

## CHEMISTRY

**Q1.**

Which of the following will first impart red colour to Bunsen flame?

- (a) Ca
- (b) Ba
- (c) Sr
- (d) Ra

**Q2.**

Which of the following does not have N-N bond?

- (a)  $N_2O$
- (b)  $N_2O_3$
- (c)  $N_2O_4$
- (d)  $N_2O_5$

**Q3.**

In Mond's process of nickel purification which of the following is used?

- (a)  $Ni(CO)_4$
- (b)  $Ni(PPh_3)_2$
- (c)  $Ni(CO)_2 (PPh_3)_2$
- (d)  $Ni(C_5H_5)(NO)$

**Q4.**

The quantum numbers listed below are of four different electrons in an atom. Which of the following is incorrect?

- (a)  $n = 4, l = 0, m_l = 0, m_s = 1/2;$
- (b)  $n = 3, l = 2, m_l = -3, m_s = 1/2;$
- (c)  $n = 3, l = 2, m_l = -2, m_s = 1/2;$
- (d)  $n = 3, l = 1, m_l = 0, m_s = 1/2;$

**Q5.**

The order observed in the boiling point of the following aqueous solutions a = 0.030 m glycerin ; b = 0.02 m KBr; c = 0.030 m benzoic acid) is

- (a)  $a < c < b$
- (b)  $c < a < b$
- (c)  $b < c < a$
- (d)  $c < b < a$

**Q6.**

How many seconds will be required to produce 1.0 g of silver (atomic weight = 108) metal by the electrolysis of a  $\text{AgNO}_3$  solution using a current of 30 amps? ( $F = 96500 \text{ coul. Mol}^{-1}$ )

- (a)  $2.7 \times 10^4$
- (b)  $2.98 \times 10^1$
- (c)  $3.2 \times 10^3$
- (d)  $3.7 \times 10^{-5}$

**Q7.**

Which of the following sequence of bond orders is correct?

- (a)  $\text{O}_2^- < \text{O}_2 > \text{O}_2^+$
- (b)  $\text{O}_2^- > \text{O}_2 < \text{O}_2^+$
- (c)  $\text{O}_2^- < \text{O}_2 < \text{O}_2^+$
- (d)  $\text{O}_2^- > \text{O}_2 > \text{O}_2^+$

**Q8.**

The reaction of pentyl magnesium bromide with water would give

- (a) pent - 1 - ene
- (b) pentane
- (c) pent - 2 - ene
- (d) pentanol - 1

**Q9.**

At constant temperature and pressure 5 litres of a hydrocarbon require 15 litres of oxygen for complete combustion. The hydrocarbon is

- (a) ethane
- (b) ethyne
- (c) ethene
- (d) propane

**Q10.**

1-butyene may be prepared by the reaction of acetylene with

- (a) sodamide and ethyl bromide]
- (b) sodamide and propyl bromide
- (c) acetamide and ethyl bromide
- (d) benzamide and ethyl bromide

**Q11.**

10 mL of conc.  $\text{H}_2\text{SO}_4$  (18M) is diluted to 10 L. the approximate strength of the acid would be:

- (a) 0.18 N
- (b) 0.36 N
- (c) 0.036 N
- (d) 0.09 N

**Q12.**

Which transformation could take place at the anode of an electrochemical cell?

- (a)  $\text{Cr}^{3+}$  to  $\text{Cr}_2\text{O}_7^{2-}$
- (b)  $\text{O}_2$  to  $\text{H}_2\text{O}$
- (c)  $\text{F}_2$  to  $\text{F}^-$
- (d)  $\text{HAsO}_2$  to  $\text{As}$

**Q13.**

Which of the following statement is incorrect?

- (a) Ferrocene has Fe metal and is 18 e-species
- (b) All the ten carbons in ferrocene are equidistant from iron metal
- (c) Zeise's salt has Pt metal and is a 18 e- species.
- (d) In Zeise salt, ethylene is perpendicular to the  $\text{PtCl}_3$  plane.

**Q14.**

The reaction of saturated solution of  $\text{Na}_2\text{Cr}_2\text{O}_7$  with concentrated  $\text{H}_2\text{SO}_4$

- (a)  $\text{Cr}_2(\text{SO}_4)_3$
- (b)  $\text{CrO}_4^-$
- (c)  $\text{CrO}_3$
- (d)  $\text{CrOSO}_4$

**Q15.**

The basic building unit of all silicates is

- (a)  $\text{SiO}$
- (b)  $(\text{SiO}_3)^{3-}$
- (c)  $\text{SiO}_2$
- (d)  $(\text{SiO}_4)^{4-}$

**Q16.**

Use the table of data shown below to calculate the average rate of the reaction between 10s and 20s (A and B)

Time (s)	[A] mol. l <sup>-1</sup>
0	0.2
5	0.14
10	0.10
15	0.071
20	0.050

- (a)  $6 \times 10^{-3}$
- (b)  $8 \times 10^{-3}$
- (c)  $5 \times 10^{-3}$
- (d) 200

**Q17.**

When an insulator is heated, an electric charge is developed on the face of the insulator crystal. This phenomenon is known as

- (a) ferroelectric effect
- (b) paramagnetic effect
- (c) pyroelectric effect
- (d) piezoelectric effect

**Q18.**

X – ray diffraction studies indicated that the edge length of unit cell of fcc lattice of KF is 537.5 pm. The distance between K<sup>+</sup> and F<sup>-</sup> ions is

- (a) 385.3 pm
- (b) 179.3 pm
- (c) 268.3 pm
- (d) 136.3 pm

**Q19.**

Among the anions Cl<sup>-</sup>, SO<sub>4</sub><sup>-2</sup>, PO<sub>4</sub><sup>-3</sup>, the coagulating power follows the order

- (a) PO<sub>4</sub><sup>-3</sup> > Cl<sup>-</sup> > SO<sub>4</sub><sup>-2</sup>
- (b) PO<sub>4</sub><sup>-3</sup> > SO<sub>4</sub><sup>-2</sup> > Cl<sup>-</sup>
- (c) Cl<sup>-</sup> > SO<sub>4</sub><sup>-2</sup> > PO<sub>4</sub><sup>-3</sup>
- (d) SO<sub>4</sub><sup>-2</sup> > Cl<sup>-</sup> > PO<sub>4</sub><sup>-3</sup>

**Q20.**

Which of the following statements is true of the critical micelle concentration?

- (a) The surfactant molecules decompose
- (b) The surfactant molecules become completely soluble.
- (c) The surfactant molecules dissociate
- (d) The surfactant molecules associate

**Q21.**

Elevation in boiling point for 13.44 g of  $\text{CuCl}_2$  dissolved in 1 kg of water will be ( $K_b = 0.52 \text{ Km}^{-1}$ ; molar mass of  $\text{CuCl}_2 = 134.4 \text{ gmol}^{-1}$ )

- (a) 0.05
- (b) 0.10
- (c) 0.16
- (d) 0.20

**Q22.**

3-Phenylpropene on reaction with HBr gives (as a major product)

- (a)  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{Br})\text{CH}_3$
- (b)  $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH}_2\text{CH}_3$
- (c)  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
- (d)  $\text{C}_6\text{H}_5\text{CH}(\text{Br})\text{CH} = \text{CH}_2$ .

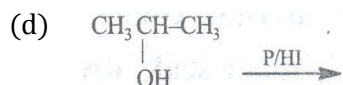
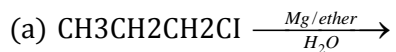
**Q23.**

$\text{CH} \equiv \text{CH}$  reacts with acetic acid in presence of  $\text{Hg}^{2+}$  to give

- (a)  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}(\text{OOC} \cdot \text{CH}_3)_2 \\ | \\ \text{CH}(\text{OOC} \cdot \text{CH}_3)_2 \end{array}$
- (b)  $\begin{array}{c} | \\ \text{CH}(\text{OOC} \cdot \text{CH}_3)_2 \\ | \\ \text{CH}_3 \end{array}$
- (c)  $\begin{array}{c} | \\ \text{CH}_2(\text{OOC} \cdot \text{CH}_3) \end{array}$
- (d) None of these

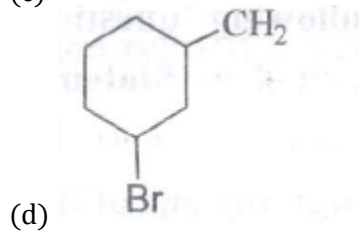
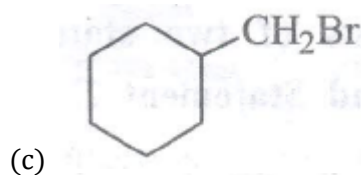
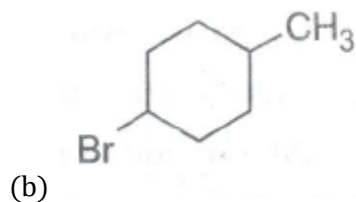
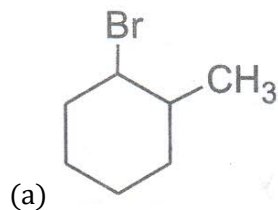
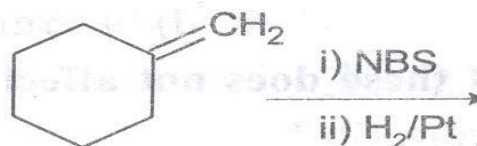
Q24.

Which of the following reactions will not give propane?



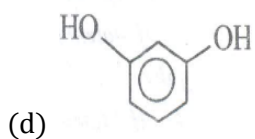
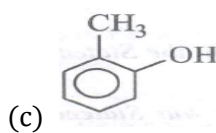
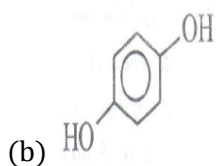
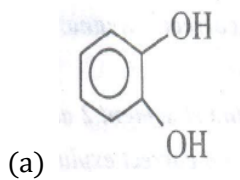
Q25.

What will be the product in the following reaction?



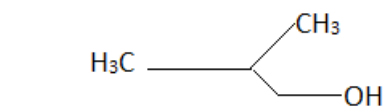
**Q26.**

Select the structural formula of catcehol.



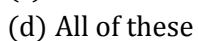
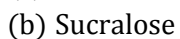
**Q27.**

Among the following the one that gives positive iodoform test upon reaction with  $I_2$  and  $NaOH$  is



**Q28.**

Which of the following artificial sweetening agent is unstable at cooking temperature :



**Q29.**

When  $\text{H}_2\text{S}$  gas is passed in metal sulphate solution in the presence of  $\text{NH}_4\text{OH}$ , a white precipitate is produced. The metal is

- (a) Zn
- (b) Fe
- (c) Pb
- (d) Hg

**Q30.**

Which of the following is peroxide :

- (a)  $\text{MnO}_2$
- (b)  $\text{SiO}_2$
- (c)  $\text{BaO}_2$
- (d) None of these

## PHYSICS

**Q1.**

Least count of Vernier calipers is  $1 \times 10^{-4}\text{m}$ . The main scale reading before zero is 9 and the zeroth division of Vernier scale division coincides with main scale division. Each main scale division is  $1 \times 10^{-3}\text{m}$ . Then the measured value is

- (a) 10mm
- (b) 9mm
- (c) 9.1mm
- (d) 9.01mm

**Q2.**

Which out of these does not affect the maximum height of a projectile?

- (a) Mass of projectile
- (b) Angle of projection
- (c) Acceleration of projectile
- (d) Magnitude of initial velocity



Following question consists of two statements printed as Statement 1 and Statement 2. While answering these questions you are required to select any one of the responses indicated as

1. If both Statement 1 and Statement 2 are true and Statement 2 is a correct explanation of Statement 1.
2. If both Statement 1 and Statement 2 are true but the Statement 2 is not a correct explanation of Statement 1.
3. If statement 1 is true but the Statement 2 is false.
4. If statement 1 is false but Statement 2 is true.

**Q3.**

Statement 1: As per law of conservation of momentum, momentum can never change.

Statement 2: Momentum is quantity of motion possessed by a body so there is no question of its change

- (a) 1 (b) 2  
(c) 3 (d) 4

**Q4.**

If momentum of a body increases by 50% kinetic energy will increase by

- (a) 50%  
(b) 150%  
(c) 125%  
(d) 100%

**Q5.**

A flywheel rotating about a fixed axis has a kinetic energy of 360 J when the angular speed is 30 rads<sup>-1</sup>. The moment of inertia of wheel about the axis of rotation is

- (a) 0.6 kgm<sup>2</sup>  
(b) 0.75 kgm<sup>2</sup>  
(c) 0.15 kgm<sup>2</sup>  
(d) 0.8kgm<sup>2</sup>

**Q6.**

The speed of the planet orbiting the sun

- (a) Increases in going from aphelion to perihelion  
(b) Increases in going from perihelion to aphelion  
(c) Remains same throughout  
(d) Varies at random

**Q7.**

Water rises in a capillary tube through a height  $h$ . If the tube is inclined to the liquid surface at  $30^\circ\text{C}$ , the liquid will rise in the tube upto its length equivalent to

- (a)  $h/2$
- (b)  $h$
- (c)  $2h$
- (d)  $4h$

**Q8.**

Steam of  $100^\circ\text{C}$  is passed into a calorimeter of water equivalent 10 mg containing 94 cc of water and 10 g of ice at  $0^\circ\text{C}$ . If the temperature of the calorimeter and its contents rises to  $5^\circ\text{C}$ , the amount of the steam passed is

- (a) 1g
- (b) 2g
- (c) 3g
- (d) 4g

**Q9.**

At room temperature, the rms speed of the molecule of a certain diatomic gas is found to be  $1930\text{ ms}^{-1}$ . The gas is

- (a)  $\text{H}_2$
- (b)  $\text{F}_2$
- (c)  $\text{O}_2$
- (d)  $\text{Cl}_2$

**Q10.**

The ratio of velocity of sound in hydrogen and oxygen at STP is

- (a) 16 : 1
- (b) 8 : 1
- (c) 4 : 1
- (d) 2 : 1

**Q11.**

When we hear a sound, we can identify its source from

- (a) The wavelength of sound
- (b) The overtones present in the sound
- (c) The intensity of sound
- (d) The amplitude of sound

**Q12.**

Four equal charges, each of charge  $Q$  are placed at the four corners of a body of side 'a' each. Work done to remove a charge  $-Q$  from the centre of the body to infinity is

- (a) 0
- (b)  $\sqrt{2}Q^2 / 4\pi\epsilon_0 a$
- (c)  $\sqrt{2}Q^2 / \pi \epsilon_0 a$
- (d)  $Q^2 / 2\pi \epsilon_0 a$

**Q13.**

The resistance of an incandescent lamp is

- (a) Greater when switched off
- (b) Smaller when switched off
- (c) Greater when Switched on
- (d) The same whether it is switched off or switched on

**Q14.**

A paramagnetic gas consists of atoms with dipole moment  $M$ . The temperature of gas is  $T_1$  and its volume density  $\rho$ . The thermal energy of each dipole compared magnetic potential energy in a magnetic field  $B$  is given by

- (a)  $3kT_1/2MB$
- (b)  $2kT_1/3MB$
- (c)  $2kT_1/MB$
- (d)  $kT_1/3MB$

**Q15.**

With a resistance  $R$  connected in series with a galvanometer of resistance  $100\Omega$ , it acts as a voltmeter of range  $0 - V$ . To double the range a resistance of  $1000\Omega$  is to be connected in series with  $R$ . The value of  $R$  is

- (a)  $1000\Omega$
- (b)  $1100\Omega$
- (c)  $800\Omega$
- (d)  $900\Omega$

**Q16.**

A pure resistive circuit element X when connected to an a.c. supply of peak voltage 200V gives a peak current of 5A. A second circuit element Y when connected to same a.c. supply gives the same value of peak current but the current lags behind by  $90^\circ$ . If series combination of X and Y is connected to the same supply, the impedance of the circuit is

- (a)  $40\sqrt{2}\ \Omega$
- (b)  $40\ \Omega$
- (c)  $80\ \Omega$
- (d)  $2\sqrt{40}\ \Omega$

**Q17.**

Magnetic flux through a circuit of resistance R changes by an amount  $\Delta\phi$  in time  $\Delta t$ . The total quantity of charge Q passing through any point in the circuit during  $\Delta t$  is represented by

- (a)  $Q = \frac{1}{R} \frac{\Delta\phi}{\Delta t}$
- (b)  $Q = \frac{\Delta\phi}{R}$
- (c)  $Q = \frac{\Delta\phi}{\Delta t}$
- (d)  $Q = R \frac{\Delta\phi}{\Delta t}$

**Q18.**

The part of the electromagnetic spectrum to which 2.7K belongs is

- (a) Radio
- (b) Microwave
- (c) X-ray
- (d)  $\gamma$ -rays

**Q19.**

A glass slab of thickness t and refractive index  $\mu$  is introduced between a projector and a screen. In order to get a sharp image, the screen may

- (a) Not be moved at all
- (b) Be moved away through a distance  $\frac{t}{\mu} (\mu - 1)$
- (c) Be moved towards the projector through a distance  $\frac{t}{\mu} (\mu + 1)$
- (d) Be moved through a distance  $\mu$

**Q20.**

Foucault's method in optics is popularly used to find the

- (a) Phase of light
- (b) Velocity of light
- (c) Frequency of light
- (d) Colour or wavelength of light

**Q21.**

If a thin prism of glass is dipped into water then minimum deviation of light w.r.t. air, produced by prism will be ( $\mu_g = 3/2$  and  $\mu_w = 4/3$ )

- (a) 1/2
- (b) 1/4
- (c) 2
- (d) 1/5

**Q22.**

When a monochromatic point source of light is at a distance of 0.2 m from a photoelectric current are respectively 0.6 V and 18 mA. If the same source is placed 0.6 m away from the photoelectric cell, then

- (a) The stopping potential will be 0.2 V
- (b) The stopping potential will be 0.6 V
- (c) The saturation current will be 6 mA
- (d) The saturation current will be 2 mA

**Q23.**

Three fourths of the active nuclei present in a radioactive sample decay in  $\frac{3}{4}$  s. The half life of the sample is

- (a) 1s
- (b)  $\frac{1}{2}$  s
- (c)  $\frac{3}{8}$  s
- (d)  $\frac{3}{4}$ s

**Q24.**

A photon is emitted as a result of transition of electron from nth orbit to one less than nth orbit when n is greater than 1. The frequency of this photon depends on n as

- (a)  $V \propto 1/n$
- (b)  $V \propto 1/n^2$
- (c)  $V \propto 1/n^3$
- (d)  $V \propto 1/n^4$

**Q25.**

The electrical conductivity of a semiconductor increases when electromagnetic of wavelength shorter than 2480 nm is incident on it. The band gap for semiconductor is

- (a) 0.9 eV
- (b) 0.7 eV
- (c) 0.5 eV
- (d) 1.1 eV

**Q26.**

On a particular day, the maximum frequency reflected from ionosphere is 10 MHz. One another day it was 8 MHz. The ratio of the maximum electron densities of the ionosphere on the days is

- (a) 16/25
- (b) 21/28
- (c) 28/21
- (d) 25/16

**Q27.**

A siren placed at a railway platform is emitted sound of frequency 5 kHz. A passenger sitting in a moving train A records a frequency of 5.5 kHz, while the train approaches the siren. The passenger in train B records a frequency of 6.0 kHz while approaching the same siren. The ratio of the velocity of train B to that of train A is

- (a) 242/252
- (b) 2
- (c) 5/6
- (d) 11/6

**Q28.**

A steady current flows in a metallic conductor of non uniform cross section. The quantity (quantities) constant along the length of the conductor is (are)

- (a) Current, electric field and drift speed
- (b) Drift speed only
- (c) Current and drift speed
- (d) Current only

**Q29.**

A uniform electric field pointing in positive x, direction exists in a region. Let A be the origin, B be the point on x-axis at  $x = +1$  cm and C be the point on the y-axis at  $y = +1$  cm. then the potentials at the points A, B and C satisfy

- (a)  $V_A < V_B$
- (b)  $V_A > V_B$
- (c)  $V_A < V_C$
- (d)  $V_A > V_C$

**Q30.**

Yellow light is used in a single slit diffraction experiment with slit width of 0.6 mm. If yellow light is replaced by X-rays, then the observed pattern will reveal

- (a) That the central maximum is narrower
- (b) More number of fringes
- (c) Less number of fringes
- (d) No diffraction pattern

### MATHEMATICS

**Q1**

The period of the function  $f(\theta) = \sin^4 \theta + \cos^4 \theta$  is

- (a)  $2\pi$
- (b)  $\pi$
- (c)  $\frac{\pi}{2}$
- (d)  $\frac{\pi}{4}$

**Q2**

Let  $R = \{(1, 3), (4, 2), (2, 4), (3, 1)\}$  be a relation on that set  $A = \{1, 2, 3, 4\}$ . The relation R is

- (a) Reflexive
- (b) Symmetric
- (c) Transitive
- (d) Antisymmetric

**Q3**

If the roots of the equation  $x^2 + bx + c = 0$  be two consecutive integers, then  $b^2 - 4c$  equals

- (a) 2
- (b) 1
- (c) -1
- (d) -2

**Q4**

The conjugate of a complex number  $\frac{i}{i+1}$  is

- (a)  $\frac{1-i}{2}$
- (b)  $\frac{1+i}{2}$
- (c)  $\frac{1}{i-1}$
- (d)  $\frac{2}{i+1}$

**Q5**

Let  $A = \begin{bmatrix} 2 & 2\alpha & \alpha \\ 0 & \alpha & 2\alpha \\ 0 & 0 & 2 \end{bmatrix}$  and  $|A^2| = 16$  then  $|\alpha|$  equals

- (a) 4
- (b) 2
- (c) 1
- (d) 8

**Q6**

If  $A^2 + A - I = 0$ , then inverse of A is

- (a)  $I - A$
- (b)  $A - I$
- (c)  $A$
- (d)  $A + I$

**Q7**

The number of ways in which 3 men and 4 women can dine at a round table, if no two men are to sit together, is given by

- (a)  $3! \times 4$
- (b)  $3 \times 4!$
- (c)  $3! \times 4!$
- (d)  $3 \times 4$

**Q8**

Two event A and B have probabilities 0.20 and 0.30 respectively. The probability that both A and B occurs simultaneously is 0.10. Then the probability that neither A nor B occurs is

- (a) 0.60
- (b) 0.40
- (c) 0.20
- (d) 0.80



**Q9**

For all  $n \in \mathbb{N}$ ,  $(2^{3n} - 1)$  is divisible by

- (a) 2
- (b) 3
- (c) 6
- (d) 7

**Q10**

The fourth term in the expansion of  $(x^2 + \frac{1}{x})^8$  is

- (a)  $28x^5$
- (b)  $56x^5$
- (c)  $x^8$
- (d)  $x^4$

**Q11**

The term independent of  $x$  in the expansion of  $(x^3 - \frac{1}{x^2})^{10}$  is

- (a) 210
- (b)  ${}^{10}C_3$
- (c)  ${}^{10}C_2$
- (d)  ${}^{10}C_5$

**Q12**

The sum of the series  $\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots$  is

- (a)  $\frac{(e^2 - 2)}{e}$
- (b)  $\frac{(e-1)^2}{2e}$
- (c)  $\frac{(e^2 - 1)}{2}$
- (d)  $\frac{(e^2 - 1)}{2e}$

**Q13**

If  $\frac{x^m}{y^n} = (x - y)^{(m-n)}$  then  $\frac{dy}{dx}$  is

- (a)  $xy$
- (b)  $\frac{x}{y}$
- (c)  $\frac{y}{x}$
- (d)  $x - y$

**Q14**

A value of  $c$  for which mean value theorem holds for function  $f(x) = x^2 + 3x$  on internal  $[2, 4]$  is

- (a) 3
- (b) 3.5
- (c) 2.5
- (d) None of these

**Q15**

The area bounded by the curve  $y = x^2$  and the straight line  $y = x$  is given by

- (a)  $\frac{1}{2}$
- (b)  $\frac{1}{3}$
- (c)  $\frac{1}{4}$
- (d)  $\frac{1}{6}$

**Q16**

$\int \frac{dx}{x(x^n - 1)}$  is equal to

- (a)  $\frac{1}{n} \log \left[ \frac{x^n - 1}{x^n} \right] + c$
- (b)  $\frac{1}{n} \log \left[ \frac{x^n + 1}{x^n} \right] + c$
- (c)  $\frac{1}{n} \log \left[ \frac{x^n}{x^n - 1} \right] + c$
- (d)  $\frac{1}{n} \log \left[ \frac{x^n}{x^n + 1} \right] + c$

**Q17**

$\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx$  is

- (a)  $\frac{\pi}{2}$
- (b)  $\frac{\pi}{4}$
- (c)  $\Pi$
- (d) 0

**Q18**

The solution of the equation  $\frac{d^2y}{dx^2} = e^{2x}$  is

- (a)  $\frac{e^{2x}}{4}$
- (b)  $\frac{e^{2x}}{4} + c$
- (c)  $\frac{e^{2x}}{2} + cx + d$
- (d) *None of these*

**Q19**

The order and degree of the differential equation  $\left(1 + \frac{dy}{dx}\right)^{\frac{4}{5}} = \frac{d^4y}{dx^4}$  are

- (a) (4, 5)
- (b) (5, 4)
- (c) (4, 4)
- (d) (5, 5)

**Q20**

The equation of the ellipse whose foci are  $(\pm 3, 0)$  and eccentricity is  $1/3$  is

- (a)  $\frac{x^2}{81} + \frac{y^2}{72} = 1$
- (b)  $\frac{x^2}{9} + \frac{y^2}{72} = 1$
- (c)  $\frac{x^2}{81} + \frac{y^2}{9} = 1$
- (d) *None of these*

**Q21**

The equation of the tangent to the circle  $x^2 + y^2 + 4x - 4y + 2 = 0$  which make equal intercepts on the positive coordinate axes, is

- (a)  $x + y = 12$
- (b)  $x + y = 4$
- (c)  $x + y = \sqrt{3}$
- (d)  $x + y = 2\sqrt{3}$

**Q22**

The least distance of the point P(5,6) from the circle  $x^2 + y^2 - 4x - 4y + 4 = 0$  is

- (a) 3
- (b) 7
- (c) 5
- (d) 4

**Q23**

A parallelepiped is formed by planes drawn through the points (1, 2, 3) and (5, 7, 9) parallel to the coordinate planes. The length of a diagonal of the parallelepiped is

- (a)  $\sqrt{80}$
- (b)  $\sqrt{88}$
- (c)  $\sqrt{77}$
- (d)  $\sqrt{84}$

**Q24**

The length of perpendicular from the centre of the sphere  $x^2 + y^2 + z^2 + 4x - 2y + 6z + 5 = 0$  to the plane  $x + 2y + 3z - 4 = 0$  is

- (a)  $\sqrt{13}$
- (b)  $\frac{13}{14}$
- (c)  $\frac{13}{\sqrt{14}}$
- (d) None of these

**Q25**

If  $\vec{a} = \hat{i}$  and  $\vec{b} = x\hat{i} - y\hat{j} + z\hat{k}$  are such that  $\vec{a}, \vec{c}$  and  $\vec{b}$  form a right handed system then  $\vec{c}$  is

- (a)  $x\hat{i} - y\hat{j}$
- (b)  $x\hat{i} + z\hat{k}$
- (c)  $z\hat{j} + y\hat{k}$
- (d) None of these

**Q26**

If the vectors  $\vec{a}, \vec{b}$  and  $\vec{c}$  from the sides BC, CA and BA respectively of a triangle ABC, Then

- (a)  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} = 0$
- (b)  $\vec{a} \times \vec{c} + \vec{b} \times \vec{c} = 0$
- (c)  $\vec{a} \times \vec{a} + \vec{a} \times \vec{b} + \vec{a} \times \vec{c} = 0$
- (d) None of these

**Q27**

A pair of fair die is thrown. The probability of getting a total of 8 is

- (a)  $\frac{1}{38}$
- (b)  $\frac{1}{2}$
- (c)  $\frac{5}{36}$
- (d)  $\frac{1}{3}$

**Q28**

Pair of fair die the thrown independently four times. The probability of getting a score of 6 twice is

- (a)  $\frac{25}{216}$
- (b)  $\frac{20}{216}$
- (c)  $\frac{4}{216}$
- (d) None of these

**Q29**

$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right)$  is equal to

- (a)  $\pi$
- (b)  $\frac{\pi}{2}$
- (c)  $\frac{\pi}{4}$
- (d) None of these

**Q30**

If  $\alpha$  is root of  $25 \sin^2 \theta + 5 \sin \theta - 12 = 0$  and  $\alpha$  lies in 1st quadrant, Then  $\cos \alpha$  is equal to

- (a)  $\frac{4}{5}$
- (b)  $\frac{-4}{5}$
- (c)  $\frac{3}{5}$
- (d)  $\frac{-3}{5}$