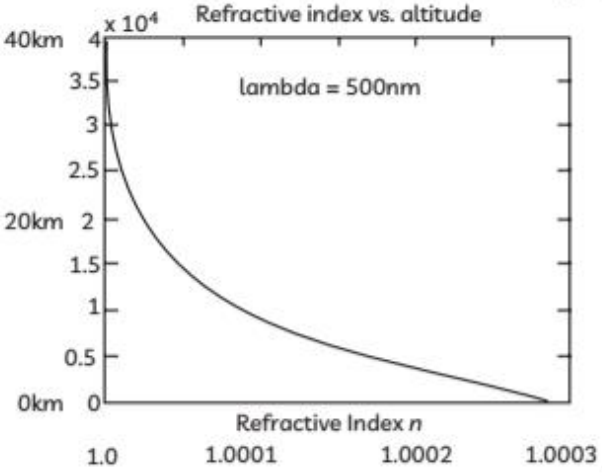
(C) A student analyzed the observations given in the table below and wrote the following statements

Set	Mixture	Initial temperature (°C)	Highest/ lowest temperature (°C)
(I)	Solid sodium hydrogen carbonate + hydrochloric acid	29.0	27.5
(II)	Solid sodium hydroxide + hydrochloric acid	29.0	35.0
(III)	Solid sodium hydroxide + water	29.0	33.0
(IV)	Solid ammonium chloride + water	29.0	26.0

What type of reaction (exothermic/ endothermic) is each set ?

39. *Ankit remarked that he has seen wavering of objects when seen through a stream of hot air rising above a tandoor or a fire. He said that the air just above the fire becomes hotter than the air further higher up. He further said that this wavering can also be seen in the earth's atmosphere as the earth's atmosphere is not evenly distributed and several observations can be explained on the basis of this phenomenon. To explain his point further, he plotted the variation of refractive index of the atmosphere with altitude*

Refractive Index vs. Altitude (500 nm wavelength)



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(A) Name the phenomenon about which Ankit remarked.

(B) Write any two observations which can be explained by the above phenomenon.

(C) What is the total time difference on duration of day on Earth? Explain.

OR

(C) What do you analyse from the graph given above ? After analysing the graph a student writes the following statements.

SOLUTION

SAMPLE PAPER - 8

SECTION - A

1. *(b) Decreases*

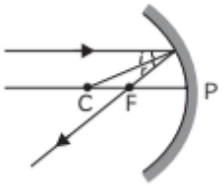
Explanation: Metallic character decreases as we move across a period in the periodic table from left to right. This occurs because as we move across a period, the nuclear charge increase and the tendency of the element to lose electrons decreases.

2. *(b) X – $CaOCl_2$, Y – $Ca(OH)_2$*

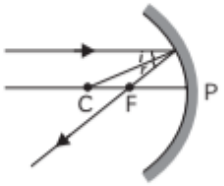
Explanation: The yellow powder X is bleaching powder which is prepared by the reaction of chlorine on dry slaked lime [$Ca(OH)_2$]. Y is dry slaked lime [$Ca(OH)_2$]

$$\underset{(Y)}{Ca(OH)_{2(s)}} + Cl_{2(g)} \rightarrow \underset{(X)}{CaOCl_{2(s)}} + H_2O_{(l)}$$

3. *(b)*



Explanation: A ray of light going parallel to the principal axis towards the mirror after reflection from the mirror will pass through the focus.



4. *(a) 7.5 m*

Explanation: As the distance between the man and the mirror is 10 m, the distance between man and his image is 10 + 10 or 20 m, as image distance and object distance are equal. Distance between the man and his image is 5 m when the man is 2.5 m away from the mirror. Therefore, the man has to walk 10 m - 2.5 m = 7.5 m towards the mirror.

5. *(a) A and D*

Explanation: 'A' represents angle of incidence and 'D' represents angle of refraction.

6. *(d) All of these*

Explanation: The two ways in which glucose is oxidized to provide energy in various organisms are aerobic respiration and anaerobic respiration. Fermentation is a type of anaerobic respiration.

7. *(a) CO_2 is released*

Explanation: Since the exhaled air is carbon dioxide rich, when air is blown from mouth into test tube, the lime water turns milky as carbon dioxide gas turns lime water milky.

8. *(a) It is a function of guard cells.*

Explanation: The opening and closing of stomatal pores is a function of guard cells. When water flows into guard cells, they swell up causing the stomatal pore to open. When the guard cells shrink, the pore closes.

9. *(b) 1 m^2, 1m*

Explanation: Electrical resistivity is defined as the electrical resistance of a conductor having cross- sectional area 1 m^2 and length 1 m.

Related Theory

Resistivity is the characteristic of the material of a conductor and its SI unit is Ohm-m.

10. *(a) A-CH_3CHO, B-CH_3COOH*
Ethanal. Ethanoic acid

Explanation: When ethanol reacts with chromic anhydride(CrO_3), only partial oxidation occurs and ethanal is formed.

$$CH_3CH_2OH \xrightarrow{CrO_3} CH_3CHO$$

On the other hand, when ethanol is heated with alkaline potassium permanganate ($KMnO_4$), it produces ethanoic acid due to complete oxidation.

$$CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4} CH_3COOH$$

Caution

Students usually make mistakes as they confused whether partial or complete oxidation occurs. In the presence of CrO_3, CH_3COOH partial oxidation of ethanol occurs. While complete oxidation of ethanol occurs in the presence of alk. $KMnO_4$.

11. *(b) Deficiency of thyroxine hormone.*

Explanation: Goitre is a condition that causes the swollen neck. Thyroxine hormone

deficiency is the cause of goitre. Because iodine aids in the production of the hormone thyroxine, which helps to prevent goitre, using iodized salt was advised.

12. *(d) Harmful and toxic*

Explanation: Biological Magnification is the process by which the harmful and toxic substances enter the food chain and get concentrated in the body of living organisms at each successive level in food chain.

13. *(c) Both (I) and (III)*

Explanation: The slope of the VI graph gives the resistance of the conductor as Ohm's law can be mathematically expressed as V = IR, or R = V/I = slope of VI graph. As slope of graph for R_1 is steeper than that of R_2, resistance $R_1 > R_2$.

14. *(c) Both (a) and (b)*

Explanation: As the old person was suffering from acidity, the antacid tablet, which is basic in nature, neutralize the excess acid in his stomach due to which he got immediate relief.

$$Ca(OH)_{2(s)} + Cl_{2(g)} \rightarrow Ca_XOCl_{2(s)} + H_2O_{(l)}$$

15. *(c) 10 mA*

Explanation: From Ohm's law,

$V = IR$

Therefore, $R = V / I$

$I = 5m\ A$ or $5 \times 10^{-3} A$

Here $R = 10$ volts / 5 mA = 2 kΩ.

When $V = 20$ volts,

$I = 20$ volts/ 2 kΩ = 10 mA

16. *(c) Only (III)*

Explanation: As per Ohm's law, V = IR. Or, I = V/R

Therefore, when R is halved, I becomes double and I becomes half when R is doubled.

As V is proportional to I, current becomes half when voltage is halved.

Therefore, statement III is the only incorrect statement.

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

Explanation: Emergency hormone-designated adrenaline hormone, also known as triple F hormone (FFF-Fight, Fright, Flight). Some of the neurons in the central nervous system and the medulla of the adrenal glands both produce it. It is quickly released into the blood during a stressful situation, sending signals to the organs to trigger a particular response, within a few minutes.

18. *(b) Both A and R are true and R is not correct explanation of A.*

Explanation: All offsprings of F_1 generation were tall with round seeds which shows that both tallness and round seed are dominant traits. However, new combinations were seen in F_2 generation which showed that the tall/short trait and the round/wrinkled seed trait are independently inherited.

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

Explanation: Food chain is a sequence of eating and being eaten among the living organisms to transfer food energy so it stabilises the population of endangered species

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

Explanation: The resistance of a conductor is directly proportional to the length of the conductor (l) and inversely proportional to the area of cross section (A).

SECTION - B

21. (A) Formation of Sodium oxide Na_2O:

Atomic number of sodium (Na) = 11

Its electronic configuration = 2, 8, 1

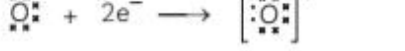
Atomic number of oxygen (O) = 8

Its electronic configuration = 2, 6

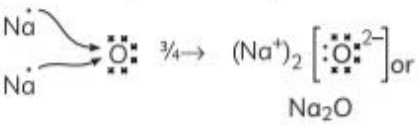
Each sodium atom can lose only one electron and attain stable configuration like that of Neon (2, 8)

$$Na \rightarrow \underset{\text{Sodium ion}}{Na^+} + e^-$$

But each oxygen atom requires two electrons to attain stable configuration of neon (2, 8).



So two sodium atoms will lose two electrons (i.e. one each)



Formation of Magnesium oxide:

Atomic number of magnesium (Mg) = 12

Electronic configuration = 2, 8, 2

It loses two electrons from its valence shell and acquires electronic configuration of neon (2, 8) and form Mg^{2+} ion.

$$Mg^{\times} \longrightarrow \underset{\text{Magnesium ion}}{Mg^{2+}} + 2e^-$$

Atomic number of oxygen = 8

Its electronic configuration = 2, 6

$$\cdot\ddot{O}\cdot + 2e^- \longrightarrow \underset{\text{Oxide ion}}{\left[:\ddot{O}:\right]^{2-}}$$

It gains two electrons to acquire the stable configuration of neon (2, 8) and becomes oxide ion (O^{2-})

$$Mg \overset{+}{\rightleftharpoons} \cdot\ddot{O}\cdot \longrightarrow (Mg^{2+})\left[:\ddot{O}:\right]^{2-}$$

(B) The ions present in sodium oxide compound (Na^2O) are sodium ions ($2N^{a+}$) and oxide ions (O^{2-}).

Ions present in Magnesium oxide compound (MgO) are magnesium ions Mg^{2+} and oxide ions (O^{2-}).

22. A covalent bond, also called a molecular bond is a chemical bond that involves the sharing of electrons between atoms. The shared electrons belong to the outermost shells of both the atoms and both the atoms need electrons to attain the noble gas configuration.

Type of bond present in N_2 molecule:

The electronic configuration of nitrogen atoms is 2, 5. Hence, nitrogen atom has 5 electrons in 'L'.

Shell and it requires three more electrons to fill the 'L' shell so two nitrogen atoms share their electrons to form a molecule of N_2. It will form triple covalent bond.

 or N ≡ N

23. The various methods used by plants to get rid of excretory products are:

(1) Oxygen and carbon dioxide are the waste products generated in plants during photosynthesis. and respiration respectively. The plants get rid of these gaseous waste products through stomata in leaves and lenticels in stems.

(2) Many plant waste products are stored in cellular vacuoles. Plants get rid of stored solid and liquid wastes by shedding of leaves, peeling of bark and felling of fruits.

OR

The amount of water re-absorbed depends on:

(1) How much excess water there is in the body.

(2) How much of dissolved waste there is to be excreted

24. Comparison of the structure of alveoli in the lungs (A) and nephrons in the kidneys (B) is given below:

S. No.	Alveoli	Nephron
(1)	These are thin walled balloon-like structure found in the lungs.	This is a cluster of very thin-walled blood capillaries present in the kidney.
(2)	These are supplied with extensive network of thin-walled blood vessels , i.e., capillaries for gaseous exchange.	Bowman's capsule is supplied with a cluster of capillaries called glomerulus for filtration. A network of blood vessels are present around the tubular part of nephron for reabsorption of useful substances and water

25. Distance of the object from the concave mirror u = – 10 cm. and magnification of the real image, m = – 3.

To find position of image, we use the formula for magnification of mirrors,

$$m = -\frac{v}{u}$$

$$\Rightarrow v = -mu = -(-3) \times (-10) = -30\ cm$$

Thus the image is situated infront of the mirror at a distance of 30 cm from it.

26. (A) If we want minimum current, we will connect the resistors in series.

If we want maximum current we will connect them in parallel.

(B) R_1 = 5 Ohms; R_2 = 10 Ohms

When connected in series

$$R = 10 + 5 = 15 \text{ Ohms}$$

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

Therefore, $$I = \frac{V}{R} = \frac{6}{15} = 0.4 \text{ A}$$

When the resistors are connected in parallel

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R = \frac{R_1 \times R_2}{R_1 \times R_2} = \frac{50}{15}$$

$$= 3.33 \text{ ohms}$$

Therefore, $$I = \frac{V}{R} = \frac{6}{3.33}$$

$$= 1.801 \text{ A}$$

OR

Given R = 20 Ohm

Let length of wire is l and when it is drawn out its new length will become $2l$.

The volume of wire in both the situations remains constant. So, if the length of wire is doubled,

the area of cross section of wire becomes half.

So, the new resistance of the wire,

$$R_{new} = \rho\frac{2l}{\frac{A}{2}} = \rho\frac{4l}{A}$$

$$= 4 \times \text{Old resistance of wire} \left(\text{because, } R = \rho\frac{l}{A}\right)$$

$$= 4 \times 20 = 80\ \Omega$$

SECTION - C

27. (A) $\underset{\text{Lead nitrate}}{2Pb(NO_3)_{2(s)}} \xrightarrow{\Delta} \underset{\text{Lead monoxide}}{2PbO_{(s)}} + \underset{\text{Nitrogen dioxide}}{4NO_{2(g)}} + \underset{\text{Oxygen}}{O_2\uparrow_{(g)}}$

(B) $\underset{\substack{\text{Calcium oxide or} \\ \text{Quicklime}}}{CaO_{(s)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}} \rightarrow \underset{\substack{\text{Calcium carbonate or} \\ \text{limestone}}}{CaCO_{3(s)}}$

(C) $\underset{\text{Aluminium}}{2Al_{(s)}} + \underset{\substack{\text{Sulphuric} \\ \text{acid}}}{3H_2SO_{4(aq)}} \rightarrow \underset{\substack{\text{Aluminium} \\ \text{sulphate}}}{Al_2(SO_4)_3} + \underset{\text{Hydrogen}}{3H_2\uparrow}$

28. (A) When we eat food containing sugar, then the bacteria present in our mouth break down the sugar to form acids such as lactic acid. This acid lowers the pH in the mouth making it acidic.Tooth decay starts when the pH of acid formed in the mouth falls below 5.5. This is because then the acid becomes strong enough to attack the enamel of our teeth and corrode it. This sets in tooth decay.

(B) The solution with highest pH (13) will have minimum hydrogen ion concentration i.e. alkaline solution and so will change colour of pH paper to light violet colour.

OR

The best way to prevent tooth decay is to clean the mouth thoroughly after eating food by rinsing it with lots of clean water. Many tooth pastes contain bases to neutralise the mouth acid. The pH of tooth paste is about 8.0. Therefore, using the tooth paste, which is generally basic, for cleaning the tooth can neutralise the excess acid in mouth and prevent tooth decay.

29. A is Na, B is NaOH and C is $NaAlO_2$ Reactions involved are:

$$\underset{A}{2Na} + 2H_2O \rightarrow \underset{B}{2NaOH} + H_2$$

$$Al_2O_3 + 2NaOH \rightarrow \underset{C}{2NaAlO_2} + H_2O$$

Let the atomic mass of alkali metal 'A' be a. When it reacts with water, it forms a compound

'B' having molecular mass 40.

Therefore, a + 16 + 1 = 40

a = 40 –17 = 23

We know that the atomic mass of Na (sodium) is 23.

Therefore, the alkali metal (A) is Na. Sodium reacts with water to form sodium hydroxide. So,

compound B is sodium hydroxide (NaOH).

Sodium hydroxide reacts with aluminium oxide (Al_2O_3) to give sodium aluminate ($NaAlO_2$).

Thus, 'C' is sodium aluminate ($NaAlO_2$).

30. (A) The adaptations of leaf for photosynthesis are as follows:

(1) Leaves have chlorophyll i.e. the main site for photosynthesis.

(2) The shape of the leaves enables to absorb maximum sunlight for photosynthesis.

(3) Leaves have stomata which help in gas exchange and transpiration. Stomata help the leaves in taking in carbon dioxide for photosynthesis.

(B) Maximum absorption of digested food occurs in small intestine due to following reasons

(1) Digestion process gets completed in small intestine.

(2) Inner lining of small intestine is provided with millions of tiny, finger

like projections called villi. Each villus has a network of fine blood capillaries close to the surface. The presence of villi gives the inner walls of small intestine greater surface area which helps in rapid absorption of food.

(3) Wall of intestine are richly supplied with blood vessels through which the absorbed food istaken to each and every cell of the body.

31. DNA copying is an essential part of the process of reproduction because it makes possible the transmission of genetic information from parents to offspring in the next generation. DNA contains information for the inheritance of characteristics from the parents to the next generation.

Advantages of sexual reproduction over asexual reproduction:

(1) In sexual reproduction, more variations are produced. Thus, it ensures survival of species in a population.

(2) Variations favour evolution and play an important role in origin of new species.

(3) It maintains chromosome number in future generation.

(4) The new formed individual has characteristics of both the parents.

OR

(A)

S.No.	Process (i) (Pollination)	Process (ii) (Fertilization)
(1)	It is the transfer of pollen grains from anther of a stamen to the stigma of a carpel of a flower.	It is the fusion of male gamete with female gamete.
(2)	It is a physical process brought by the pollinating agents like water, air, insects.	It is a physio-chemical process.
(3)	It precedes fertilization	It follows fertilization

(B) No, the copper T will not protect her from sexually transmitted diseases.

Copper T is used to keep a gap between the children. It is used by females only. Condom on the other hand prevents the deposition of sperm into the vagina and also protect both males and females from sexually transmitted diseases.

32. (A) Focal length is the reciprocal of the power in metres.

$$P = \frac{1}{f}$$

$$f = \frac{1}{P} = \frac{1}{-4}$$

$$= -0.25 \text{ m}$$

$$= -25 \text{ cm}$$

A negative power gives negative focal length and is a property of a diverging lens (concave lens).

(B) $f = -25$ cm, $u = -100$ cm

Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \quad -\frac{1}{25} = \frac{1}{v} - \frac{1}{(-100)}$$

$$\Rightarrow \quad -\frac{1}{25} = \frac{1}{v} + \frac{1}{100}$$

$$\Rightarrow -\frac{1}{25} - \frac{1}{(-100)} = \frac{1}{v}$$

$$\Rightarrow \quad \frac{-4-1}{100} = \frac{1}{v}$$

$$\Rightarrow \quad -\frac{5}{100} = \frac{1}{v}$$

$$\Rightarrow \quad \frac{1}{v} = -\frac{1}{20}$$

$$\Rightarrow \quad v = -20 \text{ cm}$$

Since v is (–) ve, therefore image is virtual. and erect.

Magnification,

$$m = \frac{v}{u} = \frac{-20}{-100}$$

$$m = 0.2$$

33. Damage to the ozone layer is a cause of concern for the following reason:

(1) Ozone layer depletion causes increased UV radiation levels at the Earth's surface, which is damaging to human health as it causes certain types of skin cancers, eye cataracts and immune deficiency disorders.

Synthetic chemicals such as Chlorofluorocarbons (CFC) are mainly responsible for drop of amount of ozone in the atmosphere.

Steps being taken to minimize its damage are:

(1) Freezing CFC production at 1986 levels as per the United Nations Environment Programme (UNEP) agreement.

(2) Replacing CFCs with environment friendly apliances.

(3) Minimizing the leakage of CFCs from refrigerators and air conditioners.

SECTION - D

34. (A) The tripod stand, the bath or beaker containing the concentrated H_2SO_4 was not properly positioned. The acid spilled over him when it lost its balance.

(B) A very effective dehydrating agent is sulfuric acid. It eliminated the water content of the skin, which became burned and charred.

(C) A student must take the following safety precautions while working in the chemistry lab:

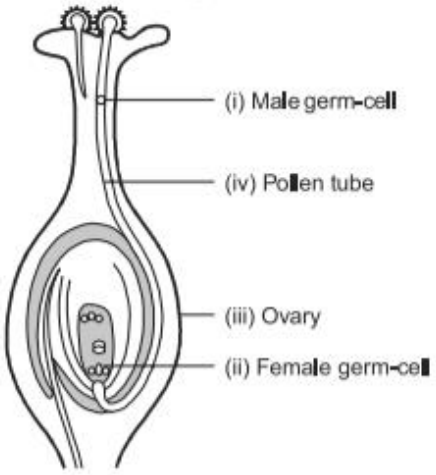
(i) In the laboratory, you must always wear an apron.

(ii) Always maintain a safe distance from the table where the experiment is being conducted.

(iii) Must maintain alertness at all times in the lab and maintain focus. Keep a safe distance at all times from the table where the experiment is being conducted.

(iv) Must maintain constant alertness and concentration in the lab.

35. (A) Diagram of longitudinal section of flower showing the process of germination of pollen on stigma:



(B) Pollination (i) is just the transfer of pollen grains from the anther of stamen to the stigma of pistil. It is carried out by agents like wind, insect etc. For pollination to happen there is no need of fertilization of gametes i.e. their union. Fertilization (ii) is fusion of male and female gamete and this process is facilitated by pollination. By pollination pollens are brought to eggs so that they can fuse and fertilisation can take place. Therefore, pollination may occur without fertilisation but fertilisation will not take place without pollination.

OR

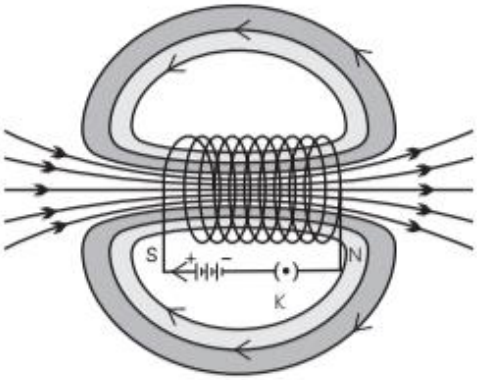
(A) A flower that contains both the male and female reproductive structures (stamen and pistil) is called a bisexual flower. Example: rose, hibiscus. Its female reproductive part is known as carpel or pistil.

(B)

Longitudinal section of flower

36. A solenoid is a coil of many circular turns of wire wrapped in the shape of a cylinder.

When current passes through the solenoid it creates a magnetic field around it. The magnetic field is uniform inside the solenoid. Thus, the solenoid behaves like a magnet. One end of the solenoid behaves as a magnetic north pole, while the other behaves as the south pole. The field lines inside the solenoid are in the form of parallel straight lines. This indicates that the magnetic field is the same at all points inside the solenoid. That is, the field is uniform inside the solenoid.



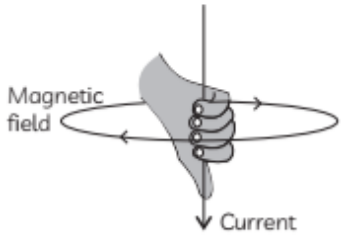
The north and south poles of the solenoid can be determined by bringing one pole of a bar magnet next to the solenoid and checking whether it is attracted to or repelled by the solenoid. If it is repelled, they are like poles and unlike poles in the vice versa case.

OR

(A) The force experienced by a current carrying conductor placed in a magnetic fields is largest, when direction of current is at right angles to the direction of magnetic field.

(B) The devices that use current carrying conductors and magnetic field are: Loudspeakers, microphones, measuring instruments, *etc.*

(C) (i) **Right Hand Thumb Rule:** Imagine holding a current carrying straight conductor in your right hand such that the thumb of right hand points along the direction of current. Then, the fingers of the hand will wrap around the conductor in the direction of the field lines of the magnetic field.



Right Hand Thumb Rule

(ii) **Fleming's Left Hand Rule:** Stretch the thumb, forefinger and the central finger of your left hand so that they are mutually perpendicular to one another. If the fore finger points in the direction of a magnetic field B and the central finger points in the direction of current 'I'. through the conductor, then the thumb will point in the direction of force F (direction of motion of conductor) acting on the conductor.

SECTION - E

37. (A) When yellow, round seeds were crossed with green, wrinkled seeds, the phenotypic ratio of F_2 progeny was:

Yellow, round : Yellow wrinkled (new combination) : Green, round (new combination) : Green, wrinkled = 9 : 3 : 3 : 1

(B) It is a monohybrid cross:

The phenotypic ratio in the F_2 generation of the given cross is 485 : 165 or approximately 3 : 1, which shows that it is a monohybrid cross.

The phenotypic ratio in the F_2 generation of a dihybrid cross is 9 : 3 : 3 : 1.

OR

(B) Purple colour is the dominant trait. As all progeny of F_1 generation had purple flowers, this is an example of monohybrid cross as Mendel used a pair of pea plants with two contrasting traits (purple flower/ white flower).

38. (A) The name given to a chemical reaction where energy is needed to break the bonds is endothermic reaction.

(B) More energy is released when new bonds are formed than is taken in when existing bonds in the reactants are broken.

(C) Both (I) and (II)

When water is added to quicklime, a lot of heat is produced:

$CaO_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)} + Heat$

Similarly, the dilution of acids is a highly exothermic process. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out, cause burns and may break the glass container.

OR

(C) Reaction at set I and IV are endothermic reactions as final temperatures are lower than initial temperatures showing that heat is absorbed during the reaction.

Reaction at set II and III are exothermic reactions as final temperatures are higher than initial temperatures showing that heat is evolved during the reaction.

39. (A) The phenomenon is "Atmospheric refraction" which is the refraction of light by the earth's atmosphere due to the decrease of refractive index with decreasing density or increasing temperature of air.

Related Theory

- *Dispersion of light is the separation of visible light into its different colors.*
- *Scattering of light is the phenomenon in which light rays get deviated from its straight path on striking an obstacle like dust or gas molecules, water vapours etc.*
- *Diffusion occurs when a ray of light strikes a surface and the light is scattered.*

(B) The two observations which can be explained by atmospheric refraction are: Twinkling of stars and advance sunrise.

Related Theory

- *Formation of rainbow is due to refraction of light, dispersion, total internal reflection and again refraction.*

(C) The total time difference on the duration of day on earth = 4 minutes = 2 minutes (due to advanced sunrise) + 2 minutes (due to delayed sunset).

OR

(C) The refractive index of the atmosphere decreases with altitude, that is, the air in the upper atmosphere is rarer as compared to the air below. As the starlight travels from a rarer medium to a denser medium, it will be bent towards the normal.