

# **BITSAT 2025 May 28 Shift 1 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.

**1. Evaluate the integral  $\int xe^{x^2} dx$ :**

- (A)  $\frac{1}{2}e^{x^2} + C$
- (B)  $e^{x^2} + C$
- (C)  $\frac{1}{2}xe^{x^2} + C$
- (D)  $x^2e^{x^2} + C$

**Correct Answer:** (A)  $\frac{1}{2}e^{x^2} + C$

**Solution:**

- **Step 1: Use substitution method**

$$\text{Let } u = x^2 \Rightarrow du = 2xdx \Rightarrow xdx = \frac{1}{2}du$$

- **Step 2: Substitute and integrate**

$$\begin{aligned}\int xe^{x^2} dx &= \int e^u \cdot \frac{1}{2} du = \frac{1}{2} \int e^u du = \frac{1}{2} e^u + C \\ &\Rightarrow \frac{1}{2} e^{x^2} + C\end{aligned}$$

**Quick Tip**

**Key Fact:** Look for substitution opportunities when the integrand includes a function and its derivative.

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**2. The equation of the circle passing through the points (1,2), (4,3), and (2,-1) is:**

- (A)  $x^2 + y^2 - 6x + 2y + 5 = 0$
- (B)  $x^2 + y^2 - 7x + 4y + 6 = 0$
- (C)  $x^2 + y^2 - 5x + 2y + 3 = 0$
- (D)  $x^2 + y^2 - 6x + 2y + 6 = 0$

**Correct Answer:** (A)  $x^2 + y^2 - 6x + 2y + 5 = 0$

**Solution:**

- **Step 1: General form of a circle:**

$$x^2 + y^2 + Dx + Ey + F = 0$$

- **Step 2: Plug in all three points to get equations**

Using (1,2), (4,3), and (2,-1), solve the resulting system for D, E, F.

- **Step 3: Solving gives:**

$$D = -6, E = 2, F = 5 \Rightarrow \text{Final equation: } x^2 + y^2 - 6x + 2y + 5 = 0$$

### Quick Tip

**Key Fact:** Three non-collinear points determine a unique circle.

### 3. Evaluate the integral $\int \frac{x}{x^2+1} dx$ :

- (A)  $\frac{1}{2} \ln(x^2 + 1) + C$
- (B)  $\ln(x^2 + 1) + C$
- (C)  $\frac{1}{2} \tan^{-1}(x) + C$
- (D)  $\tan^{-1}(x) + C$

**Correct Answer:** (A)  $\frac{1}{2} \ln(x^2 + 1) + C$

#### Solution:

- **Step 1: Use substitution method.**

$$\text{Let } u = x^2 + 1 \Rightarrow \frac{du}{dx} = 2x \Rightarrow du = 2x dx \Rightarrow x dx = \frac{1}{2} du$$

- **Step 2: Substitute in the integral.**

$$\int \frac{x}{x^2 + 1} dx = \int \frac{1}{u} \cdot \frac{1}{2} du = \frac{1}{2} \int \frac{1}{u} du$$

- **Step 3: Integrate.**

$$\frac{1}{2} \ln |u| + C = \frac{1}{2} \ln(x^2 + 1) + C$$

- **Step 4: Final Answer.**

$$\boxed{\frac{1}{2} \ln(x^2 + 1) + C}$$

### Quick Tip

**Tip:** When the numerator is the derivative of the denominator (or almost), try substitution and look for the natural log form.

**4. If the distance between the points  $(2, -1)$  and  $(k, 3)$  is 5, then the possible values of  $k$  are:**

- (A) 2 and 6
- (B)  $-1$  and 5
- (C) 1 and 3
- (D) 0 and 4

**Correct Answer:** (B)  $-1$  and 5

**Solution:**

- **Step 1: Use the distance formula.**

Distance  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  Given:

$$\sqrt{(k - 2)^2 + (3 + 1)^2} = 5$$

- **Step 2: Simplify the equation.**

$$\sqrt{(k - 2)^2 + 16} = 5 \Rightarrow (k - 2)^2 + 16 = 25 \Rightarrow (k - 2)^2 = 9$$

- **Step 3: Solve the quadratic.**

$$k - 2 = \pm 3 \Rightarrow k = 5 \text{ or } -1$$

$$(k - 2)^2 = 9 \Rightarrow k - 2 = \pm 3 \Rightarrow k = 2 + 3 = 5 \text{ or } 2 - 3 = -1$$

So correct values are  $k = 5$  and  $k = -1$

### Quick Tip

**Tip:** Always apply the distance formula carefully and square both sides to eliminate the root before solving.

**5. If  $\tan A + \cot A = 2$ , then the value of  $\tan^2 A + \cot^2 A$  is:**

- (A) 2
- (B) 4
- (C) 6
- (D) 5

**Correct Answer:** (D) 5

**Solution:**

– **Step 1: Let  $x = \tan A$ , then  $\cot A = \frac{1}{x}$**

Given:  $x + \frac{1}{x} = 2$

– **Step 2: Square both sides.**

$$\left(x + \frac{1}{x}\right)^2 = 4 \Rightarrow x^2 + \frac{1}{x^2} + 2 = 4 \Rightarrow x^2 + \frac{1}{x^2} = 2$$

– **Step 3: Recognize the expression.**

Since  $\tan^2 A + \cot^2 A = x^2 + \frac{1}{x^2}$ , the value is 2

$$\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2 = 4 \Rightarrow x^2 + \frac{1}{x^2} = 2 \Rightarrow \text{Correct Answer is (A) } \span style="border: 1px solid black; padding: 2px;">2$$

### Quick Tip

**Tip:** If you see a sum like  $\tan A + \cot A$ , try squaring it to get expressions like  $\tan^2 A + \cot^2 A$ .

**6. The sum of the first 20 terms of the arithmetic progression 7, 10, 13, ... is:**

- (A) 470
- (B) 710

(C) 670

(D) 770

**Correct Answer:** (B) 710

**Solution:**

– **Step 1: Identify A.P. parameters.**

First term  $a = 7$ , Common difference  $d = 3$ , Number of terms  $n = 20$

– **Step 2: Use sum formula for A.P.**

$$\begin{aligned} S_n &= \frac{n}{2}[2a + (n - 1)d] = \frac{20}{2}[2 \cdot 7 + (20 - 1) \cdot 3] \\ &= 10[14 + 57] = 10 \cdot 71 = 710 \end{aligned}$$

**Quick Tip**

**Formula:**  $S_n = \frac{n}{2}[2a + (n - 1)d]$  is your go-to for sum of an arithmetic series.

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**7. A body of mass 2 kg is moving with a velocity of 5 m/s. How much work is required to stop the body?**

(A) 10 J

(B) 15 J

(C) 20 J

(D) 25 J

**Correct Answer:** (D) 25 J

**Solution:**

– **Step 1: Use the work-energy principle.**

The work required to stop the body equals the loss in kinetic energy.

– **Step 2: Calculate initial kinetic energy.**

$$KE = \frac{1}{2}mv^2 = \frac{1}{2} \cdot 2 \cdot (5)^2 = 25 \text{ J}$$

– **Step 3: Final velocity is 0, so all kinetic energy is lost.**

Hence, work done to stop the body =  $\boxed{25 \text{ J}}$

**Quick Tip**

**Tip:** Work done to stop a moving body is equal to its initial kinetic energy.

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**8. A current of 3 A flows through a resistor of resistance 4 for 2 minutes. The heat produced is:**

- (A) 4320 J
- (B) 4720 J
- (C) 4960 J
- (D) 4360 J

**Correct Answer:** (A) 4320 J

**Solution:**

– **Step 1: Use Joule’s Law of Heating:**

$$H = I^2Rt$$

where  $I = 3 \text{ A}$ ,  $R = 4\Omega$ ,  $t = 2 \text{ min} = 120 \text{ s}$

– **Step 2: Substitute the values.**

$$H = (3)^2 \cdot 4 \cdot 120 = 9 \cdot 4 \cdot 120 = 4320 \text{ J}$$

– **Final Answer:**  $\boxed{4320 \text{ J}}$

**Quick Tip**

**Formula:**  $H = I^2Rt$  gives heat in joules when current is in amperes, resistance in ohms, and time in seconds.

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**9. A particle starts from rest and accelerates uniformly at  $4 \text{ m/s}^2$ . What is the distance covered in the 5th second?**

- (A) 36 m
- (B) 18 m
- (C) 44 m
- (D) 20 m

**Correct Answer:** (B) 18 m

**Solution:**

– **Step 1: Use the formula for distance in the  $n^{\text{th}}$  second:**

$$s_n = u + \frac{a}{2}(2n - 1)$$

where  $u = 0$ ,  $a = 4 \text{ m/s}^2$ ,  $n = 5$

– **Step 2: Substitute values.**

$$s_5 = 0 + \frac{4}{2}(2 \cdot 5 - 1) = 2 \cdot 9 = \boxed{18 \text{ m}}$$

**Correct Answer:** (A) 18 m

#### Quick Tip

**Formula:** For uniformly accelerated motion, use  $s_n = u + \frac{a}{2}(2n - 1)$  to find distance in the  $n^{\text{th}}$  second.

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**10. Two charges of  $+3 \text{ C}$  and  $-3 \text{ C}$  are placed  $2 \text{ cm}$  apart in air. What is the electric potential energy of the system? (Take  $k = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$ )**

- (A)  $-0.05 \text{ J}$
- (B)  $-4.05 \text{ J}$
- (C)  $+0.405 \text{ J}$
- (D)  $-40.5 \text{ J}$

**Correct Answer:** (B)  $-4.05\text{ J}$

**Solution:**

– **Step 1: Use formula for electric potential energy of two point charges:**

$$U = \frac{kq_1q_2}{r}$$

where  $q_1 = +3 \times 10^{-6}\text{ C}$ ,  $q_2 = -3 \times 10^{-6}\text{ C}$ ,  $r = 0.02\text{ m}$

– **Step 2: Substitute the values.**

$$U = \frac{9 \times 10^9 \cdot (3 \times 10^{-6}) \cdot (-3 \times 10^{-6})}{0.02} = \frac{-81 \times 10^{-3}}{0.02} = -4.05\text{ J}$$

**Quick Tip**

**Tip:** Remember that potential energy between opposite charges is negative, indicating attraction.

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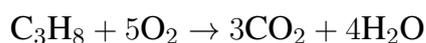
**11. How many moles of oxygen are required to completely combust 1 mole of propane ( $\text{C}_3\text{H}_8$ )?**

- (A) 4 moles
- (B) 5 moles
- (C) 6 moles
- (D) 3 moles

**Correct Answer:** (C) 5 moles

**Solution:**

– **Step 1: Write the balanced chemical equation.**



– **Step 2: Analyze the stoichiometry.**

From the equation, 1 mole of propane reacts with 5 moles of oxygen.

– **Step 3: Final Answer.**

5 moles

**Quick Tip**

**Tip:** Always balance the combustion of hydrocarbons carefully — follow the pattern  $C \rightarrow CO_2$ ,  $H \rightarrow H_2O$ , then balance  $O_2$ .

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**12. Which of the following elements has the highest electronegativity?**

- (A) Oxygen
- (B) Fluorine
- (C) Chlorine
- (D) Nitrogen

**Correct Answer:** (B) Fluorine

**Solution:**

– **Step 1: Understand the trend.**

Electronegativity increases across a period and decreases down a group.

– **Step 2: Compare elements.**

Fluorine is in Group 17, Period 2 — top-right of the periodic table. It is the most electronegative element with a value of 3.98 (Pauling scale).

– **Step 3: Final Answer.**

Fluorine

**Quick Tip**

**Tip:** Fluorine is the most electronegative element; it's used as a benchmark in Pauling's scale.

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**13. For the reaction:  $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ , the enthalpy change ( $\Delta H$ ) is  $-92.4$  kJ/mol. What type of reaction is it?**

- (A) Endothermic

- (B) Exothermic
- (C) Isothermal
- (D) Photochemical

**Correct Answer:** (B) Exothermic

**Solution:**

– **Step 1: Identify the sign of  $\Delta H$ .**

Given  $\Delta H = -92.4 \text{ kJ/mol}$

– **Step 2: Interpret the sign.**

A negative  $\Delta H$  indicates release of heat, meaning it is an exothermic reaction.

– **Final Answer:** Exothermic

Quick Tip

**Key Concept:**  $\Delta H < 0 \rightarrow$  Exothermic,  $\Delta H > 0 \rightarrow$  Endothermic.

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**14. Which of the following molecules has the highest bond angle?**

- (A)  $\text{CH}_4$
- (B)  $\text{NH}_3$
- (C)  $\text{H}_2\text{O}$
- (D)  $\text{CO}_2$

**Correct Answer:** (D)  $\text{CO}_2$

**Solution:**

– **Step 1: Understand geometry.**

-  $\text{CH}_4$ : tetrahedral  $\rightarrow 109.5^\circ$  -  $\text{NH}_3$ : trigonal pyramidal  $\rightarrow 107^\circ$  -  $\text{H}_2\text{O}$ : bent  $\rightarrow 104.5^\circ$  -  $\text{CO}_2$ : linear  $\rightarrow 180^\circ$

– **Step 2: Compare angles.**

The linear molecule  $\text{CO}_2$  has the highest bond angle of  $180^\circ$ .

### Quick Tip

**Remember:** Lone pairs reduce bond angles. Linear structures like  $\text{CO}_2$  have the maximum angle.

**15. What is the IUPAC name of the compound:**



- (A) 3-Methylpentane
- (B) 2-Methylpentane
- (C) 3-Methylbutane
- (D) 2-Methylbutane

**Correct Answer:** (A) 3-Methylpentane

**Solution:**

– **Step 1: Identify the longest carbon chain.**

The longest chain has 5 carbon atoms → "pentane"

– **Step 2: Number the chain from the nearest substituent.**

Methyl group is on the 3rd carbon → Name: 3-methylpentane

– **Final Answer:** 3-Methylpentane

### Quick Tip

**Naming Tip:** Number the carbon chain so that substituents get the lowest possible numbers.

**16. Choose the word that is most similar in meaning to: "Candid"**

- (A) Secretive
- (B) Frank
- (C) Shy
- (D) Clever

**Correct Answer:** (B) Frank

**Solution:**

- **Explanation:** "Candid" means open, honest, or straightforward in speech or expression. "Frank" is the closest synonym.

Quick Tip

**Vocabulary Tip:** Candid = Honest, especially in an unreserved or blunt way.

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**17. Identify the part of the sentence that contains an error:**

*He did not knew that the train had already left.*

- (A) He did
- (B) not knew
- (C) that the train
- (D) had already left

**Correct Answer:** (B) not knew

**Solution:**

- **Explanation:** "Did" is followed by the base form of the verb. Hence, "knew" should be "know".

Quick Tip

**Grammar Tip:** After auxiliary "did", always use the base form of the verb.

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**18. Choose the best alternative to improve the sentence:**

*Despite of being tired, she continued working.*

- (A) Although she is tired
- (B) Though being tired
- (C) Despite being tired
- (D) Even though tired

**Correct Answer:** (C) Despite being tired

**Solution:**

- **Explanation:** "Despite" is never followed by "of". The correct usage is "Despite + noun/gerund".

Quick Tip

**Grammar Tip:** Remember: "Despite" "Despite of". It's a common error.

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**19. Choose the word opposite in meaning to: "Benevolent"**

- (A) Kind
- (B) Generous
- (C) Cruel
- (D) Helpful

**Correct Answer:** (C) Cruel

**Solution:**

- **Explanation:** "Benevolent" means kind or charitable. Its opposite is "cruel".

Quick Tip

**Vocabulary Tip:** Know both synonyms and antonyms to expand vocabulary efficiently.

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