1. The velocity (v) and time (t) graph of the body in straight line motion is shown in the figure. The point S is at 4.33 seconds. The total distance covered by the body in 6 second is:

\[
\begin{align*}
\text{V(m/s)} & \quad \text{t(s)} \\
\hline
4 & \quad 1 \\
2 & \quad 3 \\
-2 & \quad 5 \\
& \quad 6
\end{align*}
\]

a) \(\frac{11}{4} m\)  
 b) \(\frac{49}{4} m\)  
 c) \(\frac{37}{3} m\)  
 d) 12m
2. Two coherent sources of a sound $S_1$ and $S_2$ produce sound waves of the same wavelength $\lambda = 1\text{m}$ in the phase. $S_1$ and $S_2$ are placed 1.5m apart. A listener located at L, directly in front of $S_2$ find that the intensity is at a min. When he is 2m away from $S_2$. The listener moves away from $S_1$ keeping his distance from $S_2$ fixed. The adjacent maximum of intensity is observed when the listener is at a distance $d$ from $S_1$. Then $d$ is:

a) 5m  

b) 12m  
c) 2m  
d) 3m

Correct Answer: There is some error in question or more data required

3. Two Zener diode (A and B) having breakdown voltage of 6V and 4V respectively, are connected. The voltage $V_0$ variation with i/p voltage linearly increasing with time is given by: ($V_{input} = 0$) ($V$ at $t=0$)
4. In an experiment verify stokes law, a small spherical ball of radius \( r \) and density \( \rho \) falls under gravity through distance \( h \) in air before entering a tank of water. If the terminal velocity of ball inside water is same as its velocity just before entering the water surface, then the value of \( h \) is proportional to (ignore viscosity of air):

a) \( r^4 \)  

b) \( r^3 \)  

c) \( r \)  

d) \( r^2 \)

Correct Answer: a) \( r^4 \)

5. A spaceship in space sweeps stationary interplanetary dust. As a result, its mass increases at a rate

\[
\frac{dM(t)}{dt} = bv^2(t)
\]

where \( v(t) \) is its instantaneous velocity. The instantaneous acceleration of the satellite is:

a) \( \frac{-2bv^3}{M(t)} \)  

b) \( \frac{-bv^3}{M(t)} \)  

c) \(-bv^3(t)\)  

d) \( \frac{-bv^3}{2M(t)} \)
6. Two different wires having length \(L_1\) and \(L_2\) and respective temperature coefficient of linear expression \(\alpha_1\) and \(\alpha_2\) are joined end to end. Then the effective temperature coefficient of linear expansion is:

\[
\frac{\alpha_1 L_1 + \alpha_2 L_2}{L_1 + L_2}
\]

Correct Answer: a)

\[
\frac{\alpha_1 L_1 + \alpha_2 L_2}{L_1 + L_2}
\]

7. In an adiabatic process, the density of a diatomic gas becomes 32 times its initial value. The final pressure of the gas is found to be \(n\) times the initial pressure. The value of \(n\) is:

\[
a) \frac{1}{128} \quad b) 32 \quad c) 326 \quad d) 32
\]

Correct Answer: a) 128

8. An iron rod of volume \(10^{-3}\text{m}^3\) and relative permeability 1000 is placed as core in a solenoid with 10 turns/cm. If a current of 0.5A is passed through the solenoid, then the magnetic moment of rod will be:

\[
a) 500 \times 10^2 \text{Am}^2 \quad b) 0.5 \times 10^2 \text{Am}^2 \quad c) 50 \times 10^2 \text{Am}^2 \quad d) 5 \times 10^2 \text{Am}^2
\]

Correct Answer: c) \(50 \times 10^2 \text{Am}^2\)

9. Ten charges are placed on the circumference of a circle of radius \(R\) with constant angular separation between successive charges. Alternate charges 1, 3, 5, 7, 9 have charge \((+q)\) each while 2, 4, 6, 8, 10 have charge \((-q)\) each. The potential \(V\) and the electric field \(E\) at the centre of circle are respectively (Take \(V = 0\) at \(w\)):
Q10) In the circuit given in figure current is different branches and the value of the one resistor are shown. The potential at point B with respect to A is?

1) -1 V 2) + 1V 3) +2V 4) -2V

Correct Answer: 2) + 1V

Q11) A driver in a car approaching a vertical wall notices that the frequency of his ear horn has changed from 440 Hz to 480 Hz when it gets reflected from the wall. If the speed of sound in air is 345 m/s, then the speed of the car is:

1) 36km/hr 2) 18 km/hr 3) 24 km/hr 4) 54 km/hr

Correct Answer: 4) 54 km/hr

Q12) An infinitely long straight wire carrying current I, one side open rectangular loop & a conductor C with a sliding connector are located in the same place. The conductor has the length l and resistance R. If slides to the right with a velocity c, The resistance of conductor & and self-inductance of the loop are negligible. The induced current in the loop as a function of separation r, between the connector & straight wire, is:

Correct Answer: a) V=0, E=0
Q13. A radioactive nucleus decays by two different processes. The half-life for the 1st process is 10s and that for the 2nd process 100s. The effective half-life of the nucleus is close to:

1) 55s
2) 9 sec
3) 6s
4) 12s

Correct Answer: 2) 9 sec

Q14) In the electrical circuit shown, the charge on the capacitor is:

\[ \frac{\mu_0}{\pi} \cdot \frac{Ivl}{Rr} \]

1) \[ \frac{\mu_0}{\pi} \cdot \frac{Ivl}{Rr} \]
2) \[ 2\pi \cdot \frac{Ivl}{Rr} \]
3) \[ \frac{\mu_0}{\pi} \cdot \frac{Ivl}{Rr} \]
4) \[ \frac{\mu_0}{4\pi} \cdot \frac{Ivl}{Rr} \]

Correct Answer: there is some error in question or more data required
15) In acceleration due to gravity in the earth’s surface at the poles is $g$ and angular velocity of the earth about the axis passing through the poles is $\omega$. An object is weighted at the equator & at the height $h$ above the poles by using a spring balance. If the weights are found to be the same, then $h$ is; ($h << R$ where $R$ = radius of the earth)

\[
\frac{R^2 \omega^2}{4g}
\]

1) \(5.45 \mu c\)

2) \(10.90 \mu c\)

3) \(16.36 \mu c\)

4) \(18.00 \mu c\)

Correct Answer: 3) \(16.36 \mu c\)
\[
\frac{R^2 \omega^2}{2g}
\]

Correct Answer: 3) 

Q16) An galvanometer is used in the laboratory for detecting the null point in the electrical experiments. If on passing a current of 5 mA it produces a deflection of \(2^\circ\), its figure of merit is close to:-

1) \(6 \times 10^{-3} \text{A/}\text{div}\)  
2) \(333^\circ \text{A/}\text{div}\)  
3) \(3 \times 10^{-3} \text{A/}\text{div}\)  
4) \(666^\circ \text{A/}\text{div}\)

Correct Answer: c) \(3 \times 10^{-3} \text{A/}\text{div}\)

\[
x = \frac{1}{\sqrt{\mu \varepsilon_0}}, \quad y = \frac{E}{B}, \quad z = \frac{2}{CR}
\]

Q17) The quantities \(x\) and \(y\) are defined where \(C\) - capacitance, \(R\) - resistance, \(l\) - length, \(E\) - Electric field, \(B\) - magnetic field \(\varepsilon_0\\mu_0\) - free space permittivity and permeability respectively, then:

1) only \(y\) and \(z\) have same dimension
2) only \(x\) and \(z\) have same dimension
3) only \(x\) and \(y\) have same dimension
4) \(x\), \(y\), and \(z\) have same dimension

Correct Answer: 4) \(x\), \(y\), and \(z\) have same dimension

Q18) Match the columns:

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation</td>
<td>Wavelength</td>
</tr>
<tr>
<td>a. Microwave</td>
<td>i. 100m</td>
</tr>
<tr>
<td>b. Gamma rays</td>
<td>ii. (10^{-15}) m</td>
</tr>
<tr>
<td>I</td>
<td>Radiation</td>
</tr>
<tr>
<td>----</td>
<td>----------------------------</td>
</tr>
<tr>
<td>c</td>
<td>All radio waves</td>
</tr>
<tr>
<td>d</td>
<td>X-rays</td>
</tr>
</tbody>
</table>

1) a - (i), b - (iii), c - (iv), d - (ii)
2) a - (ii), b - (i), c - (iv), d - (ii)
3) a - (iii), b - (i), c - (i), d - (iv)
4) a - (iv), b - (ii), c - (i), d - (iii)

*Correct Answer:* 4) a - (iv), b - (ii), c - (i), d - (iii)

---

Q19) A parallel plate capacitor has a plate of length l, width w, & separation of plates is d. If it is connected to a battery of emf V, a dielectric slab of the same thickness d & of dielectric constant K = 4 is being inserted between the plates of the capacitor. At what length of the slab inside states, will the energy stored in the capacitor be two times its initial energy stored?

\[
\frac{2l}{3}
\]
1) \(\frac{2l}{3}\)
\[
\frac{l}{2}
\]
2) \(\frac{l}{2}\)
\[
\frac{l}{3}
\]
3) \(\frac{l}{3}\)
\[
\frac{l}{4}
\]
4) \(\frac{l}{4}\)

*Correct Answer:* 3) \(\frac{l}{3}\)
20) A ring is hung on a nail. It can oscillate without slipping or sliding (i) in its plane with a time period $T_1$ and (ii) back and forth in a direction perpendicular to its plane with a period $T_2$. The ratio $\frac{T_1}{T_2}$ will be...

\[ \frac{\sqrt{2}}{3} \]

a) \( \frac{2}{3} \)

b) \( \frac{2}{\sqrt{3}} \)

c) \( \frac{2}{\sqrt{3}} \)

d) \( \frac{\sqrt{2}}{} \)

Correct Answer: c) \( \frac{2}{\sqrt{3}} \)

21) A body of mass 2kg is driven by an engine delivering a constant power of 1J/s. The body starts from rest and moves in a straight line. After 9s, the body has moved a distance (in m) ......

Correct Answer: 18

22) Nitrogen gas at $300^\circ$ temp. The temp(in K) at which the rms speed of $H_2$ molecule would be equal to the rms speed of a nitrogen molecule is (Molar mass of $N_2$ gas is 28gm).

Correct Answer: 41

23) A prism of angle $A = 1^\circ$ has a refractive index $\mu = 1.5$. A good estimate for minimum angle of deviation(in degrees) is close to $N/10$. The value of $N$ is...

Correct Answer: 5
24) The surface of a metal is illuminated alternatively with photons of energies $E=4\text{eV}$ and $E=2.5\text{eV}$ respectively. The ratio of maximum speeds of the photoelectrons emitted is the two cases is 2. The work function of the metal in eV is $\ldots$.V.

Correct Answer: 1

25) A thin rod of mass 0.9kg length 1m is suspended at rest from one end so that it can oscillate in the vertical plane. A particle of mass 0.5kg moves in a straight line with a velocity 80m/s hits the rod at its bottom most point & sticks to it. The angular speed in rad/sec of it immediately after the collision will be $\ldots$. 

Correct Answer: 20

Subject: Chemistry

1) Lattice enthalpy and enthalpy of solution of NaCl are $788\text{ K J mol}^{-1}$ and $4K\text{ J mol}^{-1}$ respectively. The hydration enthalpy of NaCl is...

a) $-780\text{ K J mol}^{-1}$
b) 780 c) -784 d) 784

Correct answer: Option(d)

2) The correct order of ionic radii of $O^{2-}, N^{3-}, F^-, Mg^{2+}, Na^+, Al^{3+}$ is

a) $N^{3-} < F^- < O^{2-} < Mg^{2+} < Na^+ < Al^{3+}$
b) $Al^{3+} < Na^+ < Mg^{2+} < O^{2-} < F^- < N^{3-}$
c) $N^{3-} < O^{2-} < F^- < Na^+ < Mg^{2+} < Al^{3+}$
d). $Al^{3+} < Mg^{2+} < Na^{+} < F^{-} < O^{2-} < N^{3-}$

Correct answer: Option(d)

====================================================================================================================================

Que.- 3 - The variation of molar conductivity with concn. of an electrolyte $x$ in aqueous soln. is shown in the given fig.

The electrolyte $x$ is:

(a) $CH_{3}COOH$  (b) $HCl$  (c) $NaCl$  (d) $KNO_{3}$

Correct answer: Option(a)

====================================================================================================================================

Que.-4- Among the following compound geometrical isomerism to exhibited by:

(a)  
(b)  
(c)  
(d)
Correct answer: *** Some problems in question. Both (b) and (c) will show geometrical isomerism.

Que. 5 - Adsorption of gas follows Freundlich absorption isotherm. If $x$ is the man of the gas absorbed on mass $m$ of the adsorbent, the correct plot of $\frac{x}{m}$ v/s $P$ is :-

(a) ![Graph A](image1)
(b) ![Graph B](image2)
(c) ![Graph C](image3)

Correct answer: Option (d)

Que. 6 - Which one of the following polymers is not obtained by condensation polymerisation?

(a) Nylon 6, 6  
(b) Buna N  
(c) Nylon 6
Que. 7- The correct statement about partially density / except at a distance from nucleus is :-
(a) it can be zero for $1s$ orbital
(b) it can be zero for $2s$ orbital
(c) it can never be zero for $2$ orbital
(d) it can be negative for $2p$ orbital
Correct answer: Option(b)

Q8) Boron & Silicon of very high priority can be obtained through:
a) Zone refining  
b) Liquation  
c) Electrolytic refining  
d) Vapour Phase refining
Correct answer: Option(a)

Que. 9 - The method that is NOT suitable for the removal of permanent hardness of water :-
(a) Claritic method
(b) Iron exchange method
(c) Calgoris method
(d) Treatment with sodium carbonate.
Correct answer: Option(a)
10. The major product form in the following reaction

\[ CH_3CH = CHCH(CH_3)_2 \xrightarrow{HBr} \]

a) \( CH_3CH_2CH(Br)CH(CH_3)_2 \)

b) \( Br(CH_2)_3CH(CH_3)_2 \)

c) \( CH_3CH(Br)CH_2CH(CH_3)_2 \)

d) \( CH_3CH_2CH_2C(Br)(CH_3)_2 \)

Correct answer: Option(c)

11. The rate constant \( k \) of a reaction is measured at different temperature \( T \) and data are plotted in given fig. the activation energy of the reaction in KJ/mol is ( \( R \)-gas constant)

a) \( 2R \)
12. An element crystallizes in a face centered cubic (fcc) unit cell with cell edge a. The distance between the centre of two nearest octahedral voids in the crystal lattice is:

\[ \frac{a}{2 \sqrt{2}} \]

Correct answer: Option(c)

13. Reaction of ammonia with exam of Cl₂ gives

a) \( \text{NCl}_3 \& \text{HCl} \)

b) \( \text{NH}_4\text{Cl} \& \text{HCl} \)

c) \( \text{NH}_4\text{Cl} \& \text{N}_2 \)

d) \( \text{NCl}_3 \& \text{NH}_4\text{Cl} \)

Correct answer: Option(a)

14. The increasing order of boiling pts of the following compound is:
15. Hydrogen peroxide in pure state is:

a) linear and almost colorless
b) non-linear & almost colorless
c) planar & blue in color
d) linear & blue in color

Correct answer: Option (b)

---

Que. -16- The final major product of following reaction is:

\[ I < III < IV < II \]

a) \[ I < IV < III < II \]

b) \[ IV < I < II < III \]

c) \[ III < I < II < IV \]

d) \[ III < I < II < IV \]

Correct answer: ***None of the given options match with the experimental data.***
17. The compound that has the largest H-M-H bond angle (M=N,O,S,C) is:
   a) \( CH_4 \)
   b) \( H_2O \)
   c) \( H_2S \)
   d) \( NH_3 \)
   Correct answer: Option(a)

18. The following molecules act as an:
a) Antidepranant

b) Anti-bacterial

c) Antiseptic
d) Anti-histamine

**Correct answer: Option(d)**
trans- \([Co(en)_2Cl_2]^+\) (A) and cis- \([Co(en)_2Cl_2]^+\) (B)

The correct statement regarding them is:-

(a) Both (A) & (B) cannot be optically active.
(b) Both (A) & (B) can be optically active.
(c) A cannot be optically active but B can be optically active.
(d) A can be optically active but B cannot be optically active.

Correct answer: Option(c)

---

Que.-21 - The volume in \(mL\) of 0.02 \(\mu\)\(K_2Cr_2O_7\) soln. required to react with 0.288 gm of ferrons oxdate in acidic medium is (Molar mass of \(Fe = 56 \text{ g/mol}\) )

The correct answer is 50

---

Que.-22 - The no. of chiral carbons present in sucrose is -----

The correct answer is 9

---

Que.-23 - Considering that \(\Delta G > P\), the magnetic moment in \(BM\) of \([Ru(H_2O)_6]^{2+}\) would be _____?

The correct answer is 0

---

24) For a reaction \(X + Y \rightleftharpoons Z\), 1.0 mol of X, 1.5mol of Y and 0.5mol of Z were taken in a 1L vessel and allowed to react. At equilibrium, concentration of Z was 1mol/L. The equilibrium constant of reaction is \(x/16\). What is \(x\)?

The correct answer is 16
25) For a dimerization reaction

\[ 2A(g) \rightarrow A_2(g) \text{ at } 298K, \Delta U^\circ = -20 KJ/mol, \text{ and} \]
\[ \Delta S^\circ = -30 Jk^{-1}mol^{-1} \]

then \( \Delta G^\circ \) will be ....

The correct answer is -13.54

Q

\[
\lim_{x \to 0} \frac{x \left( e^{(\sqrt{1+x^2+x^4}-x^2)} - 1 \right)}{\sqrt{1+x^2+x^4} - 1}
\]

a) is equal to 1
b) is equal to 0
c) doesn't exist
d) is equal to \( \sqrt{C} \)

Correct Answer:
a) is equal to 1
2) If the sum of first 20 terms of the series $\log_{\left(\frac{7}{3}\right)} x + \log_{\left(\frac{7}{3}\right)} x + \log_{\left(\frac{7}{3}\right)} x + \ldots$ is 460 then $x = ?$

a) $e^2$

b) $7^{1/2}$

c) $7^{46/21}$

d) $7^2$

Correct Answer: d) $7^2$

3) If $L = \sin^2 \left(\frac{\pi}{16}\right) - \sin^2 \left(\frac{\pi}{8}\right)$ and $M = \cos^2 \left(\frac{\pi}{16}\right) - \sin^2 \left(\frac{\pi}{8}\right)$ then

$L = \frac{1}{2\sqrt{2}} - \frac{1}{2} \cos \left(\frac{\pi}{8}\right)$

b) $L = \frac{1}{2\sqrt{2}} + \frac{1}{4} \cos \left(\frac{\pi}{8}\right)$

c) $M = \frac{1}{2\sqrt{2}} + \frac{1}{2} \cos \left(\frac{\pi}{8}\right)$

d) $M = \frac{1}{4\sqrt{2}} + \frac{1}{4} \cos \left(\frac{\pi}{8}\right)$

Correct Answer: c) $M = \frac{1}{2\sqrt{2}} + \frac{1}{2} \cos \left(\frac{\pi}{8}\right)$

4) If mean and standard deviation of the data 3,5,7,a,b are 5 & 2. Roots of the eqn:-
5) The area in sq units of the region \( A = \{(x, y) = (x - 1) \mid x \leq y \leq 2\sqrt{x}, \; 0 \leq x \leq 2\} \)

where \([x]\) denotes the greatest integer function is

\[
\frac{8}{3} \sqrt{2} - \frac{1}{2}
\]

a) \( \frac{4}{3} \sqrt{2} + 1 \)

b) \( \frac{4}{3} \sqrt{2} - \frac{1}{2} \)

c) \( 3 \sqrt{2} - 1 \)

d) \( 3 \sqrt{2} - 1 \)

Correct Answer: a) \( \frac{8}{3} \sqrt{2} - \frac{1}{2} \)

6) If the sum of the second, 3rd, 4th terms of a positive term GP is 3 & the sum of 6th, 7th & 8th terms is 243 then the sum of first 50 terms of GP is
Q7) \( \int \frac{\cos \theta}{5 + 7 \sin \theta - 2 \cos \theta} \, d\theta = A \log_e(B(\theta)) + C \) where, \( C = \text{constant of integration} \), then \( B(\theta) = \)

a) \( \frac{2 \sin \theta + 1}{1,5(\sin \theta + 3)} \)

b) \( \frac{2 \sin \theta + 1}{\sin \theta + 3} \)

c) \( \frac{5(\sin \theta + 3)}{2 \sin \theta + 1} \)

d) \( \frac{5(2 \sin \theta + 1)}{\sin \theta + 3} \)

Correct Answer: 4) \( \frac{5(2 \sin \theta + 1)}{\sin \theta + 3} \)
Q8) The derivative of \( \tan^{-1}\left\{ \frac{\sqrt{1 + x^2} - 1}{x} \right\} \) with respect to \( x \) at \( x = \frac{1}{2} \) is

1) \( \frac{2\sqrt{3}}{5} \)
2) \( \frac{\sqrt{3}}{10} \)
3) \( \frac{2\sqrt{3}}{3} \)
4) \( \frac{\sqrt{3}}{12} \)

Correct Answer: 2) \( \frac{\sqrt{3}}{10} \)

Q9) Let \( y = y(x) \) be the solution of the differential equation \( \cos x \frac{dy}{dx} + 2y \sin x = \sin 2x \), \( x \in \left(0, \frac{\pi}{2}\right) \). If \( y\left(\frac{\pi}{3}\right) = 0 \), then \( y\left(\frac{\pi}{4}\right) \) is equal to:

1) \( 2 + \sqrt{2} \)
2) \( \frac{1}{\sqrt{2}} - 1 \)
3) \( 2 - \sqrt{2} \)
4) \( \sqrt{2} - 2 \)

Correct Answer:
4) \( \sqrt{2} - 2 \)
Q10) There are 3 sections in a question paper & each section contains 5 questions. A candidate has to answer a total of 5 questions, choosing at least one question from each section. Then the number of ways in which the candidate can choose questions is:

1) 3000
2) 2250
3) 2255
4) 1500

**Correct Answer:** 2) 2250

Q11) If \( x = 1 \) is a critical point of a function \( f(x) = (3x^2 + ax - 2 - a)e^x \), then

1) \( x = 1 \) is a local maxima and \( x = \frac{-2}{3} \) is a local minima of \( f \).
2) \( x = \frac{-2}{3} \) is a local maxima and \( x = 1 \) is a local minima of \( f \).
3) \( x = \frac{-2}{3} \) and \( x = 1 \) are local minima of \( f \).
4) \( x = \frac{-2}{3} \) and \( x = 1 \) are local maxima of \( f \).

**Correct Answer:** 2) \( x = \frac{-2}{3} \) is a local maxima and \( x = 1 \) a local minima of \( f \)

Q12) If for some \( \alpha \in \mathbb{R} \), the lines

\[
L_1 : \frac{x + 1}{2} = \frac{y - 2}{-1} = \frac{z - 1}{1}
\]

and
L₂ : \( \frac{x + 2}{\alpha} = \frac{y + 1}{5 - \alpha} = \frac{z + 1}{1} \) are coplanar then the line L₂ passes through the point:

1) (2, -10, -2)
2) (10, 2, 2)
3) 10, -2, -2)
4) (-2, 10, 2)

Correct Answer:
1) (2, -10, -2)

Q13) If the length of the chord of the circle \( x^2 + y^2 = r^2 \) \((r > 0)\) along the line \( y - 2x = 3 \) is \( r \), then \( r^2 \) is equal to

\( \frac{9}{5} \)
1) \( \frac{9}{5} \)
2) 12
3) \( \frac{12}{5} \)
4) \( \frac{24}{5} \)

Correct Answer: 3) \( \frac{12}{5} \)

Q14) Which of the following points lies on the tangent to the curve \( x^4 e^y + 2 \sqrt{y + 1} = 3 \) at the point (1, 0)?

1) (2, 2)
2) (-2, 6)
3) (-2,4)
4) (2,6)

Correct Answer: 2) (-2,6)

Q15) If \( \alpha \) \& \( \beta \) are the roots of the equation \( 7x^2 - 3x - 2 = 0 \), then value of \( \frac{\alpha}{1 - \alpha^2} + \frac{\beta}{1 - \beta^2} \) equals?

1) 1/24
2) 3/8
3) 27/16
4) 27/32

Correct Answer:
3) 27/16

16) The value of \( \left( \frac{-1 + i\sqrt{3}}{1 - i} \right)^{30} \) is

a) \(-2^{15} i\)
b) \(2^{15} i\)
c) \(-2^{15}\)
d) \(6^5\)

Correct Answer: b) \(2^{15} i\)
17) If \( a + x = b + y = c + z + 1 \), where \( a, b, c, x, y, z \) are non-zero distinct real nos then \( \begin{vmatrix} x & a + y & x + a \\
y & b + y & y + b \\
z & c + y & z + c \end{vmatrix} \) is equal to

a) \( y(a - c) \)

b) \( y(a - b) \)

c) \( y(b - a) \)

d) 0

Correct Answer: b) \( y(a - b) \)

18) If the line \( y = mx + c \) is a common tangent to the hyperbola \( \frac{x^2}{100} - \frac{y^2}{64} = 1 \) and the circle \( x^2 + y^2 = 36 \) then which one of the following is true?

a) \( 4c^2 = 369 \)

b) \( 5m = 4 \)

c) \( 8m + 5 = 0 \)

d) \( c^2 = 369 \)

Correct Answer:

a) \( 4c^2 = 369 \)

19) The statement \( (p \rightarrow (q \rightarrow p)) \rightarrow (p \rightarrow (p \lor q)) \) is

a) a contradiction
b) is equivalent to \((p \lor q) \land \neg p\)

c) a tautology

d) is equivalent to \((p \land q) \lor \neg q\)

**Correct Answer:**
c) a tautology

---

20) If the system of linear equations
\[
\begin{align*}
    x + y + 3z &= 0 \\
    x + 3y + k^2z &= 0 \\
    3x + y + 3z &= 0
\end{align*}
\]

has a non zero solution \((x, y, z)\) for some \(k \in \mathbb{R}\)

then \(x + \left(\frac{y}{z}\right) = ?\)

a)-9

b)9

c)3

d)-3

**Correct Answer:** d)-3

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21) If line \(x+y=a\) and \(x-y=b\) touch the curve \(y = x^2 - 3x + 2\) at the pts where the curve intersects the x-axis then \(a/b = ?\)

**Correct Answer:** 0.5
22) If \( A = \{a, b, c\} \) and \( B = \{(1, 2, 3, 4)\} \) then the no. of elements in the set \( C = \{ f : A \rightarrow B | 2 \in f(A) \text{ and } f \text{ is not one-one} \} \) is.....

Correct Answer: 7

23) The coefficient of \( x^4 \) in the expansion of \( (1 + x + x^2 + x^3)^6 \) in powers of \( x \) is........

Correct Answer: 120

24) Let the vectors \( \vec{a}, \vec{b}, \vec{c} \) such that \( \left| \vec{a} \right| = 2, \left| \vec{b} \right| = 4, \left| \vec{c} \right| = 4 \)

If the projection of \( \vec{b} \) on \( \vec{a} \) is equal to the projection of \( \vec{c} \) on \( \vec{a} \) and \( \vec{b} \) is \( \vec{c} \) then value of \( \left| \vec{a} + \vec{b} - \vec{c} \right| = ? \)

Correct Answer: 6

25) In a bombing attack there is 50% chance that a bomb will hit the target. At least two independent hits are required to destroy the target completely. Then the minimum no of bombs that must be dropped to ensure that there is at least 99% chance of completely destroying the target is ..

Correct Answer: 11