

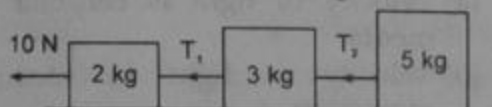
G.G.S. INDRAPRASTHA UNIVERSITY

ENGINEERING ENTRANCE

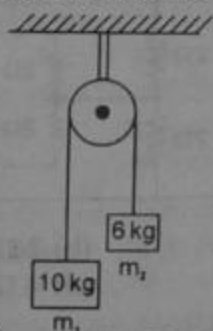
SOLVED PAPER-2004

PHYSICS

1. Three blocks of masses 2 kg, 3 kg and 5 kg are connected to each other with light string and are then placed on a frictionless surface as shown in the figure. The system is pulled by a force $F = 10$ N, then tension T_1 is :

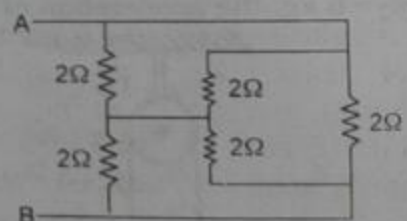


- (a) 1 N (b) 5 N
(c) 8 N (d) 10 N
2. Two masses m_1 and m_2 are attached to a string which passes over a frictionless smooth pulley. When $m_1 = 10$ kg, $m_2 = 6$ kg, the acceleration of masses is :



- (a) 20 m/s^2 (b) 5 m/s^2
(c) 2.5 m/s^2 (d) 10 m/s^2
3. An object is moving through the liquid. The viscous damping force acting on it is proportional to the velocity. Then dimension of constant of proportionality is :
- (a) $[ML^{-1}T^{-1}]$ (b) $[MLT^{-1}]$
(c) $[M^0LT^{-1}]$ (d) $[ML^0T^{-1}]$

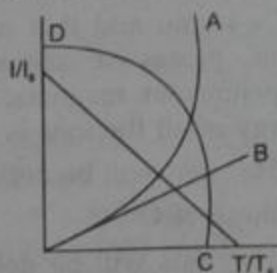
4. Magnetic meridian is a :
(a) point (b) horizontal plane
(c) vertical plane (d) line along N-S
5. The unit of L/R is (where L = inductance and R = resistance) :
(a) sec (b) sec^{-1}
(c) volt (d) ampere
6. If the current is doubled, the deflection is also doubled in :
(a) a tangent galvanometer
(b) a moving coil galvanometer
(c) both (a) and (b)
(d) none of the above
7. The permeability of a paramagnetic substance is :
(a) slightly more than vacuum
(b) slightly less than vacuum
(c) much more than vacuum
(d) none of the above
8. Which particles will have minimum frequency of revolution when projected with the same velocity perpendicular to magnetic field ?
(a) Li^+ (b) Electron
(c) Proton (d) He^+
9. A body of mass M_1 collides elastically with another mass M_2 at rest. There is maximum transfer of energy when :
(a) $M_1 > M_2$
(b) $M_1 < M_2$
(c) $M_1 = M_2$
(d) same of all values of M_1 and M_2

10. Minimum energy required to take out the only one electron from ground state of He^+ is :
 (a) 13.6 eV (b) 54.4 eV
 (c) 27.2 eV (d) 6.8 eV
11. Photons of 5.5 eV energy fall on the surface of the metal emitting photoelectrons of maximum kinetic energy 4.0 eV. The stopping voltage required for these electrons is :
 (a) 5.5 V (b) 1.5 V (c) 9.5 V (d) 4.0 V
12. Which is different from others by units?
 (a) Phase difference
 (b) Mechanical equivalent
 (c) Loudness of sound
 (d) Poisson's ratio
13. The velocity of a body of rest mass m_0 is $\frac{\sqrt{3}}{2}c$ (where c is the velocity of light in vacuum). Then mass of this body is :
 (a) $(\sqrt{3}/2)m_0$ (b) $(1/2)m_0$
 (c) $2m_0$ (d) $(2/\sqrt{3})m_0$
14. A ball is dropped from top of a tower of 100 m height. Simultaneously another ball was thrown upward from bottom of the tower with a speed of 50 m/s. They will cross each other after : ($g = 10 \text{ m/s}^2$)
 (a) 1 sec (b) 2 sec (c) 3 sec (d) 4 sec
15. The driver of a car moving towards a rocket launching pad with a speed of 6 m/s observes that the rocket is moving with speed of 10 m/s. The upward speed of the rocket as seen by the stationary observer is :
 (a) 4 m/s (b) 6 m/s
 (c) 8 m/s (d) 11 m/s
16. A satellite revolves very near to the earth surface. Its speed should be around :
 (a) 5 km/s (b) 8 km/s
 (c) 2 km/s (d) 11 km/s
17. If the density of earth is doubled keeping its radius constant, then acceleration due to gravity g is :
 (a) 20 m/s^2 (b) 10 m/s^2
 (c) 5 m/s^2 (d) 2.5 m/s^2
18. A simple pendulum oscillates in a vertical plane. When it passes through the mean position, the tension in the string is 3 times the weight of the pendulum bob. What is the maximum displacement of the pendulum of the string with respect to the vertical ?
 (a) 30° (b) 45° (c) 60° (d) 90°
19. A body of mass 8 kg is moved by a force $F = 3x \text{ N}$, where x is the distance covered. Initial position is $x = 2 \text{ m}$ and the final position is $x = 10 \text{ m}$. The initial speed is zero. The final speed is :
 (a) 6 m/s (b) 12 m/s
 (c) 18 m/s (d) 14 m/s
20. Which of the following statement is true ?
 (a) Velocity of light is constant in all media
 (b) Velocity of light in vacuum is maximum
 (c) Velocity of light is same in all reference frames
 (d) Laws of nature have identical form in all reference frames
21. Find the equivalent resistance across AB :

 (a) 1 Ω (b) 2 Ω
 (c) 3 Ω (d) 4 Ω
22. The nuclear reaction ${}_1\text{H}^1 + {}_1\text{H}^1 \rightarrow {}_2\text{He}^4$ (mass of deuteron = 2.0141 amu and of $\text{He} = 4.0024 \text{ amu}$) is :
 (a) fusion reaction releasing 24 MeV energy
 (b) fusion reaction absorbing 24 MeV energy
 (c) fission reaction releasing 0.0258 MeV energy
 (d) fission reaction absorbing 0.0258 MeV energy

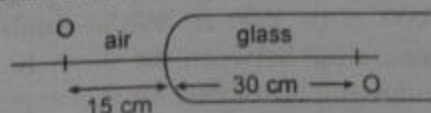
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23. In Thomson experiment of finding e/m for electrons, beam of electron is replaced by that of muons (particle with same charge as of electrons but mass 208 times that of electrons). No deflection condition in this case satisfied if :
 (a) B is increased to 208 times
 (b) E is increased to 208 times
 (c) B is increased to 14.4 times
 (d) none of the above
24. A thin metal plate P is inserted half way between the plates of a parallel plate capacitor of capacitance C in such a way that it is parallel to the two plates. The capacitance now becomes :
 (a) C (b) $\frac{C}{2}$
 (c) $4C$ (d) none of these
25. An inclined plane makes an angle 30° with horizontal. A solid sphere rolling down this inclined plane has a linear acceleration of :
 (a) $\frac{5g}{14}$ (b) $\frac{2g}{3}$
 (c) $\frac{g}{3}$ (d) $\frac{5g}{7}$
26. A bullet of mass 10 g is fired from a gun of mass 1 kg. If the recoil velocity is 5 m/s, the velocity of the muzzle is :
 (a) 0.05 m/s (b) 5 m/s
 (c) 50 m/s (d) 500 m/s
27. A particle moves with constant speed v along a circular path of radius r and completes the circle in time T . The acceleration of the particle is :
 (a) $\frac{2\pi v}{T}$ (b) $\frac{2\pi r}{T}$
 (c) $\frac{2\pi r^2}{T}$ (d) $\frac{2\pi v^2}{T}$
28. The separation between C and O-atoms in CO is 1.2 Å. The distance of carbon atom from the centre of mass is :
 (a) 0.3 Å (b) 0.7 Å
 (c) 0.5 Å (d) 0.9 Å
29. A body moves a distance of 10 m under the action of force $F = 10$ N. If the work done is 25 J, the angle which the force makes with the direction of motion is :
 (a) 0° (b) 30°
 (c) 60° (d) none of these
30. When a spring is stretched by 2 cm, it stores 100 J of energy. If it is stretched further by 2 cm, the stored energy will be increased by :
 (a) 100 J (b) 200 J
 (c) 300 J (d) 400 J
31. Two wires A and B are of same materials. Their lengths are in the ratio 1 : 2 and diameters are in the ratio 2 : 1. When stretched by force F_A and F_B respectively they get equal increase in their lengths. Then the ratio $\frac{F_A}{F_B}$ should be :
 (a) 1 : 2 (b) 1 : 1
 (c) 2 : 1 (d) 8 : 1
32. Mixed He^+ and O^{2+} ions (mass of $\text{He}^+ = 4$ amu and that of $\text{O}^{2+} = 16$ amu) beam passes a region of constant perpendicular magnetic field. If kinetic energy of all the ions is same then :
 (a) He^+ ions will be deflected more than those of O^{2+}
 (b) He^+ ions will be deflected less than those of O^{2+}
 (c) all the ions will be deflected equally
 (d) no ions will be deflected
33. In Young's double slit experiment the wavelength of light was changed from 7000 Å to 3500 Å. While doubling the separation between the slits which of the following is not true for this experiment ?
 (a) The width of the fringes changes
 (b) The colour of bright fringes changes
 (c) The separation between successive bright fringes changes
 (d) The separation between successive dark fringes remains unchanged

34. The coherence of two light sources means that the light waves emitted have :
 (a) same frequency
 (b) same intensity
 (c) constant phase difference
 (d) same velocity
35. The valence band and conduction band of a solid overlap at low temperature, the solid may be :
 (a) a metal (b) a semiconductor
 (c) an insulator (d) none of these
36. The dominant contribution to current comes from holes in case of :
 (a) metals
 (b) intrinsic semiconductors
 (c) p -type extrinsic semiconductors
 (d) n -type extrinsic semiconductors
37. The ratio of thermionic currents (I/I_0) for a metal when the temperature is slowly increased T_0 to T as shown in figure. (I and I_0 are currents at T and T_0 respectively). Then which one is correct ?



- (a) A (b) B (c) C (d) D
38. A point object O is placed in front of a glass rod having spherical end of radius of curvature 30 cm. The image would be formed at :



- (a) 30 cm left (b) infinity
 (c) 1 cm to the right
 (d) 18 cm to the left
39. In the formation of a rainbow light from the sun on water droplets undergoes :

- (a) dispersion only
 (b) only total internal reflection
 (c) dispersion and total internal reflection
 (d) none of the above

40. The angular magnification of a simple microscope can be increased by increasing :
 (a) focal length of lens
 (b) size of object
 (c) aperture of lens
 (d) power of lens
41. If no external voltage is applied across p - n junction, there would be :
 (a) no electric field across the junction
 (b) an electric field pointing from n -type to p -type side across the junction
 (c) an electric field pointing from p -type to n -type side across the junction
 (d) a temporary electric field during formation of p - n junction that would subsequently disappear

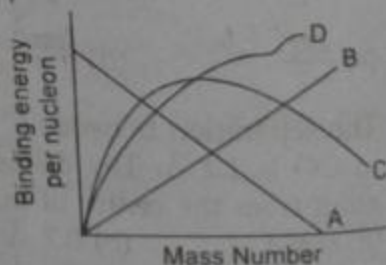
42. Light travelling from a transparent medium to air undergoes total internal reflection at an angle of incidence of 45° . Then refractive index of the medium may be :

(a) 1.5 (b) 1.3 (c) 1.1 (d) $1/\sqrt{2}$

43. Plate voltage of a triode is increased from 200 V to 225 V. To maintain the plate current, change in grid voltage from 5 V to 5.75 V is needed. The amplification factor is :

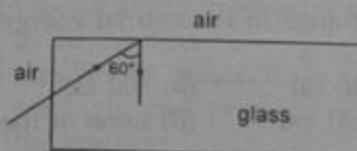
(a) 40 (b) 45 (c) 33.3 (d) 25

44. Binding energy per nucleon plot against the mass number for stable nuclei is shown in the figure. Which curve is correct ?

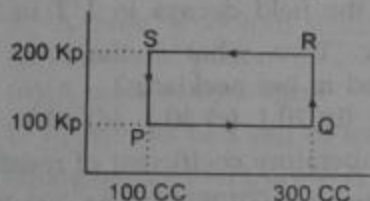


(a) A (b) B (c) C (d) D

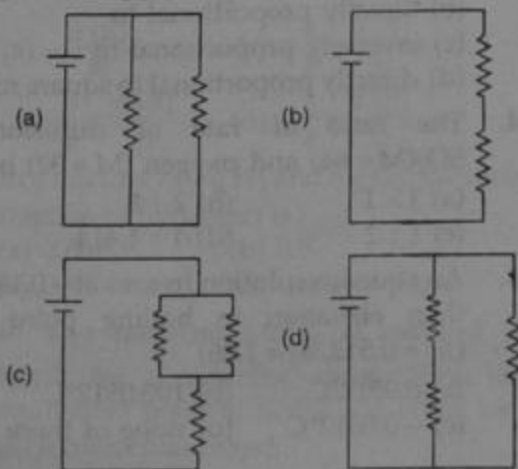
45. A light ray from air is incident (as shown in figure) at one end of a glass fiber (refractive index, $\mu = 1.5$) making an incidence angle of 60° on the lateral surface, so that it undergoes a total internal reflection. How much time would it take to traverse the straight fiber of length 1 km ?



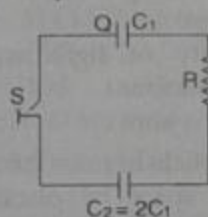
- (a) $3.33 \mu\text{s}$ (b) $6.67 \mu\text{s}$
(c) $5.77 \mu\text{s}$ (d) $3.85 \mu\text{s}$
46. A thermodynamic system is taken through the cycle $PQRSP$ process. The net work done by the system is :



- (a) 20 J (b) -20 J
(c) 400 J (d) -374 J
47. Consider four circuits shown in the figure below. In which circuit power dissipated is greatest ? (Neglect the internal resistance of the power supply).



48. Two capacitors C_1 and $C_2 = 2C_1$ are connected in a circuit with a switch between them as shown in the figure. Initially the switch is open and C_1 holds charge Q . The switch is closed. At steady state, the charge on each capacitors will be :



- (a) $Q, 2Q$ (b) $\frac{Q}{3}, \frac{2Q}{3}$
(c) $\frac{3Q}{2}, 3Q$ (d) $\frac{2Q}{3}, \frac{4Q}{3}$
49. A particle is moving in a vertical circle. The tensions in the string when passing through two positions at angles 30° and 60° from vertical (lowest positions) are T_1 and T_2 respectively. Then :
- (a) $T_1 = T_2$
(b) $T_2 > T_1$
(c) $T_1 > T_2$
(d) tension in the string always remains the same
50. A coil of 100 turns carries a current of 5 mA and creates a magnetic flux of 10^{-5} weber. The inductance is :
- (a) 0.2 mH (b) 2.0 mH
(c) 0.02 mH (d) none of these
51. The starter motor of a car draw a current $I = 300$ A from the battery of voltage 12 V. If the car starts only after 2 minutes, what is the energy drawn from the battery ?
- (a) 3 kJ (b) 30 kJ
(c) 7.2 kJ (d) 432 kJ
52. Surface of the lake is at 2°C and depth of the lake is 20 m. Find the temperature of the bottom of the lake :
- (a) 2°C (b) 3°C
(c) 4°C (d) none of these

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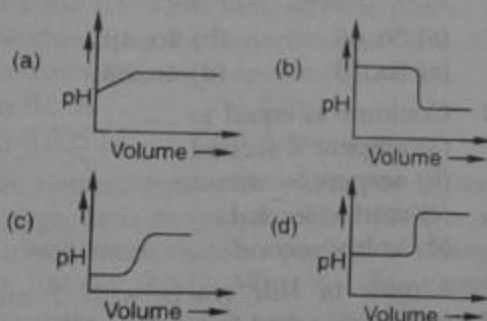
53. $y_1 = 4 \sin(\omega t + kx)$, $y_2 = -4 \cos(\omega t + kx)$, the phase difference is :
 (a) $\pi/2$ (b) $3\pi/2$ (c) π (d) zero
54. Gauss's law should be invalid if :
 (a) there were magnetic monopoles
 (b) the inverse square law were not exactly true
 (c) the velocity of light were not a universal constant
 (d) none of the above
55. A charged particle of mass 0.003 g is held stationary in space by placing it in a downward direction of electric field of $6 \times 10^4 \text{ N/C}$. Then the magnitude of the charge is :
 (a) $5 \times 10^{-4} \text{ C}$ (b) $5 \times 10^{-10} \text{ C}$
 (c) $-18 \times 10^{-6} \text{ C}$ (d) $-5 \times 10^{-9} \text{ C}$
56. A parallel plate capacitor has an electric field of 10^5 V/m between the plates. If the charge on the capacitor plate is $1 \mu\text{C}$, the force on each capacitor plate is :
 (a) 0.5 N (b) 0.05 N
 (c) 0.005 N (d) none of these
57. An elementary particle of mass m and charge $+e$ is projected with velocity v at a much more massive particle of charge Ze , where $Z > 0$. What is the closed possible approach of the incident particle ?
 (a) $Ze^2/4\pi\epsilon_0 mv^2$ (b) $Ze^2/4\pi\epsilon_0 r_H$
 (c) $Ze^2/8\pi\epsilon_0 r_H$ (d) $-Ze^2/8\pi\epsilon_0 r_H$
58. 1 g of water at atmospheric pressure has volume of 1 cc and when boiled it becomes 1681 cc of steam. The heat of vaporisation of water is 540 cal/g. Then the change in its internal energy in this process is :
 (a) 540 cal (b) 500 cal
 (c) 1681 cal (d) none of these
59. A physicist works in a laboratory where the magnetic field is 2 T. She wears a necklace enclosing area 0.01 m^2 in such a way that the plane of the necklace is normal to the field and is having a resistance $R = 0.01 \Omega$. Because of power failure, the field decays to 1 T in time 10^{-3} sec . Then what is the total heat produced in her necklace ?
 (a) 10 J (b) 20 J (c) 30 J (d) 40 J
60. The temperature coefficient of resistance of a wire is $0.00125^\circ\text{C}^{-1}$. At 300 K, its resistance is 1 Ω . At what temperature the resistance of the wire will be 2 Ω ?
 (a) 800 K (b) 1100 K
 (c) 600 K (d) None of these

CHEMISTRY

1. The solubility of CaF_2 is s moles/litre. Then solubility product is :
 (a) s^2 (b) $4s^3$ (c) $3s^2$ (d) s^3
2. If P, T, ρ and R represents pressure, temperature, density and universal gas constant respectively, then the molar mass of the ideal gas is given by :
 (a) $\frac{PRT}{P}$ (b) $\frac{PT}{PR}$ (c) $\frac{P}{\rho RT}$ (d) $\frac{RT}{\rho P}$
3. The kinetic energy of a gas molecule is temperature :
 (a) independent of (b) directly proportional to
 (c) inversely proportional to (d) directly proportional to square root of
4. The ratio of rate of diffusion of SO_2 ($M = 64$) and oxygen ($M = 32$) is :
 (a) 1 : 1 (b) 2 : 1
 (c) 1 : 2 (d) 1 : 1.414
5. An aqueous solution freezes at -0.186°C , then elevation in boiling point is :
 ($K_b = 0.512$, $K_f = 1.86$)
 (a) 0.0512°C (b) 100.0512°C
 (c) -0.0512°C (d) none of these

6. 0.56 g of a gas occupies 280 cm^3 at NTP, then its molecular mass is :
 (a) 4.8 (b) 44.8 (c) 2 (d) 22.4
7. The equivalent mass of Fe in FeO is :
 (a) 56 (b) 28 (c) 36 (d) 18.66
8. Chemical equations convey quantitative information on the :
 (a) type of atoms/molecules taking part in the reaction
 (b) number of atoms/molecules of the reactants and products involved in the reaction
 (c) quantity of reactant consumed and quantity of product formed
 (d) none of the above
9. Which one of the following is ambiguous ?
 (a) A mole of electron
 (b) A mole of sodium atoms
 (c) A mole of potassium ions
 (d) A mole of hydrogen
10. In hydrolysis of a salt of weak acid and strong base, $A^- + H_2O \rightleftharpoons HA + OH^-$, the hydrolysis constant (K_h) is equal to :
 (a) $\frac{K_w}{K_a}$ (b) $\frac{K_w}{K_b}$
 (c) $\sqrt{\frac{K_a}{C}}$ (d) $\frac{K_w}{K_a \times K_b}$
11. For a reaction of the type $aA + bB \rightarrow$ Products, the $-\frac{d[A]}{dt}$ is equal to :
 (a) $-\frac{d[B]}{dt}$ (b) $-\frac{1}{b} \times \frac{d[B]}{dt}$
 (c) $-\frac{a}{b} \times \frac{d[B]}{dt}$ (d) $-\frac{b}{a} \times \frac{d[B]}{dt}$
12. In a mixture of 1 g H_2 and 8 g O_2 , the mole fraction of hydrogen is :
 (a) 0.667 (b) 0.5
 (c) 0.33 (d) none of these
13. In acid medium MnO_4^- is reduced to Mn^{2+} , by a reducing agent. Then the equivalent mass of $KMnO_4$ is given by : (M = molecular mass)
 (a) $M/2$ (b) M (c) $M/5$ (d) $M/3$
14. For the reaction
 $CH_3COOH(l) + 2O_{2(g)} \rightleftharpoons 2CO_{2(g)} + 2H_2O(l)$
 at $25^\circ C$ and 1 atm pressure, $\Delta H = -874 \text{ kJ}$. Then the change in internal energy (ΔE) is :
 (a) -874 kJ (b) -871.53 kJ
 (c) -876.47 kJ (d) $+874 \text{ kJ}$
15. Radioactive substances emit γ -rays, which are :
 (a) +vely charged particle
 (b) -vely charged particle
 (c) massive particle
 (d) packet of energy
16. The number of α - and β - particles emitted in the reaction :
 ${}_{92}U^{238} \rightarrow {}_{82}Pb^{206}$
 (a) $8\alpha, 6\beta$ (b) $4\alpha, 4\beta$
 (c) $8\alpha, 2\beta$ (d) $4\alpha, 6\beta$
17. Coulomb is equal to
 (a) ampere \times second
 (b) ampere \times minute
 (c) watt \times second
 (d) volt \times second
18. 1 mole of KBr reacts with 1 mole of phosphoric acid to produce HBr together with :
 (a) K_3PO_4 (b) KH_2PO_4
 (c) Br_2 (d) H_2O
19. The equivalent conductances at infinite dilution for AC, BD and CD are 91, 426.2 and $126.5 \text{ ohm}^{-1} \text{ cm}^2 \text{ g equ}^{-1}$ respectively. Then the equivalent conductance of AB will be :
 (a) 390.7 (b) 323.8 (c) 210.5 (d) 150.6
20. The specific conductivity of 0.1 N KCl solution is $0.0129 \text{ ohm}^{-1} \text{ cm}^{-1}$. The resistance of the solution in the cell is 100 ohm. The cell constant of the cell will be :
 (a) 1.10 (b) 1.29 (c) 0.56 (d) 2.80

21. The standard emf of a cell $\text{Zn}/\text{Zn}^{2+} \parallel \text{Fe}^{2+}/\text{Fe}$, if electrode potentials for $(\text{Zn}/\text{Zn}^{2+})$ and $(\text{Fe}^{2+}/\text{Fe})$ are 0.763 V and -0.44 V respectively is :
 (a) +0.323 V (b) -1.203 V
 (c) +1.203 V (d) -0.323 V
22. The energy required to release 1 electron from He^+ is :
 (a) +54.4 eV (b) +13.6 eV
 (c) +27.2 eV (d) cannot be predicted
23. ${}^6\text{C}^{14}$ is formed from ${}^7\text{N}^{14}$ in the upper atmosphere by the action of the fundamental particle :
 (a) positron (b) neutron
 (c) electron (d) proton
24. Which of the following plot represents the graph of pH against volume of alkali added in the titration of NaOH and HCl ?



25. Which among the following isotope is not found in natural uranium ?
 (a) ${}_{92}\text{U}^{234}$ (b) ${}_{92}\text{U}^{235}$
 (c) ${}_{92}\text{U}^{238}$ (d) ${}_{92}\text{U}^{239}$
26. Which one out of the following statements is not correct for *ortho* and *para* hydrogen ?
 (a) They have different boiling point
 (b) *Ortho* form is less stable than *para* form
 (c) They differ in the spin of their protons
 (d) The ratio of *ortho* to *para* hydrogen increases with increase in temperature and finally pure *ortho* form is obtained
27. CO_2 is a gas, while SiO_2 is a solid, but both are :

- (a) acidic
 (b) ionic
 (c) discrete molecules
 (d) covalent containing π -bonds
28. Pure conc. HNO_3 make iron passive, as the surface is covered with protective layer of :
 (a) Fe_2O_3 (b) FeO
 (c) Fe_3O_4 (d) $\text{Fe}(\text{NO}_3)_3$
29. Which of the following is not correct for D_2O ?
 (a) Boiling point is higher than H_2O
 (b) D_2O reacts slowly than H_2O
 (c) Viscosity is higher than H_2O at 25°C
 (d) Solubility of NaCl in it is more than H_2O
30. Ozone when reacts with potassium iodide solution liberates certain product, which turns starch paper blue. The liberated substance is :
 (a) oxygen
 (b) iodine
 (c) hydrogen iodide
 (d) potassium hydroxide
31. Red hot iron absorbs SO_2 giving the product :
 (a) $\text{FeS} + \text{O}_2$ (b) $\text{Fe}_2\text{O}_3 + \text{FeS}$
 (c) $\text{FeO} + \text{FeS}$ (d) $\text{FeO} + \text{S}$
32. Ethyl iodide when heated with sodium in dry ether gives pure :
 (a) C_4H_{10} (b) C_2H_6
 (c) C_3H_8 (d) $\text{C}_2\text{H}_5\text{OH}$
33. For the reaction,
 $\text{CH}_3-\text{CH}=\text{CH}_2 + \text{HOCl} \longrightarrow \text{A}$
 The product A is :
 (a) $\text{CH}_3-\text{CHCl}-\text{CH}_2\text{OH}$
 (b) $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_2\text{Cl}$
 (c) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COCl}$
 (d) $\text{CH}_3-\text{C}(\text{OH})(\text{Cl})-\text{CH}_3$

34. Which of the following is not correct for ionic crystals ?
 (a) They possess high melting point and boiling point
 (b) All are electrolyte
 (c) Exhibit the property of isomorphism
 (d) Exhibit directional properties of the bond
35. Which of the following is not true in Rutherford's nuclear model of atom ?
 (a) Protons and neutrons are present inside nucleus
 (b) Volume of nucleus is very small as compared to volume of atom
 (c) The number of protons and neutrons are always equal
 (d) The number of electrons and protons are always equal
36. All the s-block elements of the periodic table are placed in the groups
 (a) IA and IIA (b) IIIA and IVA
 (c) B sub groups (d) VA to VIIA
37. The magnetic quantum number for d-orbital is given by :
 (a) 2 (b) 0, ± 1 , ± 2
 (c) 0, 1, 2 (d) 5
38. Which of the following molecule has zero dipole moment ?
 (a) BF_3 (b) NH_3
 (c) CHCl_3 (d) H_2O
39. In the process, $\text{O}_2^+ \longrightarrow \text{O}_2^{2+} + e^-$ the electron lost is from :
 (a) bonding π -orbital
 (b) antibonding π -orbital
 (c) $2p_z$ orbital
 (d) $2p_x$ orbital
40. Bond between A and B can be represented by

$$\text{A}-\text{B}, \text{A}^+\text{B}^-, \text{A}^-\text{B}^+$$
 (I) (II) (III)
 If A is more electronegative than B, then least contribution to the actual structure comes from :
- (a) I
 (b) II
 (c) III
 (d) all the structures have equal contribution
41. The complex formed in ring test of qualitative analysis for NO_3^- ion is :
 (a) $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]\text{SO}_4$
 (b) $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}_2]\text{SO}_4$
 (c) $[\text{Fe}(\text{NO})_5\text{H}_2\text{O}]\text{SO}_4$
 (d) $\text{FeSO}_4 \cdot \text{NO}$
42. SiF_4 gets hydrolysed giving :
 (a) SiO_2 (b) $\text{Si}(\text{OH})_2\text{F}_2$
 (c) H_2SiF_6 (d) $\text{Si}(\text{OH})_4$
43. All ores are minerals, while all minerals are not ores, because :
 (a) the metal cannot be extracted economically from all the minerals
 (b) minerals are complex compounds
 (c) the minerals are obtained from mines
 (d) all of these are correct
44. In the reaction,

$$\text{P}_2\text{O}_5 + 3\text{CaO} \longrightarrow \text{Ca}_3(\text{PO}_4)_2, \text{P}_2\text{O}_5$$
 acts as :
 (a) acidic flux (b) basic flux
 (c) basic impurity (d) acidic impurity
45. In the given reaction, the oxide of sodium is :

$$\begin{matrix} 4\text{Na} + \text{O}_2 \longrightarrow 2\text{Na}_2\text{O} \\ \text{Na}_2\text{O} + \text{H}_2\text{O} \longrightarrow 2\text{NaOH} \end{matrix}$$
 (a) acidic (b) basic
 (c) amphoteric (d) neutral
46. When CO_2 is passed through solution of calcium hydroxide, which one of the following compound is precipitated ?
 (a) $\text{Ca}(\text{HCO}_3)_2$ (b) CaO
 (c) CaCO_3 (d) $\text{Ca}(\text{OH})_2$
47. Ferric alum has the composition $(\text{NH}_4)_2\text{SO}_4 \cdot \text{Fe}_2(\text{SO}_4)_3 \cdot x\text{H}_2\text{O}$
 The value of x is :
 (a) 7 (b) 24
 (c) 6 (d) 15

48. What is the general electronic configuration for 2nd row transition series ?
 (a) $[\text{Ne}]3d^{1-10}, 4s^2$
 (b) $[\text{Ar}]3d^{1-10}, 4s^{1-2}$
 (c) $[\text{Kr}]4d^{1-10}, 5s^{1-2}$
 (d) $[\text{Xe}]5d^{1-10}, 5s^{1-2}$
49. The existence of two different coloured complexes of $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is due to :
 (a) ionisation isomerism
 (b) co-ordination isomerism
 (c) linkage isomerism
 (d) geometrical isomerism
50. IUPAC name of the compound $\text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}-\text{CH}_3$ is :

$$\begin{array}{c} \text{OH} \qquad \qquad \text{CH}_3 \\ | \qquad \qquad \qquad | \end{array}$$

 (a) 4-methyl pentene-2-ol
 (b) 2-methyl pentanol-4
 (c) 4, 4-dimethyl-butane-2-ol
 (d) 4-methyl pentane-2-ol
51. Alkyl halide on heating with alc. NH_3 in a sealed tube results
 (a) 1° amine (b) 2° amine
 (c) 3° amine (d) all of these
52. Among $\text{H}-\text{CHO}$, CH_3CHO and $\text{C}_6\text{H}_5\text{CHO}$, which will undergo Cannizzaro's reaction ?
 (a) HCHO and CH_3-CHO
 (b) CH_3-CHO and $\text{C}_6\text{H}_5\text{CHO}$
 (c) $\text{C}_6\text{H}_5\text{CHO}$ and HCHO
 (d) All of the above
53. The main product of the reaction of CH_3CONH_2 with Br_2 in aqueous potassium hydroxide medium is :
 (a) $\text{CH}_3-\text{CH}_2-\text{NH}_2$
 (b) CH_3Br
 (c) CH_3CONHBr (d) CH_3NH_2
54. In the reaction,

$$\text{HCHO} + \text{CH}_3\text{MgI} \longrightarrow \text{A} \xrightarrow{\text{H}_2\text{O}} \text{B} + \text{Mg}(\text{OH})\text{I}$$
- What are A and B ?
 (a) CH_3OMgI and CH_3-OH
 (b) $\text{CH}_3\text{CH}_2\text{OMgI}$ and $\text{C}_2\text{H}_5-\text{O}-\text{C}_2\text{H}_5$
 (c) $\text{CH}_3\text{CH}_2\text{OMgI}$ and $\text{CH}_3-\text{CH}_2-\text{OH}$
 (d) $\text{CH}_3-\text{CH}_2-\text{I}$ and $\text{CH}_3-\text{CH}_2-\text{OH}$
55. Acetylation of a secondary amine in alkaline medium yields :
 (a) N, N-dialkyl acetamide
 (b) N, N-dialkyl amine
 (c) N, N-dialkyl amide
 (d) acetyl dialkyl amine
56. In acid medium nitrobenzene is reduced to aniline as shown in the reaction

$$\text{C}_6\text{H}_5-\text{NO}_2 + 6[\text{H}] \longrightarrow \text{C}_6\text{H}_5-\text{NH}_2 + 2\text{H}_2\text{O}$$

 The reducing agent used in this reaction is :
 (a) LiAlH_4 (b) Sn/HCl
 (c) $\text{Na}/\text{Alcohol}$ (d) H_2/Ni
57. PVC is used for :
 (a) manufacture of cosmetics
 (b) manufacture of tyres
 (c) manufacture of nonstick pans
 (d) manufacture of plastic pipes
58. Acetyl salicylic acid is used as :
 (a) anti oxidant
 (b) analgesic drug
 (c) anti biotic drug
 (d) anaesthetic
59. C_6H_6 consists of one ring, while naphthalene consists of two rings. Both of them are aromatic and obey the $(4n+2)$ rule. Thus the number of π -electrons inside rings of C_6H_6 and naphthalene are respectively :
 (a) 3, 5 (b) 5, 10 (c) 6, 10 (d) 6, 12
60. In the oxidation of $\text{C}_6\text{H}_5-\text{CH}_2-\text{CH}_3$ by KMnO_4 the product formed is :
 (a) $\text{C}_6\text{H}_5-\text{CH}_2-\text{CHO}$
 (b) $\text{C}_6\text{H}_5-\text{CH}_2-\text{COOH}$
 (c) $\text{C}_6\text{H}_6-\text{COOH}$
 (d) $\text{C}_6\text{H}_5-\text{CH}_2-\text{OH}$

MATHEMATICS

- If the angles between the pair of straight lines represented by the equation $x^2 - 3xy + \lambda y^2 + 3x - 5y + 2 = 0$ is $\tan^{-1} \frac{1}{3}$. Where ' λ ' is a non-negative real number, then λ is :
 (a) 2 (b) 0
 (c) 3 (d) 1
- The distance of the line $2x - 3y = 4$ from the point (1, 1) measured parallel to the line $x + y = 1$ is :
 (a) $\sqrt{2}$ (b) $5/\sqrt{2}$
 (c) $1/\sqrt{2}$ (d) 6
- The equation of bisectors of the angles between the lines $|x| = |y|$ are :
 (a) $y = \pm x$ and $x = 0$
 (b) $x = \frac{1}{2}$ and $y = \frac{1}{2}$
 (c) $y = 0$ and $x = 0$
 (d) none of these
- The base of vertices of an isosceles triangle PQR are Q (1, 3) and R (-2, 7). The vertex P can be :
 (a) (1, 6) (b) $\left(\frac{1}{2}, 5\right)$
 (c) $\left(\frac{5}{6}, 6\right)$ (d) none of these
- The normal at the point (3, 4) on a circle cuts the circle at the point (-1, -2). Then the equation of the circle is :
 (a) $x^2 + y^2 + 2x - 2y - 13 = 0$
 (b) $x^2 + y^2 - 2x - 2y - 11 = 0$
 (c) $x^2 + y^2 - 2x + 2y + 12 = 0$
 (d) $x^2 + y^2 - 2x - 2y + 14 = 0$
- If $\cos P = \frac{1}{7}$ and $\cos Q = \frac{13}{14}$, where 'P' and 'Q' both are acute angles. Then the value of $P - Q$ is :
 (a) 30° (b) 60°
 (c) 45° (d) 75°
- The equation $3 \cos x + 4 \sin x = 6$ has solution.
 (a) finite (b) infinite
 (c) one (d) no
- If $\sec^{-1} x = \operatorname{cosec}^{-1} y$, then $\cos^{-1} \frac{1}{x} + \cos^{-1} \frac{1}{y}$ is equal to :
 (a) π (b) $\pi/4$
 (c) $-\pi/2$ (d) $\pi/2$
- If ' n ' be any integer, then $n(n+1)(2n+1)$ is :
 (a) odd number
 (b) integral multiple of 6
 (c) perfect square
 (d) does not necessarily have any of the foregoing proof
- If $\tan \theta = -\frac{4}{3}$, then the value of $\sin \theta$ is :
 (a) $-\frac{4}{5}$ but $\neq \frac{4}{5}$ (b) $-\frac{4}{5}$ or $\frac{4}{5}$
 (c) $\frac{4}{5}$ but $\neq -\frac{4}{5}$ (d) $\frac{1}{5}$
- If $c = 2 \cos \theta$, then the value of the determinant $\Delta = \begin{vmatrix} c & 1 & 0 \\ 1 & c & 1 \\ 6 & 1 & c \end{vmatrix}$ is :
 (a) $\frac{\sin 4\theta}{\sin \theta}$ (b) $\frac{2 \sin^2 2\theta}{\sin \theta}$
 (c) $4 \cos^2 \theta (2 \cos \theta - 1)$
 (d) none of these
- The set of values of x for which the inequality $|x-1| + |x+1| < 4$ always holds true is :
 (a) $(-2, 2)$ (b) $(-\infty, 2) \cup (2, \infty)$
 (c) $(-\infty, 1] \cup [1, \infty)$ (d) none of these
- The equation of the parabola whose vertex is (-1, -2), axis is vertical and which passes through the point (3, 6), is :
 (a) $x^2 + 2x - 2y - 3 = 0$
 (b) $2x^2 = 3y$
 (c) $x^2 - 2x + 2y - 3 = 0$
 (d) $x^2 - 2x - 2y - 3 = 0$

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14. The length of the axis of the conic $9x^2 + 4y^2 - 6x + 4y + 1 = 0$ are :
 (a) $\frac{1}{2}, 9$ (b) $3, \frac{2}{5}$
 (c) $1, \frac{2}{3}$ (d) $3, 2$
15. If $f(x) = \cot^{-1} \left(\frac{3x - x^3}{1 - 3x^2} \right)$ and $g(x) = \cos^{-1} \left(\frac{1 - x^2}{1 + x^2} \right)$, then $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{g(x) - g(a)}$, $0 < a < \frac{1}{2}$, is :
 (a) $\frac{3}{2(1+a^2)}$ (b) $\frac{3}{2(1+x^2)}$
 (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$
16. If $f(x) = \begin{cases} x, & 0 \leq x \leq 1 \\ 2x - 1, & 1 < x \end{cases}$, then :
 (a) f is discontinuous at $x = 1$
 (b) f is differentiable at $x = 1$
 (c) f is continuous but not differentiable at $x = 1$
 (d) none of these
17. $\lim_{x \rightarrow -2} \frac{\sin^{-1}(x+2)}{x^2 + 2x}$ is equal to :
 (a) 0 (b) ∞
 (c) $-\frac{1}{2}$ (d) none of these
18. Let $f(x) = x^p \cos \left(\frac{1}{x} \right)$, when $x \neq 0$ and $f(x) = 0$, when $x = 0$. Then $f(x)$ will be differentiable at $x = 0$, if :
 (a) $p > 0$ (b) $p > 1$
 (c) $0 < p < 1$ (d) $\frac{1}{2} < p < 1$
19. The derivative of $f(x) = 3|2+x|$ at the point $x_0 = -3$ is :
 (a) 3
 (b) -3
 (c) 0
 (d) none of these
20. Derivative of the function $f(x) = \log_5 (\log_7 x)$, $x > 7$ is :
 (a) $\frac{1}{x (\log 5) (\log 7) (\log_7 x)}$
 (b) $\frac{1}{x (\log 5) (\log 7)}$
 (c) $\frac{1}{x (\log x)}$
 (d) none of these
21. If $z = x + iy$, $z^{1/3} = a - ib$, then $\frac{x}{a} - \frac{y}{b} = k(a^2 - b^2)$, where k is equal to :
 (a) 1 (b) 2
 (c) 3 (d) 4
22. The number of real solutions of the equation $1 + |e^x - 1| = e^x (e^x - 2)$ is :
 (a) 1 (b) 2
 (c) 4 (d) 8
23. The points of extrema of $f(x) = \int_0^x \frac{\sin t}{t} dt$ in the domain $x > 0$ are :
 (a) $(2n+1)\frac{\pi}{2}$, $n = 1, 2, \dots$
 (b) $(4n+1)\frac{\pi}{2}$, $n = 1, 2, \dots$
 (c) $(2n+1)\frac{\pi}{4}$, $n = 1, 2, \dots$
 (d) $n\pi$, $n = 1, 2, \dots$
24. If $u = x^2 + y^2$ and $x = s + 3t$, $y = 2s - t$, then $\frac{d^2u}{ds^2}$ is equal to :
 (a) 12 (b) 10
 (c) 32 (d) 36
25. If the equation $x^2 + px + q = 0$ and $x^2 + qx + p = 0$ have a common root then $p + q + 1$ is equal to :
 (a) 0
 (b) 1
 (c) 2
 (d) -1

26. The value of a ($a \geq b$) for which the sum of the cubes of the roots of $x^2 - (a-2)x + (a-3) = 0$ assumes the least value, is :
 (a) 3 (b) 4
 (c) 5 (d) none of these
27. Let z_1, z_2, z_3 be three vertices of an equilateral triangle circumscribing the circle $|z| = \frac{1}{2}$. If $z_1 = \frac{1}{2} + \frac{i\sqrt{3}}{2}$ and z_1, z_2, z_3 were in anticlockwise sense, then z_2 is :
 (a) $1 + \sqrt{3}i$ (b) $1 - \sqrt{3}i$
 (c) 1 (d) -1
28. If $z = \frac{-2}{1 + \sqrt{3}i}$, then the value of $\arg(z)$ is :
 (a) π (b) $\pi/3$
 (c) $2\pi/3$ (d) $\pi/4$
29. Let ω is an imaginary cube roots of unity, then the value of $2(1 + \omega)(1 + \omega^2) + 3(2\omega + 1)(2\omega^2 + 1) + \dots + (n+1)(n\omega + 1)(n\omega^2 + 1)$ is :
 (a) $\left[\frac{n(n+1)}{2}\right]^2 + n$ (b) $\left[\frac{n^2(n+1)^2}{4}\right]$
 (c) $\left[\frac{n(n+1)}{2}\right]^2 - n$ (d) none of these
30. The locus of the point z satisfying $\arg\left(\frac{z-1}{z+1}\right) = k$, (where k is non-zero) is :
 (a) a circle with centre on y -axis
 (b) circle with centre on x -axis
 (c) a straight line parallel to x -axis
 (d) a straight line making an angle 60° with the x -axis
31. If $(3, 4, 5)$, $Q(4, 6, 3)$, $R(-1, 2, 4)$, $S(1, 0, 5)$, then the projection of RS on PQ is :
 (a) $-2/3$
 (b) $-4/3$
 (c) $1/2$
 (d) 2
32. If a line makes α, β, γ with the positive direction of x, y and z -axes respectively. Then, $\cos^2\alpha + \cos^2\beta + \cos^2\gamma$ is equal to :
 (a) $1/2$ (b) $-1/2$
 (c) -1 (d) 1
33. The projection of a line on a co-ordinate axes are 2, 3, 6. Then the length of the line is :
 (a) 7 (b) 5
 (c) 1 (d) 11
34. The decimal equivalent of the binary number 10011.1 is :
 (a) 19.50 (b) 11001.11
 (c) 5005.55 (d) 19.10
35. The binary represents of 60 is :
 (a) 101110 (b) 111100
 (c) 110011 (d) 110000
36. Which of the following statement is not tautology ?
 (a) $\neg(p \wedge q) \vee p$
 (b) $(p \wedge q) \Rightarrow p$
 (c) $q \vee \neg(p \wedge q)$
 (d) $(\neg p \wedge q) \cap (\neg p \vee p)$
37. The period of $f(x) = \sin\left(\frac{\pi x}{n-1}\right) + \cos\left(\frac{\pi x}{n}\right)$, $n \in \mathbb{Z}, n > 2$ is :
 (a) $2\pi n(n-1)$
 (b) $4n(n-1)$
 (c) $2n(n-1)$
 (d) none of these
38. For $\theta > \pi/3$, the value of $f(\theta) = \sec^2\theta + \cos^2\theta$ always lies in the interval :
 (a) (0, 2) (b) [0, 1]
 (c) (1, 2) (d) [2, ∞)
39. The radius of the circle whose arc of length 15 cm makes an angle of $\frac{3}{4}$ radian at the centre, is :
 (a) 10 cm (b) 20 cm
 (c) $11\frac{1}{4}$ cm (d) $22\frac{1}{2}$ cm

40. If $f_n(x) = e^{f_{n-1}(x)}$, for all $n \in N$ and $f_0(x) = x$, then $\frac{d}{dx} \{f_n(x)\}$ is equal to :
- (a) $f_n(x) f_{n-1}(x)$
 (b) $f_n(x) \frac{d}{dx} \{f_{n+1}(x)\}$
 (c) $f_n(x) \cdot f_{n-1}(x) \cdots f_2(x) f_1(x)$
 (d) none of these
41. If $3^x + 2^{2x} \geq 5^x$, then the solution set for x is :
- (a) $(-\infty, 2]$ (b) $[2, \infty)$ (c) $[0, 2]$ (d) $\{2\}$
42. The number of integral solution of $\frac{x+1}{x^2+2} > \frac{1}{4}$ is :
- (a) 1 (b) 2
 (c) 5 (d) none of these
43. The value of k for which the equation $(k-2)x^2 + 8x + k + 4 = 0$ has both real, distinct and -ve, is :
- (a) 0 (b) 2
 (c) 3 (d) -4
44. The triangle PQR of which the angles P, Q, R satisfy $\cos P = \frac{\sin Q}{2 \sin R}$ is :
- (a) equilateral (b) right angled
 (c) any triangle (d) isosceles
45. If $f(x) = (a - x^n)^{1/n}$, where $a > 0$ and n is a positive integer, then $f[f(x)]$ is equal to :
- (a) x^3 (b) x^2
 (c) x (d) none of these
46. The function $f(x) = [x]^2 - [x^2]$ (where $[y]$ is the greatest integer less than or equal to y) is discontinuous at :
- (a) all integers
 (b) all integers except 0 and 1
 (c) all integers except 0
 (d) all integers except 1
47. The function $f(x) = |px - q| + r|x|$, $x \in (-\infty, \infty)$ where $p > 0, q > 0, r > 0$ assumes its maximum value only at one point, if :
- (a) $p \neq q$ (b) $q \neq r$
 (c) $r \neq p$ (d) $p = q = r$
48. A function $f(x) = \frac{x^2 - 3x + 2}{x^2 + 2x - 3}$ is :
- (a) maximum at $x = -3$
 (b) maximum at $x = -3$ and maximum at $x = 1$
 (c) maximum at $x = 1$
 (d) function is increasing in its domain
49. The locus of the point $P(x, y)$ satisfying the relation $\sqrt{(x-3)^2 + (y-1)^2} + \sqrt{(x+3)^2 + (y-1)^2} = 6$ is :
- (a) straight line
 (b) pair of straight lines
 (c) circle
 (d) ellipse
50. If z_1, z_2 and z_3 are complex number such that $|z_1| = |z_2| = |z_3| = \left| \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} \right| = 1$ then $|z_1 + z_2 + z_3|$ is :
- (a) equal to 1
 (b) less than 1
 (c) greater than 3
 (d) equal to 3
51. Let a_1, a_2, a_3 be any positive real numbers, then which of the following statement is not true ?
- (a) $3a_1 a_2 a_3 \leq a_1^3 + a_2^3 + a_3^3$
 (b) $\frac{a_1}{a_2} + \frac{a_2}{a_3} + \frac{a_3}{a_1} \geq 3$
 (c) $(a_1 + a_2 + a_3) \left(\frac{1}{a_1} + \frac{1}{a_2} + \frac{1}{a_3} \right) \geq 9$
 (d) $(a_1 + a_2 + a_3) \left(\frac{1}{a_1} + \frac{1}{a_2} + \frac{1}{a_3} \right)^3 \leq 27$
52. If $ab = 2a + 3b, a > 0, b < 0$, then the minimum value of ab is :
- (a) 12 (b) 24
 (c) $\frac{1}{4}$ (d) none of these

53. Let N be +ve integer $\neq 1$, then none of the numbers $2, 3, \dots, N$ is divisor of $(N! - 1)$. So we can conclude that $(N! - 1)$ is :
- prime number
 - at least one of these number $(N + 1), (N + 2), \dots, (N! - 2)$ is a divisor of $(N! - 1)$
 - The smallest numbers between N and $N!$ which is a divisor of $(N! - 1)$ is a prime number
 - none of these
54. If $f(x) = \cos [\pi^2] x + \cos [-\pi^2] x$, then :
- $f(\pi/4) = 2$
 - $f(-\pi) = 2$
 - $f(\pi) = 1$
 - $f(\pi/2) = -1$
55. Let $f(x) = \frac{x^2 - 4}{x^2 + 4}$, for $|x| > 2$, then the function $f: (-\infty, -2] \cup [2, \infty) \rightarrow (-1, 1)$ is :
- one-one into
 - one-one onto
 - many-one into
 - many-one onto
56. The function $f(x) = \sin(\log(x + \sqrt{x^2 + 1}))$ is :
- even function
 - odd function
 - neither even nor odd
 - periodic function
57. The range of $f(x) = \sec\left(\frac{\pi}{4} \cos^2 x\right)$, $-\infty < x < \infty$ is :
- $[1, \sqrt{2}]$
 - $[1, \infty)$
 - $[-\sqrt{2}, -1] \cup [1, \sqrt{2}]$
 - $(-\infty, 1] \cup [1, \infty)$
58. For any three sets A_1, A_2, A_3 . Let $B_1 = A_1, B_2 = A_2 - A_1$ and $B_3 = A_3 - (A_1 \cup A_2)$, then which one of the following statement is always true ?
- $A_1 \cup A_2 \cup A_3 \supset B_1 \cup B_2 \cup B_3$
 - $A_1 \cup A_2 \cup A_3 = B_1 \cup B_2 \cup B_3$
 - $A_1 \cup A_2 \cup A_3 \subset B_1 \cup B_2 \cup B_3$
 - none of these
59. The domain of the function $f(x) = \frac{\sin^{-1}(3-x)}{\log(|x| - 2)}$ is :
- $[2, 4]$
 - $(3, 4]$
 - $[2, \infty)$
 - $(-\infty, 3) \cup [2, \infty)$
60. The remainder obtained when $1! + 2! + \dots + 200!$ is divided by 14 is :
- 3
 - 4
 - 5
 - none of these

Answers

PHYSICS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c) | 2. (c) | 3. (d) | 4. (c) | 5. (a) | 6. (b) | 7. (a) | 8. (a) | 9. (c) | 10. (b) |
| 11. (d) | 12. (d) | 13. (c) | 14. (b) | 15. (d) | 16. (b) | 17. (a) | 18. (d) | 19. (a) | 20. (b) |
| 21. (a) | 22. (a) | 23. (b) | 24. (c) | 25. (a) | 26. (d) | 27. (a) | 28. (b) | 29. (d) | 30. (c) |
| 31. (d) | 32. (c) | 33. (a) | 34. (c) | 35. (a) | 36. (c) | 37. (a) | 38. (a) | 39. (c) | 40. (d) |
| 41. (b) | 42. (a) | 43. (c) | 44. (c) | 45. (d) | 46. (b) | 47. (a) | 48. (b) | 49. (c) | 50. (c) |
| 51. (d) | 52. (d) | 53. (b) | 54. (b) | 55. (b) | 56. (b) | 57. (a) | 58. (b) | 59. (a) | 60. (b) |

CHEMISTRY

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (a) | 3. (b) | 4. (d) | 5. (a) | 6. (b) | 7. (b) | 8. (b) | 9. (d) | 10. (a) |
| 11. (c) | 12. (a) | 13. (c) | 14. (a) | 15. (d) | 16. (a) | 17. (a) | 18. (b) | 19. (a) | 20. (b) |
| 21. (a) | 22. (a) | 23. (b) | 24. (a) | 25. (d) | 26. (d) | 27. (a) | 28. (c) | 29. (d) | 30. (b) |
| 31. (c) | 32. (a) | 33. (b) | 34. (d) | 35. (c) | 36. (a) | 37. (b) | 38. (a) | 39. (a) | 40. (b) |
| 41. (a) | 42. (d) | 43. (a) | 44. (a) | 45. (b) | 46. (c) | 47. (b) | 48. (c) | 49. (d) | 50. (d) |
| 51. (d) | 52. (c) | 53. (d) | 54. (c) | 55. (a) | 56. (b) | 57. (d) | 58. (b) | 59. (c) | 60. (c) |

MATHEMATICS

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|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (a) | 3. (c) | 4. (c) | 5. (b) | 6. (b) | 7. (d) | 8. (d) | 9. (b) | 10. (b) |
| 11. (d) | 12. (a) | 13. (a) | 14. (c) | 15. (d) | 16. (c) | 17. (c) | 18. (b) | 19. (b) | 20. (a) |
| 21. (d) | 22. (a) | 23. (d) | 24. (b) | 25. (a) | 26. (a) | 27. (d) | 28. (c) | 29. (a) | 30. (a) |
| 31. (b) | 32. (d) | 33. (a) | 34. (a) | 35. (b) | 36. (d) | 37. (c) | 38. (d) | 39. (b) | 40. (c) |
| 41. (a) | 42. (c) | 43. (c) | 44. (d) | 45. (c) | 46. (d) | 47. (d) | 48. (d) | 49. (b) | 50. (a) |
| 51. (d) | 52. (b) | 53. (b) | 54. (d) | 55. (c) | 56. (b) | 57. (a) | 58. (b) | 59. (b) | 60. (c) |

Hints & Solutions**PHYSICS**

1. Acceleration of the system

$$a = \frac{F}{m} = \frac{10}{2+3+5} = \frac{10}{10} = 1 \text{ m/s}^2$$

$$\therefore T_1 = (3+5) \times a = 8 \times 1 = 8 \text{ N}$$

2. Acceleration of the system

$$a = \frac{m_1 - m_2}{m_1 + m_2} g$$

$$= \frac{10-6}{10+6} \times g = \frac{4}{16} \times 10 = 2.5 \text{ m/s}^2$$

3. Viscous force
- \propto
- velocity

$$F = kv$$

$$[MLT^{-2}] = k [M^0 L T^{-1}]$$

$$k = [M^1 L^0 T^{-1}]$$

- 5.
- L/R
- is called the time constant of
- $L-R$
- circuit. So, unit of
- L/R
- will be unit of time i.e., sec.

6. In moving coil galvanometer the deflection is directly proportional to the current, so if current is doubled then deflection is also doubled.

8. Frequency of particle
- $v = \frac{Bq}{2\pi m}$

$$v \propto \frac{1}{m}$$

Out of the given choices the mass of Li^+ is maximum, so its frequency will be minimum.

9. When both the mass are equal then maximum transfer of energy takes place.