# BITSAT 2025 June 23 Shift 2 Question Paper With Solutions

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

**1. What is the value of $\int \frac{1}{x^2+1}\,dx$?**

(1) $\ln|x+1| + C$

(2) $\tan^{-1} x + C$

(3) $\ln|x-1| + C$

(4) $\tan^{-1}(x^2) + C$

**Correct Answer:** (2) $\tan^{-1} x + C$

**Solution:**

The integral $\int \frac{1}{x^2+1}\,dx$ is a standard form. Recognize that $\frac{1}{x^2+a^2}$ integrates to $\frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$.

Here, $a = 1$, so:

$$\int \frac{1}{x^2+1}\,dx = \tan^{-1} x + C$$

Alternatively, use substitution: let $x = \tan\theta$, then $dx = \sec^2\theta\,d\theta$, and the integral becomes:

$$\int \frac{\sec^2\theta}{\tan^2\theta+1}\,d\theta = \int \frac{\sec^2\theta}{\sec^2\theta}\,d\theta = \int 1\,d\theta = \theta + C = \tan^{-1} x + C$$

Thus, option (2) is correct.

> **Quick Tip**
>
> The integral $\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$ is a key formula in calculus.

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**2. Solve the system of equations: $x + y = 3$, $x - y = 1$.**

(1) $x = 1, y = 2$

(2) $x = 2, y = 1$

(3) $x = 3, y = 0$

(4) $x = 0, y = 3$

**Correct Answer:** (2) $x = 2, y = 1$

**Solution:**

Add the equations:

$$(x+y) + (x-y) = 3+1 \implies 2x = 4 \implies x = 2$$

Subtract the second from the first:

$$(x+y) - (x-y) = 3-1 \implies 2y = 2 \implies y = 1$$

Verify: For $x = 2, y = 1, 2 + 1 = 3$ and $2 - 1 = 1$, which satisfies both equations. Thus, option (2) is correct.

> **Quick Tip**
>
> Use addition or subtraction to eliminate one variable in a system of linear equations.

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### 3. Find the equation of the tangent to the curve $y = x^2$ at the point (1,1).

(1) $y = 2x - 1$

(2) $y = 2x + 1$

(3) $y = x - 1$

(4) $y = x + 1$

**Correct Answer:** (1) $y = 2x - 1$

**Solution:**

The slope of the tangent is given by the derivative of $y = x^2$:

$$\frac{dy}{dx} = 2x$$

At $x = 1$, the slope is $2 \cdot 1 = 2$.

Using the point-slope form $y - y_1 = m(x - x_1)$ at point (1,1):

$$y - 1 = 2(x - 1) \implies y - 1 = 2x - 2 \implies y = 2x - 1$$

Thus, option (1) is correct.

> **Quick Tip**
>
> The derivative at a point gives the slope of the tangent line at that point.

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### 4. What is the area of a circle with diameter 10 cm?

(1) $25\pi \, \text{cm}^2$

(2) $50\pi \, \text{cm}^2$

(3) $100\pi \, \text{cm}^2$

(4) $200\pi \, \text{cm}^2$

**Correct Answer:** (1) $25\pi \, \text{cm}^2$

**Solution:**

The radius is half the diameter: $r = 10/2 = 5\,\text{cm}$.

The area of a circle is:

$$A = \pi r^2 = \pi \cdot 5^2 = 25\pi\,\text{cm}^2$$

Thus, option (1) is correct.

> **Quick Tip**
>
> The area of a circle is $\pi r^2$, where $r$ is the radius (half the diameter).

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**5. A body of mass 2 kg is moving with a velocity of 3 m/s. What is its kinetic energy?**

(1) 6 J

(2) 9 J

(3) 12 J

(4) 18 J

**Correct Answer:** (2) 9 J

**Solution:**

Kinetic energy is given by:

$$KE = \frac{1}{2}mv^2$$

where $m = 2\,\text{kg}$, $v = 3\,\text{m/s}$.

Calculate:

$$KE = \frac{1}{2} \cdot 2 \cdot 3^2 = 1 \cdot 9 = 9\,\text{J}$$

Thus, option (2) is correct.

> **Quick Tip**
>
> Kinetic energy depends on the square of velocity, so small changes in speed have a large impact.

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**6. What is the unit of electric field?**

(1) Newton

(2) Coulomb

(3) Newton per Coulomb

(4) Coulomb per Newton

**Correct Answer:** (3) Newton per Coulomb

**Solution:**

The electric field $E$ is defined as force per unit charge:

$$E = \frac{F}{q}$$

Force $F$ is in Newtons (N), charge $q$ is in Coulombs (C), so:

$$E = \frac{\text{N}}{\text{C}}$$

Thus, option (3) is correct.

> **Quick Tip**
>
> Electric field measures the force experienced by a unit positive charge.

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**7. In a series circuit, if the resistance is doubled, what happens to the current?**

(1) It doubles

(2) It halves

(3) It remains the same

(4) It becomes zero

**Correct Answer:** (2) It halves

**Solution:**

In a series circuit, Ohm's Law states $I = \frac{V}{R}$, where $V$ is voltage and $R$ is resistance. If resistance is doubled ($R \to 2R$) and voltage remains constant:

$$I_{\text{new}} = \frac{V}{2R} = \frac{1}{2} \cdot \frac{V}{R} = \frac{I}{2}$$

Thus, the current halves, so option (2) is correct.

> **Quick Tip**
>
> Current is inversely proportional to resistance in a series circuit with constant voltage.

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**8. What is the IUPAC name of CH$_3$CH$_2$OH?**

(1) Methanol

(2) Ethanol

(3) Propanol

(4) Butanol

**Correct Answer:** (2) Ethanol

**Solution:**

The compound CH$_3$CH$_2$OH has two carbon atoms, an -OH group, and no double or triple bonds, indicating an alcohol. For alcohols, the IUPAC name is based on the number of carbon atoms:

- 1 carbon: Methanol

- 2 carbons: Ethanol

- 3 carbons: Propanol

- 4 carbons: Butanol

Since there are two carbons, the name is ethanol. Thus, option (2) is correct.

> Quick Tip
>
> The suffix -ol indicates an alcohol, and the prefix (meth-, eth-, prop-) counts carbon atoms.

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**9. What is the pH of a solution with [H$^+$] = 10$^{-3}$ M?**

(1) 3

(2) 7

(3) 10

(4) 11

**Correct Answer:** (1) 3

**Solution:**

The pH is calculated as:

$$\mathrm{pH} = -\log_{10}[\mathrm{H^+}]$$

Given $[H^+] = 10^{-3}\,\text{M}$:

$$\text{pH} = -\log_{10}(10^{-3}) = -(-3) = 3$$

Thus, option (1) is correct.

> **Quick Tip**
>
> pH is the negative base-10 logarithm of the hydrogen ion concentration.

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**10. Choose the word most nearly opposite in meaning to "benevolent".**

(1) Malevolent

(2) Benign

(3) Kind

(4) Generous

**Correct Answer:** (1) Malevolent

**Solution:**

"Benevolent" means kind or generous. The opposite would mean unkind or harmful:

- Malevolent: Wishing harm, opposite of benevolent.

- Benign: Gentle, but not exactly opposite.

- Kind: Synonym of benevolent.

- Generous: Synonym of benevolent.

Thus, option (1) is correct.

> **Quick Tip**
>
> Antonyms are words with opposite meanings; check prefixes like "mal-" for opposites.

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**11. If all roses are flowers and some flowers are red, which statement must be true?**

(1) All roses are red.

(2) Some roses are red.

(3) Some flowers are not roses.

(4) None of the above.

**Correct Answer:** (4) None of the above.

**Solution:**

Analyze the statements:

- "All roses are flowers": Roses are a subset of flowers.

- "Some flowers are red": At least one flower is red, but it may or may not be a rose.

Now, evaluate the options:

- (1) All roses are red: Not necessarily true, as red flowers may not include roses.

- (2) Some roses are red: Not necessarily true, as no information confirms roses are red.

- (3) Some flowers are not roses: Not necessarily true, as all flowers could be roses.

- (4) None of the above: Since none of the statements are definitively true, this is correct.

Thus, option (4) is correct.

> **Quick Tip**
>
> In logical reasoning, only conclusions that must follow from the premises are true.