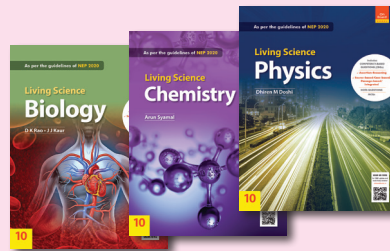


# Sample Question Paper

2024–25



## Class X SCIENCE (086)

# ANSWERS

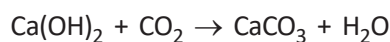
### SECTION – A

- |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|
| 1. d.  | 2. d.  | 3. b.  | 4. b.  | 5. b.  | 6. c.  | 7. d.  |
| 8. b.  | 9. c.  | 10. b. | 11. d. | 12. a. | 13. a. | 14. a. |
| 15. a. | 16. d. | 17. d. | 18. a. | 19. c. | 20. c. |        |

### SECTION – B

21. a. Calcium hydroxide reacts with carbon dioxide present in the air to form a thin layer of calcium carbonate on the walls.

b. This is a combination reaction. The chemical reaction involved is as follows:



22. Reproduction is the process by which a living organism is able to produce more of its own kind. Reproduction ensures continuity of life and survival of a species on earth. Therefore it is essential for living organisms.

23. The pericardial fluid protects the heart from mechanical injury.

Four functions of blood include: (i) Transport of nutrients from the site of absorption to different organs of the body. (ii) Transport of respiratory gases from lungs to tissues. (iii) Transport of respiratory gases from tissues to lungs. (iv) Transport of waste substances to the organs concerned with their removal from the body.

OR

The glucose which enters the nephron along with the filtrate is reabsorbed by the tubular cells and sent to the capillaries surrounding the nephron.

24. a. (i) Light speeds up or the speed of light increases when it travels from a medium of higher refractive index to a medium of lower refractive index. Therefore, speed of light increases when it travels from crown glass to water or from rock salt to water or from diamond to water.

(ii) Light slows down or the speed of light decreases when it travels from a medium of lower refractive index to a medium of higher refractive index. For example, when it travels from water to crown glass or from water to diamond.

b. The speed of light will be maximum in water.

25. The piece of wire is cut into five equal parts, which means that the resistance of each part is  $R/5$ . We know that each part is connected to each other in parallel, hence the equivalent resistance can be calculated as follows:

$$\frac{1}{R'} = \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} = \frac{25}{R}$$

$$R' = \frac{R}{25}$$

$$R : R' = 25 : 1$$

OR

- a. The magnetic field lines on the left side of A are closer to each other as compared to the right side of A. Therefore, the field is stronger on the left-hand side.
  - b. The current-carrying wire will experience a force towards the left.
26. If the tiger has 30J of energy, grass must have 3000J of energy initially. This is because the tiger must have obtained only 10% of energy from goat which must have obtained 300J of energy from grass (10% of energy possessed by plants). Hence the plants must have had 3000J of energy.

### SECTION – C

27. a. Decomposition reactions  
Example:  $\text{MgCO}_3 \xrightarrow{\Delta} \text{MgO} + \text{CO}_2$
- b. Displacement reactions  
Example:  $\text{CuSO}_4 + \text{Zn} \rightarrow \text{Cu} + \text{ZnSO}_4$
28. a. i. Solution A is hydrochloric acid and gas B is carbon dioxide.  
ii. pH less than 7. The type of element will be metal.  
iii. Acid:  $\text{H}^+$   
Base:  $\text{OH}^-$

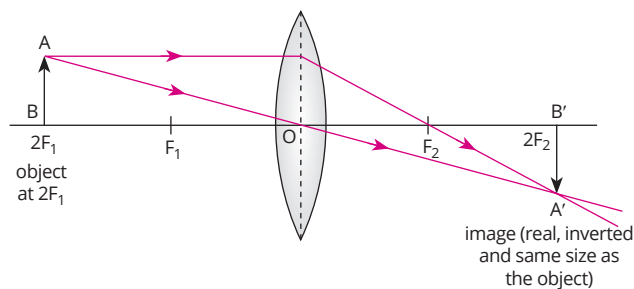
OR

- b. i. Tap water contain dissolved salts which ionize in water and hence tap water conducts electricity. But distilled water does not contain any salt and hence it does not conduct electricity.  
ii. pH of 4.6 is considered to be acidic. Therefore, the tomato juice will likely taste sour.  
iii. The function of tartaric acid in baking powder is to neutralise sodium carbonate formed during heating.
29. The hindbrain has three main centres – cerebellum, pons and medulla oblongata. The cerebellum controls the body postures, balance and movement. Pons helps in respiration. Medulla oblongata contains vital centres for breathing, swallowing, sneezing, coughing and vomiting.
30. a. 100%  
b. Every cell has the sex chromosomes as the 23rd pair. If it is XX, then the sample is from female or if it is XY, then the sample is from male.
31. a. A real image can be obtained on a screen but a virtual image cannot be obtained on a screen.  
b. i. Convex lens  
ii. Given that the distance between the flame (object) and screen (image) is 4 m, therefore,  $v + u = 4$  m. Since image is of the same size as the object, magnification is 1 and  $v = u$ . Therefore,  $2u = 4$  m or  $u = 2$  m, so the lens is to be placed at a distance of 2 m from the candle flame.

Using the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{2} - \frac{1}{-2} \quad \text{or} \quad f = 1 \text{ m}$$

iii. Ray Diagram



32. a. In 1826, a German physicist, Georg Simon Ohm established a relationship between electric current ( $I$ ) flowing through a conductor and potential difference ( $V$ ) across its terminals. This relationship is known as Ohm's law.

According to Ohm's law, the electric current ( $I$ ) flowing through a conductor between two points is directly proportional to the voltage ( $V$ ) across the two points, provided the temperature and other physical conditions of the conductor remain the same, that is,

$$I \propto V \quad \text{or} \quad V = IR$$

here  $R$  is a constant for the conductor at a given temperature and is called its resistance.

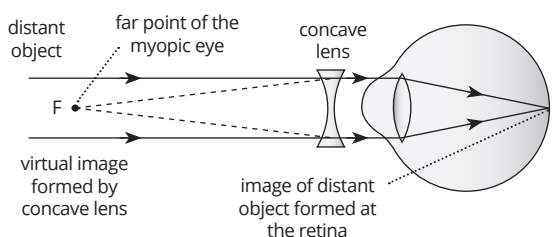
- b. Joule's law of heating, also known as the Joule's first law, states that the heat produced in a conductor due to the flow of electric current is directly proportional to the resistance of the conductor, the square of the current passing through it, and the time for which the current flows. Mathematically, Joule's law can be expressed as:

$$Q = I^2Rt$$

where:

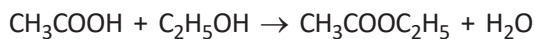
- $Q$  is the heat produced (in joules).
- $I$  is the current passing through the conductor (in amperes).
- $R$  is the resistance of the conductor (in ohms).
- $t$  is the time for which the current flows (in seconds).

33. a. The defect of vision represented in the diagram is myopia.
- b. i. Excessive curvature of the eye which leads to decrease in the focal length of the eye lens.  
 ii. Elongation in the size of the eye lens which leads to the increase in the distance of retina from the eye lens.
- c. To correct the myopic eye, the affected person has to use spectacles with concave lens of suitable focal length.



## SECTION – D

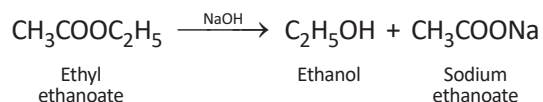
34. a. Compound A is  $\text{CH}_3\text{COOH}$  (ethanoic acid). Ethanoic acid is used as a preservative in pickles.



Compound B is  $\text{CH}_3\text{COOC}_2\text{H}_5$  (ethyl ethanoate) formed by esterification. It is a sweet-smelling ester.

- b. Esters undergo hydrolysis in the presence of a base to form alcohol and sodium salt of carboxylic acid. Sodium ethanoate when added to water reacts to form ethanoic acid.

By saponification reaction

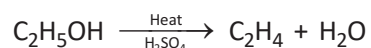


- c. Carbon dioxide gas is produced when ethanoic acid (compound A) reacts with washing soda ( $\text{Na}_2\text{CO}_3$ ).



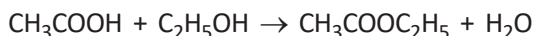
**OR**

- a. Alkanes are saturated hydrocarbons in which the carbon atoms are linked by a single covalent bond. Compound D which is ethane is a saturated hydrocarbon.
- b. Compound C is ethanol. On heating, it gives ethene as the major product. The reaction is shown below:



$\text{H}_2\text{SO}_4$  acts as a dehydrating agent and eliminates water from ethanol.

- c. The reaction between compounds B and C, ethanoic acid and ethanol, gives an ester, ethyl ethanoate. It is sweet-smelling compound and used as artificial flavouring agent.



35. a. This surgical method in males is called vasectomy.  
b. In females the surgical method on this similar line is called tubectomy.

Surgical methods are irreversible and provide permanent form of birth control by blocking the vas deferens (in males) and fallopian tube (in females).

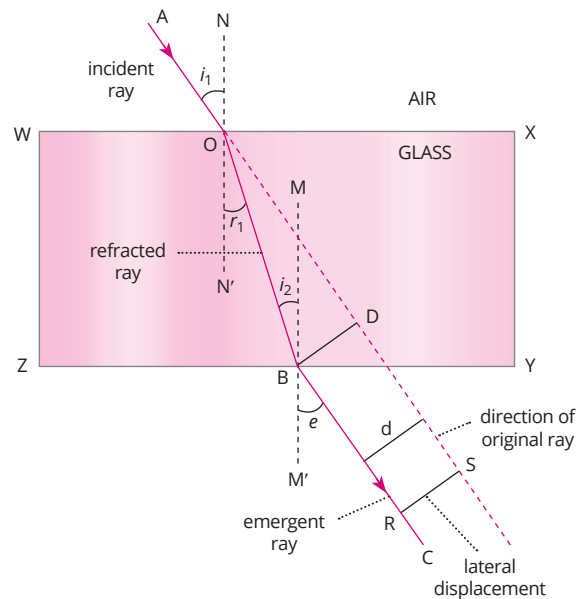
- c. Structure 'X' is vas deferens and organ 'B' is testis.  
d. The cells 'A' and 'D' are sperm and ovum respectively.

**OR**

- a. Adrenaline is the hormone responsible for these changes.  
b. It is secreted by adrenal gland (adrenal medulla).  
c. Adrenal gland also produces noradrenaline. Noradrenaline functions together with adrenaline.  
d. The thyroid gland secretes thyroxine. Thyroxine stimulates the rate of cellular oxidation and metabolism.
36. a. A lens is a piece of transparent, optical material bounded by two refracting surfaces which are usually spherical, or one surface spherical and the other plane.

CONVEX LENS	CONCAVE LENS
A convex lens is thicker in the middle and thinner at the edges.	A concave lens is thinner in the middle and thicker at the edges.
A parallel beam of light passing through this lens converges at a point after refraction.	A parallel beam of light passing through this lens appears to diverge from a point after refraction.
It is a converging lens.	It is diverging lens.
It has a real focus.	It has a virtual focus.

c. Diagram of refraction of light through a rectangular glass slab



d. Given,

Power,  $P = +5D$  and we know that,

Power,  $P = \frac{1}{f}$ , where  $f$  is the focal length of the lens.

Substituting values in the above formula, we get

$$f = \frac{1}{+5}$$

$$f = 0.2 \text{ m}$$

$$f = 0.2 \times 100 \text{ cm}$$

$$f = 20 \text{ cm.}$$

Hence, if the power of lens is +5 diopter, the focal length is 20 cm.

**OR**

a. Two characteristics of concave lenses are:

- Diverging nature: Concave lenses are thinner at the centre and thicker at the edges, causing them to diverge or spread out incoming parallel rays of light. This divergence is the result of the refractive index of the lens material being less than that of the surrounding medium, such as air.
- Virtual, upright images: When parallel rays of light pass through a concave lens, they appear to diverge from a common point behind the lens, known as the focal point. This makes the image formed by a concave lens virtual, meaning it cannot be projected onto a screen. The image is also upright, which means it has the same orientation as the object.



38. a. bb  
 b. Blue eyed  
 c. 1 : 1

OR

Phenotype of the father – BB or Bb, phenotype of mother- bb

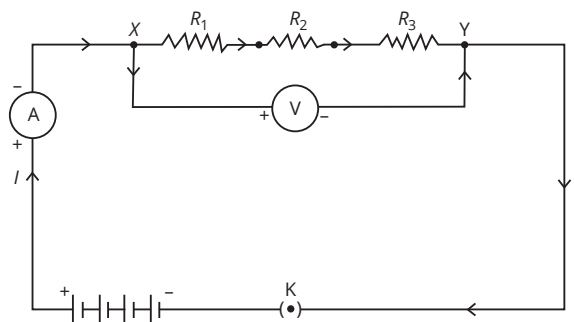
Blue eye colour trait can only be expressed in homozygous condition (bb). Therefore, it is recessive in nature.

We need data of at least three generations to identify whether a trait is dominant or recessive.

39. a. **Step 1:** Construction of circuit

- Connecting three resistances  $R_1$ ,  $R_2$ , and  $R_3$  in series combination across the battery of voltage  $V$ .
- Adding an ammeter in series and a voltmeter in parallel combination in the circuit.

**Step 2:** Circuit diagram



**Step 3:** Observation

- Take the reading of the potential difference between  $R_2$  and  $R_3$  in the absence of  $R_1$ .
- Take the reading of the potential difference between  $R_1$  and  $R_3$  in the absence of  $R_2$ .
- In each case, the ammeter reading is the same, that is, current remains the same in the circuit.

**Step 4:** Calculation

- From the Ohm's law, we know that,  $V = IR$ , where  $V$  = voltage,  $I$  = current, and  $R$  = resistance.
- The current in terms of voltage and resistance of each resistor is  $I = \frac{V}{R}$ .
- From the observation, the ratio of voltage and potential is the same. Thus, the current flowing in the circuit is the same.

b. i. Equivalent resistance ( $R_E$ ) =  $\frac{R_1 \times R_2}{R_1 + R_2} + R_3$

$$= \frac{24 \Omega \times 24 \Omega}{24 \Omega + 24 \Omega} + 12 \Omega$$

$$= 12 \Omega + 12 \Omega = 24 \Omega$$

The current through  $12 \Omega$  resistor,

$$I = \frac{V}{R_E} = \frac{6}{24} = 0.25 \text{ A}$$

- ii. The difference in the readings of  $A_1$  and  $A_2 = 0$  (As they are connected in series.)

- c. Electric power ( $P$ ) is defined as the rate of doing electrical work, or the rate at which electrical energy is consumed in an electric circuit, that is

$$\text{Electric Power } (P) = \frac{\text{Electrical work done}}{\text{Time taken}}$$

$$\text{or } P = \frac{E}{t}$$

$$\text{or } P = \frac{V \times I \times t}{t}$$

$$(\text{Since } E = V \times I \times t)$$

$$\text{or } P = V \times I$$

Electric power in terms of  $I$  and  $R$

$$V = I \times R \text{ (using Ohm's law)}$$

Substituting the value of  $V$  in the equation

$$P = V \times I$$

$$P = (I \times R) \times I = I^2 R$$

**OR**

For Bulb 1,

Power  $P = 100$  W, Voltage,  $V = 220$  V, Resistance =  $R_1$

We know,

$$P = \frac{V^2}{R_1}$$

$$100 = \frac{220 \times 220}{R_1}$$

$$R_1 = \frac{220 \times 220}{100} = 484 \Omega$$

For Bulb 2,

Power  $P = 60$  W, Voltage,  $V = 220$  V, Resistance =  $R_2$

Again using

$$P = \frac{V^2}{R_2}$$

$$60 = \frac{220 \times 220}{R_2}$$

$$R_2 = \frac{220 \times 220}{60} = 806.7 \Omega$$

As the resistances are connected in parallel,

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{484} + \frac{1}{806.7}$$

So, total resistance

$$R = 302.5 \Omega$$

We know,

$$V = I \times R$$

$$220 = I \times 302.5$$

$$I = \frac{220}{302.5} = 0.73 \text{ A}$$