BITSAT 2025 May 29 Shift 1 Question Paper

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. If one root of the quadratic equation $ax^2 + bx + c = 0$ is double the other, then what is the correct relation among the coefficients?

(A) $b^2 = 8ac$

(B) $b^2 = 4ac$

(C) $b^2 = \frac{9ac}{2}$

(D) $b^2 = 2ac$

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2. Evaluate the integral $\int_0^1 \frac{\ln(1+x)}{1+x^2}\, dx$

(A) $\frac{\pi \ln 2}{8}$

(B) $\frac{\ln 2}{2}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi \ln 2}{4}$

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3. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$, then find the angle θ between $\vec{a}$ and $\vec{b}$.

(A) $\cos^{-1}\left(\frac{3}{\sqrt{30}}\right)$

(B) $\cos^{-1}\left(\frac{5}{\sqrt{30}}\right)$

(C) $\cos^{-1}\left(\frac{6}{\sqrt{30}}\right)$

(D) $\cos^{-1}\left(\frac{7}{\sqrt{30}}\right)$

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4. If $z = x + iy$ is a complex number such that $|z - 1| = |z + 1|$, then the locus of z represents:

(A) A circle with center at origin

(B) The real axis

(C) The imaginary axis

(D) A line parallel to the x-axis

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5. Two numbers are selected at random (without replacement) from the first 6 natural numbers. What is the probability that the difference of the numbers is less than 3?

(A) $\frac{1}{3}$

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

(C) $\frac{3}{5}$

(D) $\frac{5}{15}$

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6. Solve the inequality: $\log_2(x^2 - 5x + 6) > 1$

(A) $x \in (2, 3) \cup (3, \infty)$

(B) $x \in (0, 1) \cup (4, \infty))$

(C) $x \in (0, 2) \cup (2, 3)$

(D) $x \in (1, 2) \cup (3, \infty)$

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7. If $A = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$**, then the value of** A **is:**

(A) $(a - b)(b - c)(c - a)$

(B) $(a - b)(b - c)(a - c)$

(C) $(a + b)(b + c)(c + a)$

(D) $(b - a)(c - b)(c - a)$

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8. If $\tan A + \tan B + \tan C = \tan A \tan B \tan C$**, where** $A + B + C = \pi$**, then what is the value of** $\tan A \tan B + \tan B \tan C + \tan C \tan A$**?**

(A) 1

(B) 0

(C) 2

(D) Cannot be determined

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9. A uniformly charged ring of radius R **carries total charge** Q**. Find the electric field at a point on the axis at a distance** $x = \frac{R}{\sqrt{2}}$ **from the center.**

(A) $\frac{1}{4\pi\varepsilon_0} \cdot \frac{Qx}{(R^2+x^2)^{3/2}}$

(B) $\frac{1}{4\pi\varepsilon_0} \cdot \frac{QR}{(R^2+x^2)^{3/2}}$

(C) $\frac{1}{4\pi\varepsilon_0} \cdot \frac{Q}{R^2}$

(D) $\frac{1}{4\pi\varepsilon_0} \cdot \frac{Q}{(2R^2)^{3/2}}$

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10. Light of wavelength 400 nm falls on a metal with work function $\phi = 2.0$ eV. If the intensity of the light is doubled, what happens to the maximum kinetic energy of the emitted photoelectrons?

(A) It doubles

(B) It becomes zero

(C) It increases by a factor of $\sqrt{2}$

(D) It remains the same

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11. A disc of moment of inertia I is rotating with angular velocity ω. A ring of the same mass and radius, initially at rest, is gently placed coaxially on top of the disc. What is the final angular velocity of the system?

(A) ω

(B) $\frac{2\omega}{3}$

(C) $\frac{\omega}{2}$

(D) $\frac{3\omega}{4}$

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12. A damped harmonic oscillator has an amplitude that reduces to half in 10 seconds. What will be the amplitude after 30 seconds?

(A) $\frac{1}{4}$ of original amplitude

(B) $\frac{1}{8}$ of original amplitude

(C) $\frac{1}{16}$ of original amplitude

(D) $\frac{1}{2}$ of original amplitude

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13. An ideal gas undergoes an adiabatic expansion from volume V to $2V$. If the initial temperature is T, what is the final temperature? (Assume the ratio of specific heats $\gamma = \frac{5}{3}$)

(A) T

(B) $\frac{T}{2}$

(C) $\frac{T}{2^{2/3}}$

(D) $\frac{T}{2^{5/3}}$

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14. A buffer solution is prepared by mixing 0.1 mol of acetic acid ($\mathrm{p}K_a = 4.74$) and 0.2 mol of sodium acetate in 1 L solution. What is the pH of the buffer?

(A) 4.44

(B) 5.04

(C) 4.74

(D) 5.74

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15. Which of the following coordination compounds shows linkage isomerism?

(A) $[Co(NH_3)_5Cl]Cl_2$

(B) $[Co(NH_3)_5(NO_2)]Cl_2$

(C) $[Fe(CN)_6]^{3-}$

(D) $[Cr(H_2O)_6]Cl_3$

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16. Which of the following compounds undergoes electrophilic substitution most readily?

(A) Nitrobenzene

(B) Toluene

(C) Benzene

(D) Benzoic acid

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17. A first-order reaction is 25% complete in 30 minutes. How much time will it take for the reaction to be 75% complete?

(A) 90 min

(B) 60 min

(C) 120 min

(D) 150 min

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18. Choose the word that is closest in meaning to *"esoteric"*.

(A) Obvious

(B) Mysterious

(C) Commonplace

(D) Confidential

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19. Identify the correct version of the sentence:

"Hardly had he entered the room when he was hearing the explosion."

(A) Hardly had he entered the room when he heard the explosion.

(B) Hardly he had entered the room when he heard the explosion.

(C) He hardly entered the room when he was hearing the explosion.

(D) No correction needed.

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20. The scientist's theory was initially met with _____, but later gained widespread acclaim after consistent experimental validation.

(A) skepticism

(B) celebration

(C) compliance

(D) ignorance

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21. Choose the correct meaning of the idiom *"to throw in the towel"*.

(A) To start a new challenge

(B) To refuse help

(C) To admit defeat

(D) To criticize someone openly

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22. Rearrange the following parts to form a meaningful sentence:

P. technological advancement

Q. has led to

R. in many fields

S. a significant leap

(A) P Q S R

(B) P R S Q

(C) Q P R S

(D) P Q R S