MATHEMATICS

Q.1 The area of the parallelogram, having diagonals $a = 3\hat{i} + \hat{j} - 2\hat{k}$ and $b = \hat{i} - 3\hat{j} + 4\hat{k}$, is :

(a) $10\sqrt{3}$ (b) $5\sqrt{3}$ (c) 300 (d) 8

Ans. **[a]**

Q.2 The unit vector perpendicular to $\hat{i} + \hat{j} + \hat{k}$ and $\hat{j} + \hat{k}$, is :

(a) $\hat{j}$ (b) $\hat{i} - \hat{k}$ (c) $\frac{2\hat{i} + \hat{j} + 2\hat{k}}{3}$ (d) $\frac{1}{\sqrt{2}}(\hat{i} - \hat{k})$

Ans. **[d]**

Q.3 If $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ and $\vec{a} + \vec{b} + \vec{c} = 0$, then $\vec{b}.\vec{c} + \vec{c}.\vec{a} + \vec{a}.\vec{b}$ is equal to :

(a) –25 (b) 50 (c) $5\sqrt{2}$ (d) 50

Ans. **[a]**

Q.4 The work done by the force $\hat{i} - \hat{j} + \hat{k}$ is displacing the point $\hat{i} + \hat{j}$ to the point $2\hat{i} + 3\hat{j} + 4\hat{k}$ is -

(a) 9 units (b) 1 unit (c) 6 unit (d) 3 unit

Ans. **[d]**

Q.5 If $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = \vec{b}$ and C is a point on AB such that $\overrightarrow{AC} = 3\overrightarrow{AB}$, then $\overrightarrow{OC}$ is equal to :

(a) $3\vec{a} - 2\vec{b}$ (b) $3\vec{b} - 2\vec{a}$ (c) $3\vec{a} - \vec{b}$ (d) $3\vec{b} - \vec{a}$

Ans. **[b]**

Q.6 If $2f(x + 1) + f\left(\frac{1}{x+1}\right) = 2x$, then f(2) is equal to :

(a) $\frac{5}{3}$ (b) $\frac{5}{2}$ (c) –1 (d) 2

Ans. **[a]**

Q.7 If $f(x) = \log_e\left(\frac{1+x}{1-x}\right)$ and $g(x) = \frac{3x + x^3}{1 + 3x^2}$, then (fog) (x) is equal to :

(a) 3f(x) (b) $(f(x))^3$ (c) 2f(x) (d) 3g(x)

Ans. **[a]**

Q.8 The value of $\lim_{x\to 0}\frac{x\cos x - \log_e(1+x)}{x^2}$ is :

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

Ans. **[d]**

Q.9 $\frac{d}{dx}\left(\tan^{-1}\sqrt{\frac{1+\sin\frac{x}{2}}{1-\sin\frac{x}{2}}}\right)$ is equal to :

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

Ans. **[c]**

Q.10 If $\sin y = x \sin(a + y)$, then $\frac{dy}{dx}$ is equal to :

(a) $\frac{\sin(a+y)}{\sin a}$ (b) $\frac{\sin^2(a+y)}{\sin a}$ (c) $\frac{2\sin(a+y)}{\sin a}$ (d) $\frac{\sin^2(a+y)}{\sin y}$

Ans. **[b]**

Q.11 Let $f(x + y) = f(x) f(y)\ \forall\ x, y \in R$. If $f(5) = 7$ and $f'(0) = 6$, then $f'(5)$ is equal to :

(a) 0 (b) 7 (c) 6 (d) 42

Ans. **[d]**

Q.12 The function $x - \cot x$:

(a) always increases (b) always decreases

(c) never decreases (d) sometimes increases and sometimes decreases

Ans. **[a]**

Q.13 In Lagrange's mean value theorem $f(b) - f(a) = (b - a) f'(c)$ under suitable conditions. The value of c, when the function is $f(x) = x^2 - 3x - 1$ and the interval is $\left[\frac{-11}{7}, \frac{13}{7}\right]$ is :

(a) $\frac{2}{7}$ (b) $-\frac{2}{7}$ (c) $\frac{1}{7}$ (d) $-\frac{1}{7}$

Ans. **[a]**

Q.14 The function $f(x) = 2x^3 - 9x^2 + 12x + 30$ is increasing on :

(a) (1, 2) (b) $(-\infty, 1) \cup (2, \infty)$ (c) $(-\infty, 2)$ (d) $(0, \infty)$

Ans. **[b]**

Q.15 If $x = a(t - \sin t)$, $y = a(1 - \cos t)$, then $\frac{dy}{dx}$ is equal to :

(a) $\cot t$ (b) $\cot\left(\frac{1}{2}t\right)$ (c) $\tan\left(\frac{1}{2}t\right)$ (d) $\tan t$

Ans. **[b]**

Q.16 The function $f(x) = |x - 1|$ is :

(a) continuous everywhere (b) continuous everywhere except at $x = 1$

(c) differentiable everywhere (d) differentiable nowhere

Ans. **[a]**

Q.17 If $f(x) = \frac{x}{x-1}$, then $(\underbrace{fo\ fo.....f}_{19\text{ times}})(x)$ is equal to :

(a) x (b) $\frac{19x}{x-1}$ (c) $\left(\frac{x}{x-1}\right)^{19}$ (d) $\frac{x}{x-1}$

Ans. **[d]**

Q.18 A function f is defined by $f(x) = 2 + (x - 1)^{2/3}$ in $[0, 2]$. which of the following is not correct ?

(a) f is continuous in $[0, 2]$ (b) $f(0) = f(2)$

(c) f is not derivable in $[0, 2]$ (d) Rolle's theorem is true in $[0, 2]$

Ans. **[d]**

Q.19 $\frac{d}{dx}\left(\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}\right)$ is equal to :

(a) $\frac{x^2}{2\sqrt{1+x^2}(\sqrt{1+x^2}-1)}$ (b) $\frac{1}{1+x^2}$

(c) $\frac{1}{2(1+x^2)}$ (d) $\frac{2}{1+x^2}$

Ans. **[c]**

Q.20 If displacement x of moving particle in a plane at time t is given by $x = 2\cos(t\sqrt{3}) + 3\sin(t\sqrt{3})$ then its acceleration is proportional to :

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

Ans. **[b]**

Q.21 $\int \sin^{-1} x \, dx$ is equal to :

(a) $\frac{1}{\sqrt{1-x^2}} + C$ (b) $\cos^{-1}x + C$

(c) $x \sin^{-1} x + \sqrt{1-x^2} + C$ (d) $x \sin^{-1}x - \sqrt{1-x^2} + C$

Ans. **[c]**

Q.22 The value of $\int_2^3 \frac{x+1}{x^2(x-1)} dx$ is :

(a) $\log_e \frac{16}{9} - \frac{1}{6}$ (b) $2 \log_e 2 - \frac{1}{6}$ (c) $\log_e \frac{4}{3} - \frac{1}{6}$ (d) $\log_e \frac{16}{9} + \frac{1}{6}$

Ans. **[a]**

Q.23 The area bounded by the curve $y = \log_e x$, x – axis ordinates $x = 1, x = 2$ is :

(a) $\log_e 4$ (b) $\log_e\left(\frac{2}{e}\right)$ (c) $\frac{1}{2}(\log_e 2)^2$ (d) $\log_e\left(\frac{4}{e}\right)$

Ans. **[d]**

Q.24 $\int_2^3 \frac{e^x dx}{e^x + e^{5-x}}$ is equal to :

(a) 0 (b) 1/2 (c) 1 (d) $e^2 + e^3$

Ans. **[b]**

Q.25 $\int_0^{\pi/2} \frac{dx}{\sec x + \tan x}$ is equal to :

(a) 1 (b) 0 (c) $\log_e 2$ (d) $\log_e\left(\frac{1}{2}\right)$

Ans. **[c]**

Q.26 $\int_0^{2\pi} |\sin x| dx$ is equal to

(a) 2 (b) $\sqrt{3}$ (c) 4 (d) 0

Ans. **[a]**

Q.27 The value of $\int_0^{2\pi} \frac{dx}{e^{\sin x} + 1}$ is :

(a) π (b) 0 (c) 2π (d) $\pi/2$

Ans. **[a]**

Q.28 $\int e^x \frac{x^2+1}{(x+1)^2}\,dx$ is equal to :

(a) $-\frac{e^x}{x+1}+C$ (b) $\frac{e^x}{x+1}+C$ (c) $\frac{xe^x}{x+1}+C$ (d) $e^x\frac{x-1}{x+1}+C$

Ans. **[d]**

Q.29 The area bounded by the parabola $y^2 = 4ax$ and its latus rectum is :

(a) $\frac{8}{3}a^2$ (b) $\frac{4}{3}a^2$ (c) $4a^2$ (d) $2a^2$

Ans. **[a]**

Q.30 If $b > a$, then $\int_a^b \frac{dx}{\sqrt{(x-a)(b-x)}}$ is equal to :

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

Ans. **[b]**

Q.31 The solution of the differential equation $xdy - ydx = \sqrt{x^2+y^2}\,dx$ is :

(a) $y - \sqrt{x^2+y^2} = cx$ (b) $x + \sqrt{x^2+y^2} = cx^2$ (c) $x - \sqrt{x^2+y^2} = cx$ (d) $y + \sqrt{x^2+y^2} = cx^2$

Ans. **[d]**

Q.32 The solution of the differential equation $(x+a)\frac{dy}{dx} - 3y = (x+a)^5$, when $y = 16a^5$ at $x = a$, is :

(a) $y = (x+a)^5$ (b) $2y = (x+a)^5$
(c) $2y = (x+a)^3 + (x+a)^5$ (d) $y = (x+a)^3 - (x+a)^5$

Ans. **[b]**

Q.33 The solution of the differential equation $(1+x)y\,dx + (1-y)x\,dy = 0$ is :

(a) $\log_e(xy) + x - y = c$ (b) $\log_e\left(\frac{x}{y}\right) + x + y = c$

(c) $\log_e\left(\frac{x}{y}\right) - x + y = c$ (d) $\log_e(xy) - x + y = c$

Ans. **[a]**

Q.34 The differential equation of the circles touching the y-axis at origin is :

(a) $\frac{dy}{dx} = \frac{x^2+y^2}{2xy}$ (b) $\frac{dy}{dx} = \frac{y^2-x^2}{xy}$ (c) $\frac{dy}{dx} = \frac{y^2-x^2}{2xy}$ (d) $\frac{dy}{dx} = \frac{x^2-y^2}{2xy}$

Ans. **[c]**

Q.35 The order of degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^{4/5} - 2\frac{dy}{dx}\left(\frac{d^2y}{dx^2}\right)^2 = 0$ are respectively :

(a) 2, 10 (b) 3, 10 (c) 3, 5 (d) 3, 4

Ans. **[b]**

Q.36 The solution of the differential equation $(2x - 10y^3)\frac{dy}{dx} + y = 0$ is :

(a) $(2x - 10\,y^3)y + \frac{1}{2}y^2 = c$ (b) $xy^2 = 2y^5 + c$

(c) $xy^2 = -2y^5 + c$ (d) $xy^2 = y^5 + c$

Ans. **[b]**

Q.37 $y = e^{2x}(x + c)$ is general solution of :

(a) $3y = \frac{dy}{dx} - e^{2x}$ (b) $2y = \frac{dy}{dx} - e^{2x}$ (c) $3y = e^{2y}\frac{dy}{dx}$ (d) $-3y = e^{3x}\frac{dy}{dx}$

Ans. **[b]**

Q.38 If the integrating factor of the differential equation $x\frac{dy}{dx} + my = x^2e^x$ is x^{-2}, the value of m is :

(a) –1 (b) 1 (c) 2 (d) –2

Ans. **[d]**

Q.39 The curve, which passes through the origin and is such that the area included between the curve, the ordinate and x-axis is k times the cube of the ordinate is :

(a) $ky^2 = 2x$ (b) $ky^2 = 4x$ (c) $3ky^2 = 4x$ (d) $3ky^2 = 2x$

Ans. **[c]**

Q.40 The solution of the differential equation $\frac{dy}{dx} + \frac{1}{x} = \frac{1}{x^2}e^y$ is :

(a) $2xe^{-y} = cx^2 - 1$ (b) $2xe^{y} = x^2 + c$ (c) $2xe^{-y} = cx^2 + 1$ (d) $xe^{-y} = cx^2 + 1$

Ans. **[d]**

Q.41 Let X be a finite set such that n(X) = n. The probability of selecting two subsets A, B of X, such that $B = X \sim A$, is :

(a) $\frac{1}{2}$ (b) $\frac{1}{2^n - 1}$ (c) $\frac{1}{2^n}$ (d) $\frac{1}{3^n}$

Ans. **[b]**

Q.42 If $0 < p(A) < 1$, $0 < p(B) < 1$ and $p(A \cup B) = p(A) + p(B) - p(A)\,p(B)$ then :

(a) $p(B/A) = p(B) - p(A)$ (b) $p(A' - B') = p(A') - p(B')$

(c) $p((A \cup B)') = p(A')\,p(B')$ (d) $p(A/B) = p(A)$

Ans. **[c]**

Q.43 A and B throw a die alternatively till one of them gets a six and wins the game. If A starts the game first, the probability of A winning the game is :

(a) $\frac{3}{11}$ (b) $\frac{5}{11}$ (c) $\frac{6}{11}$ (d) $\frac{7}{11}$

Ans. **[c]**

Q.44 Two dice are thrown together. The probability, that the sum of the numbers appearing on them is a prime number, is :

(a) $\frac{5}{12}$ (b) $\frac{7}{18}$ (c) $\frac{13}{36}$ (d) $\frac{1}{3}$

Ans. **[a]**

Q.45 A die is thrown six times. The probability of getting at least a 5 least five times is :

(a) $\frac{2}{279}$ (b) $\frac{3}{729}$ (c) $\frac{12}{729}$ (d) $\frac{13}{729}$

Ans. **[d]**

Q.46 For finding the root of $x^2 - 5x + 2 = 0$ near 0 by Newton-Raphson method, the second iteration x_2 is equal to

(a) 0.400000 (b) 0.438095 (c) 0.438000 (d) 0.430000

Ans. **[b]**

Q.47 On dividing the interval into four equal parts the value of the integral $\int_1^5 x^2\,dx$, by trapezoidal rule, is :

(a) 42 (b) 41.3 (c) 41 (d) 40

Ans. **[a]**

Q.48 On dividing the interval into four equal parts, the value of the integral $\int_0^1 \frac{dx}{1+x}$, by Simpson's rule, is :

(a) 2.08 (b) 0.7500 (c) 0.6933 (d) 0.6900

Ans. **[c]**

Q.49 Newton-Raphson formula is :

(a) $x_n - x_{n+1} = \frac{f'(x_n)}{f(x_n)}$ (b) $x_{n+1} = \frac{f'(x_n)}{f(x_n)}$ (c) $x_{n+1} = \frac{f(x_n)}{f'(x_n)}$ (d) $x_n - x_{n+1} = \frac{f(x_n)}{f'(x_n)}$

Ans. **[d]**

Q.50 The two numbers x_1, x_2 such that $4x_1 + 2x_2 \le 80$, $2x_1 + 5x_2 \le 180$, $x_1 \ge 0$, $x_2 \ge 0$ and for which $3x_1 + 4x_2$ is maximum, are respectively.

(a) 2, 36 (b) 20, 0 (c) 2.5, 35 (d) 0, 36

Ans. **[c]**

Q.51 If the second, third and sixth terms of an AP are in GP, then the common ratio of the GP is :

(a) 2 (b) 5 (c) 4 (d) 3

Ans. **[d]**

Q.52 If $x = cy + bz$, $y = az + cx$, $z = bx + ay$ and $(x, y, z) \neq (0, 0, 0)$ then the value of $a^2 + b^2 + c^2 + 2abc$ is :

(a) –1 (b) 1 (c) 0 (d) 2

Ans. **[b]**

Q.53 Given $A = \begin{bmatrix} 3 & 5 \\ 4 & 2 \end{bmatrix}$, then $A^2 - 5A - 11\,I$ is equal to :

(a) 3I (b) I (c) 0 (d) 2I

Ans. **[a]**

Q.54 $\sum_{r=1}^{\infty} \frac{1 + a + a^2 + ... + a^{r-1}}{r!}$ is equal to :

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

Ans. **[a]**

Q.55 The value of the determinant $\begin{vmatrix} a^2 + 1 & ab & ac \\ ba & b^2 + 1 & bc \\ ca & cb & c^2 + 1 \end{vmatrix}$ is :

(a) $(a + b + c)^2$ (b) $a^2 + b^2 + c^2$

(c) $a^2 + b^2 + c^2 + 1$ (d) 1

Ans. **[c]**

Q.56 The number of odd numbers between 1000 and 10000 that can be formed by the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 when repetition of digits is not done, is :

(a) 1280 (b) 1836 (c) 2572 (d) 1680

Ans. **[d]**

Q.57 The value of $1.2 + 2.3 + 3.4 + \ldots + 99.100$ is :

(a) 330000 (b) 333000 (c) 333300 (d) 333330

Ans. **[c]**

Q.58 The sum of n terms of the series $\frac{3}{1^2} + \frac{5}{1^2+2^2} \quad \frac{7}{1^2+2^2+3^2} + \ldots..$ is :

(a) $\frac{n+1}{n}$ (b) $\frac{n}{n+1}$ (c) $\frac{6n}{n+1}$ (d) $\frac{6(n-1)}{n}$

Ans. **[c]**

Q.59 If ω is an imaginary cube root of unity, then $(a + b - c)(a + b\omega - c\omega^2)(a + b\omega^2 - c\omega)$ is equal to :

(a) $a^3 + b^3 - c^3 + 3abc$ (b) $a^3 + b^3 - c^3$ (c) $a^3 + b^3 - c^3 - 3abc$ (d) $a^3 + b^3 - c^3 + abc$

Ans. **[a]**

Q.60 If $\left(\frac{3}{2} + \frac{\sqrt{3}}{2}i\right)^{50} = 3^{25}(x + iy)$, then (x, y) is equal to :

(a) $\left(\frac{1}{2}, \frac{-\sqrt{3}}{2}\right)$ (b) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ (c) $\left(\frac{-1}{2}, \frac{\sqrt{3}}{2}\right)$ (d) $\left(\frac{-1}{2}, \frac{-\sqrt{3}}{2}\right)$

Ans. **[b]**

Q.61 If α, β are the roots of the equation $x^2 - x + 1 = 0$, the value of $\alpha^3 + \beta^3$ is :

(a) –2 (b) 2 (c) 4 (d) –4

Ans. **[a]**

Q.62 The system of equation $-2x + y + z = a$, $x - 2y + z = b$, $x + y - 2z = c$ is consistent, if :

(a) $a + b - c = 0$ (b) $a - b + c = 0$ (c) $a + b + c \neq 0$ (d) $a + b + c = 0$

Ans. **[d]**

Q.63 The sum of the series $\frac{1}{2.3} + \frac{1}{4.5} + \frac{1}{6.7} + \ldots. \infty$ is :

(a) $\log_e 2$ (b) $\log_e 2 - 1$ (c) $1 - \log_e 2$ (d) $1 + \log_e 2$

Ans. **[c]**

Q.64 If α, β are the roots of the equation $2x^2 + 3x + 5 = 0$, then the value of determinant $\begin{vmatrix} 0 & \beta & \beta \\ \alpha & 0 & \alpha \\ \beta & \alpha & 0 \end{vmatrix}$ is :

(a) $\frac{-3}{5}$ (b) $\frac{-15}{4}$ (c) $\frac{3}{5}$ (d) $\frac{15}{4}$

Ans. **[b]**

Q.65 If the coefficients of x^r and x^{r-5} in the expansion of $(1 + x)^{51}$ are equal, the value of r is :

(a) 27 (b) 28 (c) 29 (d) 26

Ans. **[b]**

Q.66 If sin A + sin B + sin C = 3, then cos A + cos B + cos C is equal to :

(a) 3 (b) 2 (c) 1 (d) 0

Ans. **[d]**

Q.67 If $A + B = \frac{\pi}{2}$, then (1 + tan A) (1 + tan B) is equal to :

(a) 2 (b) 1 (c) 3 (d) $\sqrt{3}$

Ans. **[a]**

Q.68 The principal value of $\sin^{-1}\frac{1}{\sqrt{17}} + \cos^{-1}\frac{5}{\sqrt{34}}$ is :

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\sin^{-1}\frac{23}{17\sqrt{2}}$ (d) $\cos^{-1}\frac{23}{17\sqrt{2}}$

Ans. **[a]**

Q.69 A hyperbola passes through (3, 3) and the length of its conjugate axis is 8. The length of latus rectum is :

(a) $\frac{20}{3}$ (b) $\frac{40}{3}$ (c) $\frac{50}{3}$ (d) None of these

Ans. **[b]**

Q.70 cosec 10° – $\sqrt{3}$ sec 10° is equal to :

(a) 2 (b) $\sqrt{3}$ (c) 4 (d) 0

Ans. **[c]**

Q.71 The base BC of a triangle ABC is 6 cm and $\angle B = 112.5°$, $\angle C = 22.5°$, then its altitude is :

(a) 12 cm (b) 6 cm (c) 1.5 cm (d) 3 cm

Ans. **[d]**

Q.72 A tower subtends angles θ, 2θ, 3θ at three points A, B, C respectively lying same side on a horizontal line through the foot of the tower, then $\frac{AB}{BC}$ is equal to :

(a) $\frac{\sin 2\theta}{\sin\theta}$ (b) $\frac{\sin 3\theta}{\sin 2\theta}$ (c) $\frac{\sin 3\theta}{\sin\theta}$ (d) $\frac{\sin 3\theta}{\sin\theta + \sin 2\theta}$

Ans. **[c]**

Q.73 The general value of θ, for which $\frac{\tan 3\theta - 1}{\tan 3\theta + 1} = \sqrt{3}$ is :

(a) $\frac{n\pi}{3} + \frac{\pi}{12}$ (b) $\frac{n\pi}{3} + \frac{7\pi}{36}$ (c) $n\pi + \frac{\pi}{12}$ (d) $n\pi + \frac{7\pi}{12}$

Ans. **[b]**

Q.74 If $x + \frac{1}{x} = 2\cos\theta$, then $x^3 + \frac{1}{x^3}$ is equal to :

(a) cos 3θ (b) sin 3θ (c) 2 sin 3θ (d) 2 cos 3θ

Ans. **[d]**

Q.75 In any triangle ABC, sin 2A + sin 2B + sin 2C is equal to :

(a) 4 cos A cos B cos C (b) 2 sin A sin B sin C (c) 2 cos A cos B cos C (d) 4 sin A sin B sin C

Ans. **[d]**

Q.76 An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ with is one vertex at the origin. The length of its side is :

(a) $8a\sqrt{3}$ (b) 8a (c) $4a\sqrt{3}$ (d) 4a

Ans. **[a]**

Q.77 The value of m, for which the line y = mx + 2 is a tangent to the hyperbola $4x^2 - 9y^2 = 36$, are

(a) $\pm\frac{4\sqrt{2}}{3}$ (b) $\pm\frac{2}{3}$ (c) $\pm\frac{8}{9}$ (d) $\pm\frac{2\sqrt{2}}{3}$

Ans. **[d]**

Q.78 The distance between the two foci of the ellipse $5x^2 + 4y^2 = 20$ is :

(a) 1 (b) 2 (c) $\frac{4}{\sqrt{5}}$ (d) $2\sqrt{5}$

Ans. **[b]**

Q.79 If lines $(\tan^2\theta + \cos^2\theta)\,x^2 - 2\tan\theta.\,xy + \sin^2\theta.y^2 = 0$ makes with x-axis angles α,β, then tan α – tan β is equal to :

(a) 2 (b) 4 (c) tan θ (d) 2 tan θ

Ans. **[a]**

Q.80 The value of λ, for which the three points (1, 1), (4, – 1), (–2, λ) are collinear, is :

(a) $\frac{1}{2}$ (b) 0 (c) 3 (d) – 2

Ans. **[c]**

Q.81 The limiting point of the coaxal system of circles $x^2 + y^2 + \lambda x + 1 = 0$ are :

(a) $\left(\pm\frac{\lambda}{2},0\right)$ (b) $(\pm2,0)$ (c) $(\pm1,0)$ (d) $(0, \pm 1)$

Ans. **[c]**

Q.82 The circles $x^2 + y^2 - 6x - 8y = 0$ and $x^2 + y^2 - 6x + 8 = 0$ are :

(a) intersecting in two points (b) non intersecting

(c) touching externally (d) touching internally

Ans. **[d]**

Q.83 If a circle $x^2 + y^2 = a^2$ and the rectangular hyperbola $xy = c^2$ intersect in four points, $\left(ct_r,\frac{c}{t_r}\right)$, r = 1,2,3,4 then $t_1\ t_2\ t_3\ t_4$ is equal to :

(a) –1 (b) 1 (c) c^4 (d) $-c^4$

Ans. **[b]**

Q.84 The point of intersection of lines represented by the equation $3x^2 + 8xy - 3y^2 + 29x - 3y + 18 = 0$ is :

(a) $\left(\frac{3}{2},\frac{5}{2}\right)$ (b) $\left(\frac{-3}{2},\frac{-5}{2}\right)$ (c) $(-3, -5)$ (d) $(3, 5)$

Ans. **[b]**

Q.85 Tangents are drawn from the point (6, 8) to the circle $x^2 + y^2 = 50$. The area of the triangle formed by the tangents and the chord of contact is :

(a) 50 units (b) $25\sqrt{2}$ units (c) 25 units (d) 75 units

Ans. **[c]**

Q.86 The angle between two lines, whose direction cosines, l, m, n are given by equations $l + m - n = 0$, and $mn + 6nl - 12\,lm = 0$, is :

(a) $\tan^{-1}\left(\frac{\sqrt{3}}{19}\right)$ (b) $\cos^{-1}\left(\frac{\sqrt{3}}{19}\right)$ (c) $\cot^{-1}\left(\frac{\sqrt{3}}{19}\right)$ (d) $\sin^{-1}\left(\frac{\sqrt{3}}{19}\right)$

Ans. **[a]**

Q.87 The plane through the point P = (1, 2, 2) and normal to OP cuts the coordinate axes at A,B,C respectively, where O is the origin. The centroid of the triangle ABC is :

(a) $\left(\frac{3}{2},3,\frac{3}{2}\right)$ (b) $\left(3,\frac{3}{2},\frac{3}{2}\right)$ (c) $\left(\frac{3}{2},\frac{3}{2},3\right)$ (d) $\left(\frac{3}{2},\frac{3}{2},\frac{3}{2}\right)$

Ans. **[b]**

Q.88 A variable plane moves so that the sum of reciprocals of its intercepts on the coordinate axes is $\frac{1}{2}$. Then the plane passes through the point :

(a) (2, 2, 2) (b) (1, 1, 1) (c) $\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$ (d) (0, 0, 0)

Ans. **[a]**

Q.89 The equations of the line of the intersection of planes $4x + 4y - 5z = 12$ and $8x + 12y - 13z = 32$ can be written as :

(a) $\frac{x-1}{2}=\frac{y-2}{-3}=\frac{z}{4}$ (b) $\frac{x}{2}=\frac{y-1}{3}=\frac{z-2}{4}$

(c) $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z}{4}$ (d) $\frac{x}{2}=\frac{y}{3}=\frac{z-2}{4}$

Ans. **[c]**

Q.90 The equation of the plane through the line $P \equiv ax + by + cz + d = 0$, $P' \equiv a' x + b' y + c' z + d' = 0$ and parallel to x-axis is :

(a) $Pa + P' a' = 0$ (b) $a' P = aP'$ (c) $Pa - P' a' = 0$ (d) $a' P + aP' = 0$

Ans. **[d]**

Q.91 The point of intersection of lines $\frac{x-5}{3}=\frac{y-7}{-1}=\frac{z+2}{1}$ and $\frac{x+3}{-36}=\frac{y-3}{2}=\frac{z-6}{4}$ is :

(a) (5, 7, –2) (b) (–3, 3, 6) (c) (2, 10, 4) (d) $\left(21,\frac{5}{3},\frac{10}{3}\right)$

Ans. **[d]**

Q.92 The distance of the point (1, 2, 3) from the lines through (–1, 2, 5) and (2, 3, 4) is :

(a) $\sqrt{\frac{6}{11}}$ (b) $2\sqrt{6}$ (c) $2\sqrt{\frac{6}{11}}$ (d) $\sqrt{6}$

Ans. **[c]**

Q.93 The equation of the plane through the lines $2x - y = 0 = y - 3z$ and perpendicular to $4x + 5y - 3z = 8$ is :

(a) $8x - y - 9z = 0$ (b) $2x - 6y + 15z = 0$

(c) $10x - 6y + 3z = 0$ (d) $28x - 17y + 9z = 0$

Ans. **[d]**

Q.94 The distance of the point (–1, – 5, –10) from the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane x – y + z = 5 is :

(a) 11 (b) 17 (c) 13 (d) 19

Ans. **[c]**

Q.95 The distance between the parallel planes 2x – 2y + z + 1 = 0 and 4x – 4y + 2z + 3 = 0 is :

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$ (c) 2 (d) 4

Ans. **[a]**

Q.96 If $\vec{a}$ is any vector, then $(\vec{a}\times\hat{i})^2+(\vec{a}\times\hat{j})^2+(\vec{a}\times\hat{k})^2$ is equal to :

(a) $|\vec{a}|^2$ (b) $2|\vec{a}|^2$ (c) $3|\vec{a}|^2$ (d) 0

Ans. **[b]**

Q.97 The value of λ, for which the three points, whose position vectors are $\hat{i}+\hat{j}$, $\hat{j}+\hat{k}$, $-\hat{i}+\hat{j}+\lambda\hat{k}$ will be collinear, is :

(a) 2 (b) –1 (c) –2 (d) 1

Ans. **[a]**

Q.98 If $\hat{a},\hat{b},\hat{c}$ are unit vectors such that $\hat{a}\times(\hat{b}\times\hat{c}) = \frac{1}{2}\hat{b}$, then angle between $\hat{a}$ and $\hat{c}$ is :

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

Ans. **[d]**

Q.99 The figure formed by four points $\hat{i}+\hat{j}+\hat{k}$, $2\hat{i}+3\hat{j}$, $5\hat{j}-2\hat{k}$, $\hat{k}-\hat{j}$ is a :

(a) paralelogram (b) rectangle (c) trapezium (d) square

Ans. **[c]**

Q.100 If $\vec{a},\vec{b},\vec{c}$ are any vectors, then $[\vec{a}\ \ \vec{b}+\vec{c}\ \ \vec{a}+\vec{b}+\vec{c}]$ is equal to :

(a) $[\vec{a}\ \ \vec{b}\ \ \vec{c}]$ (b) $2\ [\vec{a}\ \ \vec{b}\ \ \vec{c}]$ (c) 0 (d) $\vec{b}.\vec{c}+\vec{c}.\vec{a}+\vec{a}.\vec{b}$

Ans. **[c]**

PHYSICS

101. A silver and a copper voltameter are connected in series with a 12.0 V battery of negligible internal resistance. If 0.806 g of silver is deposited in half an hour, the mass of copper deposited is -

(a) 0.625 g (b) 0.475 g (c) 0.525 g (d) 0.575 g

Ans. **[b]**

102. Which of the following particles do not exist in the $_{92}U^{238}$ nucleus ?

(a) 92 protons (b) 92 electrons (c) 146 neutrons (d) none of these

Ans. **[b]**

103. A monochromatic source of light operating at 200 W emits 4×10^{20} photons per second. The wavelength of the emitted light will be :

(a) 400 nm (b) 800 nm (c) 600 nm (d) 200 nm

Ans. **[a]**

104. Larger aperture of telescope is used for :

(a) Greater Magnification (b) Greater resolution

(c) Reducing lens aberration (d) Reducing cost of manufacture

Ans. **[b]**

105. If the distance of 100 W lamp is increased from a photocell, the saturation current 'i' in the photocell varies with distance 'd' as:

(a) $i \propto d^2$ (b) $i \propto d$ (c) $i \propto 1/d$ (d) $i \propto 1/d^2$

Ans. **[d]**

106. The centre of mass of a body :

(a) lies always outside the body (b) may lie within, outside or on the surface of the body

(c) lies always inside the body (d) lies always on the surface of the body

Ans. **[b]**

107. The torque on a body is zero. Which of the following should not change?

(a) Linear velocity (b) Angular velocity

(c) Force acting on the body (d) Angular displacement

Ans. **[b]**

108. A prism of 6° angle gives a deviation of 3°. The refractive index of the material of prism is :

(a) 1.5 (b) 2 (c) 0.5 (d) 1.8

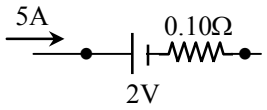
Ans. **[a]**

109. An alternating emf $E = E_0 \sin \omega t$ produces a current $I = I_0 \sin(\omega t - \pi/2)$ in a circuit. The power dissipated in the circuit is :

(a) $E_0 I_0 \sqrt{2}$ (b) $E_0 I_0 / 2$ (c) $E_0 I_0 / \sqrt{2}$ (d) Zero

Ans. **[d]**

110. A battery of emf 2.0 volts and internal resistance 0.10 Ω is being charged with a current of 5.0 A. The potential difference between the terminals of the battery is -



(a) 2.0 V (b) 2.5 V (c) 1.5 V (d) zero

Ans. **[b]**

111. An electric dipole is placed in an electric field generated by a point charge:

(a) The net electric force on the dipole must be zero

(b) The net electric force on the dipole may be zero

(c) The torque on the dipole due to the field must be zero

(d) The torque on the dipole due to the field may be zero

Ans. **[d]**

112. A 60 kg man pushes a 40 kg man by a force of 60 N. The 40 kg man has pushed the other man with a force of :

(a) 40 N (b) 0 (c) 60 N (d) 20 N

Ans. **[c]**

113. The Young's modulus for a perfectly rigid body is :

(a) zero (b) Infinity

(c) Unity (d) Greater than 1 but less than ∞

Ans. **[b]**

114. The dimensions of Planck's constant are same as that of -

(a) Frequency (b) Angular momentum

(c) Kinetic energy (d) Force

Ans. **[b]**

115. The relation between time 't' and distance 'x' is $t = \alpha x^2 + \beta x$, where α & β are constants. The retardation is:

(a) $2\alpha . v^3$ (b) $2\beta . v^3$ (c) $2\alpha\beta . v^3$ (d) $2\beta^2 v^3$

Ans. **[a]**

116. A train accelerates from rest at a constant rate α for distance x_1 and time t_1. After that it retards to rest at constant rate β for distance x_2 and time t_2. Which of the following relations is correct?

(a) $\frac{x_1}{x_2}=\frac{\alpha}{\beta}=\frac{t_1}{t_2}$ (b) $\frac{x_1}{x_2}=\frac{\beta}{\alpha}=\frac{t_1}{t_2}$

(c) $\frac{x_1}{x_2}=\frac{\alpha}{\beta}=\frac{t_2}{t_1}$ (d) $\frac{x_1}{x_2}=\frac{\beta}{\alpha}=\frac{t_2}{t_1}$

Ans. **[b]**

117. Two forces of magnitude F have a resultant of the same magnitude F. The angle between the two forces is:

(a) 45° (b) 120° (c) 150° (d) 60°

Ans. **[b]**

118. The magnitude of momentum of a particle is increased by 100%. The increase in its kinetic energy is -

(a) 100% (b) 200% (c) 300 % (d) 400%

Ans. **[c]**

119. A particle of mass 4m which is at rest explodes into three fragments. Two of the fragments each of mass *m* are found to move with a speed 'v' each in mutually perpendicular directions. The total energy released in this process -

(a) 0 (b) $\frac{3}{2}mv^2$ (c) $\frac{1}{2}mv^2$ (d) $2mv^3$

Ans. **[b]**

120. Potential energy of a particle is related to x coordinate by equation $x^2 - 2x$. Particle will be in stable equilibrium at -

(a) x = 0.5 (b) x =1 (c) x = 2 (d) x = 4

Ans. **[b]**

121. Internal forces can change :

(a) Linear momentum but not the kinetic energy

(b) Kinetic energy but not the linear momentum

(c) Linear momentum as well as kinetic energy

(d) Neither linear momentum nor kinetic energy

Ans. **[b]**

122. Which of the following properties of a wave does not change with the change in medium ?

(a) Frequency (b) Velocity

(c) Wavelength (d) Amplitude

Ans. **[a]**

123. Which one is correct ?

(a) Joule = Coulomb × Volt (b) Joule = Volt × Ampere

(c) Joule = Coulomb / Volt (d) Volt = Joule × Coulomb

Ans. **[a]**

124. What is the momentum of a photon of wavelength 6600 Å?

(a) 10^{-20} kg ms^{-1} (b) 10^{-29} kg ms^{-1}

(c) 10^{-27} kg ms^{-1} (d) 10^{-22} kg ms^{-1}

Ans. **[c]**

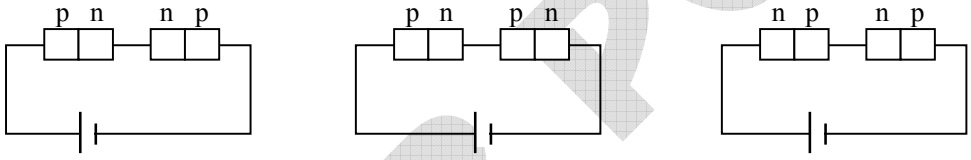
125. A p-type semiconductor is :

(a) Positively charged (b) Negatively charged

(c) Uncharged (d) Uncharged at 0°K but charged at higher temperature

Ans. **[c]**

126. Two identical p-n junctions are connected in series with a battery in three ways. The potential difference across the two p-n junctions are equal in:



Circuit-1 Circuit-2 Circuit-3

(a) Circuit 1 and circuit 2 (b) Circuit 2 and circuit 3

(c) Circuit 1 and circuit 3 (d) circuit 1 only

Ans. **[b]**

127. As compared to ^{12}C atom, ^{14}C atom has :

(a) Two extra protons and two extra electrons (b) Two extra protons but no extra electron

(c) Two extra neutrons but no extra electron (d) Two extra neutrons and two extra electrons

Ans. **[c]**

128. The pressure of a gas kept in an isothermal container is 200 kPa. If half the gas is removed from it, the pressure will be :

(a) 100 kPa (b) 200 kPa (c) 400 kPa (d) 800 kPa

Ans. **[a]**

129. Which of the following pairs of physical quantities may be represented in the same unit ?

(a) Heat and temperature (b) Temperature and mole

(c) Heat and work (d) Specific heat and heat

Ans. **[c]**

130. The mechanical equivalent of heat -

(a) has the same dimension as that of heat (b) has the same dimension as that of work

(c) has the same dimension as that of energy (d) is dimensionless

Ans. **[d]**

131. A body cools down from 65°C to 60°C in 5 minutes. It will cool down from 60°C to 55°C in -

(a) 5 minutes

(b) less than 5 minutes

(c) more than 5 minutes

(d) less than or more than 5 minutes depending on whether its mass is more than or less than 1 kg.

Ans. **[c]**

132. A proton and an electron are placed in a uniform electric field :

(a) The electric forces acting on them will be equal

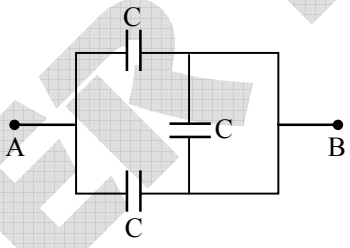
(b) The magnitude of the forces will be equal

(c) Their accelerations will be equal

(d) The magnitude of their accelerations will be equal

Ans. **[b]**

133. The equivalent capacitance of the combination between A and B is :



(a) C (b) 2C (c) C/2 (d) C/3

Ans. **[b]**

134. A negatively charged particle projected towards east is deflected towards north by a magnetic filed. The field may be -

(a) Towards west (b) Towards south

(c) Upwards (d) Downwards

Ans. **[c]**

135. Transformers are used in -

(a) DC circuit only (b) AC circuit only

(c) Both AC and DC circuits (d) Neither AC nor DC circuit

Ans. **[b]**

136. For a Hydrogen atom, in which of the following transitions will the wavelength emitted photon be minimum?
(a) n = 5 to n = 4 (b) n = 4 to n = 3
(c) n = 3 to n = 2 (d) n = 2 to n =1
Ans. **[d]**

137. X-rays can be deflected :
(a) by an electric field (b) by a magnetic filed
(c) by an electric as well as magnetic filed (d) neither by an electric nor by a magnetic field
Ans. **[d]**

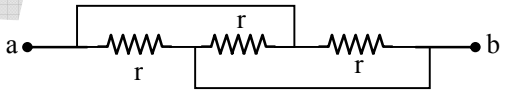
138. The change in frequency due to Doppler effect does not depend on:
(a) The speed of the source (b) The speed of the observer
(c) The frequency of the source (d) Separation between the source and the observer
Ans. **[d]**

139. Two periodic waves of amplitude A_1 and A_2 pass through a region. If $A_1 > A_2$, the difference in the maximum and minimum resultant amplitude possible is :
(a) $2A_1$ (b) $2A_2$ (c) $A_1 + A_2$ (d) $A_1 - A_2$
Ans. **[b]**

140. The excess pressure inside a soap bubble is twice the excess pressure inside a second soap bubble. The volume of the first bubble is 'n' times the volume of the second bubble then 'n' is -
(a) 8 (b) 4 (c) 2 (d) 0.125
Ans. **[d]**

141. If a vector makes angle α, β, γ with x-axis, y-axis and z-axis respectively, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is -
(a) 0 (b) 1 (c) 2 (d) 3
Ans. **[c]**

142. Find the equivalent resistance of the network between points a and b ?



(a) r (b) $\frac{r}{3}$ (c) 3r (d) $\frac{3}{r}$
Ans. **[b]**

143. The magnetic susceptibility is negative for :
(a) Paramagnetic materials only (b) Diamagnetic materials only
(c) Ferromagnetic materials only (d) Paramagnetic and ferromagnetic materials
Ans. **[b]**

144. The time constant of a L − R circuit is -

(a) R/L (b) L/R (c) LR (d) $\frac{1}{LR}$

Ans. **[b]**

145. Which of the following relation is correct ?

(a) $\sqrt{\varepsilon_0}E_0 = \sqrt{\mu_0}$ (b) $E_0 = \sqrt{\mu_0\varepsilon_0}B_0$

(c) $\sqrt{\mu_0\varepsilon_0}E_0 = B_0$ (d) $\sqrt{\mu_0 E_0} = \sqrt{\varepsilon_0}B_0$

Ans. **[b]**

146. The motion of a particle is given by x = A sin ωt + B cos ωt. The motion of the particle is -

(a) Not simple harmonic (b) Simple harmonic with amplitude A + B

(c) Simple harmonic with amplitude (A + B)/2 (d) Simple harmonic with amplitude $\sqrt{A^2 + B^2}$

Ans. **[d]**

147. A small ink dot on a paper is viewed through a glass slab of thickness 15 cm and refractive index 1.5. By what distance would the dot appear to be raised ?

(a) 10 cm (b) 5 cm (c) 7.5 cm (d) 0 cm

Ans. **[b]**

148. A thin lens of focal length + 12 cm is immersed in water. What is its new focal length (Refractive index of glass = 1.5, Refractive index of water = 1.33)

(a) 16 cm (b) 48 cm (c) 36 cm (d) 40 cm

Ans. **[b]**

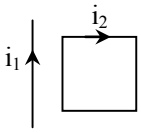
149. If Young's double slit experiment is performed in water

(a) The fringe width will decrease (b) The fringe width will increase

(c) The fringe width will remain unchanged (d) There will be no fringe

Ans. **[a]**

150. Consider the situation shown in figure. The straight wire is fixed but the loop car move under magnetic force. The loop will -



(a) Remain stationary (b) Move towards the wire

(c) Move away from the wire (d) Rotate about the wire

Ans. **[b]**

CHEMISTRY

Q.151 In analysis of third group contains of mixture analysis, solid NH_4Cl is added prior to NH_4OH for the following :
(a) availability of Cl^- ions (b) availability of NH_4^+ ions
(c) complete dissociation of NH_4OH (d) controlled dissociation of NH_4OH
Ans. **[d]**

Q.152 100 ml of an acid solution is neutralized by 50 ml of NaOH solution containing 0.2 g NaOH. The concentration of acid solution is :
(a) 0.1 N (b) 0.05 N (c) 0.5 N (d) 0.25 N
Ans. **[a]**

Q.153 An organic compound contains 38.8% carbon, 16 % hydrogen & 45.2 % nitrogen. Its empirical formula is :
(a) CH_3CN (b) C_2H_5CN (c) $CH_2(NH_2)_2$ (d) CH_3NH_2
Ans. **[d]**

Q.154 I.U.P.A.C. name of $(CH_3)_2 N–C_2H_5$ is :
(a) Dimethyl ethyl amine (b) Dimethyl monoethyl amine
(c) N,N dimethyl amino ethane (d) Dimethyl amino ethane
Ans. **[c]**

Q.155 Which compound shows geometrical isomerism among the following ?

(a) $\begin{matrix} CH_3-C-H \\ \| \\ CH_3-C-H \end{matrix}$ (b) $HO-\overset{\overset{CH_3}{|}}{\underset{\underset{COOH}{|}}{C}}-H$ (c) $CH_3–CH=CH–CH_3$ (d) $CH_3CH_2COOC_2H_5$

Ans. **[ac]**

Q.156 The most reactive compound towards nitration is :
(a) Toluene (b) benzene (c) benzoic acid (d) Nitrobenzene
Ans. **[a]**

Q.157 Which of the following compounds reacts with an aqueous solution of $Ag(NH_3)_2 OH$?
(a) Ethane (b) Ethene (c) 1 - Butyne (d) 2 - Butyne
Ans. **[c]**

Q.158 Which of the following compounds shows maximum boiling point ?
(a) isooctane (b) n – octane
(c) 2,2,3,3 – tetramethyl butane (d) n - butane
Ans. **[b]**

Q.159 HBr reacts faster with which of the following compounds ?
(a) 2 – methyl propane – 2 – ol (b) propane – 1–ol
(c) propane – 2 – ol (d) 2 – methyl propane – 1 – ol
Ans. **[a]**

Q.160 When acetaldehyde is heated with Fehling's solution, it gives the precipitate of :
(a) Cu (b) CuO (c) Cu_2O (d) Cu + CuO + Cu_2O
Ans. **[c]**

Q.161 The following reagent is used to distinguish between methanoic acid and ethanoic acid :
(a) Tollen's reagent (b) $FeCl_3$ (c) NaOH solution (d) Na_2CO_3 solution
Ans. **[a]**

Q.162 The most basic compound among the following :
(a) Aniline (b) p – nitroaniline (c) Acetanilide (d) Benzyleamine
Ans. **[d]**

Q.163 The reaction of phenol with excess of bromine water :
(a) m - bromophenol (b) o – and p – bromophenol
(c) 2,4 - dibromophenol (d) 2,4,6 - tribromophenol
Ans. **[d]**

Q.164 Tissues in the organs of living beings are made up of :
(a) fat (b) carbohydrate (c) proteins (d) vitamins
Ans. **[c]**

Q.165 Metabolic function in human bodies is carried out by :
(a) lipids (b) peptides (c) nucleic acid (d) enzymes
Ans. **[d]**

Q.166 The polymer manufactured by condensation polymerization is :
(a) polyethylene-Terphthalate (b) polystyrene
(c) polythylene propylene (d) polyvinyl chloride
Ans. **[a]**

Q.167 Which of the following polymers turns yellowish on exposure to sunlight ?
(a) Polystyrene (b) Nylon (c) Polyethylene (d) Styrene butadiene resin
Ans. **[d]**

Q.168 The cause of instability of nucleus is :
(a) high proton : electron ratio (b) high proton : neutron ratio
(c) low proton : electron ratio (d) low proton : neutron ratio
Ans. **[d]**

Q.169 Which of the following sets of quantum numbers is restricted?
(a) n = 3, ℓ =1, m = + 2 (b) n = 3, ℓ =1, m = 0 (c) n = 3, ℓ = 1, m = +1 (d) n = 3, ℓ = 1, m =–1
Ans. **[a]**

Q.170 The isotopes of an element have different :
(a) number of electrons and neutrons (b) number of protons and neutrons
(c) number of electrons and protons (d) number of neutrons only
Ans. **[d]**

Q.171 The half life period of a radioactive element is 142 days. After 568 days one gram that element will reduce to :
(a) 0.5 g (b) 0.25 g (c) 0.125 g (d) 0.0625 g
Ans. **[d]**

Q.172 The molecule having one unpaired electron is :
(a) CO (b) O_2 (c) N_2 (d) NO
Ans. **[d]**

Q.173 The number of molecular orbitals obtained by mixing two atomic orbitals from each of the atoms is :
(a) 2 (b) 3 (c) 4 (d) 6
Ans. **[c]**

Q.174 The most suitable property for molecular weight determination of polymers is :
(a) Osmotic pressure (b) Lowering of vapour pressure
(c) Elevation in boiling point (d) Depression in freezing point
Ans. **[a]**

Q.175 The number of nearest neighbours around each particle in a face centred cubic unit cell is:
(a) 4 (b) 6 (c) 8 (d) 12
Ans. **[d]**

Q.176 In which mode of expression of concentration of a solution remains independent of temperature?
(a) molarity (b) molality (c) formality (d) normality
Ans. **[b]**

Q.177 Ionic solides are generally :
(a) good conductor of electricity (b) soft
(c) volatile (d) brittle
Ans. **[d]**

Q.178 For the reaction

$$2NO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons N_2O_5(g)$$

if the equilibrium constant is K_p, then the equilibrium constant for the reaction
$2N_2O_5(g) \rightleftharpoons 2N_2O_4(g) + O_2(g)$
would be :
(a) K_p^2 (b) $\frac{2}{K_p}$ (c) $\frac{1}{K_p^2}$ (d) $2K_p$
Ans. **[c]**

Q.179 The equilibrium constant Kc for the reaction
$SO_2(g) + NO_2(g) \rightleftharpoons SO_3(g) + NO(g)$
is 16. If one mole of all four gases is taken in a one litre container, the equilibrium concentration of SO_3 would be:
(a) 0.4 m (b) 0.6 m (c) 1.4 m (d) 1.6 m
Ans. **[b]**

Q.180 An acidic buffer solution could be prepared by mixing the solutions of the following
(a) Sodium accetate and acetic acid
(b) Ammonium sulphate and sulfuric acid
(c) Ammonium chloride and ammonium hydroxide
(d) Sodium chloride and hydrochloric acid
Ans. **[a]**

Q.181 On increasing the temperature, the pKw:
(a) increase (b) decreases (c) remains constant (d) may increase or decrease
Ans. **[b]**

Q.182 The conjugate acid of NH_3 is :
(a) NH_2^- (b) NH_2OH (c) N_2H_5 (d) NH_4^+
Ans. **[d]**

Q.183 The bond enthalpy of H – H,Cl –Cl and H –Cl are 435, 243 and 431 kJ mol^{-1} respectively. The enthalpy of formation of HCl(g) would be:
(a) 92 kJ mol^{-1} (b) –92 kJ mol^{-1} (c) 184 kJ mol^{-1} (d) –184 kJ mol^{-1}
Ans. **[b]**

Q.184 Among the following for spontaneity of chemical reaction there should be :
(a) decrease in entropy and increase in free energy
(b) decrease in entropy and free energy both
(c) increase in entropy and decrease in free energy
(d) increase in entropy and free energy both
Ans. **[c]**

Q.185 Which of the following processes is associated with decrease in entropy?
(a) Vapourization of a mole of water into steam at its B.P.
(b) Dissociation of a mole of common salt in water at 300°K
(c) Mixing of two partially miscible liquids
(d) Crystallization of a salt from its saturated solution
Ans. **[d]**

Q.186 The reaction, $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$, is second order with respect to NO and order with respect to O_2. If the volume of reactant is suddenly reduced to half value, the rate of reaction would be :
(a) one-fourth of original value (b) one-eighth of original value
(c) eight times of original value (d) four times of original value
Ans. **[c]**

Q.187 For a first order reaction, the ratio of times to complete 99.9% and half of the reaction is :
(a) 8 (b) 9 (c) 10 (d) 12
Ans. **[c]**

Q.188 Molten sodium chloride conducts electricity through the following :
(a) free electrons (b) free ions (c) free molecules (d) free atoms
Ans. **[b]**

Q.189 In a galvanic cell the following reaction takes place at 298º K

$Cr_2O_7^{2+} + 14H^+ + 6Fe^{2+} \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$

given that : $E^o (Cr_2O_7^{2-}, H^+, Cr^{3+}/Pt) = 1.33$ V

$E^o (Fe^{3+}, Fe^{2+}/Pt) = 0.77$ V

The standard e.m.f. of the cell is

(a) (1.33+ 0.77)V (b) (1.33 – 0.77)V (c) –(1.33+ 0.77)V (d) (–1.33 + 0.77)V

Ans. **[b]**

Q.190 The colloidal solution is purified by the following process:

(a) disintegration (b) peptization (c) filtration (d) dialysis

Ans. **[d]**

Q.191 Milk is a kind of :

(a) Sol (b) Gel (c) Emulsion (d) Mixture

Ans. **[c]**

Q.192 The colour of Cu_2^{2+}

(a) White (b) Blue (c) Orange (d) Yellow

Ans. **[a]**

Q.193 Which one of the following is purest form of iron ?

(a) Cast iron (b) Wrought iron (c) Pig iron (d) Steel

Ans. **[b]**

Q.194 A metal gets coated with a green basic carbonate when exposed to atmosphere. The metal is :

(a) Copper (b) Zinc (c) Iron (d) Iron

Ans. **[a]**

Q.195 Which of the following elements has highest ionisation potential ?

(a) B (b) C (c) N (d) O

Ans. **[c]**

Q.196 Maximum electron affinity is shown by the following:

(a) Cl (b) Br (c) N (d) Na

Ans. **[a]**

Q.197 Bromine can be liberated from KBr solution by reaction with the following :

(a) Iodine solution (b) Chlorine water (c) Sodium chloride (d) Potassium chloride

Ans. **[b]**

Q.198 Which of the following compounds of xenon cannot be prepared?

(a) XeF (b) XeF_2 (c) XeF_4 (d) XeF_6

Ans. **[a]**

Q.199 The number of ions given by the complex compound $[Co(NH_3)_4 Cl_2] Cl$ is -

(a) 2 (b) 3 (c) 4 (d) 5

Ans. **[a]**

Q.200 When conc. HCl is added to the solution of Cr $(NO_3)_2$, then it slowly turns green due to formation of the following:

(a) $CrCl_3$ (b) Cr_2O_3 (c) CrO_4 (d) Chlorocomplex

Ans. **[b]**