

# PRACTICE PAPER – II

## MATHEMATICS

1. If  $2 < x < 3$ , then  
 (a)  $|x - 3| < |x - 2|$     (b)  $(x - 3) > (x - 2)$   
 (c)  $(x - 3)(x - 2) < 0$     (d)  $\frac{x-3}{x-2} > 0$
2. If  $z = \frac{\sqrt{3}+i}{2}$ , then  $z^{69}$  is equal to  
 (a)  $-i$     (b)  $i$   
 (c)  $1$     (d)  $-1$
3. If  $z$  is a complex number, then  $|3z - 1| = 3|z - 2|$  represents  
 (a)  $y$ -axis    (b) a circle  
 (c)  $x$ -axis    (d) a line parallel to  $y$  axis
4.  $(z + 1)(\bar{z} + 1)$  can be expressed as  
 (a)  $z\bar{z} + 1$     (b)  $|z|^2 + 1$   
 (c)  $|z + 1|^2$     (d)  $|z|^2 + 2$
5. What is the remainder obtained by dividing  $kx^2 + x - 1$  by  $x + 2k$ ?  
 (a)  $-2k - 1$     (b)  $k - 1$   
 (c)  $4k^3 + 2k - 1$     (d)  $4k^3 - 2k - 1$
6. Let  $a, b, c$  be real numbers such that  $4a + 2b + c = 0$  and  $ab > 0$ ; then the quadratic equation  $ax^2 + bx + c = 0$  has  
 (a) real roots  
 (b) non-real roots  
 (c) purely imaginary roots  
 (d) only one real roots
7. If  $x = 2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \dots}}}$ , then the value of  $x$  is  
 (a)  $\sqrt{2} - 1$     (b)  $\sqrt{2} + 1$   
 (c)  $3$     (d) none of these
8. Sum of the series  $\frac{3}{4} + \frac{5}{36} + \frac{7}{144} + \dots$  upto  $n$  terms is  
 (a)  $1 - \frac{1}{n^2}$     (b)  $\frac{n(n+2)}{(n+1)^2}$   
 (c)  $\frac{n^2 + 2n + 2}{(n+1)^2}$     (d) none of these
9. Next term of the sequence  $\frac{7}{3}, \frac{35}{6}, \frac{121}{12}, \frac{335}{24}$  ..... is  
 (a)  $\frac{863}{48}$     (b)  $\frac{869}{48}$   
 (c)  $\frac{865}{48}$     (d) none of these
10.  $(\underbrace{666\dots6}_n \text{ digits})^2 + (\underbrace{888\dots8}_n \text{ digit})$  is equal to  
 (a)  $\frac{4}{9}(10^{2n} - 1)$     (b)  $\frac{4}{9}(10^n - 1)^2$   
 (c)  $\frac{4}{9}(10^n - 1)$     (d) none of these
11. If  $n$  is an integer between  $0$  and  $> 1$ , then the minimum value of  $\lfloor \frac{n}{2} \rfloor \lfloor \frac{21-n}{2} \rfloor$  is  
 (a)  $\lfloor 9 \rfloor \lfloor 12 \rfloor$     (b)  $\lfloor 10 \rfloor \lfloor 11 \rfloor$   
 (c)  $\lfloor 20 \rfloor$     (d)  $\lfloor 21 \rfloor$
12. If  $n$  is an even positive integer, then  ${}^nC_r$  is maximum when  $r =$   
 (a)  $n$     (b)  $0$   
 (c)  $\frac{n}{2}$     (d) none of these
13. A parallelogram is cut by two sets of  $n$  parallel lines parallel to the sides of the parallelogram. The number of parallelogram thus formed is  
 (a)  ${}^nC_2 \times {}^nC_2$     (b)  ${}^{n+1}C_2 \times {}^{n+1}C_2$   
 (c)  ${}^nC_2 \times {}^{n+1}C_2$     (d) none of these
14. If  $(3\sqrt{3} + 5)^{2n+1} = p + f$ , where  $p$  is an integer and  $f$  is a proper fraction, then  $f(p+f)$  is equal to  
 (a)  $5^{n+1}$     (b)  $3^{2n+1}$   
 (c)  $2^{2n+1}$     (d) none of these
15. The integral part of  $(8 + 3\sqrt{7})^n$  is  
 (a) an odd integer  
 (b) an even integer  
 (c) zero  
 (d) nothing can be said

16. A square matrix  $A = [a_{ij}]_{n \times n}$  is called a diagonal matrix if  $a_{ij} = 0$  for
- (a)  $i = j$  (b)  $i < j$   
 (c)  $i > j$  (d)  $i \neq j$
17. The system of equations  $Ax = B$  of  $n$  equations in  $n$  unknowns has a unique solution if
- (a)  $\det A \neq 0$   
 (b)  $\det A \neq 0$ ,  $(\text{Adj } A)B = 0$   
 (c)  $\det A = 0$ ,  $(\text{Adj } A)B = 0$   
 (d)  $\det A = 0$ ,  $(\text{Adj } A)B \neq 0$
18. If for a matrix  $A$ ,  $A^2 + I = 0$ , where  $I$  is the identity matrix, then  $A$  equals
- (a)  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$  (b)  $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$   
 (c)  $\begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix}$  (d)  $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$
19. The value of  $\frac{3 + \cot 76^\circ \cot 16^\circ}{\cot 76^\circ + \cot 16^\circ}$  is
- (a)  $\cot 46^\circ$  (b)  $\tan 46^\circ$   
 (c)  $\tan 44^\circ$  (d) none of these
20. If  $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = \frac{5\pi^2}{8}$ , then  $x =$
- (a)  $-1$  (b)  $1$   
 (c)  $0$  (d) none of these
21. If  $\cos x = \tan y$ ,  $\cos y = \tan z$  and  $\cos z = \tan x$ , then a value of  $\sin x$  is equal to
- (a)  $2 \cos 18^\circ$  (b)  $\cos 18^\circ$   
 (c)  $\sin 18^\circ$  (d)  $2 \sin 18^\circ$
22. If  $\cot(\alpha + \beta) = 0$ , then  $\sin(\alpha + 2\beta)$  is equal to
- (a)  $\sin \alpha$  (b)  $\cos \alpha$   
 (c)  $\sin \beta$  (d)  $-\cos \beta$
23. If  $\tan \alpha = \frac{1}{5}$ ,  $\tan \beta = \frac{1}{239}$ , then the value of  $\tan(4\alpha - \beta)$  is
- (a)  $0$  (b)  $-1$   
 (c)  $1$  (d) not defined
24. If  $\{x\}$  and  $[\bar{x}]$  denote respectively that fractional and integral parts of a real number  $x$ , then the solution set of the equation is
- (a)  $\left\{0, \frac{5}{3}\right\}$  (b)  $\left\{\frac{5}{3}\right\}$   
 (c)  $\{0\}$  (d) none of these
25. If  $f(x) = \tan x$ ,  $-\frac{\pi}{2} < 0 < \frac{\pi}{2}$  and  $g(x) = \sqrt{3-x^2}$ , then domain of the function  $g$  of is
- (a)  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$  (b)  $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$   
 (c)  $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$  (d) none of these
26.  $3 \tan^{-1} x = \tan^{-1} \left( \frac{3x - x^3}{1 - 3x^2} \right)$  holds only if
- (a)  $|x| \leq 1$  (b)  $|x| \geq 1$   
 (c)  $|x| < \frac{1}{3}$  (d) none of these
27. Solution set of the equation  $\tan^{-1} \left( \frac{x-1}{x-2} \right) + \tan^{-1} \left( \frac{x+1}{x+2} \right) = \frac{\pi}{4}$  is
- (a)  $\left\{-\frac{1}{2}, \frac{1}{2}\right\}$  (b)  $\left\{-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right\}$   
 (c)  $\{0\}$  (d) none of these
28. If  $y = \tan \sqrt{\frac{\pi^2}{9} - x^2}$ , then
- (a)  $-\sqrt{3} \leq y \leq \sqrt{3}$   
 (b)  $0 \leq y \leq \sqrt{3}$   
 (c)  $0 \leq y \leq 3$   
 (d) none of these
29.  $\lim_{x \rightarrow 1} 2^{\frac{1}{x-1}}$  is equal to
- (a)  $0$  (b)  $1$   
 (c) does not exist (d) none of these
30.  $\lim_{x \rightarrow \frac{\pi}{4}} \frac{2\sqrt{2} - (\sin x + \cos x)^3}{1 - \sin 2x}$  is equal to
- (a)  $\frac{3\sqrt{3}}{2}$  (b)  $\frac{3\sqrt{2}}{2}$   
 (c)  $\frac{3}{2\sqrt{2}}$  (d) none of these
31. If  $\sqrt{1-x^{2n}} + \sqrt{1-y^{2n}} = a(x^n - y^n)$ , then  $\frac{dy}{dx} =$
- (a)  $\frac{\sqrt{1-x^{2n}}}{\sqrt{1-y^{2n}}}$  (b)  $\frac{\sqrt{1-y^{2n}}}{\sqrt{1-x^{2n}}}$   
 (c)  $\frac{x^{n-1}}{y^{n-1}} \sqrt{\frac{1-y^{2n}}{1-x^{2n}}}$  (d) none of these

32. If  $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ , then  $\frac{dy}{dx}$  is equal to
- (a)  $\frac{\sqrt{1-x^2}}{\sqrt{1-y^2}}$  (b)  $\sqrt{1-x^2}\sqrt{1-y^2}$   
 (c)  $\frac{\sqrt{1-x^2}y}{1-x^2}$  (d) none of these
33.  $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x-h)}{h}$ , if it exists, is equal to
- (a)  $f'(x)$  (b)  $\frac{1}{2}f'(x)$   
 (c)  $2f'(x)$  (d) none of these
34.  $\int \frac{1}{1 + \sin x + \cos x} dx =$
- (a)  $\log \left| 1 + \tan \frac{x}{2} \right|$  (b)  $\log |1 + \sin x + \cos x|$   
 (c)  $2 \log \left| 1 + \tan \frac{x}{2} \right|$  (d)  $\frac{1}{2} \log \left| 1 + \tan \frac{x}{2} \right|$
35.  $\int \frac{1}{5 - 4 \cos x} dx =$
- (a)  $\frac{2}{3} \tan^{-1} \left( \tan \frac{x}{2} \right)$  (b)  $\frac{2}{3} \tan^{-1} \left( 3 \tan \frac{x}{2} \right)$   
 (c)  $\frac{2}{9} \tan^{-1} \left( 3 \tan \frac{x}{2} \right)$  (d) none of these
36.  $\int \frac{\sin x + \cos x}{\sqrt{9 + 16 \sin 2x}} dx$  is equal to
- (a)  $\frac{1}{4} \log |\sin x - \cos x + \frac{1}{4} \sqrt{9 + 16 \sin 2x}|$   
 (b)  $\frac{1}{4} \sin^{-1} \left[ 4 \frac{(\sin x - \cos x)}{5} \right]$   
 (c)  $\frac{1}{5} \sin^{-1} \left[ 4 \frac{(\sin x - \cos x)}{5} \right]$   
 (d) none of these
37. If  $\int_{-1}^4 f(x) dx = 4$ , and  $\int_2^4 (3 - f(x)) dx = 7$ , then the value of  $\int_{-1}^2 f(x) dx$  is
- (a) -2 (b) 3  
 (c) 5 (d) none of these
38. If  $f(a-x) = f(x)$ , then  $\int_0^a x f(x) dx$  is equal to
- (a)  $\frac{a}{2} \int_0^a f(x) dx$  (b)  $a \int_0^a f(x) dx$   
 (c)  $\frac{a^2}{2} \int_0^a f(x) dx$  (d) none of these
39. Area of the parallelogram whose diagonals are  $\vec{a}$  and  $\vec{b}$  is
- (a)  $\vec{a} \cdot \vec{b}$  (b)  $|\vec{a} \times \vec{b}|$   
 (c)  $\vec{a} + \vec{b}$  (d)  $\frac{1}{2} |\vec{a} \times \vec{b}|$
40. If  $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}|$ , then  $\vec{a}$  and  $\vec{b}$  are
- (a) perpendicular (b) like parallel  
 (c) unlike parallel (d) confident
41. If  $\vec{a} \cdot \vec{b} \times |\vec{a}| \times |\vec{b}|$ , then  $\vec{a}$  and  $\vec{b}$  are
- (a) perpendicular (b) like parallel  
 (c) unlike parallel (d) coincident
42. If  $\hat{a}$  and  $\hat{b}$  are unit vector, then  $\hat{a} + \hat{b}$  is equally inclined to
- (a)  $\hat{a}$  and  $\hat{a} - \hat{b}$   
 (b)  $\hat{b}$  and  $\hat{a} - \hat{b}$   
 (c)  $\hat{a}$  and  $\hat{b}$   
 (d) none of these
43. If  $\hat{a}$  and  $\hat{b}$  be two unit vectors, then the vector  $(\hat{a} + \hat{b}) \times (\hat{a} \times \hat{b})$  is parallel to the vector
- (a)  $\hat{a} - \hat{b}$  (b)  $\hat{a} + \hat{b}$   
 (c)  $2\hat{a} - \hat{b}$  (d)  $2\hat{a} + \hat{b}$
44. The vector  $\vec{a} = \hat{i} + \hat{j} + (m+1)\hat{k}$ ,  $\vec{b} = \hat{i} + \hat{j} + m\hat{k}$  and  $\vec{c} = \hat{i} - \hat{j} + m\hat{k}$  are coplanar for
- (a)  $m = \frac{1}{2}$   
 (b)  $m = -\frac{1}{2}$   
 (c)  $m = 2$   
 (d) no value of  $m$
45.  $\hat{i} \times (\hat{x} \times \hat{i}) + \hat{j} \times (\hat{x} \times \hat{j}) + \hat{k} \times (\hat{x} \times \hat{k})$  is
- (a)  $\hat{0}$  (b)  $\vec{x}$   
 (c)  $2\vec{x}$  (d)  $\hat{0}$

### PHYSICS

46. A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m/s. To give an initial upward acceleration of  $20 \text{ m/s}^2$ , the amount of gas ejected per second to supply the needed thrust will be  
 (a) 137.5 kg/sec      (b) 185.5 kg/sec  
 (c) 127.5 kg/sec      (d) 187.5 kg/sec
47. A body of mass 10 kg and velocity 10 m/s collides with a stationary body of mass 5 kg. After collision both bodies stick to each other, velocity of the bodies after collision will be  
 (a)  $\frac{3}{10} \text{ m/s}$       (b)  $\frac{18}{3} \text{ m/s}$   
 (c)  $\frac{9}{20} \text{ m/s}$       (d)  $\frac{20}{3} \text{ m/s}$
48. The earth (mass =  $6 \times 10^{24} \text{ kg}$ ) revolves around the sun with an angular velocity  $2 \times 10^{-7} \text{ rad/sec}$  in a circular orbit of radius  $1.5 \times 10^8 \text{ km}$ . The force exerted by sun on earth in newton is  
 (a)  $36 \times 10^{21}$       (b)  $18 \times 10^{25}$   
 (c)  $29 \times 10^{39}$       (d) zero
49. A bread gives a boy of mass 40 kg an energy of 21 kJ. If the efficiency is 28%, then the height can be climbed by him using this energy, is  
 (a) 22.5 m      (b) 15 m  
 (c) 10 m      (d) 5 m
50. At what height from the earth surface, the acceleration of gravity will be half the value of  $g$  at surface? ( $R = 6400 \text{ km}$ )  
 (a) 6400 km  
 (b) 4800 km  
 (c) 8200 km  
 (d) 1600 km
51. If the gravitational force had varied as  $r^{-5/2}$  instead of  $r^{-2}$ . The potential energy of a particle at a distance  $r$  from the centre of the earth would be proportional to  
 (a)  $(r_1 - r_2)^{3/2}$   
 (b)  $r^{-3/2}$   
 (c)  $r^{-1}$   
 (d)  $r^{-2}$
52. A satellite of mass  $m$  is circulating around the earth with constant angular velocity. If the radius of the orbit is  $R_0$  and mass of the earth is  $M$ . The angular momentum about the centre of the earth is  
 (a)  $M \sqrt{\frac{GM}{R_0}}$       (b)  $m \sqrt{\frac{GM}{R_0}}$   
 (c)  $M \sqrt{gmR_0}$       (d)  $m \sqrt{GMR_0}$
53. A soap bubble has radius  $r$  and volume  $V$ . If the excess pressure inside the bubble is  $P$ , then  $PV$  is proportional to  
 (a)  $r$       (b)  $r^2$   
 (c)  $r^3$       (d)  $r^4$
54. If a body of mass 200 g falls from a height 200 m and its total potential energy is conserved into kinetic energy, at the point of contact of the body with the surface, then decrease in potential energy of the body at the contact is ( $g = 10 \text{ m/s}^2$ )  
 (a) 900 J      (b) 600 J  
 (c) 400 J      (d) 200 J
55. A particle is projected with 200 m/s at an angle  $60^\circ$ . At the highest point, it explodes into three particles of equal masses. One goes vertically upwards with velocity 100 m/s, second particle goes vertically downwards. Then the velocity of the third particle will be  
 (a) 200 m/s  
 (b) 300 m/s  
 (c) 120 m/s with  $60^\circ$  angle  
 (d) 200 m/s with  $30^\circ$  angle
56. A cylinder of 500 g and radius 10 cm has moment of inertia is (about its natural axis)  
 (a)  $3.5 \text{ kgm}^2$   
 (b)  $5 \times 10^{-3} \text{ kgm}^2$   
 (c)  $2 \times 10^{-3} \text{ kg m}^2$   
 (d)  $2.5 \times 10^{-3} \text{ kg m}^2$
57. If a body starts from rest and travels 120 cm in the 8th second. Then acceleration of the body is  
 (a)  $1.02 \text{ m/s}^2$       (b)  $0.34 \text{ m/s}^2$   
 (c)  $0.18 \text{ m/s}^2$       (d)  $0.16 \text{ m/s}^2$

58. A ball is falling in a lake of depth 200 m creates a decrease 0.1 % in its volume at the bottom. The bulk modulus of the material of the ball will be  
 (a)  $19.6 \times 10^{-8} \text{ N/m}^2$  (b)  $19.6 \times 10^{10} \text{ N/m}^2$   
 (c)  $19.6 \times 10^{-10} \text{ N/m}^2$  (d)  $19.6 \times 10^8 \text{ N/m}^2$
59. Waterfalls from a height 500 m. The rise in temperature of water at bottom if whole of the energy remains in water, will be (specific heat of water  $(c) = 4.2 \text{ kJ/kg}$ )  
 (a)  $0.23^\circ\text{C}$  (b)  $1.16^\circ\text{C}$   
 (c)  $0.96^\circ\text{C}$  (d)  $1.02^\circ\text{C}$
60. A cylindrical resonance tube, open at both ends, has a fundamental frequency  $f$  in air. If half of the length is dipped vertically in water. The fundamental frequency of the air column will be  
 (a)  $\frac{3f}{2}$  (b)  $2f$   
 (c)  $f$  (d)  $\frac{f}{2}$
61. A wave frequency 500 Hz has a velocity of 350 m/s. The distance between two nearest points, if the wave is  $60^\circ$  out of phase, will be approximately  
 (a) 70 cm (b) 0.7 m  
 (c) 12.0 cm (d) 120.0 cm
62. If the momentum of a particle is double, then its de-Broglie wavelength will become  
 (a) remain unchanged  
 (b) four times  
 (c) two times  
 (d) half times
63. A wave frequency 100 Hz is sent along a string towards a fixed end. When this wave travels back, after reflection, a node is formed at a distance of 10 cm from the fixed end of the string. The speeds of incident (and reflected) waves are  
 (a) 48 m/s (b) 20 m/s  
 (c) 10 m/s (d) 15 m/s
64. A source of sound is travelling with a velocity 40 km/hr towards an observer and emits sound of frequency 2000 Hz. If velocity of sound is 1220 km/hr, then the apparent frequency heard by an observer is  
 (a) 1980 Hz (b) 1950 Hz  
 (c) 2068 Hz (d) 2080 Hz
65. What is the dot product of two vectors of magnitude 3 and 5, if angle between them is  $60^\circ$  ?  
 (a) 5.2 (b) 7.5  
 (c) 8.4 (d) 8.6
66. Dimensions of torque are  
 (a)  $[\text{M}^2\text{L}^2\text{T}^2]$  (b)  $[\text{ML}^2\text{T}^{-2}]$   
 (c)  $[\text{ML}^0\text{T}^{-1}]$  (d)  $[\text{ML}^2\text{T}^{-1}]$
67. A glass rod of 20 cm long is clamped at the middle. It is set into the longitudinal vibration. If the emitted sound frequency is 4000 Hz, then velocity of sound in glass will be  
 (a) 2800 m/s (b) 3200 m/s  
 (c) 1600 m/s (d) 2000 m/s
68. If the critical angle for total internal reflection from a medium to vacuum is  $30^\circ$ . Then velocity of light in the medium is  
 (a)  $1.5 \times 10^8 \text{ m/s}$   
 (b)  $2 \times 10^8 \text{ m/s}$   
 (c)  $3 \times 10^8 \text{ m/s}$   
 (d)  $0.75 \times 10^8 \text{ m/s}$
69. The mass of the planet is  $1/9$ th of the mass of the earth and its radius is half that of the radius of the earth. If a body weighs 450 N on the earth, then what will be its weight on planet ?  
 (a) 150 N (b) 200 N  
 (c) 400 N (d) 100 N
70. 16 g of oxygen at  $37^\circ\text{C}$  is mixed with 14 g of nitrogen at  $27^\circ\text{C}$ , the temperature of the mixture will be  
 (a)  $30.5^\circ\text{C}$  (b)  $37^\circ\text{C}$   
 (c)  $27^\circ\text{C}$  (d)  $32^\circ\text{C}$
71. When there is not heat change from surrounding in a system, then the process is related with  
 (a) isobaric (b) isochoric  
 (c) isothermal (d) adiabatic
72. If the ratio of specific heat of a gas at constant pressure to that at constant volume is  $\gamma$ , the change in internal energy of one mole of a gas when the volume changes from  $V$  to  $2V$  at constant pressure  $P$  is  
 (a)  $\frac{\gamma PV}{\gamma - 1}$  (b)  $\frac{PV}{\gamma - 1}$   
 (c)  $\frac{R}{\gamma - 1}$

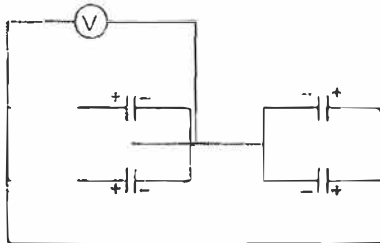
73. The original temperature of a black body is  $727^{\circ}\text{C}$ . The temperature to which that black body must be raised so as to double the total radiant energy, is

- (a)  $917^{\circ}\text{C}$                       (b)  $1190^{\circ}\text{C}$   
 (c)  $1454^{\circ}\text{C}$                       (d)  $2000\text{ K}$

74. A particle of mass  $m$  and charge  $q$  is placed at rest in a uniform electric field  $E$  and then released. The kinetic energy attained by the particle after moving a distance  $y$  is

- (a)  $q^2Ey$                       (b)  $qEy$   
 (c)  $qE^2 y$                       (d)  $qEy^2$

75. Four capacitors each of  $25\ \mu\text{F}$  are connected as shown in diagram the DC voltmeter reads 200 volt. The charge on each plate of capacitor will be



- (a)  $5 \times 10^{-2}\text{C}$                       (b)  $2 \times 10^{-2}\text{C}$   
 (c)  $5 \cdot 10^{-3}\text{C}$                       (d)  $2 \times 10^{-3}\text{C}$

76. A  $10\ \Omega$  electric heater operates on a 110 V line, then the rate at which it develops heat in watts will be

- (a) 1210                      (b) 810  
 (c) 670                      (d) 1310

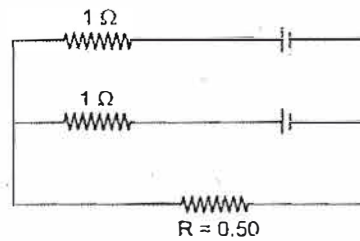
77. If the magnetic dipole is rotated through angle  $\theta$  with respect to the direction of  $H$ . Then work done will be

- (a)  $M H (1 - \cos \theta)$                       (b)  $M H \cos \theta$   
 (c)  $M H (1 - \sin \theta)$                       (d)  $M H \sin \theta$

78. If a wire of resistance  $20\ \Omega$  is covered with ice and a voltage of 210 V is applied across the wire then rate of melting of ice will be

- (a) 6.56 g/s                      (b) 0.85 g/s  
 (c) 6.56 g/s                      (d) none of these

79. Two identical batteries, each of emf 2 volt and internal resistance  $R = 0.5\ \Omega$  by passing a current through it. The maximum power that can be developed across  $R$  using these batteries is



- (a) 3.2 W                      (2) 8.2 W  
 (c) 2 W                      (d) 4 W

80. The angle of minimum deviation for a thin prism with respect to air and when dipped in

water will be  $\left( {}^a\mu_p = \frac{3}{2}, {}^a\mu_w = \frac{4}{3} \right)$

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

81. The velocity of an electron in the inner most orbit of an atom is

- (a) highest                      (b) lowest  
 (c) mean                      (d) zero

82. The diameter of the objective lense of a telescope is 5.0 m and wavelength of light is  $6000\ \text{\AA}$ . The limit of resolution of this telescope is

- (a) 0.15 sec                      (b) 0.06 sec  
 (c) 0.03 sec                      (d) 3.03 sec

83. Light of wavelength  $5000\ \text{\AA}$  falls on a sensitive plate with photoelectric work function of 1.9 eV. The maximum kinetic energy of the photoelectron emitted will be

- (a) 1.16 eV                      (b) 2.38 eV  
 (c) 0.58 eV                      (d) 2.98 eV.

84. The mass number of He is 4 and that of sulphur is 32. The radius of sulphur nucleus is larger than that of helium by a factor of

- (a) 2                      (b) 4  
 (c)  $\sqrt{8}$                       (d) 8

85. A transistor has an  $\alpha = 0.95$ , it has change in emitter current of 100 milliampere, then the change in the collector current is

- (a) 95 mA                      (b) 99.05 mA  
 (c) 100.95 mA                      (d) 100 mA

**CHEMISTRY**

86. In graphite the electrons are  
 (a) present in antibonding orbitals  
 (b) spread out between the structure  
 (c) localised on each carbon atom  
 (d) localised on every third carbon atom
87. The electroplating technique was given by  
 (a) Brogan (b) Edison  
 (c) Thomas Graham (d) Faraday
88. The type of vitamins we require daily are  
 (a) water soluble (b) alcohol soluble  
 (c) fat soluble (d) all the above
89. Primary amine reacts with carbon di sulphide in presence of excess of mercuric chloride and produce isothiocyanate. This reaction is known as  
 (a) Hoffmann bromide reaction  
 (b) Hoffmann mustard oil reaction  
 (c) Carbylamine reaction  
 (d) Perkin's reaction
90. The correct statement regarding hydrogen is  
 (a) It has same electronegativity as halogens  
 (b) It is not liberated at anode  
 (c) It has  $-1$  and  $+1$  oxidation number  
 (d) It has same ionisation potential as alkali metals.
91. Which of the following reacts with chloroform and base to form phenyl isocyanide.  
 (a) phenol (b) benzene  
 (c) nitrobenzene (d) aniline
92. Aromatic hydrocarbons shows mostly  
 (a) electrophilic addition reaction  
 (b) nucleophilic addition reaction  
 (c) nucleophilic substitution reaction  
 (d) electrophilic substitution reaction
93. Number of protons, neutrons and electrons in  ${}_{89}X^{231}$  is  
 (a) 89, 71, 89 (b) 89, 231, 89  
 (c) 89, 89, 242 (d) 89, 142, 89
94. The compound which cannot be formed is  
 (a) He (b) He<sup>+</sup>  
 (c) He<sub>2</sub> (d) He<sup>+2</sup>
95. The ferroelectric compound is  
 (a) K<sub>4</sub>[Fe(CN)<sub>6</sub>] (b) Ba TiO<sub>3</sub>  
 (c) Pb<sub>2</sub>O<sub>3</sub> (d) none of these
96.  $C_3H_8 + Cl_2 \xrightarrow{\text{Light}} C_3H_7Cl + HCl$   
 The above reaction is an example of  
 (a) substitution (b) addition  
 (c) elimination (d) rearrangement
97. For the manufacture of NH<sub>3</sub> by the following reaction  
 $N_2 + 3H_2 \rightleftharpoons 2NH_3 + 23\text{kcal}$   
 The favourable condition are  
 (a) low temp., high pressure and catalyst  
 (b) low temp., low pressure and catalyst  
 (c) high temp., high pressure and catalyst  
 (d) high temp., low pressure and catalyst
98. A gas sample has volume of 0.2 litre measured at 1 atm and 0°C. At same pressure and at 273°C, its volume is  
 (a) 0.2 litre (b) 0.4 litre  
 (c) 0.8 litre (d) 1.6 litre
99. In gas equation  $PV = nRT$  the incorrect statement is  
 (a) P is the pressure of one mole of gas  
 (b) V is the volume of one mole of gas  
 (c) n is the number of moles of gas  
 (d) n is the number of molecules of gas
100. The compound which of the following shows geometrical isomerism is  
 (a) propene (b) 1, 1-dichlorobutene  
 (c) 1-butene (d) 2-butene
101. First law of thermodynamics can be represented by the equation  
 (a)  $\Delta E = Q - W$  (b)  $\Delta E = Q + W$   
 (c)  $W = Q + \Delta E$  (d) none of these
102. The isomerism present in cyanide and isocyanide is  
 (a) functional (b) tautomer  
 (c) positional (d) none of these
103. The correct electronic configuration of Fe<sup>+2</sup> is  
 (a) 1s<sup>2</sup>, 2s<sup>2</sup> 2p<sup>6</sup>, 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>6</sup>, 4s<sup>2</sup>  
 (b) 1s<sup>2</sup>, 2s<sup>2</sup> 2p<sup>6</sup>, 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>6</sup>  
 (c) 1s<sup>2</sup>, 2s<sup>2</sup> 2p<sup>6</sup>, 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>6</sup>  
 (d) 1s<sup>2</sup>, 2s<sup>2</sup> 2p<sup>6</sup>, 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>6</sup>, 4s<sup>2</sup>

104. The volume of air needed for complete combustion of 1 kg carbon at STP is  
 (a) 3333.35 L (b) 6666.66 L  
 (c) 9333.35 L (d) 9999.99 L
105. For the reaction,  $A + B \rightleftharpoons 2C$   
 2 moles of A and 3 moles of B are allowed to react. If the equilibrium constant is 4 at 400°C, then the mole of C at equilibrium is  
 (a) 1 (b) 2.4  
 (c) 3.6 (d) 4
106. Heavy water is represented by  
 (a)  $H_3O$  (b)  $D_2O$   
 (c)  $H_2O_2$  (d)  $H_2O_3$
107.  $C_6H_6 + CH_3Cl \xrightarrow{AlCl_3} C_6H_5CH_3 + HCl$  is known as  
 (a) Kolbe's reaction  
 (b) Friedel craft's reaction  
 (c) Wurtz reaction  
 (d) Fittig reaction
108.  $F_2C = CF_2$  is a monomer of the polymer  
 (a) teflon (b) polyethylene  
 (c) bakelite (d) terylene
109. Chlorine and ethyl alcohol reacts to produce  
 (a) ethyl chloride (b) ethyl tetrachloride  
 (c) chloroform (d) chloral
110. The element which is used as semiconductor is  
 (a) Al (b) Bi  
 (c) Cr (d) Si
111. The most stable compound is  
 (a) LiF (b) LiCl  
 (c) LiBr (d) LiI
112. On adding 0.750 gm of compound in 25 gm of solvent lowered the freezing point of the solvent by 0.502°C. The molecular wt. of the substance is [the molecular depression constant = 50.2°C per 100 gm of solvent]  
 (a) 100 (b) 200  
 (c) 300 (d) 400
113. Iodoethane reacts with sodium in presence of dry ether to produce  
 (a) butane (b) butene  
 (c) pentene (d) propyne
114. One mole of an ideal gas at 27°C is expanded isothermally from 1 lit to 10 lit the value of  $\Delta E$  is [ $R = 2 \text{ Cal. K}^{-1}\text{mol}^{-1}$ ]  
 (a) zero (b) 104  
 (c) 157 (d) 175
115. A compound on treatment with NaOH followed by addition of  $AgNO_3$  produce white precipitate at room temperature the precipitate is soluble in  $NH_4OH$ . The compound is identified as  
 (a) vinyl chloride (b) benzyl chloride  
 (c) chlorobenzene (d) ethyl bromide
116. Acetaldoxime reacts with  $P_2O_5$  to produce  
 (a) ethyl cyanide  
 (b) propyl cyanide  
 (c) methyl cyanide  
 (d) none of these
117. The gas used in the hydrogenation of oils in presence of catalyst nickel is  
 (a) ozone (b) ethane  
 (c) hydrogen (d) methane.
118.  $BF_3$  act as an acid according to the concept of  
 (a) Bronsted (b) Arrhenius  
 (c) Lewis (d) All of these
119. The compound which does not have a - COOH group is  
 (a) Picric acid (b) Aspirin  
 (c) Ethanic acid (d) Benzoic acid
120. Total number of electrons in all the p-orbitals of bromine are  
 (a) 17 (b) 24  
 (c) 27 (d) 33
121. From the complete decomposition of 20 gm  $CaCO_3$  at STP the volume of  $CO_2$  obtained is  
 (a) 2.24 lit (b) 4.48 lit  
 (c) 20 lit (d) 22.4 lit
122. The formula of plaster of Paris is  
 (a)  $CaSO_4 \cdot \frac{1}{2} H_2O$   
 (b)  $CaSO_4 \cdot 2H_2O$   
 (c)  $CaSO_4 \cdot H_2O$   
 (d)  $CaSO_4 \cdot 4H_2O$



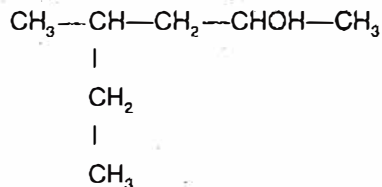
123. If two moles of an ideal gas at 273°C occupy a volume of 44.8 lit., then pressure is

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

124.  $\text{CH}_3\text{COOH} \xrightarrow{\text{Br}_2/\text{P}} \text{X} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) KCN}} \text{Y}$ , Y is identified as

- (a) succinic acid  
(b) malonic acid  
(c) glycolic acid  
(d)  $\alpha$ -hydroxy propionic acid

125. IUPAC name of



- (a) 4-methyl-3 hexanol  
(b) 4-methyl-2-hexanol  
(c) 2-ethyl-4-pentanol  
(d) 2-methyl-4-hexanol

### INTELLIGENCE, LOGIC & REASONING

**Directions (Q. 126 – 128) :** Answer the following questions.

126. B is the aunt of C and A is the husband of B. B is the sister of D. How is D related to A ?

- (a) Aunt (b) Nephew  
(c) Brother-in-law (d) Uncle

127. A is the daughter of B, C is the sister of A. B is the daughter of D. How is C related to D ?

- (a) Aunt (b) Daughter  
(c) Grand mother (d) Grand daughter

128. Rajeev is the brother of Mohan. Sonia is the sister of Sudhir. Mohan is the son of Sonia. How is Rajeev related to Sudhir ?

- (a) Father (b) Brother  
(c) Son (d) Nephew

**Directions (Q. 129 – 130) :** Complete the series with the help of given option.

129. 125, 235, 345 .....

- (a) 173 (b) 358  
(c) 259 (d) 455

130. 138, 161, 185, 210 .....

- (a) 109 (b) 236  
(c) 331 (d) 402

**Directions (Q. 131 – 132) :** Answer the given questions on the basis of the alphabate.

131. cc \_ cc, dd \_ d \_\_, cc \_ cc, dd \_ dd

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

132. k \_ mnki \_ \_ klmn

- (a) nml (b) lmn  
(c) nlk (d) rdl

**Directions (Q. 133 – 135) :** Solve the following problems.

133. If the value of the  $m + \frac{1}{m} = 4$ , then what is the

value of  $m^2 + \left[\frac{1}{m}\right]^2$  ?

- (a) 21 (b) 18  
(c) 14 (d) 9

134. How long will it take for a boy to run around a square field of area 25 hectares at 10 km. per hour ?

- (a)  $\frac{3}{11}$  hr  
(b)  $\frac{3}{8}$  hr  
(c)  $\frac{2}{10}$  hr  
(d)  $\frac{2}{9}$  hr

135. If  $\frac{17}{18}$  of an article be worth ₹ 850, then what

is the value of the article ?

- (a) 540  
(b) 480  
(c) 306  
(d) 204

## ENGLISH LANGUAGE & COMPREHENSION

**Directions (Q. 136 – 139) :** *Read the passage and answer the following questions.*

I was under the canvas with guns. They smelled clearly of oil and grease. I lay and listened to the rain on the canvas and the clicking of the car over the rails. There was a little light come through and I lay and looked at the guns. They had their canvas jackets on. I thought they must have been sent ahead from the third army. The bump on my forehead was swollen, and I stopped the bleeding by lying still and letting it coagulate, then picked away the dried blood except over the cut.

- 136.** The author lay still because  
 (a) he was injured and bleeding  
 (b) he was hiding  
 (c) he hasn't enough space to sit in  
 (d) he secretly wanted to know about guns

**137.** 'Coagulate' means

- (a) to be dried up  
 (b) to stop flowing  
 (c) to collect  
 (d) become thick and set

**138.** The vehicle in which the author travelled was

- (a) a motor car            (b) a railway carriage  
 (c) a motor trolley        (d) a military truck

**139.** In the sentence 'they had their canvas jackets on the word' 'they' stands for

- (a) guns                      (b) soldiers  
 (c) railway carriages        (d) third army.

**Directions (Q. 140 – 141) :** *Choose the antonyms of the given words.*

**140.** ADDUCE

- (a) decay                      (b) to allure  
 (c) withdraw                (d) bring forward

**141.** REPOSE

- (a) in motion                (b) rest  
 (c) do not care              (d) tranquility

**Directions (Q. 142 – 143) :** *Re-arrange the jumbled parts of the following sentences.*

**142.** The theme

1. from love                      2. runs right  
 3. through the book            4. of the outcast  
 (a) 3421                            (b) 3412  
 (c) 4123                            (d) 1234

**143.** Such is the

1. really knows  
 2. true wisdom and humility  
 3. the less conceited  
 4. for the more a man  
 (a) 1432                          (b) 1234  
 (c) 1423                          (d) 2413

**Directions (Q. 144 – 146) :** *In the following sentences, choose the most appropriate preposition.*

**144.** The man in the street compelled to reveal ..... corruption.

- (a) at                              (b) on  
 (c) about                        (d) for

**145.** She felt sympathetic.....all the war prisoners.

- (a) towards                      (c) for  
 (b) about                         (d) with

**146.** A person who has no aptitude ..... business can never succeed ..... it.

- (a) about, by                      (b) at, about  
 (c) for, in                         (d) in, with

**Directions (Q. 147 – 148) :** *Each of the following words is followed by four likely synonyms. One of them is not the correct synonym. Pick up that.*

**147.** Difficult

- (a) calm                         (b) inconvenient  
 (c) tough                        (d) hard

**148.** Sorrow

- (a) misery                        (b) unhappiness  
 (c) beautiful                      (d) sadness

**Directions (Q. 149 – 150) :** *Select the words which are related to each other in the same way as the capitalised words are related to each other.*

**149.** BORROWING : RENTAL : : ?

- (a) Give : Take  
 (b) Dog : Animal  
 (c) Leading : Landing  
 (d) Stealing : Theft

**150.** CHOP: MINCE : : ?

- (a) Fry : Bake                      (b) Pass : Fail  
 (c) Cut : Cake                      (d) Speak : Listen