



## SECTION A

## MCQ

Q: 1 Aadrita took a blue-coloured solution of the sulphate of metal A in a beaker. She then added metal powders B, C and D one after the other to the beaker. She wrote her observations as shown below.



Aadrita again took sulphate solution of metal A in a fresh beaker then added powder of metal B followed by powder of metal D. What will the colour of the solution likely to be now?

- 1 blue                       2 pink                       3 green                       4 colourless

Q: 2 Y and Z are metals known to undergo the following reactions at high temperature.



Bishen, Chandra, Prasanna and Venkat are looking at the following written on a piece of paper and wondering if it is a valid chemical equation.



Bishen : It is valid because it is balanced.

Chandra : It is valid because YO gets reduced to the metal Y and ZO gets reduced to the metal Z as per the above two equations.

Prasanna : It is efficient because it avoids the trouble of writing two equations separately and the law of conservation of mass is not violated. It's just like adding 2 algebraic equations.

Venkat : This equation can lead to a wrong understanding that YO and ZO can be reduced ONLY if they are reduced together.

Who understands chemical equations best?

- 1 Bishen                       2 Chandra                       3 Prasanna                       4 Venkat

Q: 3 The corrosion of iron to form rust is an example of a/an \_\_\_\_\_ reaction.

- 1 decomposition                       2 displacement                       3 oxidation                       4 reduction

**Q: 4** A baking soda acid fire extinguisher is an emergency fire protection device that can extinguish or control small fires. The fire extinguisher is activated by dumping the baking soda into acid water.

**How does this fire extinguisher work?**

- 1** by the formation of water                       **2** by the formation of hydrogen gas  
 **3** by the formation of sodium chloride             **4** by the formation of carbon dioxide gas

**Q: 5** A substance ionizes partially in water to produce a low concentration of  $\text{OH}^-$  ions. Such a substance is MOST likely a \_\_\_\_\_.

- 1** strong base                       **2** weak base                       **3** strong acid                       **4** weak acid

**Q: 6** Which of the following explains why pickles should NOT be stored in metal containers?

- 1** The oil in the pickle causes the metal container to rust.  
 **2** The acids in the pickle will react with the metal to form harmful salts.  
 **3** The acids in the pickle will release water which reacts with metals to form harmful gases.  
 **4** (There is no real reason, pickles can be stored in metal containers if they are dry before adding pickles.)

**Q: 7** Which of the following correctly explains why an ovum (unfertilized egg) is usually larger than a sperm?

- 1** Unlike a sperm, an ovum is multicellular.  
 **2** The ovum contains the zygote inside it.  
 **3** The ovum contains more genetic material than the sperm.  
 **4** The ovum contains nutrients to help growth after fertilization.

**Q: 8 Unisexual flowers are flowers which have only the male part or the female part of the flower.**

Such flowers can be present either together on a single plant or separately on two different plants.

Persimmon (Japani Phal) tree is an example where the male and the female flowers are always produced on different trees.

Shown below is a Persimmon tree and its fruit (Japani Phal).



Natasha had a Persimmon tree with male flowers in her garden. Her neighbour, Rachel also had a Persimmon tree but with female flowers in her garden.

**What might be the effect of this?**

- 1** Many flowers bloomed on Natasha's tree every year but they never bore any fruits, while Rachel's tree bore fruits.
- 2** Many flowers bloomed on Rachel's tree every year but they never bore any fruits, while Natasha's tree bore fruits.
- 3** Both Natasha's and Rachel's tree bore fruits every year.
- 4** Neither Natasha's nor Rachel's tree bore fruits every year.

**Q: 9** Leaf buds of plants like Bryophyllum grow into new plants.



Which of the following is true about this method of reproduction?

- i. it is an asexual method of reproduction
- ii. it is a sexual method of reproduction
- iii. it is a vegetative method of propagation

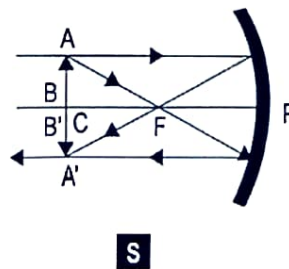
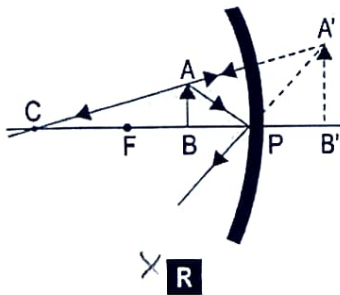
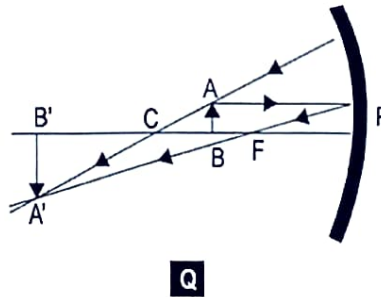
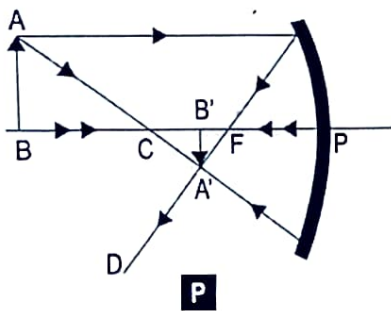
**1** only i

**2** only ii

**3** only i and iii

**4** only ii and iii

**Q: 10** Which of the following ray diagrams CORRECTLY represents the use of a concave mirror as a shaving mirror?



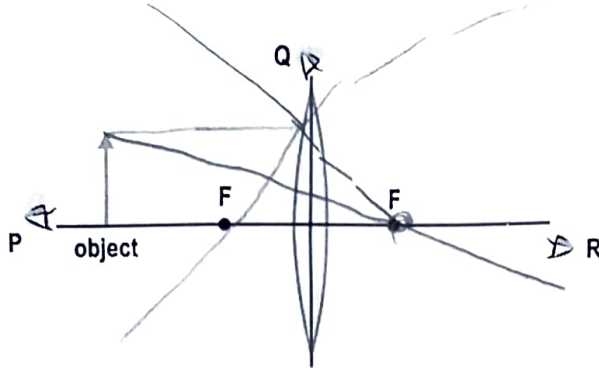
**1** P

**2** Q

~~**3**~~ R

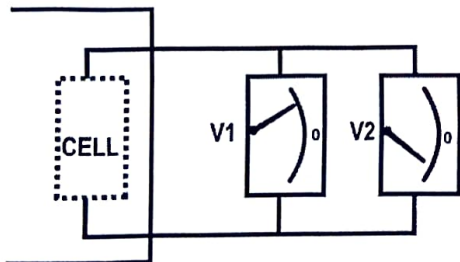
~~**4**~~ S

**Q: 11** At which point (s) should an observer place his eye in order to see the image of the object? (You are not allowed to use a screen to observe the image)



- 1** at position P only
- 2** at positions P or Q
- 3** at position R only
- 4** at any of the three positions shown

**Q: 12** A voltmeter (V1) with a zero reading at the centre but no marking of polarities is connected across an electric cell hidden inside a box with its terminals brought out. It reads as shown in the figure. Another identical voltmeter (V2) also with no marking of polarity is connected in parallel and its needle deflects by the exact same angle from the centre line but in the opposite direction.



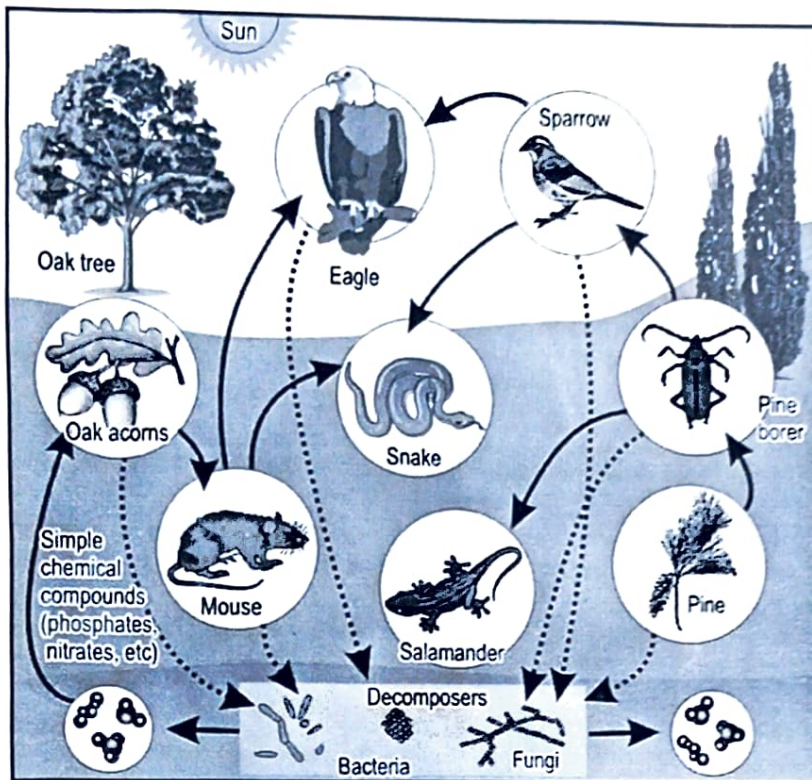
What can we conclude from this?

- 1** V1 is faulty.
- 2** The cell is faulty.
- 3** Either V1 or V2 is faulty.
- 4** Both V1 and V2 are faulty.

**Q: 13** There are three different types of bulbs - 20 watts, 30 watts and 40 watts. Which bulb will produce **MAXIMUM** light?

- 1** 20 watt bulb
- 2** 30 watt bulb
- 3** 40 watt bulb
- 4** (Nothing can be said, without knowing the technology used in each bulb.)

Study the food web given below and answer the next two questions.



**Q: 14** Which of the following do the decomposers in this food web break down?

- 1 only the simple chemical compounds
- 2 only mouse and salamander
- 3 only the animals
- 4 all the dead material

**Q: 15** Which of the following can be said of the above food web?

- 1 Insects are eaten only by birds.
- 2 Fungi make their own food using sunlight.
- 3 Some birds can be predators of other birds.
- 4 The snake is a natural predator of all other animals.

**Q: 16** Which of the following facts is true about ozone?

- 1 It exists in the diatomic state.
- 2 It emits harmful radiations.
- 3 It is stable nearer to the Earth's surface.
- 4 It can cause harm to organisms that are exposed to it.

**Q: 17** The rate of transpiration in plants is governed by various factors. An increase in which of the following factors will also increase the rate of transpiration?

- P) temperature
- Q) humidity
- R) wind speed
- S) intensity of sunlight

- 1** only P
- 3** only P, R and S

- 2** only P and S
- 4** all - P, Q, R and S

## SECTION B

### Assertion and Reasoning

**Q: 18** Two statements are given below. One is labeled Assertion (A) and the other is labeled Reason (R).

**Assertion (A):** The black coloured coating on the surface of a glass turns brown when heated in the presence of hydrogen.

**Reason (R):** The black coloured coating gets changes to its corresponding metallic form on reaction with hydrogen.

Which of the following is correct?

- 1** Both A and R are true, and R is the correct explanation of A.
- 2** Both A and R are true, but R is not the correct explanation of A.
- 3** A is true but R is false.
- 4** A is false but R is true.

**Q: 19** Two statements are given below. One is labelled Assertion (A) and the other is labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements A and R.

**Assertion (A):** A ray passing through the centre of curvature of a concave mirror is reflected back along the same direction.

**Reason (R):** The rays reflected by a concave mirror follow the laws of reflection.

- 1** Both A and R are true and R is the correct explanation of A.
- 2** Both A and R are true but R is NOT the correct explanation of A.
- 3** A is true but R is false.
- 4** A is false but R is true.

**Q: 20** Two statements are given below - one labelled Assertion (A) and the other labelled Reason (R).

**Assertion (A):** Plants with more root hair tend to absorb more water and minerals

**Reason (R):** Root hair increases the surface area of root.

Which of the following is correct?

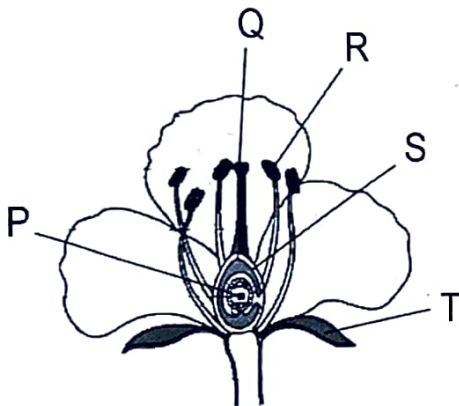
- 1** Both A and R are true and R is the correct explanation for A.
- 2** Both A and R are true and R is not the correct explanation for A.
- 3** A is true but R is false.
- 4** A is false but R is true.

### SECTION C

**Q: 21** Madhu has one molar solutions of sulphuric acid and acetic acid. [2]

Which of the two solutions is a stronger acid? Explain why.

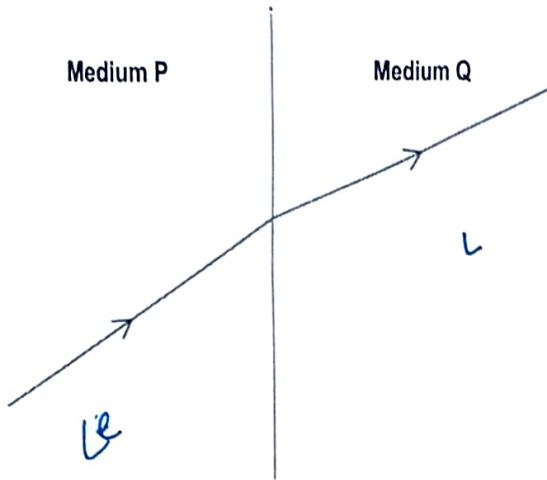
**Q: 22** Different parts of a flower have been labelled by letters in the cross-section of a flower [2] below.



(a) Identify the labelled parts from their description given below. (One has been done for you as an example: (i) - (T))

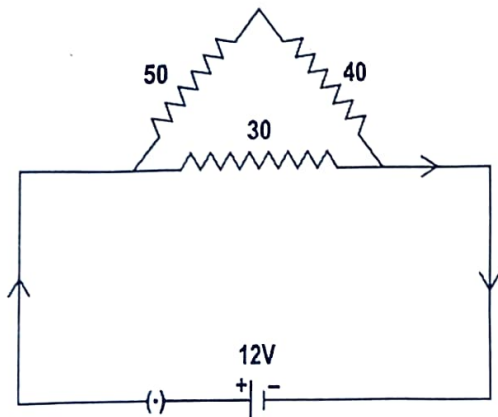
- (i) It protects the flower when its a bud.
- (ii) A seed is formed from it.
- (iii) Pollen is transferred to it in pollination.
- (iv) It grows into a fruit after fertilisation.
- (v) Pollen grains develop in it.

Q: 23 The diagram below shows the path of a light ray as it moves from medium P to medium Q. [2]



- (a) Which of the two mediums has the higher refractive index? Justify your answer.  
 (b) Draw the path of another incident ray moving from P to Q with an angle of incidence of  $0^\circ$ .

Q: 24 (a) Find the total equivalent resistance in the following circuit diagram. All the resistances are in ohms. [2]



- (b) Find the magnitude of the current that will be drawn from the battery in the circuit.



- Q: 25 Blue and green garbage bins like the one shown below are placed at certain spots in cities. The green bin is labeled 'Wet Waste' and the blue bin is labeled 'Dry Waste'. [2]



- (a) Explain why it is important to separate garbage into wet and dry waste.
- (b) Give one example of a waste material that can be disposed off in each of the bins.

- Q: 26 Give a reason for the following: [2]

- (a) During respiration, not all energy given out by the breakdown of glucose is converted into chemical energy.
- (b) Aerobic respiration is preferred over anaerobic respiration.

### SECTION D

- Q: 27 Answer the following questions based on the information below: [3]

A group of students were discussing how in chemical reactions heat energy can either be absorbed or evolved. They stated that in respiration glucose burns in the body and releases energy whereas in photosynthesis green plants convert carbon dioxide and water in the presence of sunlight to give glucose and oxygen, which is the source of energy.

- (a) Is photosynthesis exothermic or endothermic? Justify your answer.
- (b) Write the balanced chemical equation for photosynthesis.
- (c) Explain how respiration takes place within the human body at low temperatures.

**Q: 28** Turmeric solution (yellow in colour) and red cabbage solution (blue in colour) are used as indicators. Study the table given below and answer the questions that follow. [3]

Name of the substance	With turmeric (yellow)	With red cabbage (bluish-violet)
Lemon juice	No change	Changes to red
Milk of Magnesia	Changes to red	Changes to green
Sugar Solution	No change	No change
Baking Soda	Changes to red	Changes to green
Substance 'X'	No change	No change

(a) Turmeric is added to a colourless basic solution.

(i) What will be the colour of the solution?

(ii) What colour will this solution change to if an excess of lemon juice is now added to it?

(b) Aditya wants to use only one of the indicators to test if a solution is definitely acidic or basic. Which indicator should he use?

(c) What is substance 'X' likely to be - acidic, basic or neutral? Give a reason for your answer.

**Q: 29** Unicellular organisms reproduce asexually giving rise to identical offspring. Fission, fragmentation, regeneration, and budding are some of the methods by which an organism can reproduce without the requirement of fusion of gametes. Offspring produced by asexual reproduction are considered to be genetically identical to their parent. [3]

(a) Radha thinks that variation is impossible in these organisms. Is she correct? Justify.

(b) In humans, the liver is able to replace any lost liver tissue. Even if half the liver is functioning normally, it can grow the rest of the organ back. Give one example of an organism that can reproduce in the same way as the liver and state the method of asexual reproduction it undergoes.

**Q: 30** The power of a lens is +2.0 D. [3]

(a) Will light rays passing through this lens converge or diverge? Justify your answer.

(b) What should be done to decrease the power of the lens?

**Q: 31** What will happen to the resistance of a metal wire in the following cases? Explain your [3]  
answer in each case.

- (a) when a part of its length is cut off
- (b) when the voltage applied across it in a circuit is increased, assuming its temperature remains constant
- (c) when its area of cross-section is reduced

**Q: 32** An ecosystem comprises both biotic and abiotic factors that are interdependent on each other. [3]

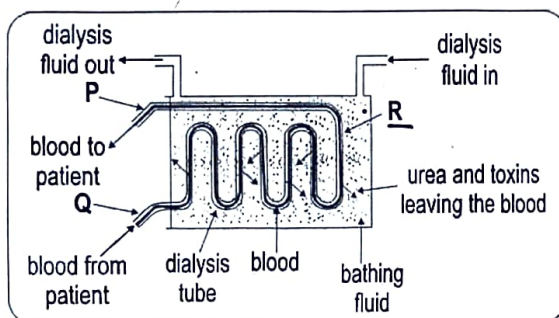
A crow may receive a different percentage of energy from the producers, depending on the food web it is a part of. However, a horse will receive the same percentage of energy from the producers in any food web.

State whether these statements are true or false. Justify.

**Q: 33** [3]

Dialysis is the use of a machine as an artificial kidney to filter and remove the toxic substance urea from blood.

The diagram below shows the arrangement of the tubes and types of fluids used for dialysis.



Complete the following table to draw similarities between the working of a dialysis machine and functional kidneys.

Part of the dialysis machine	Part of the excretory system that performs a similar function	Function of this part of the excretory system
P		
Q		
R		

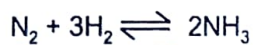
Q: 34 (a) Explain what is meant by 'a balanced chemical equation.'

[5]

(b) Balance the following chemical equation.



(c) What does the sign between the reactants and products indicate in the reaction below?



(d) State any one factor of a reaction that a chemical equation does NOT give any information about.

Q: 35 (a) State Ohm's law.

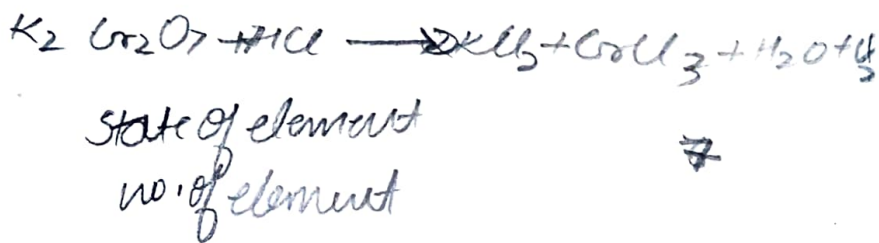
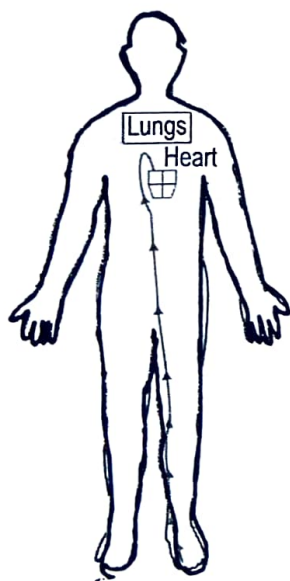
[5]

(b) What happens to the magnitude of current passing through a wire if its resistance gets tripled?

(c) How much minimum work is required to be done in moving 1 C of charge externally between the terminals of a 10 V battery?

(d) What is a variable resistor? Draw the symbol of a variable resistor.

Q: 36 Shown here is a diagram of a human body. Part of the path that the blood follows from [5] the toe of the left leg to the right side of the heart is already shown.



(a) Copy the above diagram and draw the path that the blood will take here onwards to flow and reach the toe again.

(b) Explain why the drawn path is the one that the blood will flow through.

(c) The two sides of the heart, the left and the right side, are separated by a thick wall. What could be the reason?

**Q: 37** Krishna owns a plot of land that does not support crop cultivation. To investigate this issue, a pH test is performed using a litmus indicator, which reveals that the soil has a pH level of 5.5. [4]

- (a) What does a pH level of 5.5 indicate about the soil's condition?
- (b) Mention how litmus indicator's color or appearance could have changed after its interaction with the soil.
- (c) To address the issue of soil acidity, mention any one substance that can be added to the soil.
- (d) Based on (c), what is the scientific name of the reaction that occurs between this substance being added and the substances already present in the soil?

**Q: 38** Raman and Lavina did not want children for a few years and therefore visited a doctor to discuss ways of family planning. Lavina has a history of allergies to several chemicals and metals and also suffers from hormonal imbalance. Therefore, she is suggested to not undergo surgery. [4]

- (a) Without detailed testing, what method can the doctor suggest to the couple to prevent pregnancy for a few years? How does this method work?
- (b) A friend of the couple suggested the following methods to prevent pregnancy for a few years:
  - (i) blocking the vas deferens surgically
  - (ii) contraceptive pillsShould the couple implement this method? Why or why not?

**Q: 39** (a) What happens to a ray of light passing through the centre of curvature of a concave mirror? [4]

(b) Smriti is looking at herself in a convex mirror in a science museum, standing 2 m away from the mirror. Her image appears to be around half her actual height. Estimate the focal length of the mirror.

End of Questions in Paper