BITSAT 2025 June 25 Shift 2 Question Paper With Solutions

Time Allowed :3 Hours	**Maximum Marks :**390	**Total questions :**130

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Duration of Exam: 3 Hours
2. Total Number of Questions: 130 Questions
3. Section-wise Distribution of Questions:
    - Physics - 40 Questions
    - Chemistry - 40 Questions
    - Mathematics - 50 Questions
4. Type of Questions: Multiple Choice Questions (Objective)
5. Marking Scheme: Three marks are awarded for each correct response
6. Negative Marking: One mark is deducted for every incorrect answer.
7. Each question has four options; only one is correct.
8. Questions are designed to test analytical thinking and problem-solving skills.

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1. A car accelerates from rest to a speed of 20 m/s in 10 seconds. What is its acceleration?

(1) 2 m/s²

(2) 3 m/s²

(3) 4 m/s²

(4) 5 m/s²

Correct Answer: (1) 2 m/s²

Solution:

Step 1: Identify given values

- Initial velocity, $u = 0\,\text{m/s}$ (since the car starts from rest)
- Final velocity, $v = 20\,\text{m/s}$
- Time, $t = 10\,\text{s}$
- Acceleration, $a = ?\,\text{m/s}^2$

Step 2: Select the appropriate kinematic equation

The first kinematic equation is:

$$v = u + at$$

This equation relates initial velocity, final velocity, acceleration, and time, which matches our given data.

Step 3: Substitute values into the equation

Since $u = 0$:

$$v = 0 + at \implies v = at$$

Substitute $v = 20\,\text{m/s}$ and $t = 10\,\text{s}$:

$$20 = a \times 10$$

Step 4: Solve for acceleration

$$a = \frac{20}{10} = 2\,\text{m/s}^2$$

Quick Tip

Use the basic kinematic equation $v = u + at$ to find acceleration when starting from rest.

2. Which of the following is the correct unit for electric charge?

(1) Coulomb

(2) Ampere

(3) Volt

(4) Joule

Correct Answer: (1) Coulomb

Solution:

Step 1: Define electric charge

Electric charge is a fundamental property of matter that causes it to experience a force in an electric field. The SI unit for electric charge is defined in the context of electric current.

Step 2: Analyze each option

- **Coulomb (C)**: The Coulomb is the SI unit of electric charge. It is defined as the charge transported by a constant current of 1 ampere in 1 second:

$$1\,\mathrm{C} = 1\,\mathrm{A} \cdot 1\,\mathrm{s}$$

- **Ampere (A)**: The Ampere is the SI unit of electric current, measuring the flow of charge per unit time:

$$1\,\mathrm{A} = \frac{1\,\mathrm{C}}{1\,\mathrm{s}}$$

- **Volt (V)**: The Volt is the SI unit of electric potential difference or voltage, defined as:

$$1\,\mathrm{V} = \frac{1\,\mathrm{J}}{1\,\mathrm{C}}$$

- **Joule (J)**: The Joule is the SI unit of energy or work, defined as:

$$1\,\mathrm{J} = 1\,\mathrm{N} \cdot \mathrm{m} = 1\,\mathrm{kg} \cdot \mathrm{m}^2/\mathrm{s}^2$$

Step 3: Conclusion

Only the Coulomb is the unit of electric charge.

Quick Tip

Remember that Coulomb is the unit of charge, Ampere is for current, and Volt is for potential difference.

3. Which of the following has the greatest electronegativity?

(1) Fluorine

(2) Oxygen

(3) Nitrogen

(4) Chlorine

Correct Answer: (1) Fluorine

Solution:

Step 1: Understand electronegativity trends

In the periodic table:

- Electronegativity increases across a period (left to right) due to increasing nuclear charge.

- Electronegativity decreases down a group due to increased atomic size and shielding.

Step 2: Locate elements in the periodic table

- Fluorine (F): Group 17, Period 2

- Oxygen (O): Group 16, Period 2

- Nitrogen (N): Group 15, Period 2

- Chlorine (Cl): Group 17, Period 3

All are in the upper-right corner, where electronegativity is highest.

Step 3: Compare electronegativity values

Using the Pauling scale (approximate values):

- Fluorine: 3.98

- Oxygen: 3.44

- Nitrogen: 3.04

- Chlorine: 3.16

Fluorine has the highest value.

Step 4: Analyze trends

- Across Period 2 (N, O, F): Electronegativity increases, so F ¿ O ¿ N.

- Down Group 17 (F, Cl): Electronegativity decreases, so F ¿ Cl.

Thus, Fluorine is the most electronegative.

Step 5: Conclusion

Fluorine has the greatest electronegativity, matching option (1)

Quick Tip

Fluorine is the most electronegative element. The electronegativity decreases as you move down a group in the periodic table.

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4. What is the value of $\sin 30^\circ$?

(1) $\frac{1}{2}$

(2) $\frac{\sqrt{3}}{2}$

(3) 1

(4) 0

Correct Answer: (1) $\frac{1}{2}$

Solution:

Step 1: Recall standard trigonometric values

For common angles, sine values are:

$$\sin 0^\circ = 0, \quad \sin 30^\circ = \frac{1}{2}, \quad \sin 45^\circ = \frac{\sqrt{2}}{2}, \quad \sin 60^\circ = \frac{\sqrt{3}}{2}, \quad \sin 90^\circ = 1$$

So, $\sin 30^\circ = \frac{1}{2}$.

Step 2: Derive using a 30-60-90 triangle

Consider a 30-60-90 right triangle, where angles are 30°, 60°, and 90°, and sides are in the ratio $1 : \sqrt{3} : 2$ (opposite 30°, opposite 60°, hypotenuse).

For angle 30°:

$$\sin 30^\circ = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{1}{2}$$

Step 3: Check options

Option (1) $\frac{1}{2}$ matches.

Quick Tip

For basic angles like $30^\circ, 45^\circ$, and 60°, remember the standard values of sine and cosine.

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5. The number of significant figures in the measurement 0.00456 is:

(1) 2

(2) 3

(3) 4

(4) 5

Correct Answer: (2) 3

Solution:

Step 1: Rules for significant figures

- All non-zero digits are significant.

- Zeros between non-zero digits are significant.

- Leading zeros (before the first non-zero digit) are not significant.

- Trailing zeros in a decimal number are significant if explicitly shown.

Step 2: Analyze the number 0.00456

Write the number: 0.00456

- Leading zeros: 0.004 (these are not significant).

- Non-zero digits: 4, 5, 6 (all are significant).

- There are no trailing zeros after the decimal point in this case.

So, the significant figures are: 4, 5, 6.

Total: 3 significant figures.

Quick Tip

Count significant figures by ignoring leading zeros and counting from the first non-zero digit.

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6. Which of the following is the correct electronic configuration for Oxygen (O)?

(1) $1s^2 2s^2 2p^4$

(2) $1s^2 2s^2 2p^6$

(3) $1s^2 2s^2 2p^3$

(4) $1s^2 2s^2 3p^2$

Correct Answer: (1) $1s^2 2s^2 2p^4$

Solution:

Step 1: Determine Oxygen's atomic number

Oxygen (O) has an atomic number of 8, meaning it has 8 electrons in a neutral atom.

Step 2: Order of orbital filling

Electrons fill orbitals in order of increasing energy:

$$1s \to 2s \to 2p \to 3s \to 3p \to \ldots$$

Capacities:

- $1s$: 2 electrons

- $2s$: 2 electrons

- $2p$: 6 electrons

Step 3: Assign electrons

For 8 electrons:

- $1s^2$: 2 electrons (filled)

- $2s^2$: 2 electrons (filled, total 4)

- $2p^4$: 4 electrons (total 8)

So, the configuration is:

$$1s^2 2s^2 2p^4$$

Step 4: Check options

- (1) $1s^2 2s^2 2p^4$: Correct, matches our calculation.

- (2) $1s^2 2s^2 2p^6$: Total 10 electrons (Neon), incorrect.

- (3) $1s^2 2s^2 2p^3$: Total 7 electrons (Nitrogen), incorrect.

- (4) $1s^2 2s^2 3p^2$: Incorrect, as Oxygen's electrons are in 2p, not 3p.

Step 5: Conclusion

The correct configuration is option (1).

Quick Tip

Remember the order of filling orbitals: $1s \to 2s \to 2p \to 3s \to 3p$.

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7. Which of the following is an example of a scalar quantity?

(1) Velocity

(2) Force

(3) Temperature

(4) Displacement

Correct Answer: (3) Temperature

Solution:

Step 1: Define scalar and vector quantities

- **Scalar**: Has only magnitude (e.g., mass, temperature).

- **Vector**: Has magnitude and direction (e.g., velocity, force).

Step 2: Analyze each option

- **Velocity**: Has magnitude (speed) and direction (e.g., 20 m/s north). Vector.

- **Force**: Has magnitude (e.g., 10 N) and direction (e.g., upward). Vector.

- **Temperature**: Has magnitude (e.g., 25°C) but no direction. Scalar.

- **Displacement**: Has magnitude (e.g., 5 m) and direction (e.g., east). Vector.

Step 3: Conclusion

Temperature is the only scalar quantity, matching option (3).

Quick Tip

Remember that scalar quantities only have magnitude, while vectors have both magnitude and direction.

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8. The equation of a straight line is given by $y = 3x + 4$. What is the slope of the line?

(1) 3

(2) 4

(3) 1

(4) 0

Correct Answer: (1) 3

Solution:

Step 1: Identify the line equation form

The equation is:

$$y = 3x + 4$$

This is in slope-intercept form:

$$y = mx + c$$

where:

- m: slope

- c: y-intercept

Step 2: Extract the slope

Compare:

$$y = 3x + 4 \implies m = 3,\ c = 4$$

The slope is 3.

Quick Tip

In the equation of a line $y = mx + c$, m represents the slope.

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9. Which of the following is a non-metal?

(1) Sodium

(2) Iron

(3) Carbon

(4) Copper

Correct Answer: (3) Carbon

Solution:

Step 1: Define metals and non-metals

- **Metals**: Shiny, good conductors, malleable (e.g., sodium, iron).

- **Non-metals**: Dull, poor conductors, brittle (e.g., carbon in forms like graphite or diamond).

Step 2: Analyze each option

- **Sodium (Na)**: Group 1, shiny, conductive. Metal.

- **Iron (Fe)**: Transition metal, strong, conductive. Metal.

- **Carbon (C)**: Group 14, exists as graphite (dull, conducts slightly) or diamond (insulator). Non-metal.

- **Copper (Cu)**: Transition metal, shiny, excellent conductor. Metal.

Step 3: Conclusion

Carbon is the only non-metal, matching option (3).

Quick Tip

Non-metals are typically brittle, not shiny, and have low conductivity compared to metals.

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10. The roots of the equation $x^2 + 5x + 6 = 0$ are:

(1) -2 and -3

(2) 1 and 6

(3) -1 and -6

(4) -3 and -2

Correct Answer: (1) -2 and -3

Solution:

Step 1: Write the equation

$$x^2 + 5x + 6 = 0$$

Step 2: Factorize the quadratic

We need two numbers that:

- Multiply to give the constant term (6)

- Add to give the coefficient of x (5)

Test pairs for 6:

- $1 \times 6 = 6$, $1 + 6 = 7$ (no)

- $2 \times 3 = 6$, $2 + 3 = 5$ (yes)

So:

$$x^2 + 5x + 6 = (x + 2)(x + 3)$$

Set each factor to zero:

$$x + 2 = 0 \implies x = -2$$

$$x + 3 = 0 \implies x = -3$$

Roots are -2 and -3.

Step 3: Verify with quadratic formula

For $ax^2 + bx + c = 0$:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Here, $a = 1$, $b = 5$, $c = 6$:

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \cdot 1 \cdot 6}}{2 \cdot 1}$$

$$= \frac{-5 \pm \sqrt{25 - 24}}{2} = \frac{-5 \pm \sqrt{1}}{2} = \frac{-5 \pm 1}{2}$$

$$x = \frac{-5 + 1}{2} = \frac{-4}{2} = -2$$

$$x = \frac{-5 - 1}{2} = \frac{-6}{2} = -3$$

Roots are -2 and -3.

Step 4: Check options

Option (1) -2 and -3 matches.

Quick Tip

Factor quadratic equations whenever possible to find the roots quickly.
