Mathematics

1. \( m \) Boys and 2 girls each compete with each other two times. If Boys Vs Boys played 84 times more than Boys Vs Girls, then \( m \) equals to
   (A) 12
   (B) 8
   (C) 6
   (D) 7

2. If \( ^nC_4, ^nC_5 \) and \( ^nC_6 \) are in A.P. then the value of \( n \) is
   (A) 8
   (B) 14
   (C) 16
   (D) 10

3. The expression \( \sim (\sim P \rightarrow 2) \) is logically equivalent to
   (A) \( \sim P \land 2 \)
   (B) \( \sim P \land \sim 2 \)
   (C) \( P \land 2 \)
   (D) \( P \land \sim 2 \)

4. \( \int \frac{3x^{13} + 2x^{11}}{(2x^4 + 3x^2 + 1)^4}dx \) is equal to
   (A) \( \frac{x^4}{(2x^4 + 3x^2 + 1)^4} + C \)
   (B) \( \frac{x^{12}}{6(2x^4 + 3x^2 + 1)^3} + C \)
   (C) \( \frac{x^4}{6(2x^4 + 3x^2 + 1)^3} + C \)
   (D) \( \frac{x^{12}}{(2x^4 + 3x^2 + 1)^3} + C \)

5. If the sum of 1st 15 terms of the series \( \left(\frac{3}{4}\right)^3 + \left(\frac{1}{2}\right)^3 + \left(\frac{2}{3}\right)^3 + 3^3 + \left(\frac{3}{4}\right)^3 \) is equal to 225 \( K \), then \( K \) is
   (A) 54
   (B) 9
   (C) 108
   (D) 27
6. The integral \( \int_1^e \left( \left( \frac{e}{x} \right)^{2x} - \left( \frac{e}{x} \right)^x \right) \log_e x \, dx \) equal to

(A) \( \frac{3}{2} - \frac{1}{e} - \frac{1}{2e^2} \)

(B) \( -\frac{1}{2} + \frac{1}{e} - \frac{1}{2e^2} \)

(C) \( \frac{3}{2} - e - \frac{1}{2e} \)

(D) \( \frac{1}{2} - e - \frac{1}{e^2} \)

7. \( \lim_{n \to \infty} \frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \cdots + \frac{1}{5n} = \)

(A) \( \frac{\pi}{2} \)

(B) \( \frac{\pi}{4} \)

(C) \( \tan^{-1} 2 \)

(D) \( \tan^{-1} 3 \)

8. Let \( f'(x) = f(x), f(1) = 2 \) and \( h(x) = f(f(x)) \), then \( h'(1) \) equal to

(A) \( 4e \)

(B) \( 2e^2 \)

(C) \( 4e^2 \)

(D) \( 2e \)

9. \( \lim_{x \to 1^-} \frac{\sqrt{\pi - \sqrt{2} \sin^{-1} x}}{\sqrt{1-x}} \) is equal to

(A) \( \sqrt{\frac{2}{\pi}} \)

(B) \( \sqrt{\frac{\pi}{2}} \)

(C) \( \frac{1}{\sqrt{2\pi}} \)

(D) \( \frac{1}{\sqrt{\pi}} \)

10. A tangent to \( x^2 = 8y \) makes an angle of \( \theta \) with the positive \( x \)-axis, then equation of tangent will be

(A) \( y \cot \theta = x - 2 \tan \theta \)

(B) \( y \cot \theta = x + 2 \tan \theta \)

(C) \( y \cot \theta = x - \tan \theta \)

(D) \( y = x \tan \theta - 2 \cot \theta \)
11. Number of irrational terms in the expansion of \((\frac{1}{\sqrt{7}} - 3^{\frac{1}{10}})^{60}\) is
   (A) 54
   (B) 48
   (C) 53
   (D) 55

12. There are 5 observation, out of which 3 are 3, 4, 4 and mean of these 5 observation is 4 and variance is 5.2, then absolute difference of remaining observation is
   (A) 8
   (B) 7
   (C) 9
   (D) 10

13. \(A = \{ x : 2^{(x+2)(x^2 - 5x + 6)} = 1, 4 \ x \in I \}\)
   \(B = \{ x : -3 < 2x - 1 < 9, \ & x \in I \}\), then
   Number of subsets of \(A \times B\) are
   (A) \(2^{15}\)
   (B) \(2^{18}\)
   (C) \(2^{10}\)
   (D) \(2^{21}\)

14. If \(A = \begin{bmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{bmatrix}, \theta \in [\frac{3\pi}{4}, \frac{5\pi}{4}]\) then range of \(det(A)\) is
   (A) \([0, \frac{3}{2}]\)
   (B) \([\frac{3}{2}, 3]\)
   (C) \([2, 3]\)
   (D) \([0, 3]\)

15. A line passing through \((-3, 4)\) is bisected at the same point between the coordinate axes, then equation of line is
   (A) \(3x + 4y = 24\)
   (B) \(-4x + 3y = 24\)
   (C) \(3x + 4y = 7\)
   (D) None of these.
16. A circle of radius \( r \) is passing origin and cuts coordinate axes at \( A \) and \( B \). Then locus of foot of the perpendicular from origin upon line joining \( A \) and \( B \) is

(A) \((x^2 + y^2)^3 = r^2 x^2 y^2\)
(B) \((x^2 + y^2)^2 (x + y) = r^2 xy\)
(C) \((x^2 + y^2) = r^2 x^2 y^2\)
(D) \((x^2 + y^2)^3 = r^2 xy\)

17. One of the extremity of the minor axis of the ellipse is \( B \). \( S \) and \( S' \) are the foci of the ellipse. If area of right triangle \( SBS' \) is equal to 8, then length of the latus rectum is

(A) \(4 \sqrt{2}\)
(B) \(\frac{4}{\sqrt{2}}\)
(C) 4
(D) 8

18. A tangent of parabola \( y = x^2 - 5x + 5 \) is parallel to \( 2y = 4x + 1 \), then this tangent also passes through

(A) \(\left(\frac{7}{2}, \frac{1}{4}\right)\)
(B) \(\left(\frac{1}{4}, \frac{7}{2}\right)\)
(C) \(\left(\frac{7}{2}, -\frac{1}{4}\right)\)
(D) \(\left(\frac{1}{4}, -7\right)\)

19. Let \( \vec{a} \times (\vec{b} \times \vec{c}) = \frac{\vec{b}}{2} \) and \( \vec{b} \), \( \vec{a} \) are non parallel unit vectors. If angle between \( \vec{a} \) and \( \vec{b} \) is \( \alpha \) and angle between \( \vec{a} \) and \( \vec{b} \) is \( \beta \), then \(|\alpha - \beta|\) is equal to

(A) \(\frac{\pi}{2}\)
(B) \(\frac{\pi}{6}\)
(C) \(\frac{\pi}{3}\)
(D) \(\frac{\pi}{4}\)
20. If angle between the lines \( \frac{x-2}{1} = \frac{y-3}{2} = \frac{z+5}{-2} \) and \( 2x - y - kz = \lambda \) is \( \cos^{-1}\left(\frac{2\sqrt{2}}{3}\right) \), then find \( k \)
(A) \( \frac{\sqrt{3}}{5} \)
(B) \( \frac{3}{\sqrt{5}} \)
(C) \( \frac{\sqrt{5}}{3} \)
(D) \( \frac{\sqrt{3}}{\sqrt{5}} \)

21. There are 60 students in a class, out of which 40 opt for NCC, 30 opt for NSS and 20 opt for both, then the probability that a student has opted for none of the NCC or NSS
(A) \( \frac{5}{6} \)
(B) \( \frac{1}{6} \)
(C) \( \frac{1}{3} \)
(D) \( \frac{1}{2} \)

22. Let \( f(x) = x^3 - 3(a - 2)x^2 + 3ax + 7 \) and \( f(x) \) is increasing in \( (0, 1] \) and decreasing in \( [1, 5) \), then roots of the equation \( \frac{f(x) - 14}{(x - 1)^2} = 0 \) is
(A) 1
(B) 3
(C) 7
(D) -2

23. If \( y(x) \) satisfied the differential equation \( \frac{dy}{dx} = \frac{x^2 - 2y}{x} \) where \( y(1) = -2 \), then \( y(x) \) will pass through the point
(A) \( (0, \sqrt{3}) \)
(B) \( (3, 0) \)
(C) \( (\sqrt{3}, 0) \)
(D) \( (0, 3) \)
24. If \( \alpha, \beta \in \left(0, \frac{\pi}{2}\right) \) and if \( \sin^4 \alpha + 2 \cos^4 \beta + 2 = 4\sqrt{2}\sin \alpha \cos \beta \) then the value of \( \cos(\alpha + \beta) - \cos(\alpha - \beta) \) is
   (A) \( \sqrt{2} \)
   (B) \( \frac{1}{\sqrt{2}} \)
   (C) \( -\frac{1}{\sqrt{2}} \)
   (D) \( -\sqrt{2} \)

25. Let \( f(x) = (1 + m)x^2 - 2(1 + 3m)x + 4(1 + 2m) \). Number of integral values of \( m \) for which given quadratic expression is always positive is
   (A) 8
   (B) 7
   (C) 8
   (D) 9

26. Point \( P \) is at a height of 25m from surface of take. The angle of elevation from point \( P \) on a cloud is 30° and angle of depression of image of cloud in water is 60° then height of cloud from surface of take is
   (A) 75 m
   (B) 45 m
   (C) 50 m
   (D) 49 m

27. If \( Z_1 \) and \( z_2 \) lies on \( |Z| = 9 \) and \( |Z - 3 - 4i| = 4 \) respectively, find minimum possible value of \( |Z_1 - Z_2| \)
   (A) 0
   (B) 5
   (C) 13
   (D) 2

28. A dice is thrown repeatedly. If ‘5’ or ‘6’ appears, person wins Rs. 100 otherwise he loses Rs. 50. He does it until he wins Rs. 100 or he tosses maximum for 3 times. Then find the expected gain.
   (A) \( \frac{400}{3} \) gain
   (B) \( \frac{400}{9} \) gain
   (C) 0
   (D) \( \frac{400}{3} \) loss
29. A plane passing through 3 points $(-\lambda^2, 1, 1), (1, -\lambda^2, 1), (1, 1, 1 - \lambda^2)$ and also passes through $(1, -1, -1)$, then the set crossing all the real value of $\lambda$ is

(A) $\{-3, 3\}$

(B) $\{-\sqrt{3}, 1, \sqrt{3}\}$

(C) $\{1\}$

(D) $\{-\sqrt{3}, \sqrt{3}\}$

30. Let system of linear equations $x - y - z = \lambda x$, $x + 2y + z = \lambda y$, $-x - y = \lambda z$ have non-trivial solution, then set containing all the values of $y$ is

(A) singleton set

(B) has more than two elements

(C) $\emptyset$

(D) has exactly two elements

**Physics**

1. A block is on a rough inclined plane. To keep it at rest force required is maximum $2N$ downward or maximum $10N$ upward. Find the coefficient of friction

![Diagram of a block on an inclined plane]

(A) $\frac{2}{3}$

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

(C) $\frac{\sqrt{3}}{4}$

(D) $\frac{\sqrt{3}}{2}$
2. The equivalent capacitance between $A$ and $B$ is $0.5 \mu F$. Find volume of $C$.

![Diagram of capacitors](image)

(A) $2 \mu F$
(B) $\frac{6}{5} \mu F$
(C) $\frac{11}{7} \mu F$
(D) $\frac{7}{11} \mu F$

3. The displacement of a particle is given by $y = (5 \sin 3\pi t + \sqrt{3} \cos 3\pi t)$ m Find the period and amplitude of oscillation

\[
\omega = 3\pi = \frac{2\pi}{7}
\]
\[
T = \frac{2}{3}\pi
\]

(A) $\frac{3}{3} s, \sqrt{28} m$
(B) $1 s, 5 + \sqrt{3}$
(C) $\frac{2}{3} s, (5 + \sqrt{3}) m$
(D) $3 s, \sqrt{28} m$

4. $\alpha$ – particle of mass $m$ strikes a heavy stationary nucleus head-on elastically. After collision $\alpha$ – particle retrace and loses 64% of its $KE$ then mass of the heavy nucleus is.

(A) $2m$
(B) $4m$
(C) $1.5m$
(D) $5m$
5. In frank – Hertz experiment, kinetic energy of electron is $5.6 \ eV$. It is projected in $Hg^-$ vapor and it comes out with $KE \ 0.7 \ eV$. By $Hg^-$ vapor.
   (A) $250 \ nm$
   (B) $300 \ nm$
   (C) $200 \ nm$
   (D) $220 \ nm$

6. An object is at a distance $2f$ from a converging lens. Now whole system is put in water, then the finally image

   ![Diagram of a lens system]

   (A) is not formed
   (B) gets magnified
   (C) is real and erect
   (D) None

7. The currents in some branches are given. The currents in remaining resistance $R_1$, $R_2$ and $R_3$ are respectively

   ![Diagram of a circuit]

   (A) $0.4A, 0.4A, 1.1A$
   (B) $0.4A, 1.2A, 0.5A$
   (C) $0, 1.2A, 1.1A$
   (D) $0.4A, 0.4A, 0.5A$

8. A cylinder, half filled, is rotated about a vertical axis $w = 2 \ rotation/second \ \frac{H}{2}$. Find difference between the maximum and minimum heights

   ![Diagram of a cylinder and water]

   5cm
9. Find the phase difference between currents $l_1$ and $l_2$ at steady state

\[ l_1 = 10 \Omega \]
\[ l_2 = 20 \Omega \]
\[ \sqrt{3} \text{ H} \]
\[ \sqrt{3} \text{ mF} \]

(A) $90^\circ$
(B) $30^\circ$
(C) $60^\circ$
(D) $0^\circ$

10. Moment of inertial of solid sphere about an axis at a distance $x$ from centre is $I$. Which of the following is correct graph of $I$ v/s $x$.

(A) 
(B)
11. A soap bubble is blown such that rate of increases of volume w.r.t. time remains constant variation of pressure w.r.t. time would be:

(A) 

(B) 

(C) 

(D) 

12. Satellite $A$ has mass $m$ and orbital radius $R$. Satellite $B$ has mass $2m$ and orbital radius $2R$. The ratio of kinetic energy of satellite $A$ and $B$ will be:

(A) 1
13. A galvanometer of resistance $50\,\Omega$ and deflection current $4 \times 10^{-4}A$. Find resistance connected to the galvanometer to form a voltmeter of range $2.5\,V$.

(A) $6250\,\Omega$
(B) $200\,\Omega$
(C) $250\,\Omega$
(D) $6200\,\Omega$

14. Light of frequency $v$ is incident on metal surface whose stopping potential is $\frac{v_0}{2}$. Now, when the light of frequency $\frac{v}{2}$ is incident on same metal surface, stopping potential become $V_0$. Then the threshold frequency of metal surface is:

(A) $\frac{2}{3}v$
(B) $\frac{3}{2}v$
(C) $2v$
(D) $\frac{v}{2}$

15. To double the transmission range, by what factor length of antenna should be increased?

(A) $\sqrt{2}$
(B) $\frac{1}{\sqrt{2}}$
(C) 2
(D) 4

16. A plano concave lens of radius of curvature $R$ and refractive index $\mu_1$ has focal length $f_1$. Similarly a plano convex lens of radius of curvature $R$ and refractive index $\mu_2$ has focal length $f_2$. Both lenses are joined so that there is no gap between them. Find equivalent focal length of combined system.

(A) $\frac{R}{\mu_2 - \mu_1}$
(B) $\frac{2f_1f_2}{f_1 + f_2}$
17. A rod of length 10 m with its length along north-east, south-west direction falls vertically downward with speed 5 m/s. If the horizontal component of earth's magnetic field is \(0.3 \times 10^{-4}\) Tesla, then the induced EMF developed across the ends of rod is.
(A) \(1.5 \times 10^{-3}\) V
(B) \(1.1 \times 10^{-3}\) V
(C) \(1.2 \times 10^{-3}\) V
(D) \(1.4 \times 10^{-3}\) V

18. \(V_{BB}\) can vary between 0 and 5 V. Find minimum value of base current and \(V_{BB}\) so that transistor work in saturation mode. [Given \(\beta = 200\) and \(V_{BE} = 1\) Volt]

(A) 20 \(\mu\)A, 2.8 V
(B) 25 \(\mu\)A, 3.5 V
(C) 20 \(\mu\)A, 3.5 V
(D) 25 \(\mu\)A, 2.8 V

19. In a resonance tube experiment with a tuning fork of 512 Hz fundamental mode is obtained when length of air column is 11 cm. For the vibration in same mode with 256 Hz, length of air column is 27 cm. Find speed of sound.
(A) 328 m/s
(B) 322 m/s
(C) 350 m/s
(D) 341 m/s
20. Given graph is between charge passing through a conductor vs time. Determine the value of current at \( t = 4 \) s.

(A) 2
(B) 4
(C) 0
(D) 1.5

21. The dimensional formula (in S.I.) of the quantity \( \frac{L}{CVR} \) (where \( C = \) capacitance, \( V = \) voltage & \( R = \) resistance)

(A) \([M^{-1}L^{-2}T^2A]\)
(B) \([M^{-2}L^{-1}T^2A]\)
(C) \([A^{-1}]\)
(D) \([T^{-2}]\)

22. For the equation \( y(t) = 5(cm)[\sin 3\pi t + \sqrt{3} \cos 3 \pi t] \) where \( t \) is in seconds, find amplitude and time period.

(A) 5 cm, \( \frac{2}{3} \) sec
(B) 5 cm, \( \frac{3}{2} \) sec
(C) 10 cm, \( \frac{2}{3} \) sec
(D) 10 cm, \( \frac{3}{2} \) sec

23. In the figure given \( A \) and \( B \) are two particles having same magnitude of angular velocity in opposite sense at \( t = 0 \) then \( \vec{V}_A - \vec{V}_B \) at \( t = \frac{\pi}{2\omega} \) sec

(A) \( -\omega R_1 \hat{i} + \omega R_2 \hat{i} \)
24. A small ball of mass 20 gm is projected with initial velocity 5 m/s from point A along the circular groove of rad 10 m. Find its angular momentum about O when it reaches at point B as shown in the figure.
(A) 2 kgm²/s
(B) 4 kgm²/s
(C) 6 kgm²/s
(D) 8 kgm²/s

25. A parallel plate capacitor having area of each plate 1 m² and electric field between plates is 100 V/m. Find magnitude of charge on each plate.
(A) 8.85 × 10⁻¹⁰ C
(B) 7.85 × 10⁻¹⁰ C
(C) 6.85 × 10⁻¹⁰ C
(D) 9.85 × 10⁻¹⁰ C

26. Consider a vertical cylinder with a partition of mass m separating the cylinder having length l₁ and l₂ with l₁ length lying above the partition. If n moles of gas is given in each chamber at temperature T. Find the mass of piston for it to remain in equilibrium.
(A) \( \frac{nRT}{g} \left( \frac{l_1-l_2}{l_1l_2} \right) \)
(B) \( \frac{2nRT}{g} \left( \frac{l_1-l_2}{l_1l_2} \right) \)
(C) \( \frac{nRT}{g} \left( \frac{l_2-l_1}{l_1l_2} \right) \)
(D) \( \frac{nRT}{g} \left( \frac{l_2+l_1}{l_1l_2} \right) \)

27. After undergoing 6 α – decay and 4 β decay the radioactive nucleus of \( ^{232}_{90}Th \) gets converted into \( ^aZX \), the value of A and Z are
(A) 204 & 80
(B) 208 & 82
28. Intensity of radiation at surface of sun is $10^8 \text{W/m}^2$. RMS value of magnetic induction is
(A) $10^{-2} T$
(B) $10^{-4} T$
(C) $1 T$
(D) $10 T$

29. In a Searl's experiment, relative density of block is 8. When wire is loaded with block elongation is 4 mm. If block is submerged completely in liquid of relative density 2 then elongation in wire will be
(A) 3 mm
(B) 5 mm
(C) 2 mm
(D) 6 mm

Chemistry

1. Find the product of the following reaction:

![Chemical Structure](image)
2. Volume strength of \(1 MH_2O_2\)
   (A) 11.35
   (B) 22.7
   (C) 34.05
   (D) 5.6

3. Monomer of Nylon–66
   (A) \(HCOO(CH_2)_4COOH, NH_2(CH_2)_6NH_2\)
   (B) \(HCOO(CH_2)_2COOH, NH_2(CH_2)_4NH_2\)
   (C) \(HCOO(CH_2)_4COOH, NH_2(CH_2)_4NH_2\)
   (D) \(HCOO(CH_2)_6COOH, NH_2(CH_2)_6NH_2\)

4. Which one of these does not show catenation.
   (A) C
   (B) Si
   (C) Ge
   (D) Pb

5. 

   \[
   \begin{align*}
   \text{(1) } & NaNO_2 | H^+ \\
   \text{(2) } & CrO_4 | H^+ \\
   \text{(3) } & H^+
   \end{align*}
   \]

   \(X\) will be (major)
6. 'X' is

\[
\begin{align*}
\text{CH}_3 & \quad \text{HCl} \quad \text{C=CH}_2 \\
\text{C} \quad \text{O} & \\
\text{O} & \\
\end{align*}
\]

\text{X}

(A) 

(B) 

(C) 

(D)
7. X will be

(A) \begin{tikzpicture}
\node (a) at (0,0) {Br};
\node (b) at (1,0) {Br};
\end{tikzpicture}

(B) \begin{tikzpicture}
\node (a) at (0,0) {\text{CH}_2\text{=CH}_2};
\node (b) at (1,0) {Br};
\end{tikzpicture}

(C) \begin{tikzpicture}
\node (a) at (0,0) {\text{CH}_2\text{=CH}_2};
\node (b) at (1,0) {\text{CH}_2\text{=CH}_2};
\end{tikzpicture}

(D) \begin{tikzpicture}
\node (a) at (0,0) {\text{CH}_3};
\node (b) at (1,0) {\text{CH}_3};
\end{tikzpicture}

8. X will be

(A) \begin{tikzpicture}
\node (a) at (0,0) {\text{CH}_3\text{=CH}_3};
\node (b) at (1,0) {\text{COCH}_3};
\end{tikzpicture}

(B) \begin{tikzpicture}
\node (a) at (0,0) {\text{CH}_3\text{=CH}_3};
\node (b) at (1,0) {\text{COOEt}};
\end{tikzpicture}
9. Which of the following is not a component of photochemical smog?
   (A) $\text{CF}_2\text{Cl}_2$
   (B) Acrolein
   (C) Peroxynitrate
   (D) $\text{O}_3$

10. Consider the following reaction

\[
\text{C} + \text{O}_2 \rightarrow \text{CO}_2 \quad \Delta H_1 = x \quad \ldots (i)
\]

\[
\text{C} + \frac{1}{2} \text{O}_2 \rightarrow \text{CO} \quad \Delta H_2 = y \quad \ldots (ii)
\]

\[
\text{CO} + \frac{1}{2} \text{O}_2 \rightarrow \text{CO}_2 \quad \Delta H_3 = z \quad \ldots (iii)
\]

What is the relation between $x, y, z$?

(A) $x = y + z$

(B) $x = y - z$

(C) $2x = y + z$

(D) $y = x + z$
12. An octahedral homoleptic complex of $Mn^{+2}$ having $\mu = 5.93 \text{ BM}$ will have which of the following ligand
(A) $NCS^-$
(B) $CN^-$
(C) $\text{en}$
(D) $CO$

13. $Cl_2$ is reacting with hot concentrate NaOH. The product will be
(A) $Cl^-, ClO^-$
(B) $Cl^-, ClO_2^-$
(C) $Cl^-, ClO_3^-$
(D) $OCl^-, ClO_3^-$

14. $x$ gram of benzoic acid dissolved in 30 $gm$ of benzene then $\Delta T_y = 2$ degree of association of benzoic acid is 80%, $k_y = 5$
(A) 12.2
(B) 24.4
(C) 36.6
(D) 18.3

15. De-Broglie’s wave length of $e^-$ in H-like species $1.5 \pi a_0$, Calculate $\frac{n}{Z}$
(A) $\frac{3}{4}$
(B) $\frac{3}{2}$
(C) 1
(D) $\frac{1}{2}$

16. 8g NaOH present in 18g of water. Determine mole fraction of NaOH and molality
(A) 0.167,22
(B) 0.167,11
(C) 0.2,11
(D) 0.2,22

17. $K_{sp}$ of $Ag_2CO_3$ is $8 \times 10^{-12}$, Solubility of $Ag_2CO_3$ in 0.1$M$ $AgNO_3$.
(A) $8 \times 10^{-10} M$
(B) $2 \times 10^{-6} M$
18. Which of the following has strongest $p\pi - p\pi$ bonding?
   (A) $C$
   (B) $Si$
   (C) $Ge$
   (D) $Pb$

19. On heating gas in an open vessel, if the gas escaped at $T_i = 27^\circ C$ then $T$ is?
   (A) 500 K
   (B) 750 K
   (C) 900 K
   (D) 700 K

20. Which of the following is correct order if size
   (A) $Nd > Ho > Ce > Eu$
   (B) $Eu > Ce > Ho > Nd$
   (C) $Ce > Nd > Eu > Ho$
   (D) $Nd > Ho > Fu > Ce$

21. Which of the following doesn’t required calcination
   (A) $Fe_2O_3\cdot xH_2O, MgO$
   (B) $ZnO, MgO$
   (C) $ZnCO_3, MgO$
   (D) $CaCO_3, CaO$

22. Calculate degree of ionization ($\alpha$) for weak acid HA. Given.
   \[ \lambda_0^*(NaCl) = 148.4 \]
   \[ \lambda_M^*(NaA) = 425.9 \]
   \[ \lambda_M^*(HCl) = 122.6 \]
Specific conductance $K$ for $10^{-3} \, M \, HA = 5 \times 10^{-5}$

(A) 0.225  
(B) 0.125  
(C) 0.5  
(D) 0.1

23. Which of the following incorrect?

(A) Tyndall effect is used to distinguish between colloidal and true solution  
(B) Latex acidic solution is colloid of rubber with (+)ve charge  
(C) Lyophilic colloid can be coagulated by adding electrolyte  
(D) Artificial ran can be created by spreading electrified sand of opposite charge on clouds by a aero plane

24. Which of the following is not isothermal process/expansion?

(A) \[
\begin{array}{c}
\text{P} \\
\frac{1}{V}
\end{array}
\]

(B) \[
\begin{array}{c}
\text{U} \\
V
\end{array}
\]

(C) \[
\begin{array}{c}
\text{PV} \\
P
\end{array}
\]

(D) \[
\begin{array}{c}
\text{P} \\
V
\end{array}
\]
25. Potassium is used as
(1) for enzyme activation
(2) Like sodium it helps in transportation of nerve signal
(3) Oxidizes ATP
Which of the above are correct statement (S)
(A) 2 Only
(B) 1,2,3
(C) 1,2
(D) 2,3

26. Which of the following aldehyde will not give Grignard product?

(A) P & Q
(B) Q & R
(C) P, Q, & S
(D) P & S