Class X Session 2024-25
Subject - Science
Sample Question Paper - 15

Time: 3 hours. **Total Marks: 80**

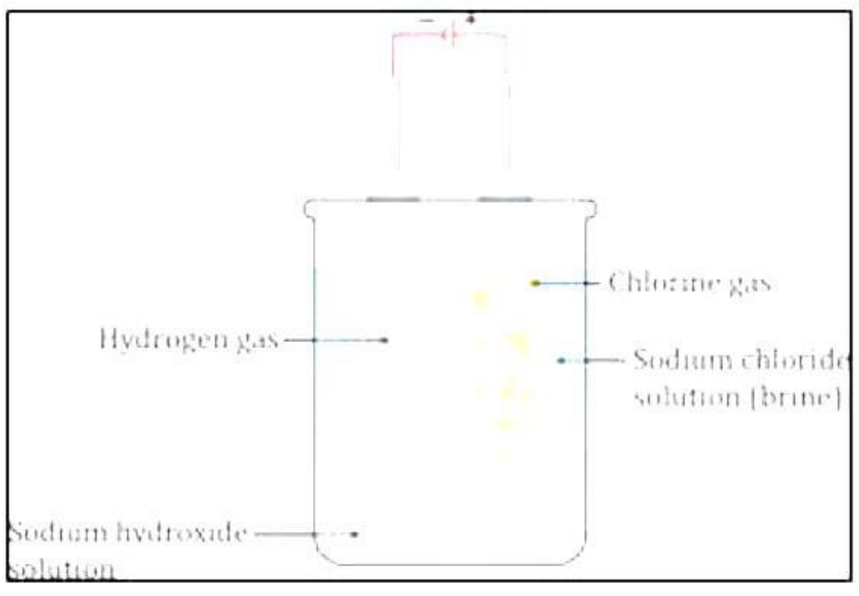
General Instructions:

1. *All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.*
2. *Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.*
3. *Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.*
4. *Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.*
5. *Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.*
   Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

SECTION - A

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

1. As per below set up, please select the valid statements mentioned below. [1]



i. Sodium hydroxide is formed near anode
ii. Chlorine is given off at anode
iii. Hydrogen gas is given off at cathode
iv. Hydrogen gas is given off at anode

a) i and iii
b) ii and iii
c) i and iv
d) only iv

2. Manjiri opened a bag of potato chips that had been sitting on the shelf for a long time and noticed they had a bad smell and taste. What process caused the chips to become rancid? [1]

a) Corrosion
b) Oxidation
c) Reduction
d) Hydrogenation

3. The functional group which is common between aldehydes and ketones is: [1]

a) Carbonyl group
b) Nitro group
c) Amide group
d) Hydroxyl group

4. Aluminium is extracted from its Al_2O_3 by: [1]

a) Calcination
b) Roasting
c) Electrolytic reduction
d) Thermit process

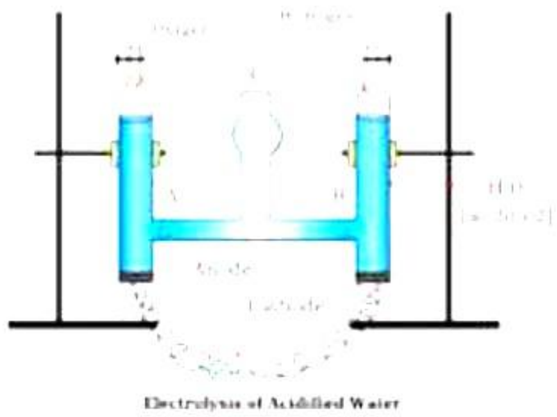
5. Meenal notices that the silver Diya after using for Diwali celebrations, kept in the open for a few days turned black. It must be due to the formation of: [1]

a) H_2S
b) AgS
c) $AgSO_4$
d) Ag_2S

6. Calcium oxide reacts with water to produce slaked lime. It is an example of: [1]

a) Decomposition reaction
b) Combination reaction
c) Displacement reaction
d) Oxidation reaction

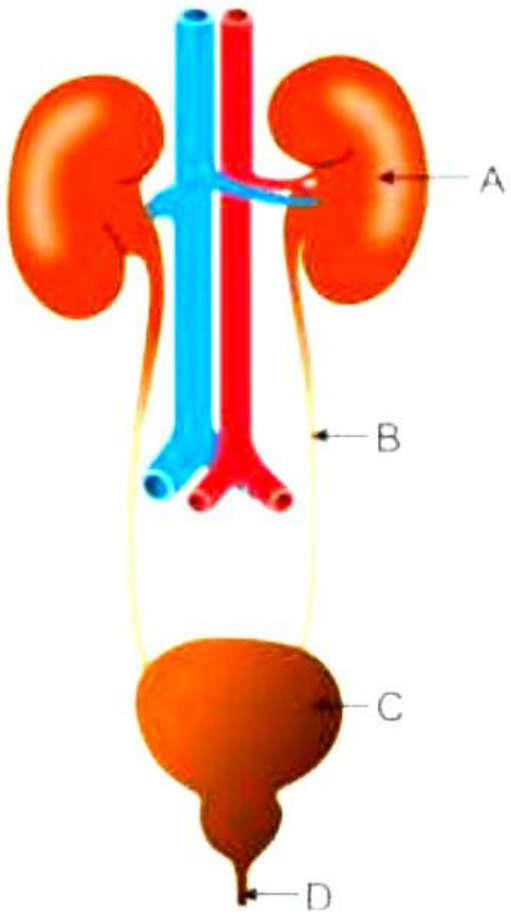
7. Which type of reaction is taking place in the following experiment? [1]



Electrolysis of Acidified Water

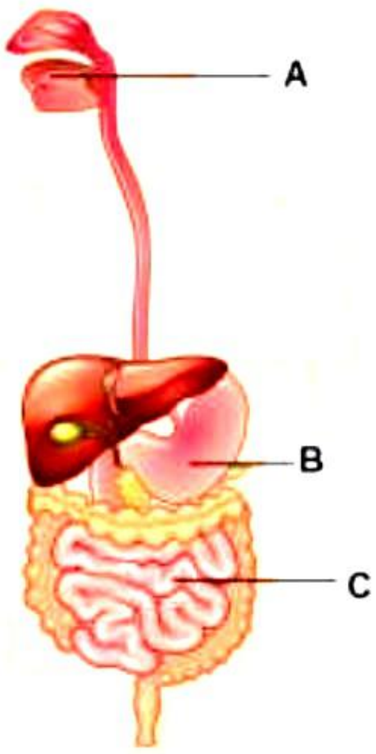
a) Displacement
b) Decomposition
c) Combination
d) Double displacement

8. Carefully study the diagram of the human excretory system with labels A, B, C and D. Select the option which gives the correct main function of the labelled organs. [1]



a) A is Kidney - Filters the blood and concentrates the filtrate to make urine.
b) B is Urethra – Expels urine out of the body
c) C is Urinary bladder – Dilutes the urine
d) D is Ureter – Transports urine to the urinary bladder

9. A, B and C are structures associated with the human digestive system. Identify the option which indicates the correct pairing of the enzyme produced and the food component digested by it. [1]



a) A: Amylase – Fat, B: Trypsin – Protein, C: Pepsin – Protein
b) A: Amylase – Starch, B: Pepsin – Protein, C: Lipase – Fats
c) A: Amylase – Protein, B: Trypsin – Fats, C: Pepsin – Protein
d) A: Amylase – Starch, B: Pepsin – Fats, C: Lipase – Protein

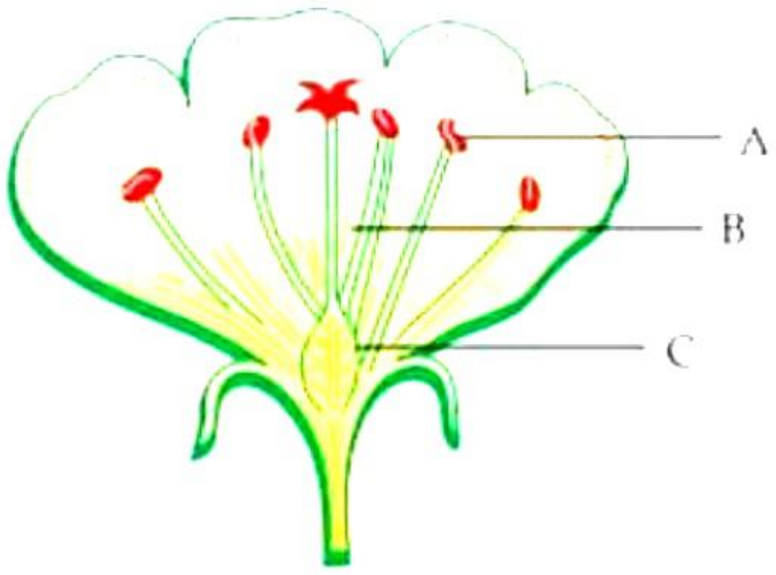
10. If a pea plant with violet flowers is crossed with a pea plant with white flowers, then what percentage of F_1 and F_2 generation respectively will bear violet flowers? [1]

a) 25%, 25%
b) 50%, 50%
c) 75%, 100%
d) 100%, 75%

11. The figure below shows the stages of ripening of a banana. Which hormone is responsible for this change? [1]

a) Auxin
b) Cytokinin
c) Ethylene
d) Abscisic acid

12. Which of these parts assist in the production of pollen grains? [1]



a) A only
b) B only
c) A and B
d) B and C

13. If the 'a' is object distance, 'b' is image distance and 'c' is focal length of concave mirror. Then the mirror formula is written as _____. [1]

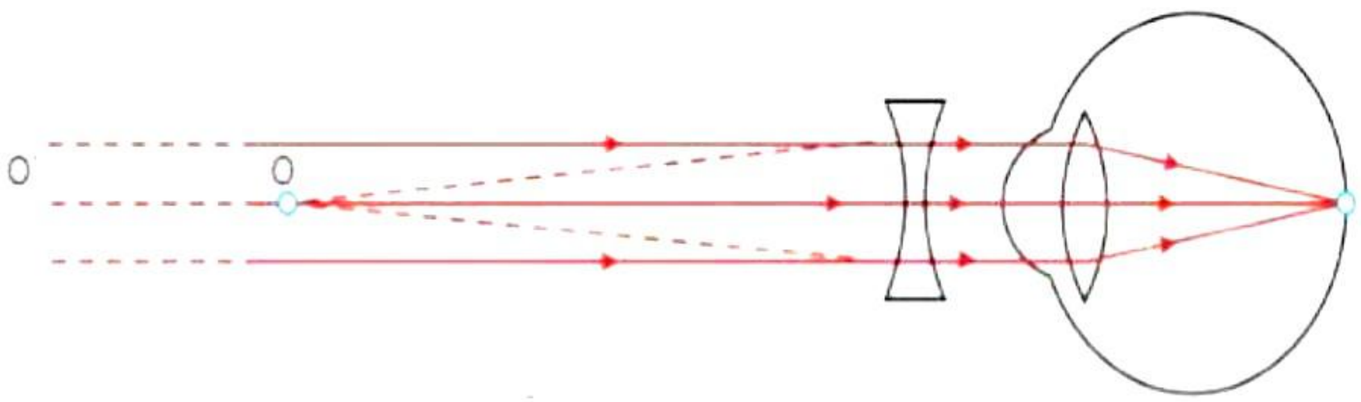
a) $\frac{1}{a}-\frac{1}{b}=\frac{1}{c}$

b) $\frac{1}{b}-\frac{1}{c}=\frac{1}{a}$

c) $\frac{1}{c}+\frac{1}{b}=\frac{1}{a}$

d) $\frac{1}{a}+\frac{1}{b}=\frac{1}{c}$

14. The below ray diagram depicts [1]



a) Correction of myopia
b) Correction of hypermetropic eye
c) Correction of presbyopia
d) None of these

15. What is the ratio of the average amount of energy absorbed by the producers to the average amount of energy absorbed by the primary consumers? [1]

a) 1 : 2
b) 2 : 1
c) 1 : 10
d) 10 : 1

16. Which of the following groups of organisms do not constitute an appropriate food chain operating in an ecosystem? [1]

(i) Grass, rabbit, wolf, lion
(ii) Plankton, grasshopper, fish, man
(iii) Grass, wolf, snake, tiger
(iv) Grass, grasshopper, frog, snake, eagle

a) (i) and (iii)
b) (iii) and (iv)
c) (ii) and (iii)
d) (i) and (iv)

Question No. 17 to 20 consists 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 shiny white finish on walls is obtained after two to three days of white washing the walls.
Reason: Calcium oxide reacts with carbon dioxide to produce calcium hydrogen carbonate which gives a shiny white finish. [1]

18. Assertion: Sexual reproduction leads to a greater variety in population.
Reason: It plays an important role in the origin of new species. [1]

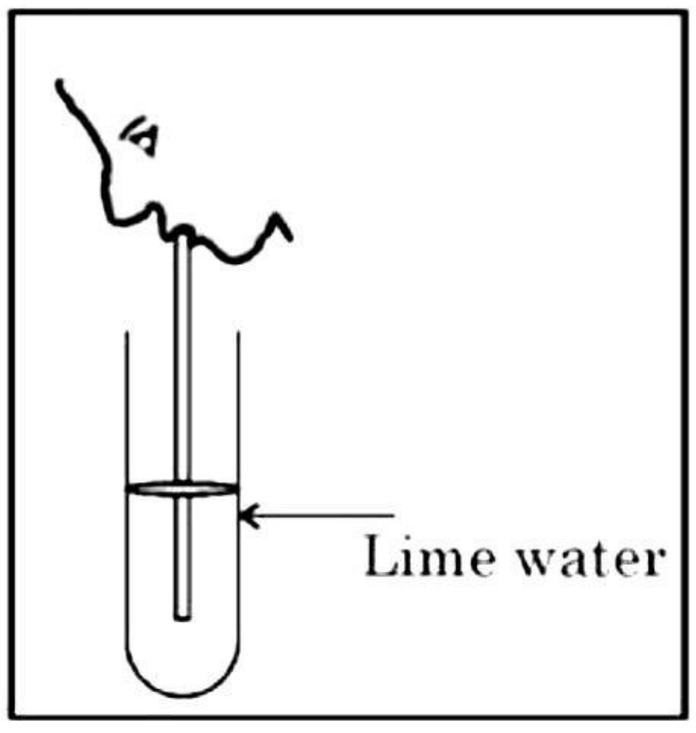
19. Assertion: If DDT is present in water bodies, then fish-eating birds accumulate maximum amount of DDT in their bodies.
Reason: Pesticides are not metabolized within the bodies of living organisms and get concentrated at each trophic level leading to bioaccumulation. [1]

20. Assertion: In an AC generator, increasing the strength of the magnetic field can increase the magnitude of the induced current.
Reason: A stronger magnetic field will induce a larger EMF in the armature coils. [1]

SECTION - B

Question No. 21 to 26 are very short answer questions.

21. Rayn is blowing air into lime water. Write your observation and reason for it? Write the chemical equation which can take place in the below experiment. [2]



22. Why is it said that sexual reproduction promotes diversity of characters in the offspring? [2]

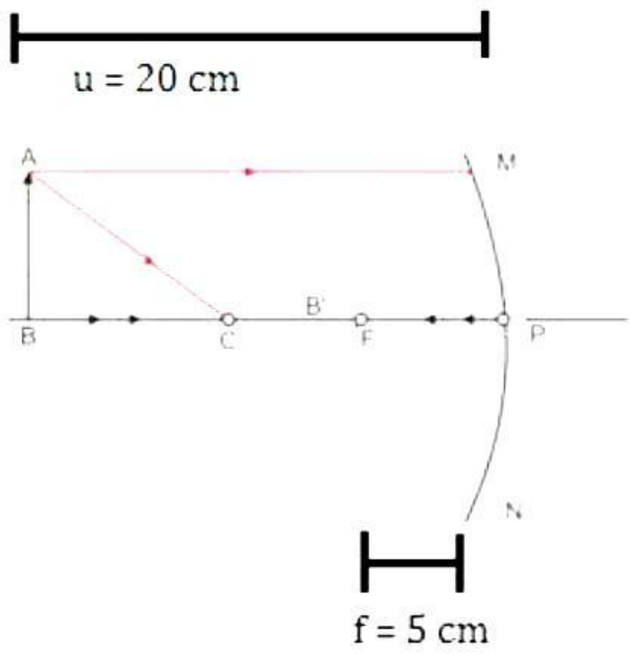
23. Why does blood in the arteries flow with jerks and is under pressure? [2]

OR

Differentiate between single circulation and double circulation found in vertebrates.

24. Why are heating elements used in electric iron and electric toasters made of alloys rather than pure metals? [2]

25. Observe the diagram and answer the questions given below: [2]



(i) Complete the given ray diagram.

(ii) Calculate the position of the image formed.

OR

The refractive index of glass for light going from air to glass is $\frac{3}{2}$. What will be the refractive index of glass for light going from glass to air?

26. Why a vegetarian food habit helps us in getting more energy? [2]

SECTION - C

Question No. 27 to 33 are short answer questions.

27. Observe the following reactions and answer the following questions. [3]

$C + O_2 \rightarrow CO_2 + Heat$ .....(A)

$N_2 + O_2 + Heat \rightarrow 2NO$.....(B)

What are the types of reactions? Explain and write one more example of one of the types.

28. Sample of five metals 'A', 'B', 'C', 'D' and 'E' was taken and added to the following solution one by one. The results obtained have been tabulated as follows. [3]

Metal	$FeSO_4$	$CuSO_4$	$ZnSO_4$	$AgNO_3$	$Al_2(SO_4)_3$	$MgSO_4$
A	No Reaction	Displacement	No reaction	Displacement	No reaction	No reaction
B	Displacement	Displacement	No reaction	Displacement	No reaction	No reaction
C	No reaction	No reaction	No reaction	Displacement	No reaction	No reaction
D	No reaction	No reaction	No reaction	No reaction	No reaction	No reaction
E	Displacement	Displacement	Displacement	Displacement	No reaction	No reaction

Use the above table to answer the following questions about the given metals.

(a) What would you observe if 'B' is added to $CuSO_4$?
(b) Arrange 'A', 'B', 'C', 'D' and 'E' in the increasing order of reactivity.
(c) Container of which metal can store zinc sulphate and silver nitrate solution?

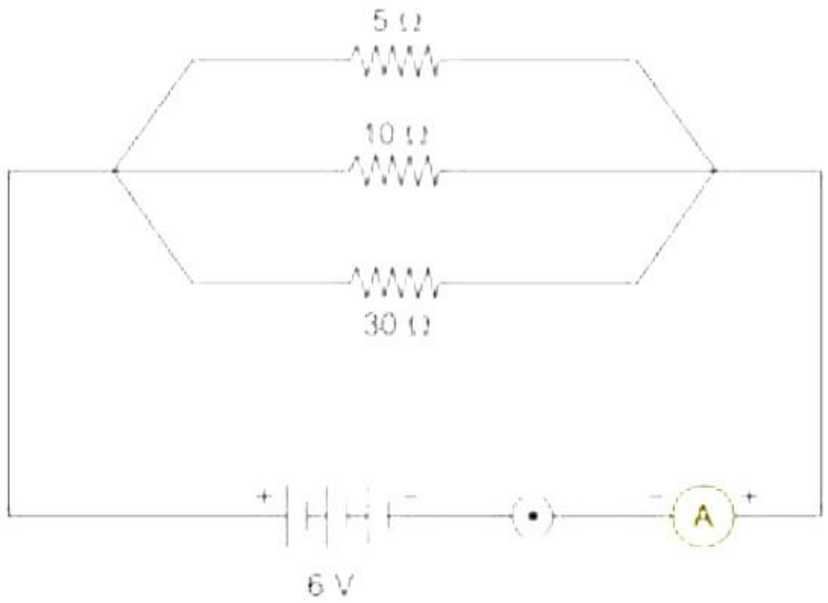
OR

Draw the structures of hydrocarbons containing three carbon atoms with following functional groups.
(a) alkene
(b) carboxylic acid
(c) aldehyde

29. [3]
(a) Riddhi was studying in her room. Suddenly, she could smell something burning and saw smoke in her room. She rushed out of her room immediately. Was Riddhi's action voluntary or involuntary? Explain.
(b) Which signals will get disrupted in case of a spinal cord injury?

30. The genotype of green-stemmed tomato plants is denoted as GG and that of purple-stemmed tomato plants as gg. When these two are crossed, [3]
(a) What colour of stem would you expect in their F_1 progeny?
(b) Give the percentage of purple-stemmed plants if F_1 plants are self-pollinated.
(c) In what ratio would you find the genotypes GG and Gg in the F_2 progeny?

31. Raj connected three resistance of value 5 Ω, 10 Ω and 30 Ω in parallel combination across a 6 V power supply as shown below. [3]



Determine the following with the help of the given information.
(a) Value of current passing through each resistor
(b) Total current in circuit
(c) Effective resistance

32. [3]

(a) What type of spectacles should a person who suffers from myopia and hypermetropia wear?

(b) The far point of a myopic person is 50 cm. What is the nature and power of lens required to correct the defect?

(c) With the help of ray diagram show the formation of an image by a myopic eye and the correction of myopia by using an appropriate lens using ray diagrams.

33.

(a) What type of lens should we use to get a diminished, virtual, and erect image?

(b) Explain the above case with the help of ray diagram.

(c) State the characteristics of images formed in the case of convex mirror. [3]

SECTION - D

Question No. 34 to 36 are long answer questions.

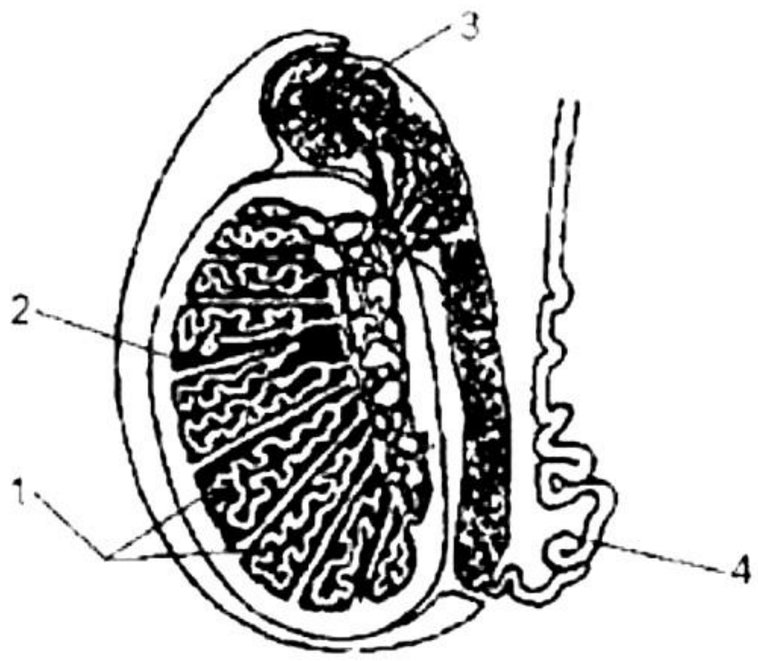
34. What are hydrocarbons? Distinguish alkanes from alkenes and each of them from alkynes giving one example of each. Also draw the structures of each compound cited as an example to justify your answer. [5]

OR

An organic compound A (molecular formula $C_2H_4O_2$) reacts with Na metal to form a compound B and evolves a gas which burns with a pop sound. Compound A on treatment with an alcohol C in the presence of a little of concentrated sulphuric acid forms a sweet-smelling compound D (molecular formula $C_3H_6O_2$). Compound D on treatment with NaOH solution gives back B and C. Identify A, B, C and D and give the chemical reactions involved. [5]

35. [5]

(a) Given below is a diagram of the lateral section of the human testis. Study the same and answer the questions which follow:



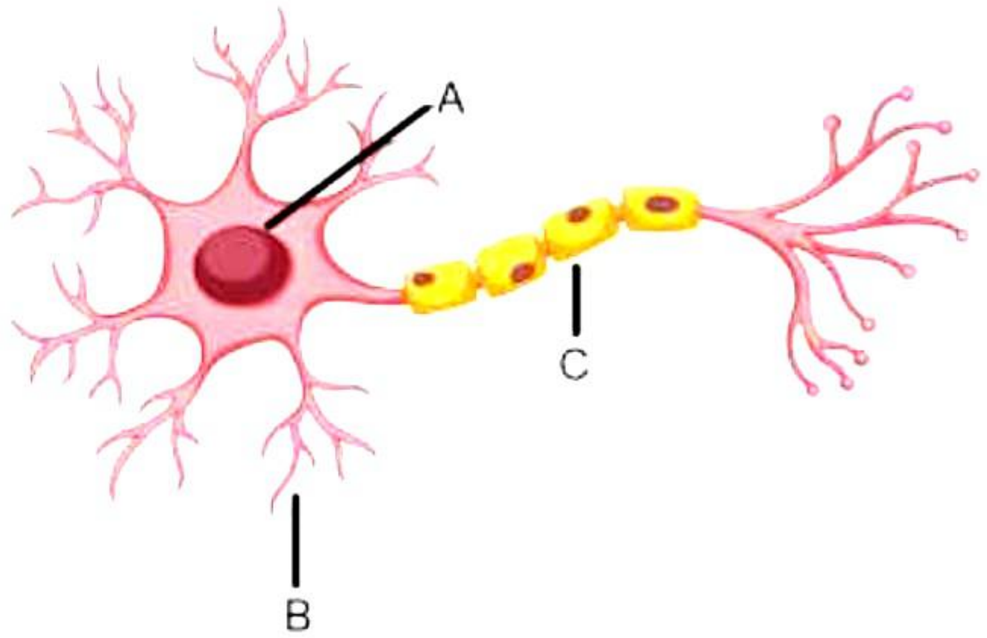
(i) State the functions of the parts labelled 2 and 3.

(ii) What is the significance of the testes being located in the scrotal sac outside the abdomen?

(b) A few tapioca plants remained in the farmland after harvest. Harvesting was done in summer. Then there was a summer rain. When these plants were harvested and the tubers eaten raw, they tasted sweet. Can you explain the reason for the sweet taste of the tubers?

OR

Given below is the structure of a neuron. A neuron helps in the conduction and transmission of nerve impulses.



(a) Name the parts labelled A, B and C.

(b) Which labelled part acquires information in the neuron?

(c) With reference to the given figure, how does information travel in a neuron?

(d) In what form does this information travel?

(e) Where is the impulse converted into a chemical signal for onward transmission?

36.

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

(i) Magnetic field produced around a straight conductor carrying current

(ii) Force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it

(iii) Current induced in a coil due to its rotation in a magnetic field

(b) Differentiate between AC and DC. Write one advantage of AC over DC. [5]

OR

Tanmay is studying his air conditioner's energy consumption. The refrigerator has a power consumption of 800 watts and is connected to a 220 V power supply.

(a) How much energy will the refrigerator consume if it is kept ON for 10 hours each day for a week? Express your answer in MJ.

(b) Tanmay replaced his Air conditioner during the Diwali sale; the new one has a power rating of half of its initial value. How much energy will the new Air conditioner consume if it is kept ON for the same time?

(c) Also, find the amount he saves if the charge of 1 unit of electricity is 4 rupees.

(1 unit = 3.6 MJ) [5]

SECTION - E

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

37. We know that on the basis of reactivity of different metals with oxygen, water, and acids as well as displacement reactions, the metals have been arranged in the decreasing order of their reactivity. This arrangement of metals is known as activity series or reactivity series of metals. The base of reactivity is the tendency of metals to lose electrons. If a metal can lose electrons easily to form positive ions, it will react readily with other substances. Therefore, it will be a reactive metal. On the other hand, if a meal loses electrons less rapidly to form a positive ion, it will react slowly with other substances. Therefore, such a metal will be less reactive. [4]

(a) Give one example each of:

i. The element which is less reactive than hydrogen.

ii. The element which is more reactive than hydrogen.

(b)

i. Give two examples of metals which react vigorously with oxygen.

ii. Give the correct order of reactivity for the given metals: Al, Na, Cu, Mg.

OR

(c) Sameera has two types of nails to hang beautiful murals she received as her birthday gifts.

Type A: Iron nails are of pure strong iron.

Type B: Iron nails of zinc coated iron.

A. 

B. 

Which type of nails should Sameera prefer and why? Explain what sacrificial metal is.

38. A cross was carried out between a pure-bred pea plant with axial flowers and a pure-bred pea plant with terminal flowers, and the F_1 progeny was obtained. This progeny was selfed to obtain the F_2 progeny. Answer the following questions. [4]

(a) What is the phenotype of the F_1 progeny and why?

(b) Give the phenotypic ratio of the F_2 progeny.

(c) Why is the F_2 progeny different from the F_1 progeny?

OR

(c) Instead of the above cross, if there was a cross between violet flowered and white flowered plants resulting in 400 plants in F_2 generation, how many plants would bear violet flowers? Give reason for your answer.

39. Ananya places an object is placed at the different locations in front of an optical device. The optical device used is convex lens. Following are the distances at which the object was placed from a convex lens. The focal length of this convex lens used is 15 cm:

i. 35 cm

ii. 30 cm

iii. 20 cm

iv. 10 cm [4]

a) Which position of the object will produce a magnified real image?

b) An image produced will be magnified virtual image when an object is placed at

c) Which position of the object will produce a diminished real image?

OR

d) What is the object distance when an image produced will be of same size as the object?

Solution

SECTION - A

1. Correct option – b: ii and iii
Chlorine is given off at anode and hydrogen is given off at cathode.

2. Correct option – b: Oxidation
Rancidity means having an unpleasant smell or taste usually from chemical change or decomposition.

3. Correct option – a: Carbonyl group
Carbonyl group (C=O) is present in both aldehydes and ketones.

4. Correct option – c: Electrolytic reduction
Aluminium is extracted by the electrolytic reduction of molten aluminium oxide.

5. Correct option – d: Ag_2S
Silver Diya kept in the open for a few days turned black due to formation of silver sulphide.

6. Correct option – b: Combination reaction
A combination reaction is a reaction in which two or more elements or compounds combine to form a single compound.
$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$

7. Correct option – b: Decomposition
Electrical decomposition of water takes place in electrolysis to form hydrogen and oxygen.

8. Correct option – a: A is Kidney - Filters the blood and concentrates the filtrate to make urine.
A is kidney, B is ureter, C is urinary bladder, D is urethra.
The kidneys filter the blood and concentrate the filtrate to make urine. They also help regulate blood pressure.

9. Correct option – b: A: Amylase – Starch, B: Pepsin – Protein, C: Lipase – Fats
Salivary amylase secreted in the mouth digests starch, pepsin secreted in the stomach digests proteins and lipase secreted in the small intestine digests fats.

10. Correct option – d : 100%, 75%
In a monohybrid cross, in F_1 generation all plants bears violet flowers only. In F_2 generation, 75% of the plants bear violet flowers while 25% bear white flowers.

11. Correct option – c : Ethylene
Ethylene is a gaseous plant hormone that plays an important role in inducing the ripening process for many fruits.

12. Correct option – a : A only
A is anther, B is style and C is ovary. Anther is the male reproductive part of a flower which assists in the production of pollen grains.

13. Correct option – d) $\frac{1}{a}+\frac{1}{b}=\frac{1}{c}$
If the 'a' is object distance, 'b' is image distance and 'c' is focal length of concave mirror. Then the mirror formula is written as
$\frac{1}{a}+\frac{1}{b}=\frac{1}{c}$

14. Correct option – a) Correction of myopia
The given ray diagram depicts the correction of myopia. Concave lens is used to correct myopic eye.

15. Correct option – d) 10:1
In an ecosystem, Sun is the ultimate source of energy. Solar energy is utilized by the plants to produce food by the process of photosynthesis. The consumers obtain energy from the producers. The energy is transferred from one trophic level to another. According to the 10% law of energy transfer in a food chain, 90% of captured energy is lost as heat and only 10% is available for use for the next trophic level. Thus, for every 10 units of energy absorbed by producers, only 1 unit is absorbed by the primary consumers.

16. Correct option – c) (ii) and (iii)
In group (ii) plankton and fish belong to the aquatic food chain, whereas man and grasshopper are found in the terrestrial ecosystem. Hence, group (ii) does not constitute an appropriate food chain.
In group (iii) wolf, grass, snake, tiger, there is no herbivore animal to consume grass. Hence, this group also does not constitute a proper food chain.

17. A is true but R is false.
Calcium hydroxide is present in whitewash. It reacts slowly with the carbon dioxide present in air to produce a thin layer of shiny calcium carbonate.

18. Both A and R are true, but R is not the correct explanation of A.
Sexual reproduction provides genetic diversity because the gametes, sperm and the egg produced contain different combinations of genes than the parent organisms. Sexual reproduction increases genetic diversities and plays a role in the origin of new species.

19. Both A and R are true, and R is the correct explanation of A.
Pesticides such as DDT are not metabolized within the bodies of living organisms and get concentrated at each trophic level leading to bioaccumulation. At every trophic level, the concentration of DDT increases and is maximum at the highest trophic level. Since fish-eating birds occupy the topmost trophic level, they are likely to have maximum amount of DDT in their bodies.

20. Correct option – a) Both the assertion and reason are correct, and the reason is the correct explanation for the assertion.
A stronger magnetic field will induce a larger EMF in the armature coils because the rate of change of magnetic flux cutting the coils will be greater. This is due to the increased magnetic flux density. A larger EMF will, in turn, lead to a larger induced current.

SECTION - B

21. The lime water would turn milky because of carbon dioxide passing through it.
The chemical reaction is as follows:

$Ca(OH)_2 + CO_2 \rightleftharpoons CaCO_3 + H_2O$

22. It is said that sexual reproduction promotes diversity of characters in the offspring because the process involves fusion of the gametes from two different and sexually distinct individuals. During fusion, the genetic constitution of the gametes leads to variation in the offspring. This genetic variation helps species to survive better in the changing environment which is necessary for evolution.

23. Blood in the arteries moves because of the pressure of blood from the heart. Each time the heart pumps, it pushes the blood a little further. Thus, blood in the arteries flows with jerks and is under pressure.
Veins do not rely on the heart to move blood. Veins have a system of valves to keep the blood from not moving backward, and muscles contract the veins to move the blood.

OR

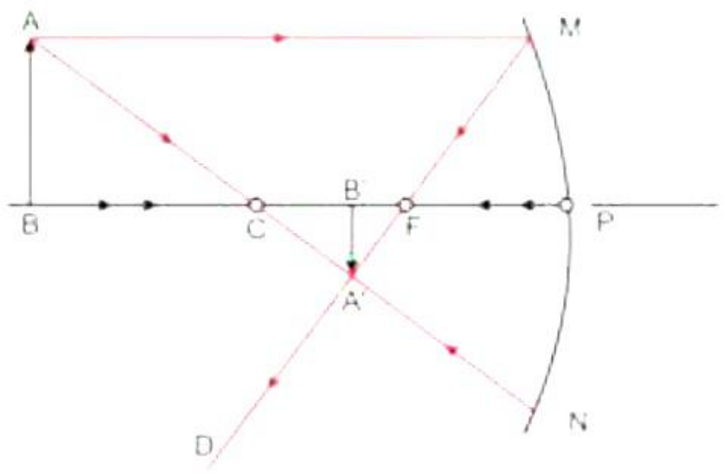
<u>Differences between single circulation and double circulation in vertebrates:</u>

Single circulation	Double circulation
• Blood passes through the heart only once in one complete cycle.	• Blood passes through the heart twice in one complete cycle.
• Heart has only deoxygenated blood.	• Heart has both oxygenated and deoxygenated blood.
• It is less efficient.	• It is more efficient.

24.

a) Alloys have high resistivity, so they can generate more heat for same amount of current passing through them.
b) Alloys have high melting points and so they do not melt easily, while pure metals have low melting points.
c) Thus, heating elements used in appliances like electric iron and electric toaster are made of alloys rather than pure metals.

25.



Object beyond C

We know,

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

v = ?, f = - 5 cm (focal length of concave mirror)

u = - 20 cm

$\therefore \frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-5} - \frac{1}{-20} = \frac{-15}{100}$

$\therefore v = -6.67$ cm

Thus, the image is formed at a distance of 6.67 cm between the centre of curvature and the focus.

OR

By the principle of reversibility,

$_a\mu_g = \frac{1}{_g\mu_a}$

$\therefore {}_g\mu_a = \frac{1}{3/2} = \frac{2}{3}$ or $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$

$\therefore {}_g\mu_a = \frac{4}{6}$

26. A person having a vegetarian food habit is close to the producer level and gets maximum amount of energy as compared to the organisms at a higher trophic level. This is because only 10% of energy is passed on from one trophic level to another. So, as we move closer to the level of producers, more energy is obtained. Hence, vegetarian food habit helps us in getting more energy.

SECTION - C

27. Type A reaction is exothermic reaction. Carbon burns in oxygen to form carbon dioxide and heat energy is produced.

Chemical reactions which proceed with the evolution of heat energy are called exothermic reactions.

Example of exothermic reaction is, when water is added to quick lime (calcium oxide), slaked lime (calcium hydroxide) is produced with a lot of heat energy.

$CaO + H_2O \rightarrow Ca(OH)_2 + Heat$

Type B is an endothermic reaction.

Chemical reactions which proceed with the absorption of heat energy are called endothermic reactions.

28.

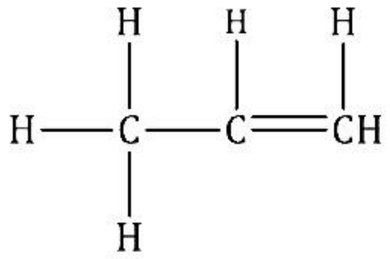
(a) Reddish brown deposit of copper will be formed since displacement has taken place.

(b) E>B>A>C>D. This is because, if more the metal reacts, then more reactive it is. After counting number of displacements, a metal will give, E is the most reactive and D is least reactive.

(c) Container of metal D can be used for this purpose as it does not react with any of them.

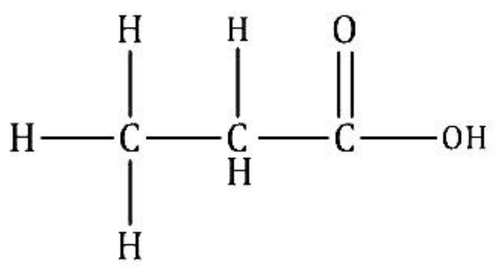
OR

(a) Hydrocarbon containing 3 carbon atoms and functional group 'alkene' is propene or prop-1-ene.



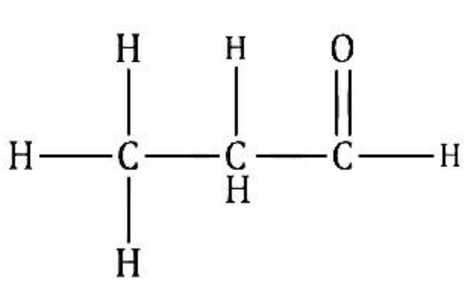
prop-1-ene

(b) Hydrocarbon containing 3 carbon atoms and functional group 'carboxylic acid' is propanoic acid.



propanoic acid

(c) Hydrocarbon containing 3 carbon atoms and 'aldehyde' group is propanal.



propanal

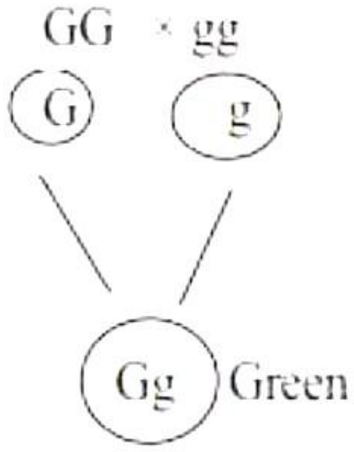
29.

(a) Riddhi's action was voluntary because the action of rushing out of the room was under her conscious control. The smoke and smell were perceived by her sensory receptors and signals were sent to the brain. The brain then signaled the effector organ , i.e., the legs to move out of the room.

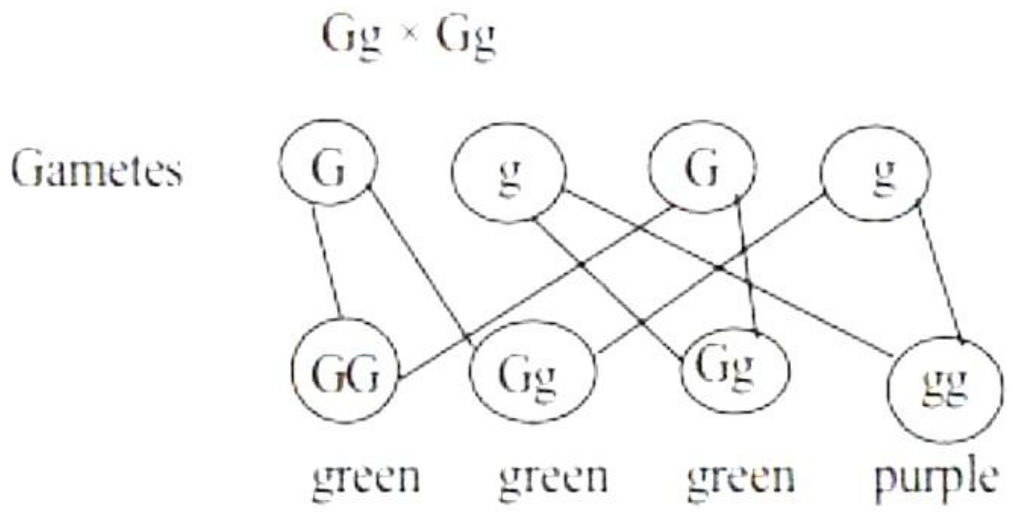
(b) In case of a spinal cord injury, signals coming from the nerves as well as the signals coming to the receptors will be disrupted. Both these signals meet in a bundle in the spinal cord. Hence, both these signals get disrupted.

30.

(a) Parental phenotype: green stem and purple stem
Parental genotype: GG × gg
F_1 progeny would be green-stemmed tomato plants.



(b) F_1 plants are self-pollinated
Gg × Gg



Percentage of purple-stemmed plants (gg) = 25%

(c) F_2 progeny ratio of GG and Gg = 1:2

31.

a)

The resisitors are connected in parallel and so the current through each resistor is different.

Current through 5Ω resistor is $I_1 = \frac{6}{5} = 1.2$ A

Current through 10Ω resistor is $I_1 = \frac{6}{10} = 0.6$ A

Current through 30Ω resistor is $I_1 = \frac{6}{30} = 0.2$ A

b) Total current in the circuit, I = I1 + I2 + I3 = 1.2 + 0.6 + 0.2 = 2 A

c)

Total effective reisitance of the circuit is

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{5} + \frac{1}{10} + \frac{1}{30}$$

$$\rightarrow \frac{1}{R_P} = \frac{10}{30}$$

$$\rightarrow R_P = 3\Omega$$

32.

(a) Spectacles having bifocal lens

(b) $u = \infty$

$v = -50$ cm

Using lens formula

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

$$\frac{1}{f} = \frac{1}{-50} - \frac{1}{\infty}$$

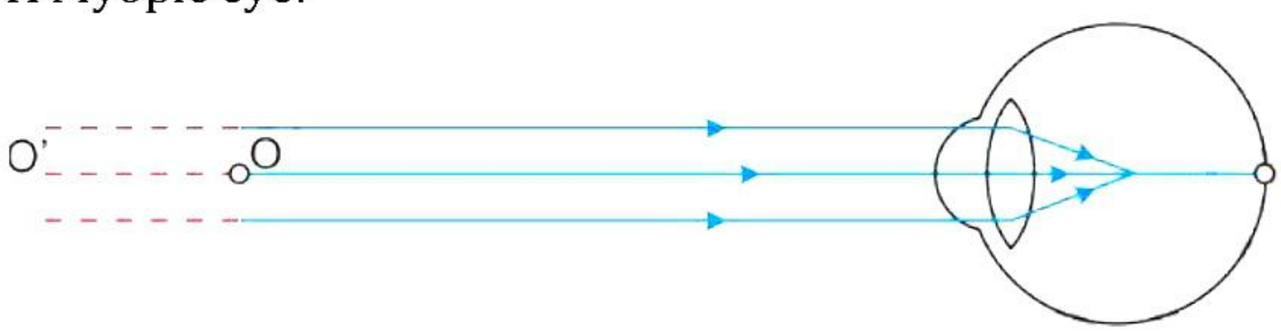
$f = -50$ cm

$$\text{Power of lens, } P = \frac{1}{f} = \frac{100}{-50} = -2\,D$$

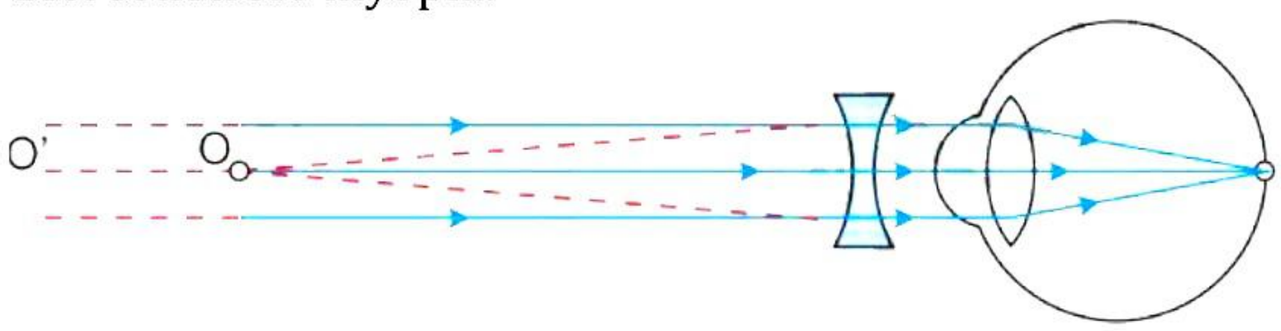
Nature of lens – concave

(c)

A Myopic eye:



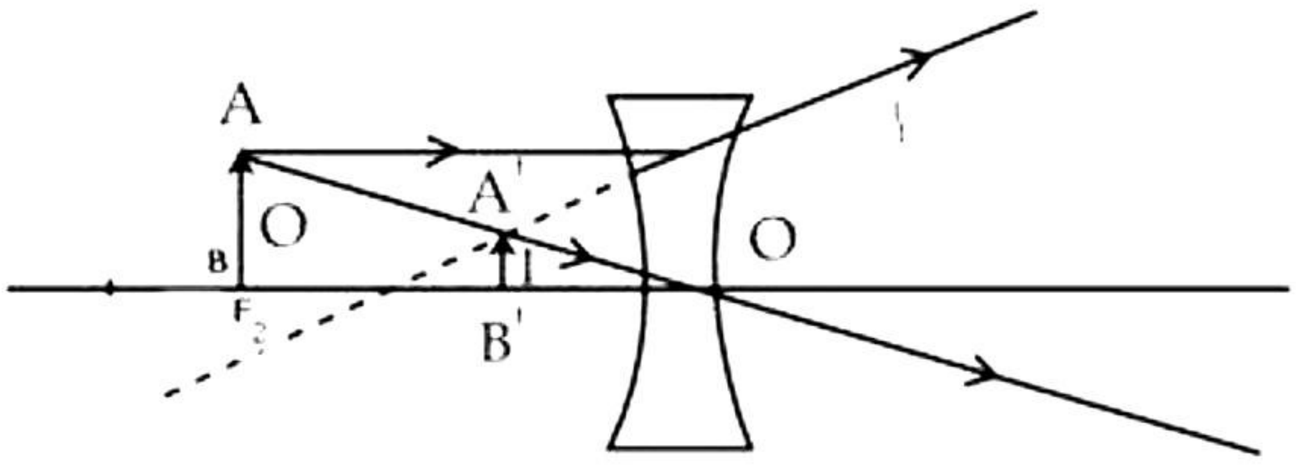
Correction for myopia:



33.

(a) We must use concave lens since the image is virtual, erect, diminished.

(b)



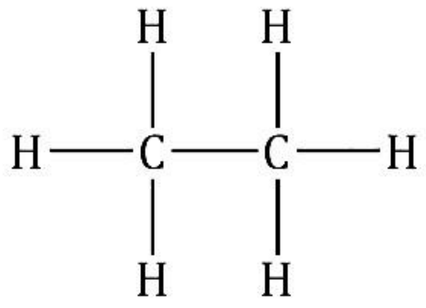
(c) The nature of image formed by the convex mirror is virtual, erect and diminished irrespective of the position of the object.

SECTION - D

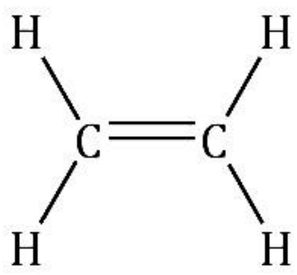
34. Distinguishing factors between alkanes, alkenes and alkynes are as follows:

Alkanes	Alkenes	Alkynes
Alkanes are hydrocarbons in which all the linkages between the carbon atoms are single covalent bonds.	Alkenes are unsaturated aliphatic hydrocarbons, which contain one double bond.	Alkynes are unsaturated aliphatic hydrocarbons, which contain one triple bond.
Alkanes are saturated hydrocarbons with the general formula $C_nH_{2n}+2$.	Alkenes are unsaturated hydrocarbons with the general formula C_nH_{2n}.	Alkynes are unsaturated hydrocarbons with the general formula C_nH_{2n-2}.
They are less reactive because of the non-availability of electrons in the single covalent bond.	Alkenes are more reactive than alkanes and alkynes because of the presence of a double bond.	Alkynes are more reactive than alkanes because of a triple bond.
They undergo substitution reactions.	They undergo addition reaction.	They undergo addition reaction.
Example: Ethane	Example: Ethene	Example: Ethyne

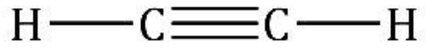
The structure of Ethane is:



The structure of Ethene is:



They structure of Ethyne is:



OR

An organic compound A (molecular formula $C_2H_4O_2$) reacts with Na metal to form a compound B and evolves a gas which burns with a pop sound.

A is ethanoic acid, CH_3COOH.
B is sodium ethanoate, CH_3COONa

$$2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2 \uparrow$$
$$A(C_2H_4O_2) \qquad\qquad B$$

Compound A (ethanoic acid) on treatment with an alcohol C in the presence of a little concentrated sulphuric acid forms a sweet-smelling compound D (molecular formula $C_3H_6O_2$).

C is methanol, CH_3OH
D is methyl ethanoate, CH_3COOCH_3

$$CH_3COOH + CH_3OH \longrightarrow CH_3COOCH_3 + H_2O$$
$$A \qquad C \qquad D(C_3H_6O_2)$$

Compound D (methyl ethanoate) on treatment with NaOH solution gives back B (sodium ethanoate) and C (methanol).

$$CH_3COOCH_3 + NaOH \longrightarrow CH_3COONa + CH_3OH$$
$$D \qquad\qquad B \qquad C$$

35.

(a)

(i) (Part 2) <u>Seminiferous tubules:</u> Produce sperms by the process of spermatogenesis.
(Part 3) <u>Epididymis:</u> Stores sperms for some days during which they mature and become motile.

(ii) The production and survival of sperms require a temperature which is lower than the normal body temperature. So, the testes are located in the scrotal sac which is outside the abdomen to maintain a temperature 3°C below the normal body temperature.

(b) Before the rains, the tubers contained starch. When it rained, the plants started growing again producing new foliage. So, the plant converted the starch in the tuber to sugar, a water-soluble form, in order to be transported. This sugar made the tuber sweet.

OR

(a) A – Cyton
B – Dendrites
C - Axon

(b) Part B (dendrites) acquire information in the neuron.

(c) Information travels in a neuron from Part B (dendrites) to Part A (cyton) to Part C (axon).
(d) Information travels in a neuron in the form of electrical impulses.
(e) The impulse is converted into a chemical signal for onward transmission at the synapse.

36.

(a)

(i) Right-hand thumb rule: If one holds a wire carrying current in the right hand in such a way that the thumb indicates the direction of current, then the folded fingers indicate the direction of the magnetic field surrounding the wire.

(ii) Fleming's left-hand rule: If we stretch the first three fingers of the left hand mutually perpendicular to each other such that the forefinger points along the direction of the magnetic field and the middle finger points along the direction of the current, then the thumb indicates the direction of the force experienced by the conductor.

(iii) Fleming's right-hand rule: If the forefinger, middle finger, and thumb of the right hand are stretched at right angles to each other, with the forefinger in the direction of the field and the thumb in the direction of the motion of the wire, then the induced current in the wire is in the direction of the middle finger.

(b) The direction of AC changes after equal intervals of time. The direction of DC does not change. Advantage of AC over DC is that AC can be transmitted over long distances without much loss of energy.

OR

(a) Given that,

Potential difference, V = 220 V

Electric power, P = 800W

Time for which it is kept ON, t =60 × 60 × 10×7

Therefore,

Energy consumed by Air conditioner, E = P × t

E = 800 × 3600 × 70

E = 201,600,000 J or 201.6 MJ

(b) Given that,

New power rating, P’ = 800/2 = 400 W

Time, t = 60 × 60 × 10 × 7

Now,

Energy consumed, E = P’ × t = 400× 3600× 70

E = 100.8 × 106 -J = 100.8 MJ

Alternate method:

Since the power rating is halved, the new power rating can be determined by finding the ratio of initial and final energy consumption since the time period is constant.

i.e., P’ = ½ × P

$$\frac{E}{E} = \frac{P \times t}{P \times t}$$

$$\therefore E = 201.6 \times \frac{1}{2} = 100.8 \text{ MJ}$$

(c) Difference in energy consumption, $\Delta E = E - E' = 100.8$ MJ

Thus, Total unit of power consumed = 100.8/3.6 = 28 Units.

Net saving = 28 × 4 = 112 rupees

SECTION - E

37.

(a)

i) Copper is placed below hydrogen in activity series therefore, it is less reactive than hydrogen.

ii) Iron is placed above hydrogen in activity series therefore, it is more reactive than hydrogen.

(b)

i) Metals which react vigorously with oxygen: Sodium and potassium.

ii) Correct order of reactivity of given metals: Na > Mg > Al > Cu.

OR

(c) Sameera should prefer Type B iron nails coated with zinc.

Reason: Type A nails are pure iron nails which get rusted due to corrosion.

Type B iron nails are galvanized nails.

Galvanising is a method of rust prevention. The iron or steel object is coated in a thin layer of zinc. This stops oxygen and water reaching the metal underneath. Zinc also acts as a sacrificial metal. Zinc is more reactive than iron, so it oxidises in preference to the iron object.

38.

(a) A pea plant with axial flowers (AA; dominant) was crossed with a pea plant with terminal flowers (aa, recessive). All the F_1 progeny would bear axial flowers because the trait for axial flowers is dominant over the trait for terminal flowers.

(b) In the F_2 generation,

Parents → Aa × Aa

Gametes → A, a A, a

	A	**a**
A	AA (Axial)	Aa (Axial)
a	Aa (Axial)	aa (Terminal)

Phenotypic ratio of F_2 progeny → Axial : Terminal = 3 : 1

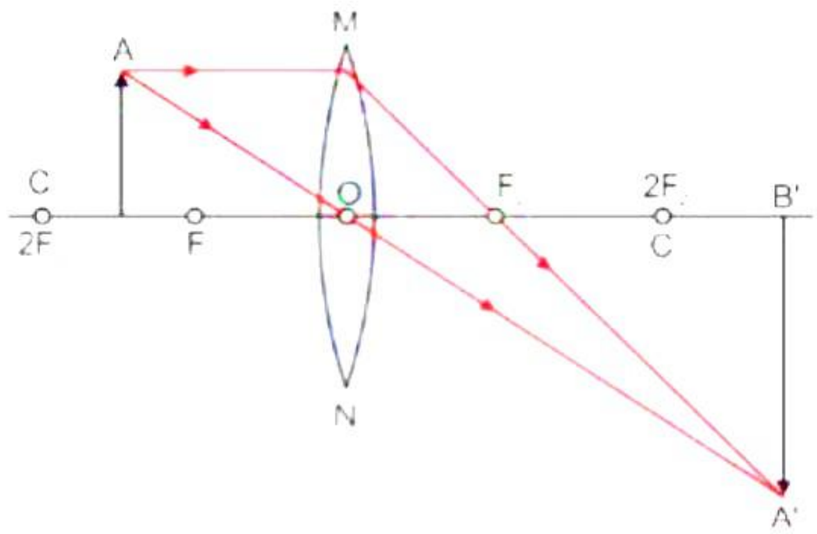
(c) F_1 plants are heterozygous (Aa), and hence, only the dominant trait is visible in the F_1 generation. In the F_2 generation, factors responsible for the two traits are segregated and recombined to form a homozygous recessive trait for terminal flowers (aa). Therefore, the F_2 progeny is different from the F_1 progeny.

OR

(c) With respect to flower colour in pea plants, the trait for violet colour is dominant over the trait for white flower colour. Thus, the phenotypic ratio of violet flowered and white flowered plants in F_2 generation would be 3 : 1. Hence, out of 400 plants, 300 plants would bear violet flowers and 100 plants would bear white flowers.

39.

a) The position of the object will produce a magnified real image when an object is placed between F and 2F on the left side of lens.



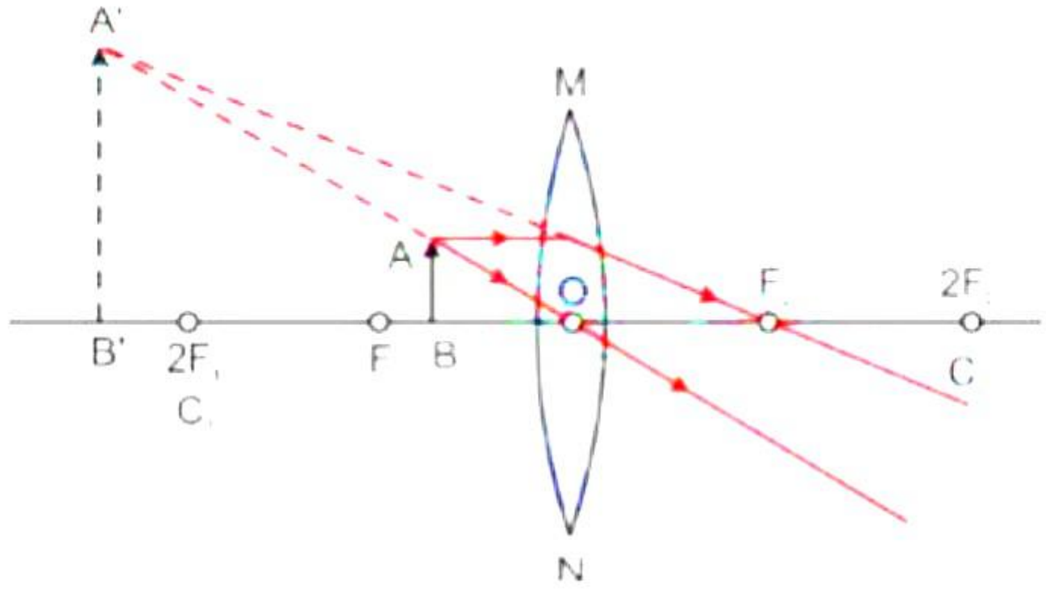
f = 15 cm and 2F position will be = 2 × 15 = 30 cm

The distance between 15 cm and 30 cm is 20 cm.

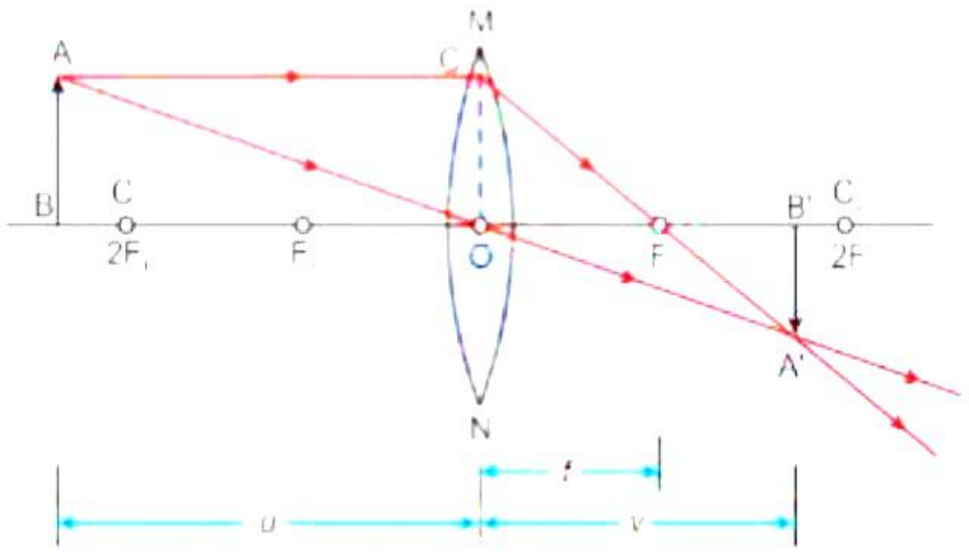
b) The image formed should be virtual and erect. In front of convex lens, this type of image is possible only when object is placed within focus.

Focal length = 15 cm

Thus, the position lying within the focal length of convex lens is 10 cm.



c) When object is placed beyond the 2F the image formed is diminished real image. We know the focal length of lens is 15 cm then the 2F will be equal to 30 cm. The distance beyond 30 cm i.e., 2F is 35 cm.



OR

d) The image formed is of same size as that of object when an object is placed at 2F of convex lens. We know, 2F position is at 30 cm as focal length is 15 cm. Thus, for this convex lens the image formed will be of same size as that of object when and object is placed at 30 cm.