SECTION – A

1. The velocity of projection of a projectile is $(6\hat{\imath} + 8\hat{\jmath})$ m/sec. the horizontal range of the particle is (g=10 m/sec^2)

   (a) 4.9 m (b) 9.6 m (c) 19.6 m (d) 14 m

2. A block of mass 1 kg lies on a horizontal surface in a truck. The coefficient of static fuction between the block and the surface is 0.6. if the acceleration of the truck is 5 m/sec^2, the frictional force acting on the block is

   (a) 5 N (b) 6 N (c) 10 N (d) 15 N

3. The kinetic energy of a body of mass 2 kg and momentum of 2 Ns is

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

4. Let a_r and a_t, represent radial and tangential acc^n. the motion a particle may be circular if

   (a) $a_r = 0$, $a_t = 0$ (b) $a_r = 0$, $a_t \neq 0$ (c) $a_r \neq 0$, $a_t = 0$ (d) none of these

5. 2 masses 1 g and 4 g are moving with equal K.E. the ratio of the magnitude of their linear momentum is

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

6. There are particles of same mass. If one of the particles is at rest always and the other has an acceleration $\vec{a}$. Acceleration of centre of mass is

   (a) zero (b) 1/2 $\vec{a}$

   (c) $\vec{a}$ (d) centre of mass for such a system can not be defined

7. The moment of inertia (I) for a uniform circular disc is

   (a) MR^2 (b) $MR^2/4$ (c) $MR^2/2$ (d) 3/2 MR^2

8. A constant torque acting on a uniform circular what changes its angular momentum from A_0 to 4 A_0 in 4 sec. the magnitude of this torque is

   (a) 4 A_0 (b) A_0 (c) 12 A_0 (d) 3 $A_0/4$

9. In absence of external forces on a rigid system, which of the following quantities must remain constant?

(a) Angular momentum (b) positive vector

(c) both (a) and (b) (d) none of these

10. The centre of a disc rolling without slipping on a plane moves with a speed v. a particle on the lower half of the rim making an angle 60^0 with the vertical, will be moving at speed

(a) zero (b) v (c) $\sqrt{2}$ v (d) 2 v

11. Frequency of a spring mass system is v. if it is taken in a lift with constant acceleration upward, then frequency will

(a) decrease (b) increase (c) remain constant (d) none of these

12. In a SHM, if particle oscillates with frequency v the the frequency of oscillation. Of its kinetic energy

(a) v (b) v/2 (c) 2v (d) 4v

13. Under similar condition of temperature and pressure in which of the following gasses, the velocity of sound will be largest.

(a) H_2 (b) N_2 (c) He (d) CO_2

14. Let E be the electric field and V_1 the electric potential at a point

(a) If E $\pm$ O, cannot be 0 (b) If E = 0, v must be 0

(c) if v = 0, E must be 0 (d) none of these

15. The force between 2 short electric dipoles separated by a distance r is directly proportional to

(a) r^2 (b) r^4 (c) r^{-2} (d) r^{-4}

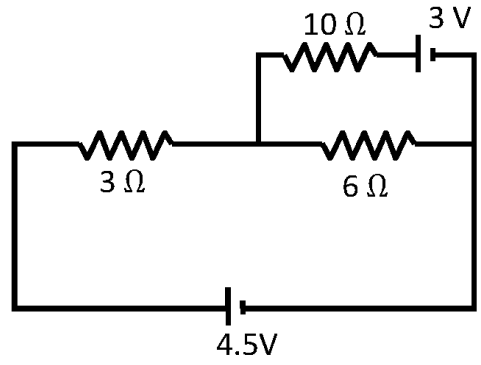
16. Find the current through the 10 Ω resistor shown in the figure

(a) zero

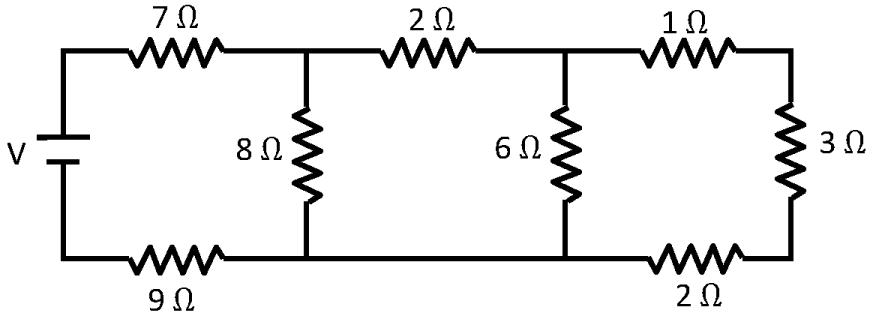
(b) 1 A

(c) 2 A

(d) 5 A

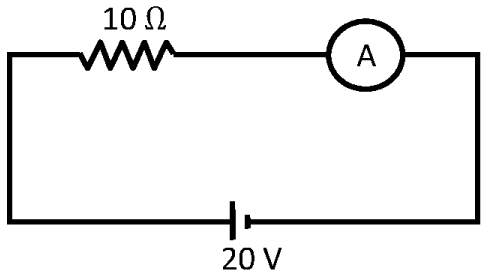


17. In the ladder network shown, current through the resistor 3 Ω is 0.25 A.the input voltage V is equal to



(a) 10 v (b) 20 v (c) 5 v (d) 15/2 v

18. The ammeter shown in the figure consists of a 480 Ω coil connected in parallel to a 20 Ω shunt. Find the reading of the ammeter



(a) 50/73 A
(b) 40/53 A
(c) 80/93 A
(d) 73/50 A

19. A parallel plate condenser is connected to a battery of e.m.f. 4V. if a plate of electric constant 8 is insected into it, then the potential difference on the condenser will be

(a) 1/2 V (b) 2 V (c) 4 V (d) 32 V

20. The material for making permanent magnets shold have

(a) High retentivity, high coercivity (b) high retentivity, low coercivity
(c) low retentivity, high coecivity (d) low retentivity, low coercivity

21. A conducting rod of length l rotates will a uniform angular velocity ω about its ⊥ bisector. A uniform magnetic field β exists parallel to the axis of rotation. The potential difference between the 1 ends of the end is

(a) $2\beta\omega l^2$ (b) $\frac{1}{2}\beta\omega l^2$ (c) $\beta\omega l^2$ (d) zero

22. The average power delivered to a series AC circurit is given by (symbols have their usual meaning)

(a) $E_{rms}\ I_{rms}$ (b) $E_{rms}\ I_{rms}\cos\phi$ (c) $E_{rms}\ I_{rms}\sin\phi$ (d) zero

23. Critical angle of light passing from glass to air is minimum for

(a) red (b) green (c) yellow (d) violet

24. The critical angle of light going from medium A to medium B is θ. The speed of light in medium A is V. the speed of light in medium B is

(a) $\frac{V}{\sin\theta}$ (b) $V\sin\theta$ (c) $V\cot\theta$ (d) $V\tan\theta$

25. When a lens of power P (in air) made of material of refractive index μ is immersed in liquid of refractive index μ_0. Then the power of lens is

(a) $\frac{\mu-1}{\mu-\mu_0}P$ (b) $\frac{\mu-\mu_0}{\mu-1}P$ (c) $\frac{\mu-\mu_0}{\mu-1}\frac{P}{\mu_0}$ (d) none of these

SECTION – B

1. For the gas phase reaction,

$PCl_5 \leftrightharpoons PCl_3(g) + Cl_2(g)$

(a) $\Delta H < 0$ $\Delta S < 0$ (b) $\Delta H > 0$ $\Delta S < 0$

(c) $\Delta H = 0$ $\Delta S < 0$ (d) $\Delta H > 0$ $\Delta S > 0$

2. Oxidation no. of Cr in CrO_5

(a) + 10 (b) +8 (c) + 6 (d) + 4

3. The calomel electrode used as reference electrode contains

(a) $PbO_2 + PbSO_4$ mixture (b) $HgCl_2$

(c) Hg_2Cl_2 (d) $ZnCl_2$

4. A current of 2 amp when passed for 5 hours through a molten salt. Deposits 22.2 g of metal of atomic mass 177. The oxidation state of metal in the salt is

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

5. The equilibrium constant for the reaction

$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$

(a) $K_c = \frac{1}{[CO_2]}$ (b) $K_c = [CO_2]$

(c) $K_c = \frac{[CaO][CO_2]}{[CaCO_3]}$ (d) $K_c = [CaO][CO_2]$

6. In an equilibrium reaction, for which $\Delta G^0 = 0$ the equilibrium constant K should be

(a) zero (b) 10 (c) 1 (d) 2

7. Isotonic solution have:

(a) same boiling point (b) same vapour preosure

(c) same melting point (d) same osmotic pressure

8. If the absolute temperature of an ideal gas is double and the pressure is reduced to one – half the volume of the gas will

(a) remain unchanged (b) be double

(c) be halved (d) increase fourfold

9. Momentum of a photon of wavelength λ is

(a) $h\lambda/c^2$ (b) h/λ (c) zero (d) $h\lambda/c$

10. The Bohr orbit radius for H-atom (n = 1) is approximately 0.53 Å. The radius for the first excited state (n = 2) orbit is

(a) 0.13 Å (b) 1.06 Å (c) 4.77 Å (d) 2.12 Å

11. The element ^{232}Th belong to thorium series. Which of the following will act as end product of series?

(a) $^{208}_{82}Pb$ (b) $^{209}_{82}Bi$ (c) $^{206}_{82}Pb$ (d) $^{207}_{82}Pb$

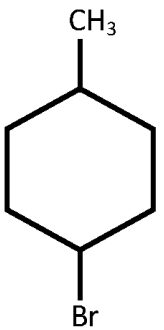
12. In the Arrhenius equation $K = A\, e^{-Ea/RT}$, the Arrhenius constant A will be equal to rate at

(a) T = 0 (b) T = ∞ (c) Ea = RT (d) Ea = ∞

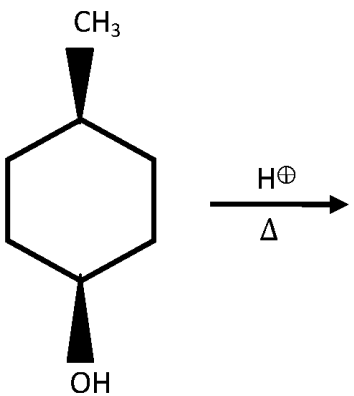
13. Molecular mass of a tribasic acid is M. its equivalent mass is

(a) M/3 (b) 3M (c) M/9 (d) 9M

14. How many geometrical isomer one possible for given compound



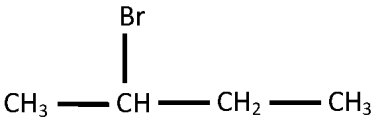
(a) 0 (b) 2 (c) 3 (d) 4

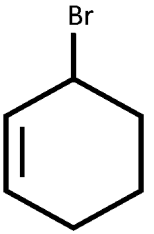
15. 

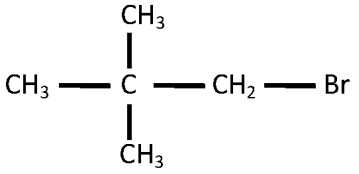
$\xrightarrow[\Delta]{H^{\oplus}}$ Products obtained are

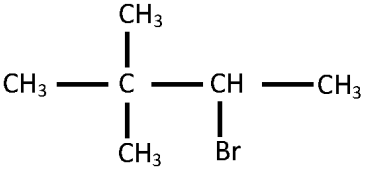
(a) Recemic (b) Diastereomers (c) G.I. (d) Positional isomer

16. Which of the following is inert towards E_2 reaction

(a) 

(b) 

(c) 

(d) 

17. Oxidatin state of N in N_2O_5

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

18. No. of P – O – P bonds in P_4O_{10}

(a) 4 (b) 10 (c) 6 (d) 3

19. Ligands are

(a) Lewis acid (b) Lewis base (c) neutral (d) none

20. EAN of a metal carbonyl $M(CO)_x$ is 36. If atomic no. of metal M is 26. What is the value of x?

(a) 4 (b) 8 (c) 5 (d) 6

21. Which of the following process(es) occur dunig the extraction of copper from chalcopyriter

(a) Froth floatation (b) Roasting

(c) Bessemirisation (d) calcinations

22. Which of the following does not exist or rarely exists?

(a) Fe^{2+} (b) Mn^{7+} (c) Zn^{2+} (d) Zn^{6+}

23. The element which forms oxides in all oxidation states +I to + IV

(a) N (b) P (c) As (d) Sb

24. The most powerful oxidizing agent among the following is:

(a) Flourine (b) Chlorine (c) Iodine (d) Bromine

25. Which carbocation is most reactive towards E_1 mechanism?

(a) 3^0 (b) 2^0 (c) 1^0 (d) methylic carbocation

SECTION – C

1. If $|z - 25i| \leq 15$ then $|maximum\ \arg(z) - minimum\ \arg(z)|$ equals

(a) $2\cos^{-1}\left(\frac{3}{5}\right)$ (b) $2\cos^{-1}\left(\frac{4}{5}\right)$ (c) $\frac{2\pi}{2} + \cos^{-1}\left(\frac{3}{5}\right)$ (d) $\sin^{-1}\left(\frac{3}{5}\right) + \cos^{-1}\left(\frac{3}{5}\right)$

2. If the equation $\sqrt{x+1} - \sqrt{x} = a$ has a solution then

(a) 0 < a < 1 (b) a ≥ 1 (c) 0 < a ≤ 1 (d) a ≤ 1

3. Sum of non-real roots of $(x^2 + x - 2)(x^2 + x - 3) = 12$

(a) 1 (b) -1 (c) -6 (d) 6

4. Find the sum of series $1^2 + 2^2 + 3^2 + \cdots \ldots + 10^2$

(a) $(55)^2$ (b) 385 (c) 437 (d) None of these

5. If $\log x^2 - \log 2x = 3\log 3 - \log 6$ then x equals

(a) 9 (b) 3 (c) 4 (d) 5

6. The number of words that can be formed by using the letters of the word MATHEMATIC that start as well as end with T is

(a) 80720 (b) 90720 (c) 20860 (d) 137528

7. Valur of the expression $C_0^2 + C_1^2 + C_2^2 \ldots \ldots \ldots C_n^2$ is

(a) $2^{(2n-1)}$ (b) 2n ($^{2n}C_n$) (c) $^{2n}C_n$ (d) none of these

8. If A is an orthogonal matrix then $|A|$ is

(a) 1 (b) -1 (c) ± 1 (d) 0

9. $A = \begin{bmatrix} 1 + 2\omega^{100} + \omega^{200} & \omega^2 & 1 \\ 1 & 1 + \omega^{101} + 2\omega^{202} & \omega \\ \omega & \omega^2 & 2 + \omega^{100} + 2\omega^{200} \end{bmatrix}$

(a) $|A| = 5$ (b) $|A| = 0$ (c) A is symmetric (d) none of these

10. Two square are choosen at random on a chessboard. The probability that they have a side in common.

(a) 1/9 (b) 2/7 (c) 1/18 (c) none of these

11. $3\sin\theta + 5\cos\theta = 5$ then $5\sin\theta - 3\cos\theta$ is equal to

(a) 3 (b) 8 (c) 7 (d) none of these

12. The straight line $x + y = 0, 3x + y - 4 = 0$ and $x + 3y - 4 = 0$, forms a triangle which is

(a) isosceles (b) equilateral (b) right angled (d) none of these

13. The points (2, 3), (0, 2), (4, 5) and (0, t) are concyclic if the value of t is

(a) 5 (b) 1 (c) 17 (d) 19

14. Equation of the normal at a point on the parabola $y^2 = 36x$ whose ordinate is three times its abscissa is

(a) $2x + 3y + 44 = 0$ (b) $2x - 3y + 44 = 0$

(c) $2x + 3y - 44 = 0$ (d) $2x - 3y = 0$

15. If ABCD is quadrilateral and E and F are the mid points of AC and BD respectively then $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CD}$ is equal to

(a) $2\overrightarrow{EF}$ (b) $3\overrightarrow{EF}$ (c) $4\overrightarrow{EF}$ (d) $6\overrightarrow{EF}$

16. $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = z$ intersectat a point if K is equal to

(a) 2/9 (b) 1/2 (c) 9/2 (d) 1/6

17. The value of $\lim_{x\to -2} \frac{(x^2-x-6)^2}{(x+2)^2}$ is

(a) 6 (b) 25 (c) 9 (d) 16

18. $\lim_{x\to 0} \frac{\tan x - \sin x}{x^3}$ is

(a) 0 (b) 1/2 (c) 2 (d) none of these

19. If $\cos^{-1}\left(\frac{x^2-y^2}{x^2+y^2}\right) = \log a$ then $\frac{dy}{dx}$ is equal to

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

20. If $f(x) = x^{1/x}$ then $f'(e)$ is equal to

(a) $e^{\frac{1}{(e-3)}}$ (b) $e^{\frac{1}{(e-2)}}$ (c) $e^{\frac{1}{e}}$ (d) none of these

21. If $a, b > 0$, then the maximum value of $y = \frac{b^2}{a+b} + \frac{a^2}{x}, \theta < x < a$

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

22. The shortest distance of (0, 0) from the curve $y = \frac{e^x + e^{-x}}{2}$ is

(a) 1/2 (b) 1/3 (c) 2 (d) none of these

23. $I = \int_{-2}^{2} |1 - x^4| \, dx$ then I equals

(a) 6 (b) 8 (c) 12 (d) 21

24. $I = \int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\tan x}}$ then I equals

(a) π/12 (b) π/6 (c) π/4 (d) π/3

25. The area bounded by $y = x^2$ and $y = 1 - x^2$ is

(a) $\frac{\sqrt{8}}{3}$ (b) $\frac{16}{3}$ (c) $\frac{32}{3}$ (d) $\frac{16}{9}$