XLENT TALENT SEARCH EXAM

QUESTIONS PAPER-1

INSTRUCTIONS:

The duration of the test will be **60 minutes.** Use the time accordingly.

The test paper consists of **50 questions** divided into four sections, **Section A, Section B, Section C & Section D.**

- **Section A** contains **10** questions of Physics.
- **Section B** contains **10** questions of Chemistry.
- **Section C** contains **10** questions of Mathematics.
- **Section D** contains **20** questions of Aptitude.

Each question will have **4 choices,** with the only **single choice** being correct.

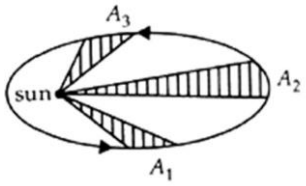
You will get **2 marks** for every correct answer.

There will be **no negative marking** for any wrong answer or unanswered question.

SECTION-A

PHYSICS

1. A planet moving around sun sweeps area A_1 in 2 days, A_2 in 3 days and A_3 in 6 days.
   Then the relation between A_1, A_2 and A_3 is



A. $3A_1 = 2A_2 = A_3$ B. $2A_1 = 3A_2 = 6A_3$ C. $3A_1 = 2A_2 = 6A_3$ D. $6A_1 = 3A_2 = 2A_3$

2. A bomb of mass 30 kg at rest explodes into two pieces of masses 18 kg and 12 kg. The velocity 18 kg mass is 6 ms^{-1}. The KE of the other mass is

A. 256 J B. 486 J C. 524 J D. 324 J

3. Two sitar strings, A and B, playing the note 'Dha' are slightly out of tune and produce beats of frequency 5 Hz. The tension of the string B is slightly increased and the beat frequency is found to decrease by 3 Hz. If the frequency of A is 425 Hz, the original frequency of B (in Hz) is:

A. 430 B. 420 C. 428 D. 422

4. If the earth were to suddenly contract to $\frac{1^{th}}{n}$ of its present radius without any change in its mass, the duration of the new day will be nearly

A. $\frac{24}{n}$hr B. 24n hr C. $\frac{24}{n^2}$ hr D. $24n^2$ hr

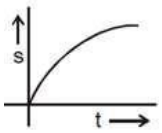
5. The length and breadth of a rectangle are (5.7 ± 0.1) cm and (3.4 ± 0.2) cm. The area of the rectangle with error limits is

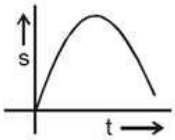
A. (19.0 ± 1.5) sq.cm. B. (19.0 ± 2.5) sq.cm. C. (19.0 ± 3.5) sq.cm. D. (19.0 ± 4.5) sq.cm.

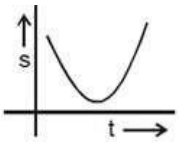
6. A simple harmonic motion having an amplitude A and time period T is represented by the equation: $y = 5 \sin\pi (t + 4)$ m. Then the values of A (in m) and T (in sec) are

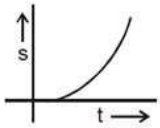
A. A = 5; T = 2 B. A = 10; T = 1 C. A = 5; T = 1 D. A = 10; T = 2

7. The displacement of a ball falling from rest in a viscous medium is plotted against time. Choose a possible option.

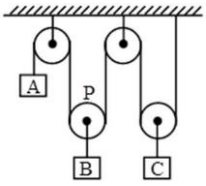
A. 

B. 

C. 

D. 

8. In the ideal case,



A. the magnitude of the acceleration of A is the sum of the magnitude of the acceleration of B and C.

B. the magnitude of the acceleration of A is arithmetic mean of the magnitude of the acceleration of B and C.

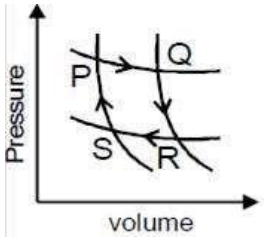
C. if P is massless, the net force on the pulley is non-zero.

D. None of these.

9. A container with insulating walls is divided into equal parts by a partition fitted with a valve. One part is filled with an ideal gas at a pressure P and temperature T, whereas the other part is completely evacuated. If the valve is suddenly opened, the pressure and temperature of the gas will be:

A. $\frac{P}{2}, \frac{T}{2}$ B. P, T C. $P, \frac{T}{2}$ D. $\frac{P}{2}, T$

10. A fixed mass of gas undergoes the cycle of changes represented by PQRSP as shown in figure. In some of the changes, work is done on the gas and in others, work is done by the gas. In which pair of the changes work is done on the gas?



A. PQ and RS B. PQ and QR C. OR and RS D. RS and SP

SECTION-B

CHEMISTRY

11. 20 ml of 0.1 N $BaCl_2$ is mixed with 30 ml of 0.2 N $Al_2(SO_4)_3$. The maximum weight in grams of $BaSO_4$ that would be formed, assuming the reaction to be 60% efficient is, approximately (Atomic mass of Ba= 133.3 u)

A. 0.12 B. 0.23 C. 0.14 D. 0.24

12. Two glass bulbs A (of 100 mL capacity), and B (of 150 ml capacity) containing same gas are connected by a small tube of negligible volume. At particular temperature, the pressure before opening the valve $\frac{P_A}{P_B} = \frac{20}{1}$. The stopcock is opened without changing the temperature. The pressure in A will-

A. drop by 75% B. drop by 57% C. drop by 25% D. will remain same

13. In hydrogen atom, energy of first excited state is -3.4eV. Then, KE of same orbit of hydrogen atom:

A. + 3.4 eV B. + 6.8 eV C. - 13.6 eV D. + 13.6 eV

14. For heteronuclear diatomic molecule A-B having electronegativity difference ($X_a - X_b$), the bond length can be calculated as:

$d_{a-b} = r_a + r_b - m(X_a - X_b)$

Then, the value of 100m is:

A. 4 B. 7 C. 9 D. 14

15. The heat of combustion of benzene in a bomb calorimeter (i.e. constant volume) was found to be 3263.9 kJ mol^{-1} at 25°C. The heat of combustion of benzene at constant pressure will be

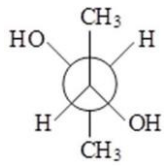
A. -3490.6 kJ mol^{-1} B. -3476.6 kJ mol^{-1} C. -3267.6 kJ mol^{-1} D. -3467.6 kJ mol^{-1}

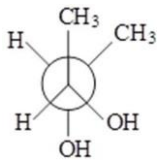
16. 50 ml of 0.6 M NaOH is added to 100 ml of 0.6 M acetic acid. What is the additional volume of 1.2 M NaOH required for making the solution of pH 4.74?

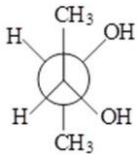
The ionization constant of acetic acid is 1.8×10^{-5}

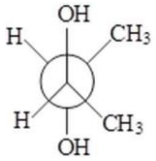
A. 0 B. 2 C. 4 D. 10

17. Which one of the following is the least stable conformer?

A. 

B. 

C. 

D. 

18. Element $M + N_2 \xrightarrow{\Delta} \xrightarrow{H_2O} NH_3$

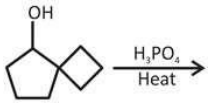
Element M belonging to group 13 can be

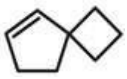
A. B or Al B. Ga or Al C. Mg, Al or B D. Mg or B

19. Which of the following compounds does not give a precipitate with excess of NaOH?

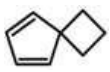
A. $ZnSO_4$ B. $FeSO_4$ C. $AgNO_3$ D. $HgCl_2$

20. What is the major dehydration product in the following reaction?



A. 

B. 

C. 

D. 

SECTION-C

MATHEMATICS

21. The focus of parabola $(y - 8)^2 = 12x$ is?

A. (-3, -8) B. (-3, 8) C. (3, -8) D. (3, 8)

22. The point on the line $4x + 3y = 5$, which is equidistant from (1,2) and (3,4) is

A. (7, -4) B. (-10, 15) C. $\left(\frac{1}{7}, \frac{8}{7}\right)$ D. $\left(0, \frac{5}{4}\right)$

23. If the ratio of the sum of n terms of two AP's is 2n : (n+1), then ratio of their sum of 8 terms is-

A. 15 : 8 B. 8 : 13 C. n : (n– 1) D. 5 : 17

24. If $\tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$, then sin α + cos α and sin α – cos α must be equal to

A. $\sqrt{2}\cos\theta,\ \sqrt{2}\sin\theta$ B. $\sqrt{2}\sin\theta,\ \sqrt{2}\cos\theta$

C. $\sqrt{2}\sin\theta,\ \sqrt{2}\sin\theta$ D. $\sqrt{2}\cos\theta,\ \sqrt{2}\cos\theta$

25. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots then the value of 'q' is

A. 49/4 B. 12 C. 3 D. 4

26. The ratio of the coefficient of X^{15} to the term independent of x in the expansion of $\left(x^2 + \frac{2}{x}\right)^{15}$ is:

A. 7 : 16 B. 7 : 64 C. 1 : 4 D. 1 : 32

27. Ten different letters of an alphabet are given. Words with five letters are formed from these given letters. Determine the number of words which have at least one letter repeated.

A. 69762 B. 69676 C. 69760 D. 69766

28. The sum of the real roots of the equation $x^3 + 3x^2 + 2x = x + 2$ is

A. –2 B. –3 C. –1 D. $-\sqrt{5}$

29. If $f(x) = \begin{cases} x^2\text{-}3, & 2<x<3 \\ 2x+5, & 3<x<4 \end{cases}$, the equation whose roots are $\lim_{x\to 3^-} f(x)$ and $\lim_{x\to 3^+} f(x)$ is

A. $x^2 - 7x + 3 = 0$ B. $x^2 - 20x + 66 = 0$ C. $x^2 - 17x + 66 = 0$ D. $x^2 - 18x + 60 = 0$

30. Let f(x) be defined for all x > 0 and be continuous. Let f(x) satisfy $f\left(\frac{x}{y}\right) = f(x) - f(y)$ for all *x*, *y* and f(e) = 1 then

A. f(x) = ln x B. f(x) is bounded C. $f\left(\frac{1}{x}\right) \to 0$ as x → 0 D. x f(x) →1 as x → 0

SECTION-D

APTITUDE

31. If $(2x + 3y + 4)(2x + 3y – 5)$ is equivalent to $(ax^2 + by^2 + 2hxy + 2gx + 2fy + c)$, then what is the value of {(g + f – c)/abh}?

A. $\frac{37}{216}$ B. $\frac{35}{432}$ C. $\frac{19}{108}$ D. $\frac{19}{216}$

32. The volume of a right circular cone is equal to that of a sphere whose radius is half the radius of the base of the cone. What is the ratio of the radius of the base to the height of the cone?

A. 1 : 4 B. 1 : 2 C. 4 :1 D. 2 : 1

33. $\left\{-\frac{2}{3} \times \left(\frac{1}{2} + \frac{1}{4}\right)\right\}$ equals

A. 1/2 B. -1/2 C. 0 D. 1/4

34. The value of $\left[\frac{1}{2} \times \frac{2}{3} - \frac{1}{2} \times \frac{1}{3} + \frac{1}{2} \times \frac{4}{3}\right]$ equals

A. $\frac{5}{6}$ B. $\frac{5}{4}$ C. $\frac{6}{5}$ D. $\frac{2}{3}$

35. Which of the following represents the largest four-digit number divisible by each of 7, 11, 12, 27, and 28.

A. 8123 B. 8383 C. 8534 D. 8316

36. If 120 is 20% of a number, then 120% of that number will be

A. 20 B. 120 C. 480 D. 720

37. Ratio of the present age of A and B is 10 : 9 . After 4 years sum of their ages will be 84 years. Find the age of A, 4 years ago.

A. 32 years B. 44 years C. 36 years D. 40 years

38. The average of the first 9 natural prime numbers is

A. 9 B. 10 C. $11\frac{2}{9}$ D. $11\frac{1}{9}$

39. Subtract $5x^2 - 4y^2 + 6y - 3$ from $7x^2 - 4xy + 8y^2 + 5x - 3y$

A. $2x^2 - 4xy + 12y^2 + 5x - 9y + 3$ B. $2x^2 + 4xy + 12y^2 + 5x + 9y + 3$

C. $12x^2 + 4y^2 + 8xy + 5x + 3y - 3$ D. $12x^2 + 4y^2 + 8xy + 5x + 3y + 3$

40. Calculate the value of $\left(\frac{9}{8}\right)^{-3} \times \left(\frac{9}{8}\right)^{2}$.

A. $\frac{9}{8}$ B. $\frac{8}{9}$ C. $-\frac{9}{8}$ D. $-\frac{8}{9}$

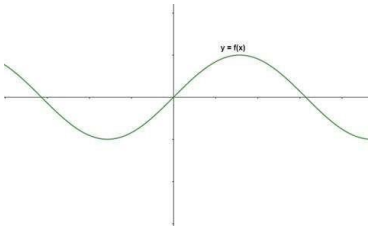
41. Calculate the value of $\left[\left\{\left(\frac{-1}{3}\right)^{2}\right\}^{-2}\right]^{-1}$.

A. 81 B. -81 C. $-\frac{1}{81}$ D. $\frac{1}{81}$

42. Simplify: $\frac{3^{-3}}{3^{3}} \times 81^{2} \times 243^{3}$

A. 3^{-17} B. 3^{-15} C. 3^{17} D. 3^{15}

43. Find the number of zeroes of the polynomial p(x) represented below.



A. 1 B. 2 C. 3 D. 4

44. The number of zeros of $x^2 + 4x + 2$

A. 1 B. 2 C. 3 D. none of these

45. The value of *k*, if $(x - 1)$ is a factor of $4x^3 + 3x^2 - 4x + k$, is

A. 1 B. 2 C. –3 D. 3

46. For what value of k, 4 is a zero of polynomial $3x^2 + 4x + 2k$?

A. 18 B. 16 C. -16 D. -18

47. If x = 2 and x = 0 are the roots of the polynomial $f(x) = 2x^3 - 5x^2 + ax + b$. Then, (a + b) equals

A. 2 B. -1 C. 1 D. -2

48. Which of the following is a zero of the polynomial $x^4 + 3x^3 - 5x^2 - 20 = 0$?

A. -1 B. 0 C. 1 D. 2

49. If $\frac{2}{p} + \frac{3}{q} = 13$ and $\frac{5}{p} - \frac{4}{q} = -2$ then what is the value of p+q?

A. $\frac{5}{6}$ B. $\frac{4}{7}$ C. $\frac{5}{4}$ D. 11

50. The length of the rectangle is 10 cm more than its breadth. If the perimeter of the rectangle is 72 cm, then find sum of its length and breadth.

A. 30 cm B. 35 cm C. 36 cm D. 40 cm