

BITSAT 2025 May 28 Shift 1 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. 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**

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

- **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.

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

$$\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2 = 4 \Rightarrow x^2 + \frac{1}{x^2} = 2 \Rightarrow \boxed{\text{Correct Answer is (A) 2}}$$

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.

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.

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:**

$$H = I^2 R t$$

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

9. A particle starts from rest and accelerates uniformly at 4 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^{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^{th} second.

10. Two charges of $+3 \text{ C}$ and -3 C are placed 2 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 J
- (B) -4.05 J
- (C) $+0.405 \text{ J}$
- (D) -40.5 J

Correct Answer: (B) -4.05 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.

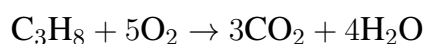
11. How many moles of oxygen are required to completely combust 1 mole of propane (C_3H_8)?

- (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 .

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.

13. For the reaction: $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, the enthalpy change (ΔH) 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 ΔH .**

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

– **Step 2: Interpret the sign.**

A negative ΔH 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.

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

- (A) CH_4
- (B) NH_3
- (C) H_2O
- (D) CO_2

Correct Answer: (D) CO_2

Solution:

– **Step 1: Understand geometry.**

- CH_4 : tetrahedral $\rightarrow 109.5^\circ$ - NH_3 : trigonal pyramidal $\rightarrow 107^\circ$ - H_2O : bent $\rightarrow 104.5^\circ$ - CO_2 : linear $\rightarrow 180^\circ$

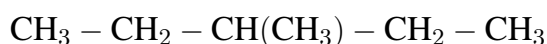
– **Step 2: Compare angles.**

The linear molecule CO_2 has the highest bond angle of 180° .

Quick Tip

Remember: Lone pairs reduce bond angles. Linear structures like 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.

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.

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.

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.
