Class XII: Scholarship Test
Sample Paper

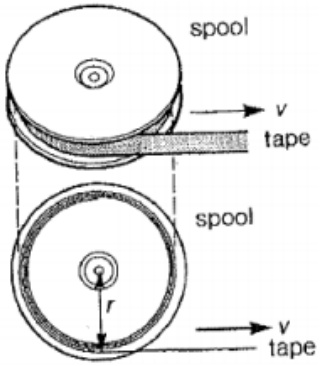
Time: 60 Minutes **Maximum Marks: 120**

1. All questions carry equal marks.
2. There are 30 questions in the test. For each question you will be awarded **4 marks** for the correct answer and zero mark for all other cases.

1. A physical quantity $P = ((abc^2)^{1/2})/(d^3 e^{1/3})$ is determined by measuring a, b, c, d and e separately with the percentage error of 2% , 3%, 2%, 1% and 6% respectively. Minimum amount of error is contributed by the measurement.
   (a) B (b) A
   (c) D (d) E
   (e) C

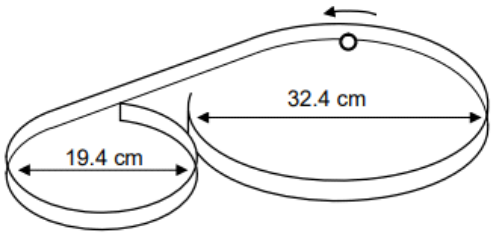
2. A wooden block of mass m1 accelerates at 10 ms^{-2} when a force of 5 N acts on it. Another block of mass m^2 accelerates at 20 ms^{-2} when same force acts on it. Find the acceleration if both the blocks are tied together and same force acts on their combination :
   (a) 1.67 ms^{-2} (B) 4.67 ms^{-2}
   (c) 6.67 ms^{-2} (D) None of these

3. In a tape cassette, the tape leaves one spool at a constant speed v and at a variable distance r from the centre.



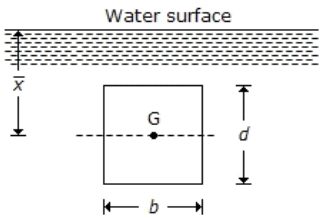
   Which of the following statements is true?
   (a) The angular velocity decreases as radius r decreases.
   (b) The angular velocity increases as radius r decreases.
   (c) The angular velocity is directly proportional to the speed v.
   (d) The angular velocity is directly proportional to the speed v^2 .

4. A small sphere is travelling horizontally around the circumference of the bigger circular loop in the figure below with an angular velocity of 63.0 rad s-1 .



   The sphere then moves into the smaller loop and continues to move along its circumference. What will be the angular velocity of the sphere when it is moving in the smaller loop?
   (a) 37.7 rad s^{-1} (b) 63.0 rad s^{-1}
   (c) 105 rad s^{-1} (d) 126 rad s^{-1}

5. A vertically immersed surface is shown in the below figure. The distance of its centre of pressure from the water surface is?



   (a) $\left(\frac{bd^2}{12}\right) + \bar{x}$ (b) $\left(\frac{bd^2}{12\bar{x}}\right) + \bar{x}$?

   (c) $\frac{b^2}{12} + \bar{x}$ (d) $\frac{d^2}{12} + \bar{x}$?

6. Mercury is often used in clinical thermometers. Which of the following is not a reason for this?
(a) The coefficient of thermal expansion is large
(b) It is shiny
(c) It is liquid at room temperature
(d) It has high density

7. A thick walled hollow sphere has outer radius R. It rolls down an inclined plane without slipping and its speed at the bottom is V. If the inclined plane is frictionless and the sphere slides down without rolling its speed at the bottom will be 5V/4. What is the radius of gyration of sphere?

(a) $\frac{R}{\sqrt{2}}$ (b) $\frac{R}{2}$

(c) $\frac{3R}{4}$ (d) $\frac{\sqrt{3}R}{4}$

8. Two circular loops of radius R and nR are made from the same wire. The moment of inertia about the axis passing through the center and perpendicular to the plane of larger loop is 8 times that of smaller loop. What is the value of n?
(a) 2 (b) 4
(c) 6 (d) 8

9. The rate of flow of a liquid through an orifice of a tank does not depend upon:
(a) The size of orifice
(b) Density of liquid
(c) The height of fluid column
(d) Acceleration due to gravity

10. A wooden block of mass m tied to a string is attached to the bottom of a vessel containing water and the block is completely immersed. What is the tension in the string if the upward thrust is twice the weight of the block?
(a) Mg/2 (b) Mg
(c) 3Mg (d) Zero

11. A one electron system has its electron revolving in the 3rd orbit. The light of maximum wavelength which can eject the electron from the third orbit has energy of 6.04 eV. Which of the following statement regarding the above mentioned species is false?
(a) The ionization energy of the species is 54.36eV.
(b) If the electron falls to second Bohr orbit, visible light would be emitted.
(c) The atomic number is 2.
(d) A visible light may bring about transition from 4th to higher orbit.

12. The correct order of radii is
(a) N < Be < B
(b) $F^- < O^{2-} < N^{3-}$
(c) Na < Li < K
(d) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

13. CO_2 is isostructural with
(a) $HgCl_2$ (b) CH_4
(c) $SnCl_2$ (d) NO_2

14. Which of the following is thermally less stable than $CaCO_3$
(a) Na_2CO_3 (b) $SrCO_3$
(c) $BaCO_3$ (d) $CuCO_3$

15. When equal volumes of the following solutions are mixed, precipitation of AgCl ($K_{sp} = 1.8 \times 10^{-10}$) will occur only with
(a) 10^{-4} M (Ag^+) and 10^{-4} M (Cl^-)
(b) 10^{-5} M (Ag^+) and 10^{-5} M (Cl^-)
(c) 10^{-6} M (Ag^+) and 10^{-6} M (Cl^-)
(d) 10^{-10} M (Ag^+) and 10^{-10} M (Cl^-)

16. Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, present as M^{2+} and M^{3+} in its oxide. Fraction of the metal which exists as M^{3+} would be
(a) 7.01% (b) 4.08%
(c) 6.05% (d) 5.08%

17. Sodium nitrate decomposes above 800°C, which product is not produced
(a) N_2 (b) O_2
(c) NO_2 (d) Na_2O

18. Which of the following, has the most acidic hydrogen?
(a) 3-hexanone (b) 2,4-hexanedione
(c) 2,5-hexanedione (d) 2,3-hexanedione

19. The total number of cyclic isomers possible for a hydrocarbon with the molecular formula C_4H_6 is
(a) 4 (b) 3
(c) 5 (d) 6

20. When O_2 is adsorbed on a metallic surface, electron transfer occurs from the metal to O_2. The statement which is incorrect is?
(a) O_2 is physisorbed
(b) Heat is released
(c) Occupancy of $*\pi_{2p}$ of O_2 is increased
(d) Bond length of O_2 is increased

21. Coefficient of X^{11} in the expansion of $(1 + X^2)^4 (1 + X^3)^7 (1+ X^4)^{12}$ is
(a) 1051 (b) 1106
(c) 1113 (d) 1120

22. Let S be the set of all non-zero real numbers ? such that the quadratic equation $\alpha X^2 - X + \alpha = 0$ has two distinct real roots X_1 and X_2 satisfying the inequality $|X_1 - X_2| < 1$. Which of the following interval is a subset of S?

(a) $\left(-\frac{1}{2}, -\frac{1}{\sqrt{5}}\right)$ (b) $\left(-\frac{1}{\sqrt{5}}, 0\right)$

(c) $\left(0, \frac{1}{\sqrt{5}}\right)$ (d) $\left(\frac{2}{\sqrt{5}}, \frac{1}{2}\right)$

23. If a, b, c are positive real numbers such that a + b + c + d = 2, then M = (a + b)(c + d) satisfies the relation

(a) $0 < M \leq 1$ (b) $1 \leq M \leq 2$

(c) $2 \leq M \leq 3$ (d) $3 \leq M \leq 4$

24. Let S = {1, 2, 3 ,……., 9}. For k = 1, 2, …… 5, let N_k be the number of subsets of S, each containing five elements out of which exactly k are odd. Then $N_1 + N_2 + N_3 + N_4 + N_5$ =

(a) 210 (b) 252

(c) 126 (d) 125

25. If $f(X) = \cos(\log X)$, the $f(X).f(Y) - \frac{1}{2}[f(X/Y) + f(XY)]$ has the value

(a) –1 (b) $\frac{1}{2}$

(c) –2 (d) None of these

26. The minimum value of the sum of real numbers a^{-5} , a^{-4} , $3a^{-3}$, 1 , a^8 , a^{10} with a > 0 is ?

(a) 7 (b) 8

(c) 9 (d) 6

27. Let a, b and c be real numbers with $a \neq 0$ and let α , β be the roots of the equation $ax^2 + bx + c = 0$. Express the roots of $a^3x^2 + abcx + c^3 = 0$ in terms of α , β

(a) $\alpha^2\beta, \beta, \alpha$ (b) $\alpha^2\beta, \beta^2, \alpha$

(c) α, β (d) α^2, β^2

28. Four fair dice D_1 , D_2 , D_3 , D_4 each having 6 faces numbered 1, 2, 3, 4, 5, 6 are rolled simultaneously. The probability that D_4 shows a number appearing on one of D_1 , D_2 , D_3 is

(a) $\frac{91}{216}$ (b) $\frac{108}{216}$

(c) $\frac{125}{216}$ (d) $\frac{127}{216}$

29. If z is any complex number satisfying $|z-3-2i| \leq 2$, the the maximum value of |2z-6 +5i| is ?

(a) 3 (b) 4

(c) 5 (d) 6

30. If $f(x) = \sin x + \cos x$, $g(x) = x^2 - 1$, the g{f(x)} is invertible in the domain

(a) $\left[0, \frac{\pi}{2}\right]$ (b) $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

(c) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (d) $[0, \pi]$