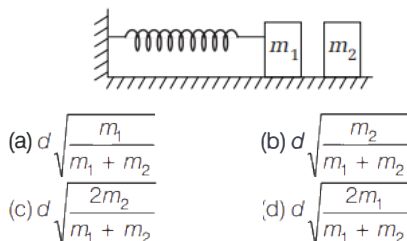


MET 2015 Memory Based Question Paper PDF

Physics

- Two point charges $2q$ and $8q$ are placed at a distance r apart. Where should a third charge $-q$ be placed between them, so that the electrical potential energy of the system is minimum?
 - At a distance of $r/3$ from $2q$
 - At a distance of $2r/3$ from $2q$
 - At a distance of $r/6$ from $2q$
 - None of the above
- If levels 1 and 2 are separated by an energy $E_2 - E_1$, such that the corresponding transition frequency falls in the middle of the visible range, calculate the ratio of the populations of two levels in the thermal equilibrium at room temperature.
 - 1.15×10^{-3}
 - 2.9×10^{-3}
 - 2.168×10^{-3}
 - 1.96×10^{-3}
- The energy of a hydrogen atom in its ground state is -13.6 eV. The energy of the level corresponding to the quantum number $n = 5$ is
 - -5.40 eV
 - -0.54 eV
 - -8.5 eV
 - -2.72 eV
- We have a galvanometer of resistance 25Ω . It is shunted by 2.5Ω wire. The part of the total current that flows through the galvanometer is given as
 - $\frac{i}{i_0} = \frac{4}{11}$
 - $\frac{i}{i_0} = \frac{3}{11}$
 - $\frac{i}{i_0} = \frac{2}{10}$
 - $\frac{i}{i_0} = \frac{1}{11}$
- Two moles of helium are mixed with n moles of hydrogen. The root mean square (rms) speed of gas molecules in the mixture is $\sqrt{2}$ times the speed of sound in the mixture. Then, the value of n is
 - 1
 - 3
 - 2
 - 3
- A coil having n turns and resistance $R\Omega$ is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time t second from a magnetic field w_1 weber to w_2 weber. The induced current in the circuit is
 - $\frac{-(w_2 - w_1)}{5Rt}$
 - $\frac{-n(w_2 - w_1)}{5Rt}$
 - $\frac{-(w_2 - w_1)}{Rnt}$
 - $\frac{-n(w_2 - w_1)}{Rt}$
- A thin film of soap solution ($\mu_s = 1.4$) lies on the top of a glass plate ($\mu_g = 1.5$). When incident light is almost normal to the plate, two adjacent reflection maxima are observed at two wavelengths 420 nm and 630 nm. The minimum thickness of the soap solution is
 - 420 nm
 - 450 nm
 - 630 nm
 - 1260 nm
- A coil in the shape of an equilateral triangle of side l is suspended between the pole pieces of a permanent magnet such that $\mathbf{B}$ is in the plane of the coil. If due to current i in the triangle, a torque τ acts on it. The side l of the triangle is
 - $\frac{2}{\sqrt{3}} \left(\frac{\tau}{Bi} \right)$
 - $2 \left(\frac{\tau}{\sqrt{3} Bi} \right)^{1/2}$
 - $\frac{2}{\sqrt{3}} \left(\frac{\tau}{Bi} \right)^{1/2}$
 - $\frac{1}{\sqrt{3}} \frac{\tau}{Bi}$

9. The two blocks of masses m_1 and m_2 are kept on a smooth horizontal table as shown in the figure. Block of mass m_1 but not m_2 is fastened to the spring. If now both the blocks are pushed to the left, so that the spring is compressed at a distance d . The amplitude of oscillation of block of mass m_1 after the system released, is

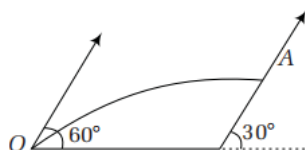


10. A juggler keeps on moving four balls in air throwing the balls after regular intervals. When one ball leaves his hand (speed $= 20 \text{ ms}^{-1}$), the position of other balls (height in metre) will be (take $g = 10 \text{ ms}^{-2}$)

- (a) 10, 20, 10
(b) 15, 20, 15
(c) 5, 15, 20
(d) 5, 10, 20

11. Two coils have mutual inductance 0.005 H . The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10 \text{ A}$ and $\omega = 100 \pi \text{ rad/s}$. The maximum value of emf in the second coil is
- (a) 12π (b) 8π
(c) 5π (d) 2π

12. A ball is projected from the point O with velocity 20 m/s at an angle of 60° with horizontal as shown in the figure. At highest point of its trajectory, it strikes a smooth plane of inclination 30° at point A . The collision is perfectly inelastic. The maximum height from the ground attained by the ball is



- (a) 18.75 m (b) 15 m
(c) 22.5 m (d) 20.25 m

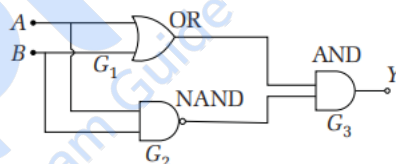
13. In a nuclear reactor, ^{235}U undergoes fission liberating 200 MeV of energy. The reactor has a 10% efficiency and produces 1000 MW power. If the reactor is to function for 10 yr , then find the total mass of uranium required.

- (a) $36.5 \times 10^3 \text{ kg}$ (b) $36 \times 10^2 \text{ kg}$
(c) $39.5 \times 10^3 \text{ kg}$ (d) $38.2 \times 10^3 \text{ kg}$

14. A capacitor of capacitance $10 \mu\text{F}$ is charged to potential 50 V with a battery. The battery is now disconnected and an additional charge $200 \mu\text{C}$ is given to the positive plate of the capacitor. The potential difference across the capacitor will be

- (a) 50 V (b) 80 V
(c) 100 V (d) 60 V

15. The following configuration of gate is equivalent to

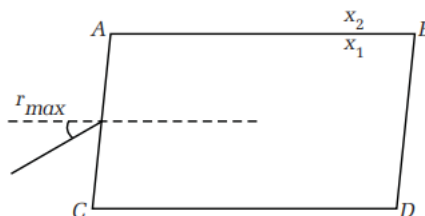


- (a) NAND (b) XOR
(c) OR (d) None of these

16. Under what conditions current passing through the resistance R can be increased by short circuiting the battery of emf E_2 ? The internal resistances of the two batteries are r_1 and r_2 respectively.

- (a) $E_2 r_1 > E_1 (R + r_2)$ (b) $E_1 r_2 < E_2 (r_1 + R)$
(c) $E_2 r_2 < E (R +)$ (d) $E_1 r_1 > E_2 (r_1 + R)$

17. A rectangular glass slab $ABCD$ of refractive index n_1 is immersed in water of refractive index n_2 ($n_1 > n_2$). A ray of light is incident at the surface AB of the slab as shown. The maximum value of the angle of incidence α such that the ray comes out only from the another surface CD is given by



- (a) $\sin^{-1} \left[\frac{n_1}{n_2} \cos \left(\sin^{-1} \left(\frac{n_2}{n_1} \right) \right) \right]$
 (b) $\sin^{-1} \left[n_1 \cos \left(\sin^{-1} \left(\frac{1}{2} \right) \right) \right]$
 (c) $\sin^{-1} \left(\frac{n_1}{n_2} \right)$
 (d) $\sin^{-1} \left(\frac{n_2}{n_1} \right)$
18. A sinusoidal wave travelling in the positive direction on stretched string has amplitude 20 cm, wavelength 1 m and wave velocity 5 m/s. At $x = 0$ and $t = 0$, it is given that $y = 0$ and $\frac{dy}{dt} < 0$. Find the wave function $y(x, t)$.
- (a) $y(x, t) = (0.02 \text{ m}) \sin [(2\pi \text{ m}^{-1})x + (10\pi \text{ s}^{-1})t] \text{ m}$
 (b) $y(x, t) = (0.02 \text{ m}) \cos [(10\pi \text{ s}^{-1})t + (2\pi \text{ m}^{-1})x] \text{ m}$
 (c) $y(x, t) = (0.02 \text{ m}) \sin [(2\pi \text{ m}^{-1})x - (10\pi \text{ s}^{-1})t] \text{ m}$
 (d) $y(x, t) = (0.02 \text{ m}) \sin [(\pi \text{ m}^{-1})x + (5\pi \text{ s}^{-1})t] \text{ m}$
19. The length of a potentiometer wire is l . A cell of emf E is balanced at length $l/3$ from the positive end of the wire. If the length of the wire is increased by $l/2$. Then, at what distance will the same cell give a balance point?
- (a) $\frac{2l}{3}$ (b) $\frac{l}{2}$ (c) $\frac{l}{6}$ (d) $\frac{4l}{3}$
20. Find the inductance of a unit length of two parallel wires, each of radius a , whose centres are at distance d apart and carry equal currents in opposite directions. Neglect the flux within the wire.
- (a) $\frac{\mu_0}{2\pi} \ln \left(\frac{d-a}{a} \right)$ (b) $\frac{\mu_0}{\pi} \ln \left(\frac{d-a}{a} \right)$
 (c) $\frac{3\mu_0}{\pi} \ln \left(\frac{d-a}{a} \right)$ (d) $\frac{\mu_0}{3\pi} \ln \left(\frac{d-a}{a} \right)$
21. Two wires of same lengths are shaped into a square and a circle. If they carry same current, then the ratio of their magnetic moments is
- (a) $2 : \pi$ (b) $\pi : 2$ (c) $\pi : 4$ (d) $4 : \pi$
22. A circular coil of 100 turns has an effective radius of 0.05 m and carries a current of 0.1 A. How much work is required to turn it in an external magnetic field of 1.5 Wb/m^2 through 180° about its axis perpendicular to the magnetic field. The plane of the coil is initially perpendicular to the magnetic field.
- (a) 0.456 J (b) 2.65 J (c) 0.2355 J (d) 3.95 J
23. The time constant of L - R circuit is
- (a) LR (b) $\frac{L}{R}$
 (c) $\frac{R}{L}$ (d) $\frac{1}{LR}$
24. In wave mechanics, the angular momentum of an electron is given by
- (a) $\sqrt{l \frac{h}{2\pi}}$ (b) $\sqrt{l(l+1) \frac{h}{2\pi}}$
 (c) $\sqrt{\frac{h^2 \pi}{l(l+1)}}$ (d) $\sqrt{\frac{h^2 \pi}{l}}$
25. The alternating voltage and current in an electric circuit are respectively given by
 $E = 100 \sin 100 \pi t$, $I = 5 \sin 100 \pi t$
 The reactance of the circuit will be
- (a) 1Ω (b) 0.05Ω
 (c) 20Ω (d) zero
26. The biological damage caused by 1 gray α -radiation is compared with 1 gray γ -radiation in the same type of human tissue. The damage caused by the γ -radiation is
- (a) more serious as compared to the damage caused by the α -radiation.
 (b) less serious as compared to the damage caused by the α -radiation
 (c) equally serious as the damage caused by the α -radiation
 (d) incomparable with the damage caused by the α -radiation, because γ -radiation are not particles.
27. Two identical coherent sources placed on a diameter of a circle of radius R at separation x ($\ll R$) symmetrically about the centre of the circle. The sources emit identical wavelength λ each. The number of points on the circle with maximum intensity is ($x = 5\lambda$)
- (a) 20 (b) 22
 (c) 24 (d) 26
28. Two point masses 1 and 2 move with uniform velocities $\mathbf{v}_1$ and $\mathbf{v}_2$ respectively. Their initial position vectors are $\mathbf{r}_1$ and $\mathbf{r}_2$, respectively. Which of the following should be satisfied for the collision of the point masses?
- (a) $\frac{\mathbf{r}_1 - \mathbf{r}_2}{|\mathbf{r}_2 - \mathbf{r}_1|} = \frac{\mathbf{v}_2 - \mathbf{v}_1}{|\mathbf{v}_2 - \mathbf{v}_1|}$ (b) $\frac{\mathbf{r}_2 - \mathbf{r}_1}{|\mathbf{r}_1 - \mathbf{r}_1|} = \frac{\mathbf{v}_2 - \mathbf{v}_1}{|\mathbf{v}_2 - \mathbf{v}_1|}$
 (c) $\frac{\mathbf{r}_2 - \mathbf{r}_1}{|\mathbf{r}_2 + \mathbf{r}_1|} = \frac{\mathbf{v}_2 - \mathbf{v}_1}{|\mathbf{v}_2 + \mathbf{v}_1|}$ (d) $\frac{\mathbf{r}_2 + \mathbf{r}_1}{|\mathbf{r}_2 + \mathbf{r}_1|} = \frac{\mathbf{v}_2 - \mathbf{v}_1}{|\mathbf{v}_2 + \mathbf{v}_1|}$

29. A neutron moving with a speed v makes a head on collision with a hydrogen atom in ground state kept at rest. The minimum kinetic energy of neutron for which inelastic collision will take place is

(a) 10.2 eV (b) 20.4 eV
(c) 12.1 eV (d) 16.8 eV

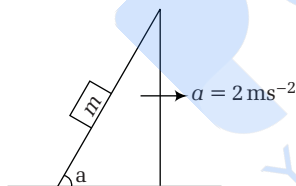
30. The specific heat at constant volume for the monoatomic argon is 0.075 kcal/kg-K, whereas its gram molecular specific heat is $C_V = 2.98$ cal/mol K. The mass of the carbon atom is

(a) 6.60×10^{-23} g (b) 3.30×10^{-23} g
(c) 2.20×10^{-23} g (d) 13.20×10^{-23} g

31. Order of magnitude of density of uranium nucleus is ($m_p = 1.6 \times 10^{-27}$ kg)

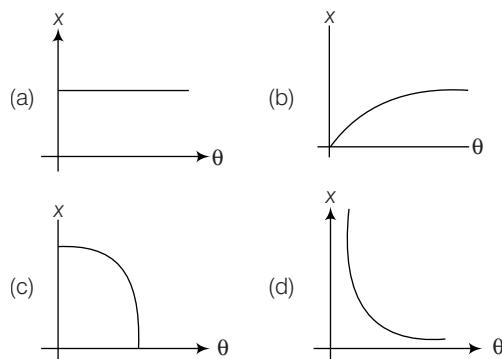
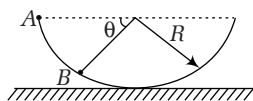
(a) 10^{20} kg/m³ (b) 10^{17} kg/m³
(c) 10^{14} kg/m³ (d) 10^{11} kg/m³

32. A block of mass m is lying on the edge having inclination angle $\alpha = \tan^{-1}\left(\frac{1}{5}\right)$. Wedge is moving with a constant acceleration, $a = 2\text{ms}^{-2}$. The minimum value of coefficient of friction μ , so that m remains stationary with respect to wedge is



(a) $\frac{2}{a}$ (b) $\frac{5}{12}$ (c) $\frac{1}{5}$ (d) $\frac{2}{5}$

33. A small particle of mass m is released from rest from point A inside a smooth hemispherical bowl as shown in the figure. The ratio (x) of magnitude of centripetal force and normal reaction on the particle at any point B varies with θ as



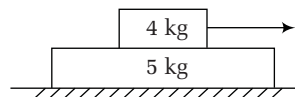
34. A solid cylinder is rolling down on an inclined plane of angle θ . The coefficient of static friction between the plane and the cylinder is μ_s . The condition for the cylinder not to slip is

(a) $\tan \theta \geq 3 \mu_s$ (b) $\tan \theta > 3 \mu_s$
(c) $\tan \theta \leq 3 \mu_s$ (d) $\tan \theta < 3 \mu_s$

35. For a given density of a planet, the orbital speed of satellite near the surface of the planet of radius R is proportional to

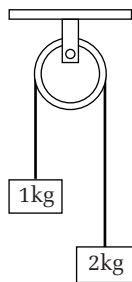
(a) $R^{1/2}$ (b) $R^{3/2}$
(c) $R^{-1/2}$ (d) R^0

36. A large slab of mass 5 kg lies on a smooth horizontal surface, with a block of mass 4 kg lying on the top of it, the coefficient of friction between the block and the slab is 0.25. If the block is pulled horizontally by a force of $F = 6$ N, the work done by the force of friction on the slab between the instants $t = 2$ s and $t = 3$ s is



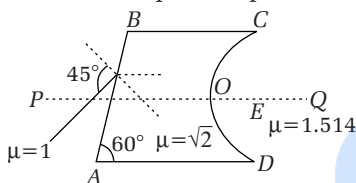
(a) 2.4 J (b) 5.55 J
(c) 4.44 J (d) 10 J

37. Two unequal masses are connected on two sides of a light string passing over a light and smooth pulley as shown in the figure. The system is released from the rest. The larger mass is stopped for a moment, 1s after the system is set into motion. The time elapsed before the string is tight again is



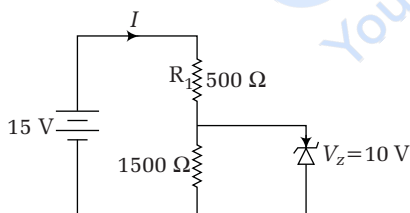
- (a) $1/4$ s (b) $1/2$ s (c) $2/3$ s (d) $1/3$ s

38. Figure shows an irregular block of material of refractive index $\sqrt{2}$. A ray of light strikes the face AB as shown in figure. After refraction, it is incident on a spherical surface CD of radius of curvature 0.4 m and enters a medium of refractive index 1.514 to meet PQ at E . Find the distance OE upto two places of decimal.



- (a) 7 m (b) 7.29 m (c) 6.06 m (d) 8.55 m

39. The ratio of the energy required to raise a satellite upto a height h above the earth to the kinetic energy of the satellite into the orbit is
(a) $h : R$ (b) $R : 2h$ (c) $2h : R$ (d) $R : h$
40. In the circuit diagram, the current through the Zener diode is



- (a) 10 mA (b) 3.33 mA (c) 6.67 mA (d) 0 mA

41. The frequency of sonometer wire is f , but when the weights producing the tensions are completely immersed in water, the frequency becomes $f/2$ and on immersing the weights in a certain liquid, the frequency becomes $f/3$. The specific gravity of the liquid is
(a) $4/3$ (b) $16/9$
(c) $15/12$ (d) $32/27$

42. Find the frequency of light which ejects electron from a metal surface fully stopped by a retarding potential of 3 V. The photoelectric effect begins in this metal at a frequency of 6×10^{15} Hz.

- (a) 1.324×10^{15} Hz
(b) 2.295×10^{16} Hz
(c) 3.678×10^{18} Hz
(d) 2.7×10^{14} Hz

43. Equations of a stationary and a travelling waves are as follows, $y_1 = a \sin kx \cos \omega t$ and $y_2 = a \sin (\omega t - kx)$. The phase difference between two points $x_1 = \frac{\pi}{3k}$ and $x_2 = \frac{3\pi}{2k}$ are

ϕ_1 and ϕ_2 respectively for two waves. The ratio $\frac{\phi_1}{\phi_2}$ is

- (a) 1 (b) $5/6$
(c) $3/4$ (d) $6/7$

44. Out of a photon and an electron, the equation $E = Pc$, is valid for

- (a) both (b) neither
(c) photon only (d) electron only

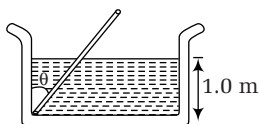
45. A small block of wood of specific gravity 0.5 is submerged at a depth of 1.2 m in a vessel filled with the water. The vessel is accelerated upwards with an acceleration $a_0 = g/2$. Time taken by the block to reach the surface, if it is released with zero initial velocity is

- (a) 0.6 s (b) 0.4 s
(c) 1.2 s (d) 1 s

46. An electron beam accelerated from rest through a potential difference of 5000 V in vacuum is allowed to impinge on a surface normally. The incident current is $50 \mu\text{A}$ and if the electron comes to rest on striking the surface, the force on it is

- (a) 1.1924×10^{-8} N (b) 2.1×10^{-8} N
(c) 1.6×10^{-8} N (d) 1.6×10^{-6} N

47. A uniform rod of length 2 m, specific gravity 0.5 and mass 2 kg is hinged at one end to the bottom of a tank of water (specific gravity $= 1.0$) filled upto a height of 1 m as shown in the figure. Taking the case $\theta \neq 0^\circ$, the force exerted by the hinge on the rod is



- (a) 10.2 N upwards
(b) 4.2 N downwards
(c) 8.3 N downwards
(d) 6.2 N upwards
48. A projectile is thrown in upward direction making an angle of 60° with the horizontal direction with a velocity of 150 ms^{-1} . Then, the time after which its inclination with horizontal is 45° , is
(a) $15(\sqrt{3} - 1) \text{ s}$
(b) $15(\sqrt{3} + 1) \text{ s}$
(c) $7.5(\sqrt{3} - 1) \text{ s}$
(d) $7.5(\sqrt{3} + 1) \text{ s}$
49. When a copper sphere is heated, percentage change is
(a) maximum in radius
(b) maximum in volume
(c) maximum in density
(d) equal in radius, volume and density
50. In Young's double slit experiment, fringes of width β are produced on the screen kept at a distance of 1m from the slit. When the screen is moved away by $5 \times 10^{-2} \text{ m}$, fringe width changes by $3 \times 10^{-5} \text{ m}$. The separation between the slits is $1 \times 10^{-3} \text{ m}$. The wavelength of light used is.....nm.
(a) 500 (b) 600 (c) 700 (d) 400

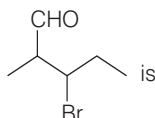
Chemistry

1. How many moles of $\text{Al}_2(\text{SO}_4)_3$ would be in 50 g of the substance?
(a) 0.0843 mol (b) 0.952 mol
(c) 0.481 mol (d) 0.140 mol
2. The ionisation energy of hydrogen atom is 13.6 eV. What will be the ionisation energy of He^+ ?
(a) 13.6 eV (b) 54.4 eV
(c) 122.4 eV (d) Zero
3. In which of the following arrangement the order is not according to the property indicated against it?
(a) $\text{Li} < \text{Na} < \text{K} < \text{Rb}$ (increasing metallic radius)
(b) $\text{I} < \text{Br} < \text{F} < \text{Cl}$ (increasing electron gain enthalpy, with negative sign)
(c) $\text{B} < \text{C} < \text{N} < \text{O}$ (increasing first ionisation enthalpy)
(d) $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$ (increasing ionic size)
4. The $\text{H}-\text{O}-\text{H}$ bond angle in H_2O is 104.5° . This fact can be explained with the help of
(a) valence shell electron pair repulsion theory (VSEPR)
(b) molecular orbital theory
(c) presence of hydrogen bond
(d) electronegativity difference between hydrogen and oxygen atoms
5. Under which of the following condition, vander waals' gas approaches ideal behaviour?
(a) Extremely lower pressure
(b) Low temperature
(c) High pressure
(d) Low product of pV
6. The enthalpy of combustion of carbon and carbon monoxide are -393.5 and -283 kJ/mol respectively. The enthalpy of formation of carbon monoxide per mole is
(a) 110.5 kJ (b) 676.5 kJ
(c) -676.5 kJ (d) -110.5 kJ
7. Equivalent amounts of H_2 and I_2 are heated in a closed vessel till equilibrium is obtained. If 80% of the hydrogen can be converted to HI, the K_C at this temperature is
(a) 64 (b) 16 (c) 0.25 (d) 4
8. Which of the following is false about H_2O_2 ?
(a) Act as both oxidising and reducing agent
(b) Two OH bond lie in the same plane
(c) Pale blue liquid
(d) Can be oxidised by ozone
9. KO_2 is used in space and submarines because it
(a) absorb CO_2 and increase O_2 concentration
(b) absorb moisture
(c) absorb CO_2
(d) produce ozone

10. The relative Lewis acid character of boron trihalides is the order

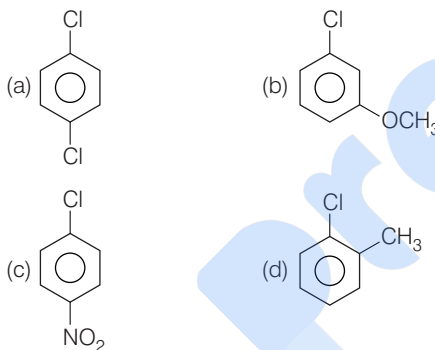
- (a) $\text{BI}_3 > \text{BBr}_3 > \text{BF}_3 > \text{BCl}_3$
 (b) $\text{BI}_3 > \text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$
 (c) $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$
 (d) $\text{BCl}_3 > \text{BF}_3 > \text{BI}_3 > \text{BBr}_3$

11. The IUPAC name of



- (a) 2-methyl-3-bromo hexanal
 (b) 3-bromo-2-methyl butanal
 (c) 2-bromo-3-bromo butanal
 (d) 3-bromo-2-methyl pentanal

12. Which of the following would react most readily with nucleophiles?



13. Ethyl acetoacetate shows, Which type of isomerism?

- (a) Chain (b) Optical
 (c) Metamerism (d) Tautomerism



Here the compound C is

- (a) 3-bromo -2,4,5,6-trichloro toluene
 (b) o-bromo toluene
 (c) p-bromo toluene
 (d) m-bromo toluene

15. An important product in the ozone depletion by chlorofluoro carbons is

- (a) Cl_2 (b) OCl
 (c) OF_2 (d) O_2F_2

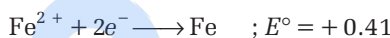
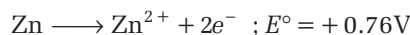
16. The crystalline structure of NaCl is

- (a) hexagonal close packing
 (b) face centred cubic
 (c) square planar
 (d) body centred cubic

17. 40% by weight solution will contain how much mass of the solute in 1L solution, density of the solution is 1.2 g/mL?

- (a) 480 g (b) 48 g
 (c) 38 g (d) 380 g

18. The standard reduction potential E° for half reactions are,



The emf of the cell reaction;



- (a) -0.35 V (b) +0.35 V
 (c) +1.17 V (d) -1.17 V



The activation energy for the forward reaction is 50 kcal. What is the activation energy for the backward reaction?

- (a) -72 kcal (b) -28 kcal
 (c) +28 kcal (d) +72 kcal

20. The coagulating power of an electrolyte for arsenious sulphide decrease in order

- (a) $\text{Na}^+ > \text{Al}^{3+} > \text{Ba}^{2+}$ (b) $\text{PO}_4^{3-} > \text{SO}_4^{2-} > \text{Cl}^-$
 (c) $\text{Cl}^- > \text{SO}_4^{2-} > \text{Al}^{3+}$ (d) $\text{Al}^{3+} > \text{Ba}^{2+} > \text{Na}^+$

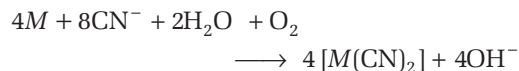
21. ${}_{88}^{228}\text{X} - 3\alpha, -\beta \longrightarrow \text{Y}$. The element Y is

- (a) ${}_{82}^{216}\text{Pb}$ (b) ${}_{82}^{217}\text{Pb}$ (c) ${}_{83}^{218}\text{Bi}$ (d) ${}_{83}^{216}\text{Bi}$

22. Hydrolysis of NCl_3 gives NH_3 and X. Which of the following is X?

- (a) HClO_4 (b) HClO_3
 (c) HOCl (d) HClO_2

23. In the reaction,



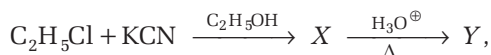
identify the metal M.

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

24. In which of the following complex ion, the central metal ion is in a state of sp^3d^2 hybridisation?

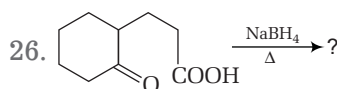
- (a) $[\text{CoF}_6]^{3-}$ (b) $[\text{Co}(\text{NH}_3)_6]^{3+}$
(c) $[\text{Fe}(\text{CN})_6]^{3-}$ (d) $[\text{Cr}(\text{NH}_3)_6]^{3+}$

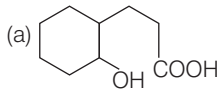
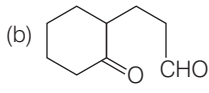
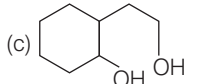
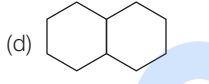
25. In the reaction sequence,



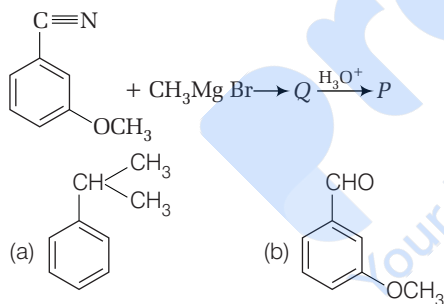
what is the molecular formula of Y?

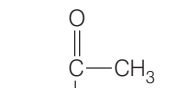
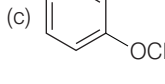
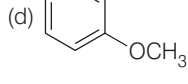
- (a) $\text{C}_3\text{H}_6\text{O}_2$ (b) $\text{C}_3\text{H}_5\text{N}$
(c) $\text{C}_2\text{H}_4\text{O}_2$ (d) $\text{C}_2\text{H}_6\text{O}$



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

27. The product P in the reaction is

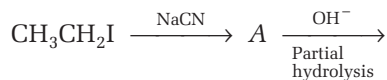


- (a)  (b) 
(c)  (d) 

28. An organic compound of molecular formula $\text{C}_3\text{H}_6\text{O}$ did not give a silver mirror with Tollen's reagent, but gave an oxime with hydroxylamine, it may be

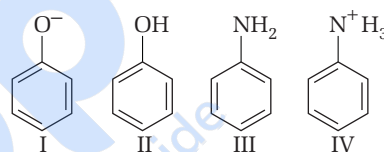
- (a) CH_3COCH_3
(b) $\text{C}_2\text{H}_5\text{CHO}$
(c) $\text{CH}_2=\text{CH}-\text{CH}_2-\text{OH}$
(d) $\text{CH}_3-\text{O}-\text{CH}=\text{CH}_2$

29. Given the following sequence of reactions,



- (a) $\text{CH}_3\text{CH}_2\text{NH}_2$ (b) $\text{CH}_3\text{CH}_2-\text{C}(=\text{O})-\text{NHBr}$
(c) $\text{CH}_3\text{CH}_2\text{COONH}_4$ (d) $\text{CH}_3-\text{CH}_2-\text{C}(=\text{O})-\text{NBr}_2$

30. Coupling of diazonium salts of the following takes place in the order



- (a) $\text{IV} < \text{II} < \text{III} < \text{I}$ (b) $\text{IV} < \text{III} < \text{II} < \text{I}$
(c) $\text{II} < \text{IV} < \text{I} < \text{III}$ (d) $\text{I} < \text{II} < \text{III} < \text{IV}$

31. Which of the following pairs give positive Tollen's test?

- (a) Glucose, sucrose
(b) Glucose, fructose
(c) Hexanal, acetophenone
(d) Fructose, sucrose

32. Which one is chain growth polymer?

- (a) Teflon (b) Nylon-6 (c) Nylon-66 (d) Bakelite

33. Sodium alkyl benzene sulphonate is used as

- (a) soap (b) fertilizer
(c) detergent (d) pesticide

34. Brown ring is made for

- (a) NO_3^- (b) Cl^- (c) I^- (d) Br^-

35. The purest zinc is made by

- (a) electrolytic refining (b) zone refining
(c) The van-Arkel method (d) Mond process

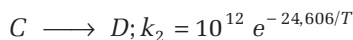
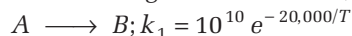
36. Which of the following is the strongest oxidising agent?

- (a) HOCl (b) HClO_2 (c) HClO_3 (d) HClO_4

37. In aerosol, the dispersion medium is

- (a) solid (b) liquid
(c) gas (d) Any of these

38. For the two gaseous reactions, following data



the temperature at which k_1 becomes equal to k_2 is

- (a) 400 K (b) 1000 K
(c) 800 K (d) 1500 K
(e) 500 K

39. How long (in hours) must a current of 5.0 A be maintained to electroplate 60g of calcium from molten CaCl_2 ?

- (a) 27 h (b) 8.3 h
(c) 11 h (d) 16 h

40. Calculate the molal depression constant of a solvent which has freezing point 16.6°C and latent heat of fusion 180.75 J/g .

- (a) 2.68 (b) 3.86
(c) 4.68 (d) 2.86

41. In CsCl type structure, the coordination number of Cs^+ and Cl^- respectively are

- (a) 6, 6 (b) 6, 8
(c) 8, 8 (d) 8, 6

42. 9.2 g N_2O_4 is heated in 1L vessel till equilibrium state is established.



In equilibrium state, 50% N_2O_4 was dissociated, equilibrium constant will be (molecular wt. of $\text{N}_2\text{O}_4 = 92$)

- (a) 0.1 (b) 0.4
(c) 0.3 (d) 0.2

43. Enthalpy is equal to

- (a) $T^2 \left[\frac{\delta (G/T)}{\delta T} \right]_p$
(b) $-T^2 \left[\frac{\delta (G/T)}{\delta T} \right]_p$
(c) $T^2 \left[\frac{\delta (G/T)}{\delta T} \right]_V$
(d) $-T^2 \left[\frac{\delta (G/T)}{\delta T} \right]_V$

44. The isoelectronic pair is

- (a) Cl_2O , ICl_2^- (b) Cl_2^- , ClO_2
(c) IF_2^- , I_3^- (d) ClO_2^- , ClF_2^+

45. Which of the following has largest ionic radius?

- (a) Cs^+ (b) Li^+
(c) Na^+ (d) K^+

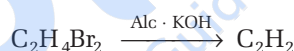
46. The ground state term symbol for an electronic state is governed by

- (a) Heisenberg principle (b) Hund's rule
(c) Aufbau principle (d) Pauli exclusion principle

47. 2.76 g of silver carbonate on being strongly heated yield a residue weighing

- (a) 2.16 g (b) 2.48 g
(c) 2.64 g (d) 2.32 g

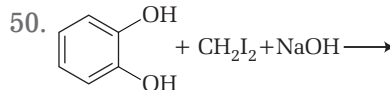
48. The following reaction is an example of reaction.



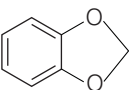
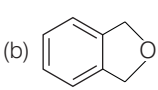
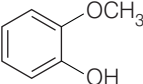
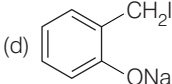
- (a) addition
(b) dehydrobromination
(c) substitution
(d) bromination

49. I_2 dissolve in KI solution due to formation of

- (a) KI_2 and I^-
(b) K^+ , I^- and I_2
(c) I_3^-
(d) None of the above



The product is

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

Mathematics

1. The approximate value of $(1.0002)^{3000}$ is
 - (a) 1.2
 - (b) 1.4
 - (c) 1.6
 - (d) 1.8
2. $(\mathbf{a} \cdot \hat{\mathbf{i}})(\mathbf{a} \times \hat{\mathbf{i}}) + (\mathbf{a} \cdot \hat{\mathbf{j}})(\mathbf{a} \times \hat{\mathbf{j}}) + (\mathbf{a} \cdot \hat{\mathbf{k}})(\mathbf{a} \times \hat{\mathbf{k}})$ is equal to
 - (a) $3\mathbf{a}$
 - (b) $\mathbf{a}$
 - (c) 0
 - (d) None of these
3. If $A = \{(x, y) : x^2 + y^2 = 25\}$ and $B = \{(x, y) : x^2 + y^2 = 144\}$; then $A \cap B$ contains
 - (a) one point
 - (b) three points
 - (c) two points
 - (d) four points
4. The value of c prescribed by Lagrange's mean value theorem, when $f(x) = \sqrt{x^2 - 4}$, $a = 2$ and $b = 3$, is
 - (a) 2.5
 - (b) $\sqrt{5}$
 - (c) $\sqrt{3}$
 - (d) $\sqrt{3} + 1$
5. The mean deviation from the mean of the series $a, a + d, a + 2d, \dots, a + 2nd$, is
 - (a) $n(n+1)d$
 - (b) $\frac{n(n+1)d}{2n+1}$
 - (c) $\frac{n(n+1)d}{2n}$
 - (d) $\frac{n(n-1)d}{2n+1}$
6. If $f(x) = xe^{x(1-x)}$, then $f(x)$ is
 - (a) increasing on $\left[-\frac{1}{2}, 1\right]$
 - (b) decreasing on R
 - (c) increasing on R
 - (d) decreasing on $\left[-\frac{1}{2}, 1\right]$
7. If ω is an imaginary cube root of unity, then the value of $(1 + \omega)(1 + \omega^2)(1 + \omega^3)(1 + \omega^4)(1 + \omega^5) \dots (1 + \omega^{3n})$ is
 - (a) 2^{3n}
 - (b) 2^{2n}
 - (c) 2^n
 - (d) None of these
8. Let X denotes the number of times heads occur in n tosses of a fair coin. If $P(X = 4)$, $P(X = 5)$ and $P(X = 6)$ are in AP, then the value of n is
 - (a) 7, 14
 - (b) 10, 14
 - (c) 12, 7
 - (d) 14, 12
9. If there is a term containing x^{2r} in $\left(x + \frac{1}{x^2}\right)^{n-3}$, then
 - (a) $n - 2r$ is a positive integral multiple of 3.
 - (b) $n - 2r$ is even
 - (c) $n - 2r$ is odd
 - (d) None of the above
10. The value of $\sin^{-1} \left\{ \cot \left(\sin^{-1} \sqrt{\frac{2-\sqrt{3}}{4}} + \cos^{-1} \frac{\sqrt{12}}{4} + \sec^{-1} \sqrt{2} \right) \right\}$ is
 - (a) $\frac{\pi}{4}$
 - (b) $\frac{\pi}{6}$
 - (c) 0
 - (d) $\frac{\pi}{2}$
11. If $\cos^{-1} \frac{x}{2} + \cos^{-1} \frac{y}{3} = \theta$, then $9x^2 - 12xy \cos \theta + 4y^2$ is equal to
 - (a) 36
 - (b) $-36 \sin^2 \theta$
 - (c) $36 \sin^2 \theta$
 - (d) $36 \cos^2 \theta$
12. If $\tan(\sec^{-1} x) = \sin\left(\cos^{-1} \frac{1}{\sqrt{5}}\right)$, then x is equal to
 - (a) $\pm \frac{3}{\sqrt{5}}$
 - (b) $\pm \frac{\sqrt{5}}{3}$
 - (c) $\pm \frac{\sqrt{3}}{\sqrt{5}}$
 - (d) None of these
13. The equation of the tangent to the curve $y = (2x - 1)e^{2(1-x)}$ at the point of its maximum, is
 - (a) $y - 1 = 0$
 - (b) $x - 1 = 0$
 - (c) $x + y - 1 = 0$
 - (d) $x - y + 1 = 0$
14. The proposition $(p \rightarrow \sim p) \wedge (\sim p \rightarrow p)$ is
 - (a) a tautology
 - (b) a contradiction
 - (c) neither tautology nor contradiction
 - (d) both tautology and contradiction
15. The number of ways in which four letters can be selected from the word 'DEGREE', is
 - (a) 7
 - (b) 6
 - (c) $\frac{6!}{3!}$
 - (d) None of these

16. If $PQRS$ is a convex quadrilateral with 3, 4, 5 and 6 points marked on sides PQ , QR , RS and PS respectively. Then, the number of triangles with vertices on different sides is
- (a) 220 (b) 270
(c) 282 (d) 342
17. $\lim_{x \rightarrow -1} \left(\frac{x^4 + x^2 + x + 1}{x^2 - x + 1} \right)^{\frac{1 - \cos(x+1)}{(x+1)^2}}$ is equal to
- (a) 1 (b) $\sqrt{\frac{2}{3}}$
(c) $\sqrt{\frac{3}{2}}$ (d) $e^{1/2}$
18. The term independent of x in the expansion of $\left(x - \frac{1}{x}\right)^4 \left(x + \frac{1}{x}\right)^3$, is
- (a) -3 (b) 0
(c) 1 (d) 3
19. If A is a square matrix such that $A^2 = A$ and $(1 + A)^n = I + \lambda A$, then λ is equal to
- (a) $2n - 1$ (b) $2^n - 1$
(c) $2n + 1$ (d) None of these
20. The functions $u = e^x \sin x$ and $v = e^x \cos x$ satisfy the equation
- (a) $v \frac{du}{dx} - u \frac{dv}{dx} = u^2 + v^2$ (b) $\frac{d^2 u}{dx^2} = 2v$
(c) $\frac{d^2 v}{dx^2} = -2u$ (d) All of these
21. The derivative of $\tan^{-1} \left(\frac{\sqrt{1+x^2} - 1}{x} \right)$ with respect to $\tan^{-1} \left(\frac{2x\sqrt{1-x^2}}{1-2x^2} \right)$ at $x = 0$, is
- (a) $\frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) 1
22. $\int \frac{1-x^2}{(1+x^2)\sqrt{1+x^4}} dx$ is equal to
- (a) $\sqrt{2} \sin^{-1} \left\{ \frac{\sqrt{2}x}{x^2+1} \right\} + C$ (b) $\frac{1}{\sqrt{2}} \sin^{-1} \left\{ \frac{\sqrt{2}x}{x^2+1} \right\} + C$
(c) $\frac{1}{2} \sin^{-1} \left\{ \frac{\sqrt{2}x}{x^2+1} \right\} + C$ (d) None of these
23. In a ΔABC , if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix} = 0$, then $\sin^2 A + \sin^2 B + \sin^2 C$ is equal to
- (a) $\frac{3\sqrt{3}}{2}$ (b) $\frac{9}{4}$
(c) $\frac{5}{4}$ (d) 2
24. The area of the region enclosed by the curves $y = x$, $x = e$, $y = \frac{1}{x}$ and the positive X -axis, is
- (a) $\frac{1}{2}$ sq unit (b) 1 sq unit
(c) $\frac{3}{2}$ sq units (d) $\frac{5}{2}$ sq units
25. The value of $\lim_{x \rightarrow \infty} \left\{ \frac{a_1^{1/x} + a_2^{1/x} + \dots + a_n^{1/x}}{n} \right\}^{nx}$, is
- (a) $a_1 + a_2 + \dots + a_n$ (b) $e^{a_1 + a_2 + \dots + a_n}$
(c) $\frac{a_1 + a_2 + \dots + a_n}{n}$ (d) $a_1 a_2 \dots a_n$
26. $\int \frac{\sec^2 x}{(\sec x + \tan x)^{9/2}} dx$ equals
- (a) $-\frac{1}{(\sec x + \tan x)^{1/2}} \left\{ \frac{1}{11} - \frac{1}{7} (\sec x + \tan x)^2 \right\} + K$
(b) $\frac{1}{(\sec x + \tan x)^{11/2}} \left\{ \frac{1}{11} - \frac{1}{7} (\sec x + \tan x)^2 \right\} + K$
(c) $-\frac{1}{(\sec x + \tan x)^{11/2}} \left\{ \frac{1}{11} + \frac{1}{7} (\sec x + \tan x) \right\} + K$
(d) None of the above
27. The centre of the circle passing through $(0, 0)$ and $(1, 0)$ and touching the circle $x^2 + y^2 = 9$, is
- (a) $\left(\frac{3}{2}, \frac{1}{2}\right)$ (b) $\left(\frac{1}{2}, \frac{3}{2}\right)$
(c) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (d) $\left(\frac{1}{2}, \pm \sqrt{2}\right)$
28. If the line $x - 1 = 0$ is the directrix of the parabola $y^2 - kx + 8 = 0$, then one of the value of k is
- (a) $\frac{1}{8}$ (b) 8 (c) 4 (d) $\frac{1}{4}$

29. The area of the region bounded by the parabola $(y - 2)^2 = (x - 1)$, the tangent to the parabola at the point $(2, 3)$ and the X -axis, is
 (a) 3 (b) 6
 (c) 9 (d) 12
30. Solution of the differential equation
 $x = 1 + xy \frac{dy}{dx} + \frac{(xy)^2}{2!} \left(\frac{dy}{dx} \right)^2 + \frac{(xy)^3}{3!} \left(\frac{dy}{dx} \right)^3 + \dots$ is
 (a) $y = \log_e(x) + C$ (b) $y = (\log_e x)^2 + C$
 (c) $y = \pm \sqrt{(\log_e x)^2 + 2C}$ (d) $xy = x^y + C$
31. Numbers $1, 2, 3, \dots, 100$ are written down on each of the cards A, B and C . One number is selected at random from each of the cards. The probability that the numbers so selected can be the measures (in cm) of three sides of a right angled triangle, is
 (a) $\frac{4}{100^3}$ (b) $\frac{3}{50^3}$
 (c) $\frac{3!}{100^3}$ (d) None of these
32. If $f(x) = \begin{cases} \frac{\sin(\cos x) - \cos x}{(\pi - 2x)^3}, & x \neq \frac{\pi}{2} \\ k, & x = \frac{\pi}{2} \end{cases}$
 is a continuous at $x = \frac{\pi}{2}$, then k is equal to
 (a) 0 (b) $-\frac{1}{6}$ (c) $-\frac{1}{24}$ (d) $-\frac{1}{48}$
33. If $[]$ denotes the greatest integer function, then $f(x) = [x] + \left[x + \frac{1}{2} \right]$
 (a) is continuous at $x = \frac{1}{2}$
 (b) is discontinuous at $x = \frac{1}{2}$
 (c) $\lim_{x \rightarrow (1/2)^+} f(x) = 2$
 (d) $\lim_{x \rightarrow (1/2)^-} f(x) = 1$
34. If $f(x) = \min \{1, x^2, x^3\}$, then
 (a) $f(x)$ is not everywhere continuous
 (b) $f(x)$ is continuous and differentiable everywhere
 (c) $f(x)$ is not differentiable at two points
 (d) $f(x)$ is not differentiable at one point
35. If $x_n = \cos \frac{\pi}{3^n} + i \sin \frac{\pi}{3^n}$, then $x_1 \cdot x_2 \cdot x_3 \dots$ is equal to
 (a) 1 (b) -1
 (c) i (d) $-i$
36. The total number of natural numbers of 6 digits that can be made with digits 1, 2, 3, 4, if all digits are to appear in the same number at least once, is
 (a) 1560 (b) 840
 (c) 1080 (d) 480
37. The number of solutions of the equation $9x^2 - 18|x| + 5 = 0$ belonging to the domain of definition of $\log_e \{(x+1)(x+2)\}$, is
 (a) 1 (b) 2
 (c) 3 (d) 4
38. If $2^x + 2^y = 2^{x+y}$, then $\frac{dy}{dx}$ is equal to
 (a) $\frac{2^x + 2^y}{2^x - 2^y}$ (b) $\frac{2^x + 2^y}{1 + 2^{x+y}}$
 (c) $2^{x-y} \left(\frac{2^y - 1}{1 - 2^x} \right)$ (d) $\frac{2^{x+y} - 2^x}{2^y}$
39. If $3x + y = 0$ is a tangent to the circle with centre at the point $(2, -1)$, then the equation of the other tangent to the circle from the origin, is
 (a) $x - 3y = 0$ (b) $x + 3y = 0$
 (c) $3x - y = 0$ (d) $2x + y = 0$
40. If $\sin A + \cos A = m$ and $\sin^3 A + \cos^3 A = n$, then
 (a) $m^3 - 3m + n = 0$ (b) $n^3 - 3n + 2m = 0$
 (c) $m^3 - 3m + 2n = 0$ (d) $m^3 + 3m + 2n = 0$
41. In $\triangle ABC$, if $a = 4, b = 3, \angle A = 60^\circ$. Then, c is the root of the equation
 (a) $c^2 - 3c - 7 = 0$ (b) $c^2 + 3c + 7 = 0$
 (c) $c^2 - 3c + 7 = 0$ (d) $c^2 + 3c - 7 = 0$
42. The sum to n terms of the series
 $\frac{3}{1^2} + \frac{5}{1^2 + 2^2} + \frac{7}{1^2 + 2^2 + 3^2} + \dots$ is
 (a) $\frac{6n}{n+1}$ (b) $\frac{9n}{n+1}$
 (c) $\frac{12n}{n+1}$ (d) $\frac{3n}{n+1}$

43. The value of $\int_{\sqrt{\ln 2}}^{\sqrt{\ln 3}} \frac{x \sin x^2}{\sin x^2 + \sin (\ln 6 - x^2)} dx$ is
- (a) $\frac{1}{4} \ln \frac{3}{2}$ (b) $\frac{1}{2} \ln \frac{3}{2}$
 (c) $\ln \frac{3}{2}$ (d) $\frac{1}{6} \ln \frac{3}{2}$
44. $\int_1^4 \log_e [x] dx$ equals
- (a) $\log_e 2$
 (b) $\log_e 3$
 (c) $\log_e 6$
 (d) None of the above
45. The radius of the circle passing through the foci of the ellipse $9x^2 + 16y^2 = 144$ and having its centre at $(0, 3)$, is
- (a) 4 (b) 3 (c) $\sqrt{12}$ (d) $\frac{7}{2}$
46. If $f(x) = \frac{\sin(e^x - 2) - 1}{\log(x - 1)}$, then $\lim_{x \rightarrow 2} f(x)$ is given by
- (a) -2 (b) -1
 (c) 0 (d) 1
47. If $\tan A$ and $\tan B$ are the roots of the equation $x^2 - ax + b = 0$, then the value of $\sin^2(A + B)$ is
- (a) $\frac{a^2}{a^2 + (1 - b)^2}$ (b) $\frac{a^2}{a^2 + b^2}$
 (c) $\frac{a^2}{(a + b)^2}$ (d) $\frac{a^2}{b^2 + (1 - a)^2}$
48. In a $\triangle ABC$, if $a^2 + b^2 + c^2 = ac + \sqrt{3}ab$, then the triangle is
- (a) equilateral
 (b) right angled and isosceles
 (c) right angled and not isosceles
 (d) None of the above
49. Let $\mathbf{a}, \mathbf{b}$ and $\mathbf{c}$ be non-zero vectors such that no two are collinear and $(\mathbf{a} \times \mathbf{b}) \times \mathbf{c} = \frac{1}{3} |\mathbf{b}| |\mathbf{c}| \mathbf{a}$. If θ is the acute angle between the vectors $\mathbf{b}$ and $\mathbf{c}$, then $\sin \theta$ equals
- (a) $\frac{2\sqrt{2}}{3}$ (b) $\frac{\sqrt{2}}{3}$
 (c) $\frac{2}{3}$ (d) $\frac{1}{3}$
50. The distance of the point $(1, 1)$ from the line $2x - 3y - 4 = 0$ in the direction of the line $x + y = 1$, is
- (a) $\sqrt{2}$ (b) $5\sqrt{2}$
 (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$
51. The two tangents to the curve $ax^2 + 2hxy + by^2 = 1$, $a > 0$ at the points, where it crosses X -axis, are
- (a) parallel (b) perpendicular
 (c) inclined at an angle $\frac{\pi}{4}$ (d) None of these
52. The greatest value of the function $f(x) = xe^{-x}$ in $[0, \infty)$, is
- (a) 0 (b) $\frac{1}{e}$
 (c) $-e$ (d) e
53. If an isosceles triangle of vertical angle 2θ is inscribed in a circle of radius a . Then, area of the triangle is maximum, when θ is equal to
- (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$
 (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$
54. The range of the function $f(x) = \log_5(25 - x^2)$ is
- (a) $[0, 5]$ (b) $[0, 2]$
 (c) $(0, 2)$ (d) None of these
55. The image of the point $P(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$, is
- (a) $(3, 5, -2)$ (b) $(-3, 5, 2)$
 (c) $(3, -5, 2)$ (d) $(3, 5, 2)$
56. Equation of the plane that contains the lines $\mathbf{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\mathbf{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - 2\hat{k})$, is
- (a) $\mathbf{r} \cdot (2\hat{i} + \hat{j} - 3\hat{k}) = -4$ (b) $\mathbf{r} \times (-\hat{i} + \hat{j} + \hat{k}) = 0$
 (c) $\mathbf{r} \cdot (-\hat{i} + \hat{j} + \hat{k}) = 0$ (d) None of these
57. The distance of the point $(3, 8, 2)$ from the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-2}{3}$ measured parallel to the plane $3x + 2y - 2z + 15 = 0$, is
- (a) 2 (b) 3
 (c) 6 (d) 7

58. Let u_1 and u_2 be two urns such that u_1 contains 3 white, 2 red balls and u_2 contains only 1 white ball. A fair coin is tossed. If head appears, then 1 ball is drawn at random from urn u_1 and put into u_2 . However, if tail appears, then 2 balls are drawn at random from u_1 and put into u_2 . Now, 1 ball is drawn at random from u_2 . Then, probability of the drawn ball from u_2 being white is
- (a) $\frac{13}{30}$ (b) $\frac{23}{30}$ (c) $\frac{19}{30}$ (d) $\frac{11}{30}$
59. Let $D_k = \begin{vmatrix} a & 2^k & 2^{16} - 1 \\ b & 3(4^k) & 2(4^{16} - 1) \\ c & 7(8^k) & 4(8^{16} - 1) \end{vmatrix}$, then the value of $\sum_{k=1}^{16} D_k$ is
- (a) 0 (b) $a + b + c$
(c) $ab + bc + ca$ (d) None of these
60. The eccentricity of the conic $x^2 - 4x + 4y^2 = 12$ is
- (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{2}{\sqrt{3}}$
(c) $\sqrt{3}$ (d) None of these
61. The value of $\int \frac{1}{\sin\left(x - \frac{\pi}{3}\right)\cos x} dx$ is
- (a) $2 \log \left| \sin x + \sin\left(x - \frac{\pi}{3}\right) \right| + C$
(b) $2 \log \left| \sin x \cdot \sin\left(x - \frac{\pi}{3}\right) \right| + C$
(c) $2 \log \left| \sin x - \sin\left(x - \frac{\pi}{3}\right) \right| + C$
(d) None of the above
62. Two common tangents to the circle $x^2 + y^2 = 2a^2$ and parabola $y^2 = 8ax$ are
- (a) $x = \pm (y + 2a)$ (b) $y = \pm (x + 2a)$
(c) $x = \pm (y + a)$ (d) $y = \pm (x + a)$
63. The equation of the plane through the intersection of the planes $x + y + z = 1$ and $2x + 3y - z + 4 = 0$ and parallel to X -axis, is
- (a) $y - 3z + 6 = 0$
(b) $3y - z + 6 = 0$
(c) $y + 3z + 6 = 0$
(d) $3y - 2z + 6 = 0$
64. Let $\mathbf{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\mathbf{b} = \hat{i} + \hat{j}$. If $\mathbf{c}$ is a vector such that $\mathbf{a} \cdot \mathbf{c} = |\mathbf{c}|$, $|\mathbf{c} - \mathbf{a}| = 2\sqrt{2}$ and the angle between $\mathbf{a} \times \mathbf{b}$ and $\mathbf{c}$ is 30° . Then, $|(\mathbf{a} \times \mathbf{b}) \times \mathbf{c}|$ is equal to
- (a) $\frac{2}{3}$ (b) $\frac{3}{2}$
(c) 2 (d) 3
65. Order and degree of a differential equation $\frac{d^2 y}{dx^2} = \left\{ y + \left(\frac{dy}{dx} \right)^2 \right\}^{1/4}$ are
- (a) 4 and 2 (b) 1 and 2
(c) 1 and 4 (d) 2 and 4
66. A cone whose height is always equal to its diameter, is increasing in volume at the rate of $40 \text{ cm}^3/\text{s}$. At what rate is the radius increasing when its circular base area is 1 m^2 ?
- (a) 1 mm/s (b) 0.001 cm/s
(c) 2 mm/s (d) 0.002 cm/s
67. The sum to infinity of the series $1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \frac{14}{3^4} + \dots$ is
- (a) 2 (b) 3
(c) 4 (d) 6
68. The equations of the straight lines passing through the point (4, 3) and making intercepts on the coordinate axes whose sum is -1, is
- (a) $\frac{x}{2} - \frac{y}{3} = 1$ and $\frac{x}{-2} + \frac{y}{1} = 1$
(b) $\frac{x}{2} - \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$
(c) $\frac{x}{2} + \frac{y}{3} = 1$ and $\frac{x}{2} + \frac{y}{1} = 1$
(d) None of the above
69. One possible condition for the three points (a, b) , (b, a) and $(a^2, -b^2)$ to be collinear, is
- (a) $a - b = 2$ (b) $a + b = 2$
(c) $a = 1 + b$ (d) $a = 1 - b$
70. The number of positive integral solutions of $x^2 + 9 < (x + 3)^2 < 8x + 25$, is
- (a) 2 (b) 3
(c) 4 (d) 5

General English & Aptitude

1. John M Keynes was advocate of which of the following suggestions?
 - (a) Pending money recklessly during recessions is suicidal
 - (b) Exorbitant spending during recessions is likely to boost economy
 - (c) Aggressive deficit spending is likely to be fatal for economic meltdown
 - (d) Government stimulus to economy may not help because of red-tapism
 - (e) None of the above
 2. Which of the following is true about Keynes philosophy?
 - (a) Actual spending money during meltdown is more important than where and on what it is spent
 - (b) Government should be selective in approach for spending money during recession
 - (c) Filling old bottles with banknotes and burying them is an atrocious proposal
 - (d) Creating jobs and prosperity during recessions is almost an impracticable proposal
 - (e) None of the above
 3. The author of the passage calls Barack Obama and his team as 'Keynesians' because
 - (a) Barack Obama has been reluctant to follow Keynes' philosophy
 - (b) his team is advising Barack to refrain from Keynes' philosophy
 - (c) Barack Obama and his team have decided to fill old bottles with banknotes
 - (d) building houses has been under the active consideration of Barack Obama and his team
 - (e) None of the above
 4. What, according to Keynes, is the 'aggregate demand'?
 - (a) Goods and Services Sector
 - (b) Stimulation of a short-term activity
 - (c) Attempting to rev up the sluggish economy
 - (d) Pumping one trillion dollars into economy
 - (e) None of the above
 5. Highways, bridges, ethanol plants etc., are considered by the author as
 - (a) reasonably appropriate propositions to spend money on
 - (b) measures that affect the environment adversely
 - (c) imprudent proposals to waste money on
 - (d) tax saving schemes bestowed on builders
 - (e) None of the above
 6. Obama's upcoming American Recovery and Reinvestment Plan focuses on which of the following?
 - A. Recovery of all debts from the debtors in a phased manner.
 - B. Pumping money very liberally in projects that are mandatory.
 - C. Investing money recklessly in any project regardless of its utility.
 - (a) Only A
 - (b) Only B
 - (c) Only C
 - (d) B and C
 - (e) All of the above
- Directions (Q. Nos. 7 and 8)** Choose the word which is most opposite in meaning of the word printed in **bold** as used in the passage.
7. **Moribund**
 - (a) Declining
 - (b) Waning
 - (c) Thriving
 - (d) Pessimistic
 - (e) Glorifying
 8. **Beleaguered**
 - (a) Carefree
 - (b) Harassed
 - (c) Stressful
 - (d) Uneventful
 - (e) Evaporating
- Directions (Q.Nos. 9 and 10)** Choose the word which is most nearly the same in meaning as the word given in **bold** as used in the passage.
9. **Apocalyptic**
 - (a) Unwelcome
 - (b) Disastrous
 - (c) Risk-free
 - (d) Joyous
 - (e) Ceremonious
 10. **Resuscitate**
 - (a) Meltdown
 - (b) Devastate
 - (c) Mislead
 - (d) Save
 - (e) Deactivate

Directions (Q.Nos. 11-15) *Rearrange the following seven sentences (A), (B), (C), (D), (E), (F) and (G) in the proper sequence to form a meaningful paragraph, then answer the questions given below them.*

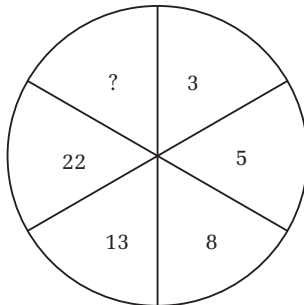
- A. People thoroughly dedicated to social service but not fulfilling the eligibility requirements would not be able to contest elections.
- B. Those who fulfil the stipulated criteria of age and formal education may not be necessarily devoted to social service.
- C. This system has both advantages and disadvantages.
- D. Therefore, imposing such eligibility requirements is likely to be counter-productive.
- E. In certain democratic countries, elections can be contested by anybody.
- F. People would be deprived of the probable benefit accrued from services of such people.
- G. There are no eligibility requirements of formal education and upper age limit stipulated in their Constitution.
11. Which sentence should be the **FOURTH** in the paragraph?
 (a) A (b) B
 (c) C (d) D
 (e) E
12. Which sentence should be the **LAST** in the paragraph?
 (a) A (b) B
 (c) C (d) D
 (e) E
13. Which sentence should be the **FIRST** in the paragraph?
 (a) G (b) F
 (c) E (d) D
 (e) C
14. Which sentence should be the **SECOND** in the paragraph?
 (a) G (b) F
 (c) E (d) D
 (e) C
15. Which sentence should be the **THIRD** in the paragraph?
 (a) A (b) B
 (c) C (d) D
 (e) E

Directions (Q. Nos. 16-20) *In each of the following sentences there are two blank spaces. Below each five pairs of words have been denoted by (a), (b), (c), (d) and (e). Find out which pair of words can be filled up in the blanks in the sentence in the same sequence to make the sentence meaningfully complete.*

16. As public resources are there is a need for of the private sector in development.
 (a) exhaustive, participation
 (b) relative, solicitation
 (c) necessary, regulation
 (d) dwindling, coveting
 (e) limited, involvement
17. The Government is likely to a new rural infrastructure by the end of March.
 (a) formulate, development
 (b) frame, policy
 (c) sanction, funds
 (d) inspect, clearance
 (e) conceive, inflow
18. State owned banks may lose Government business if they to fulfil their developmental role.
 (a) valuable, compete (b) approved, omit
 (c) lucrative, fail (d) significant, neglected
 (e) profitable, succeed
19. The company was with a to improve power distribution in rural areas.
 (a) initiated, backing (b) established, aim
 (c) promote, priority (d) started, mandate
 (e) acquired, belief
20. The Finance Minister is that the country will a 9% growth rate.
 (a) assured, check (b) convinced, ensure
 (c) confident, post (d) proposed, achieve
 (e) challenged, sustain
21. In an examination, Raju got more marks than Mukesh but not as many as Priya. Priya got more marks than Gaurav and Kavita. Gaurav got less marks than Mukesh but his marks are not the lowest in the group. Who is second in the descending order of marks?
 (a) Priya (b) Kavita
 (c) Raju (d) Gaurav

Directions (Q. Nos. 22 and 23) Select the missing number from the given responses.

22.



- (a) 1 (b) 26 (c) 39 (d) 45

23.

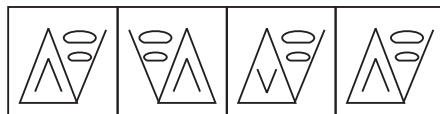
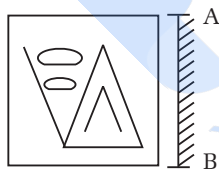
64	36	2
81	25	4
144	16	?

- (a) 6 (b) 8 (c) 3 (d) 16

24. Ashish walked 50 m towards East and took a right turn and walked 40 m. He again took a right turn and walked 50 m. How far is he from the starting point?

- (a) 10 m (b) 25 m
(c) 30 m (d) 40 m

25. Which of the answer figure is exactly the mirror image of the given figure, when the mirror is held on the line AB?



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

26. The least number which when divided by 5, 6, 7 and 8 leaves a remainder 3 but when divided by 9 leaves no remainder, is

- (a) 1677
(b) 1683
(c) 2523
(d) 3363

27. If $\frac{x+y}{x-y} = \frac{5}{2}$, then value of $\frac{x}{y}$ is

- (a) $\frac{3}{8}$ (b) $\frac{8}{3}$
(c) $\frac{5}{3}$ (d) $\frac{3}{5}$

28. Ram bought a refrigerator with 5% discount on the labelled price. Had he bought it with 20% discount, he would have saved ₹ 1500. At what price did he buy the refrigerator?

- (a) ₹ 10000
(b) ₹ 9000
(c) ₹ 8000
(d) ₹ 9500

29. The ratio of the incomes of A and B is 5 : 4 and the ratio of their expenditures is 3 : 2. If at the end of the year, each saves ₹ 1600, then the income of A is

- (a) ₹ 3400
(b) ₹ 3600
(c) ₹ 4000
(d) ₹ 4400

30. The difference between the compound interest and simple interest on a certain sum of money for 3yr at $6\frac{2}{3}\%$ per annum is ₹ 184, then what is the sum?

- (a) ₹ 13500
(b) ₹ 12500
(c) ₹ 11500
(d) ₹ 10500