

# Bihar Board Class 10 Science Question Paper with Solutions(Memory Based)

Time Allowed :3 Hours	Maximum Marks :70	Total questions :37
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## General Instructions

Read the following instructions very carefully and strictly follow them:

1. Please check that this question paper contains 23 printed pages.
2. Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
3. Please check that this question paper contains 37 questions.
4. 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

**1. Volt (V) is equal to:**

- (A) C/J
- (B) J/C
- (C) J/A
- (D) A/J

**Correct Answer:** (2) J/C

**Solution: Concept:** Electric potential (Voltage) is defined as the work done per unit charge in moving a test charge between two points in an electric field.

Mathematically,

$$V = \frac{W}{Q}$$

where,

- $V$  = potential difference (Volt)
- $W$  = work done (Joule)
- $Q$  = charge (Coulomb)

Thus, the SI unit of voltage is:

$$1 \text{ Volt} = \frac{1 \text{ Joule}}{1 \text{ Coulomb}} = \text{J/C}$$

**Step 1:** Using the definition of potential difference,

$$V = \frac{\text{Work done}}{\text{Charge}} = \frac{J}{C}$$

Hence, Volt is equal to Joule per Coulomb.

### Quick Tip

Remember: Voltage = Energy per charge. So, Volt = Joule/Coulomb (J/C).

## 2. The rate of flow of electric charge is called:

- (A) Electric current
- (B) Electromotive force
- (C) Potential difference
- (D) none of these

**Correct Answer:** (1) Electric current

**Solution: Concept:** Electric current is defined as the rate of flow of electric charge through a conductor.

Mathematically,

$$I = \frac{Q}{t}$$

where,

- $I$  = electric current
- $Q$  = charge

- $t = \text{time}$

Thus, current measures how much charge passes through a point in a given time.

**Step 1:** From the definition,

$$\text{Rate of flow of charge} = \frac{\text{Charge}}{\text{Time}} = \text{Current}$$

**Step 2:** Checking options:

- Electromotive force (EMF) = energy per charge
- Potential difference = work done per charge

Hence, the correct answer is electric current.

### Quick Tip

Remember: Current = Flow of charge per second. Formula:  $I = \frac{Q}{t}$

### 3. Which of the following statements is true?

- (A) joule = volt  $\times$  ampere
- (B) joule = coulomb  $\times$  volt
- (C) joule =  $\frac{\text{ampere}}{\text{volt}}$
- (D) joule =  $\frac{\text{coulomb}}{\text{volt}}$

**Correct Answer:** (2) joule = coulomb  $\times$  volt

**Solution: Concept:** Electric potential difference is defined as work done per unit charge:

$$V = \frac{W}{Q}$$

Rearranging the formula:

$$W = V \times Q$$

Here,

- $W = \text{work done (Joule)}$
- $V = \text{potential difference (Volt)}$

- $Q$  = charge (Coulomb)

Thus,

$$1 \text{ Joule} = 1 \text{ Volt} \times 1 \text{ Coulomb}$$

**Step 1:** Using the definition of voltage:

$$V = \frac{J}{C}$$

**Step 2:** Rearranging:

$$J = C \times V$$

Hence, joule equals coulomb multiplied by volt.

#### Quick Tip

From  $V = \frac{J}{C}$ , always remember: Joule = Volt  $\times$  Coulomb.

#### 4. The functional group –CHO is called:

- (A) ether group
- (B) carbonyl group
- (C) aldehydic group
- (D) alcoholic group

**Correct Answer:** (3) aldehydic group

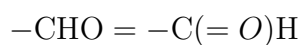
**Solution: Concept:** Functional groups determine the chemical properties of organic compounds.

The group –CHO represents:

- A carbon atom double bonded to oxygen (carbonyl)
- The same carbon bonded to hydrogen

This specific structure defines an aldehyde.

**Step 1:** Structure of the group:



**Step 2:** Classification:

- Ether group:  $-O-$
- Carbonyl group: general  $>C=O$
- Alcoholic group:  $-OH$
- Aldehydic group:  $-CHO$

Thus, the functional group  $-CHO$  is the aldehydic group.

#### Quick Tip

Remember:  $-CHO \rightarrow$  Aldehyde  $-> C=O \rightarrow$  Carbonyl  $-OH \rightarrow$  Alcohol

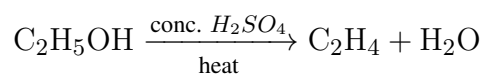
**5. Which of the following gases is formed on heating ethanol with concentrated  $H_2SO_4$ ?**

- (A)  $CH_4$
- (B)  $C_2H_2$
- (C)  $C_2H_6$
- (D)  $C_2H_4$

**Correct Answer:** (4)  $C_2H_4$

**Solution: Concept:** Concentrated sulphuric acid acts as a strong dehydrating agent. When ethanol is heated with concentrated  $H_2SO_4$ , it removes a molecule of water (dehydration reaction).

**Step 1:** Dehydration of ethanol:



**Step 2:** Product formed:

- Ethene ( $C_2H_4$ ) is an unsaturated hydrocarbon (alkene).

Thus, the gas formed is ethene.

#### Quick Tip

Heating alcohol with conc.  $H_2SO_4 \rightarrow$  Dehydration reaction  $\rightarrow$  Alkene formation.  
Ethanol gives ethene ( $C_2H_4$ ).

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## 6. What are the laws of reflection and refraction?

**Solution: Concept:** Reflection and refraction describe how light behaves when it interacts with surfaces or different media.

### Laws of Reflection:

**First Law:** The incident ray, the reflected ray, and the normal at the point of incidence all lie in the same plane.

**Second Law:** The angle of incidence is equal to the angle of reflection.

$$\angle i = \angle r$$

### Laws of Refraction (Snell's Laws):

**First Law:** The incident ray, refracted ray, and the normal at the point of incidence lie in the same plane.

**Second Law (Snell's Law):** For a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant.

$$\frac{\sin i}{\sin r} = \text{constant} = n$$

where  $n$  is the refractive index of the medium.

### Refractive Index Formula:

$$n = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$$

### Quick Tip

Reflection:  $i = r$  Refraction:  $\frac{\sin i}{\sin r} = n$  (Snell's Law)

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## 7. Differentiate between real and virtual images.

**Solution: Concept:** Images formed by mirrors and lenses are classified as real or virtual depending on whether light rays actually meet or only appear to meet.

### Difference between Real and Virtual Images:

Property	Real Image	Virtual Image
Formation	Formed by actual convergence of rays	Formed by apparent convergence of rays
Screen	Can be obtained on a screen	Cannot be obtained
Nature	Usually inverted	Erect (upright)
Location	Formed in front of mirror / other side of lens	Formed behind mirror / same side of lens
Examples	Image by convex lens (beyond focal length), concave mirror	Plane mirror, convex mirror

**Explanation:**

**Real Image:** When reflected or refracted rays actually meet at a point, a real image is formed. Since light physically converges, it can be projected on a screen.

**Virtual Image:** When rays only appear to meet when extended backward, the image formed is virtual. Since no actual convergence occurs, it cannot be caught on a screen.

**Quick Tip**

Real image → Rays actually meet → Screen possible. Virtual image → Rays only appear to meet → No screen.

**8. Explain the causes and correction methods (with diagrams) for Hypermetropia (long-sightedness) and Myopia.**

**Solution: Concept:** Defects of vision occur when the eye lens does not focus light properly on the retina. Two common defects are Myopia (short-sightedness) and Hypermetropia (long-sightedness).

**1. Myopia (Short-sightedness)**

**Definition:** A person can see nearby objects clearly but distant objects appear blurred.

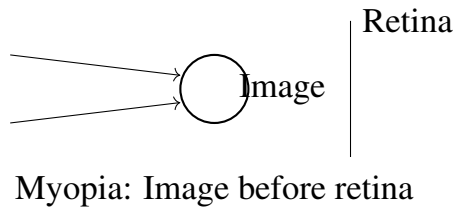
**Causes:**

- Eyeball becomes elongated
- Eye lens has too much converging power (short focal length)

**Image Formation:** Image of distant object forms **in front of the retina**.

**Correction:** Corrected using a **concave (diverging) lens** which diverges incoming rays so they focus on the retina.

**Diagram (Myopia and its correction):**



## 2. Hypermetropia (Long-sightedness)

**Definition:** A person can see distant objects clearly but nearby objects appear blurred.

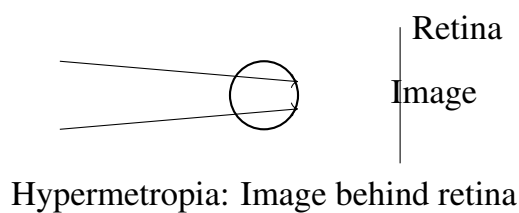
**Causes:**

- Eyeball is too short
- Eye lens has less converging power (long focal length)

**Image Formation:** Image of nearby object forms **behind the retina**.

**Correction:** Corrected using a **convex (converging) lens** which converges rays before they enter the eye so the image forms on the retina.

**Diagram (Hypermetropia and its correction):**



**Summary Table:**

Defect	Image Position	Correcting Lens
Myopia	In front of retina	Concave lens
Hypermetropia	Behind retina	Convex lens

### Quick Tip

Myopia → Cannot see far → Concave lens  
Hypermetropia → Cannot see near → Convex lens

## 9. Learn the chemical differences between metals and non-metals.

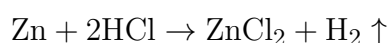
**Solution: Concept:** Metals and non-metals differ significantly in their chemical behavior due to differences in electron configuration, ion formation, and bonding nature.

### Chemical Differences between Metals and Non-metals:

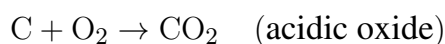
Property	Metals	Non-metals
Electron tendency	Lose electrons (electropositive)	Gain electrons (electronegative)
Ion formation	Form cations (+)	Form anions (-)
Reaction with oxygen	Form basic or amphoteric oxides	Form acidic or neutral oxides
Reaction with water	Many metals react to form hydroxide + $H_2$	Generally do not react with water
Reaction with acids	React with dilute acids to release $H_2$ gas	Usually do not react with dilute acids
Bond formation	Form ionic compounds	Form covalent compounds
Nature of oxides	Basic (e.g., $Na_2O$ )	Acidic (e.g., $CO_2$ , $SO_2$ )

### Examples:

#### Metals:



#### Non-metals:



**Explanation:** Metals have fewer valence electrons and tend to lose them easily, forming positive ions and ionic compounds. Non-metals have more valence electrons and tend to gain or share electrons, leading to covalent bonding and acidic oxides.

### Quick Tip

Metals: Lose electrons → Basic oxides → Ionic bonds  
Non-metals: Gain/share electrons  
→ Acidic oxides → Covalent bonds

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