AIPMT - 2004

Q.1 When three identical bulbs of 60 watt, 200 volt rating are connected in series to a 200 volt supply, the power drawn by them will be :-

(1) 180 watt (2) 10 watt

(3) 20 watt (4) 60 watt

Q.2 The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then:-

(1) The resistance will be halved and the specific resistance will remain unchanged

(2) The resistance will be halved and the specific resistance will be doubled

(3) The resistance and the specific resistance, will both remain unchanged

(4) The resistance will be doubled and the specific resistance will be halved

Q.3 Resistances n, each of r ohm, when connected in parallel give an equivalent resistance of R ohm. If these resistances were connected in series, the combination would have a resistance in ohms, equal to

(1) $\frac{R}{n^2}$ (2) R/n

(3) nR (4) n^2R

Q.4 The unit of permittivity of free space ε_0 is :-

(1) Newton metre^2/ Coulomb^2

(2) Coulomb^2 /Newton metre^2

(3) Coulomb^2/ (Newton metre)^2

(4) Coulomb/Newton metre

Q.5 A galvanometer acting as a voltmeter will have :-

(1) a high resistance in series with its coil

(2) a low resistance in parallel with its coil

(3) a low resistance in series with its coil

(4) a high resistance in parallel with its coil

Q.6 Which one of the following statements is true for the speed 'v' and the acceleration 'a' of a particle executing simple harmonic motion

(1) Value of a is zero, whatever may be the value of 'v'

(2) When 'v' is zero, a is zero

(3) When 'v' is maximum, a is zero

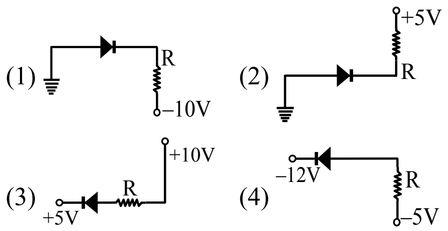
(4) When 'v' is maximum, a is maximum

Q.7 Two springs of spring constants k_1 and k_2 are joined in series. The effective spring constant of the combination is given by -

(1) $\frac{(k_1 + k_2)}{2}$ (2) $k_1 + k_2$

(3) $\frac{k_1k_2}{(k_1 + k_2)}$ (4) $\sqrt{k_1k_2}$

Q.8 Of the diodes shown in the following diagrams, which one of the diode is reverse biased ?



Q.9 A car is moving towards a high cliff. The car driver sounds a horn of frequency 'f'. The reflected sound heard by the driver has a frequency 2f. If 'v' be the velocity of sound then the velocity of the car, in the same velocity units, will be -

(1) v/3 (2) v/4 (3) v/2 (4) v/$\sqrt{2}$

Q.10 The density of newly discovered planet is twice that of earth. The acceleration due to gravity at the surface of the planet is equal to that at the surface of the earth. If the radius of the earth is R, the radius of the planet would be :-

(1) 4R (2) ¼ R (3) ½ R (4) 2R

Q.11 A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from :-

(1) Two points propagating in two different parallel directions

(2) One point propagating in two different directions through slab

(3) One point propagating in the same direction through slab

(4) Two points propagating in two different non parallel directions

Q.12 A particle of mass m_1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v_2. Both of them have the same momentum but their different kinetic energies are E_1 and E_2 respectively.
If $m_1 > m_2$ then :

(1) $\frac{E_1}{E_2} = \frac{m_1}{m_2}$ (2) $E_1 > E_2$

(3) $E_1 = E_2$ (4) $E_1 < E_2$

Q.13 The refractive index of the material of a prism is $\sqrt{2}$ and its refracting angle is 30º. One of the refracting surfaces of the prism is made a mirror inwards. A beam of monochromatic light entering the prism from the other face will retrace its path after reflection form the mirrored surface if its angle of incidence on the prism is :-

(1) 60º (2) 0º (3) 30º (4) 45º

Q.14 A stone is tied to a string of length 'ℓ' and is whirled in a vertical circle with the other end of the string as the centre. At a certain instant of time, the stone is at its lowest position and has a speed 'u'. The magnitude of the change in velocity as it reaches a position where the string is horizontal (g being acceleration due to gravity) is :-

(1) $\sqrt{u^2 - g\ell}$ (2) $u - \sqrt{u^2 - 2g\ell}$

(3) $\sqrt{2g\ell}$ (4) $\sqrt{2(u^2 - g\ell)}$

Q.15 In semiconductors at a room temperature

(1) The valence band is completely filled and the conduction band is partially filled

(2) The valence band is completely filled

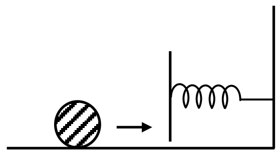
(3) The conduction band is completely empty

(4) The valence band is partially empty and the conduction band is partially filled

Q.16 The peak voltage in the output of a half wave diode rectifier fed with a sinusoidal signal without filter is 10V. The d. c. component of the output voltage is :-

(1) $\frac{10}{\pi}$V (2) 10 V (3) $\frac{20}{\pi}$V (4) $\frac{10}{\sqrt{2}}$V

Q.17 A mass of 0.5 kg moving with a speed of 1.5 m/s on a horizontal smooth surface, collides with a nearly weightless spring of force constant k = 50 N/m. The maximum compression of the spring would be :-



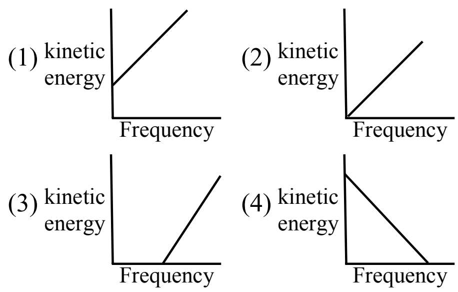
(1) 0.12 m (2) 1.5 m (3) 0.5 m (4) 0.15 m

Q.18 If in a nuclear fusion process the masses of the fusing nuclei be m_1 and m_2 and the mass of the resultant nucleus be m_3, then

(1) $m_3 = |m_1 - m_2|$ (2) $m_3 < (m_1 + m_2)$

(3) $m_3 > (m_1 + m_2)$ (4) $m_3 = m_1 + m_2$

Q.19 According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is :-



Q.20 A nucleus represented by the symbol ${}^{A}_{Z}X$ has :-

(1) Z protons and A –Z neutrons

(2) Z protons and A neutrons

(3) A protons and Z –A neutrons

(4) Z neutrons and A –Z protons

Q.21 The dimensions of universal gravitational constant are :-

(1) ML^2T^{-1} (2) $M^{-2}L^3T^{-2}$

(3) $M^{-2}L^2T^{-1}$ (4) $M^{-1}L^3T^{-2}$

Q.22 In India electricity is supplied for domestic use at 220 V. It is supplied at 110 V in USA. If the resistance of a 60W bulb for use in India is R, The resistance of a 60W bulb for use in USA will be :-

(1) 2R (2) R/4 (3) R/2 (4) R

Q.23 The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in a time Δt. Then the total quantity of electric charges Q that passes any point in the circuit during the time Δt is represented by :-

(1) $Q = \frac{\Delta\phi}{R}$ (2) $Q = \frac{\Delta\phi}{\Delta t}$

(3) $Q = R \cdot \frac{\Delta\phi}{\Delta t}$ (4) $Q = \frac{1}{R} \cdot \frac{\Delta\phi}{\Delta t}$

Q.24 A bullet of mass 2 g is having a charge of 2 μC. Through what potential difference must it be accelerated, starting from rest, to acquire a speed of 10 m/s ?

(1) 50 kV (2) 5V (3) 50 V (4) 5kV

Q.25 The equation of state for 5g of oxygen at a pressure P and temperature T, when occupying a volume V, will be :-

(1) PV = 5 RT (2) PV = (5/2) RT

(3) PV = (5/16) RT (4) PV = (5/32) RT

Where is the gas constant.

Q.26 If λ_m denotes the wavelength at which the radioactive emission from a black body at a temperature T K is maximum, then :-

(1) λ_m is independent of T

(2) $\lambda_m \propto T$

(3) $\lambda_m \propto T^{-1}$

(4) $\lambda_m \propto T^{-}4$

Q.27 The ratio of the radii of gyration of a circular disc about a tangential axis in the plane of the disc and of a circular ring of the same radius about a tangential axis in the plane of the ring is:-

(1) 2 : 1 (2) $\sqrt{5} : \sqrt{6}$

(3) 2 : 3 (4) $1 : \sqrt{2}$

Q.28 A round disc of moment of inertia I_2 about its axis perpendicular to its plane and passing through its centre is placed over another disc of moment of inertia I_1 rotating with an angular velocity ω about the same axis. The final angular velocity of the combination of discs is :-

(1) ω (2) $\frac{I_1\omega}{I_1 + I_2}$

(3) $\frac{(I_1 + I_2)\omega}{I_1}$ (4) $\frac{I_2\omega}{I_1 + I_2}$

Q.29 A ball of mass 2 kg and another of mass 4 kg are dropped together from a 60 feet tall building. After a fall of 30 feet each towards earth, their respective kinetic energies will be in the ratio of-

(1) 1: 4 (2) 1: 2 (3) 1: $\sqrt{2}$ (4) $\sqrt{2}$:1

Q.30 The half life of radium in about 1600 years. Of 100g of radium existing now, 25g will remain undecayed after :-

(1) 6400 years (2) 2400 years

(3) 3200 years (4) 4800 years

Q.31 M_P denotes the mass of a proton and M_n that of a neutron. A given nucleus, of binding energy B, contains Z protons and N neutrons. The mass M(N, Z) of the nucleus is given by (c is velocity of light)

(1) $M(N, Z) = NM_n + ZM_P + Bc^2$

(2) $M(N, Z) = NM_n + ZM_P - B/c^2$

(3) $M(N, Z) = NM_n + ZM_P + B/c^2$

(4) $M(N, Z) = NM_n + ZM_P - Bc^2$

Q.32 A telescope has an objective lens of 10 cm diameter and is situated at a distance of one kilometer from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 5000 Å, is of the order of-

(1) 5 m (2) 5 mm (3) 5 cm (4) 0.5 m

Q.33 The phase difference between two waves, represented by

$y_1 = 10^{-6} \sin \{100t + (x/50) + 0.5\}$m

$y_2 = 10^{-6} \cos\{100t + \left(\frac{x}{50}\right)\}$m

Where X is expressed in metres and t is expressed in seconds, is approximately : -

(1) 2.07 radians (2) 0.5 radians

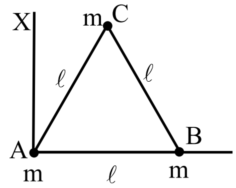
(3) 1.5 radians (4) 1.07 radians

Q.34 A block of mass m is placed on a smooth wedge of inclination θ. The whole system is accelerated horizontally so that the block does not slip on the wedge. The force exerted by the wedge on the block (g is acceleration due to gravity) will be :-

(1) mg sin θ (2) mg

(3) mg/cosθ (4) mg cosθ

Q.35 Three particles, each of mass m gram, are situated at the vertices of an equilateral triangle ABC of side ℓ cm. (as shown in the figure). The moment of inertia of the system about a line AX perpendicular to AB and in the plane of ABC, in gram cm^2 units will be :-



(1) $2\,m\ell^2$ (2) $\frac{5}{4}\,m\ell^2$ (3) $\frac{3}{2}\,m\ell^2$ (4) $\frac{3}{4}\,m\ell^2$

Q.36 Energy E of a hydrogen atom with principal quantum number n is given by $E = \frac{-13.6}{n^2}$ eV. The energy of a photon ejected when the electron jumps from n = 3 state to n = 2 state of hydrogen is approximately :-

(1) 0. 85 eV (2) 3.4 eV

(3) 1.9 eV (4) 1.5 eV

Q.37 A wheel having moment of inertia 2 kg–m^2 about its vertical axis, rotates at the rate of 60 rpm about the axis. The torque which can stop the wheel's rotation in one minute would be :-

(1) $\frac{\pi}{12}$ N – m (2) $\frac{\pi}{15}$ N – m

(3) $\frac{\pi}{18}$ N – m (4) $\frac{2\pi}{15}$ N – m

Q.38 Consider a system of two particles having masses m_1 and m_2. If the particle of mass m_1 is pushed towards the mass centre of particles through a distance 'd', by what distance would the particle of mass m_2 move so as to keep the mass centre of particles at the original position :-

(1) $\frac{m_1}{m_2}d$ (2) d

(3) $\frac{m_2}{m_1}$ (4) $\frac{m_1}{m_1+m_2}d$

Q.39 If $|\vec{A}\times\vec{B}| = \sqrt{3}\ \vec{A}.\vec{B}$ then the value of $|\vec{A}+\vec{B}|$ is:-

(1) $\left(A^2+B^2+\frac{AB}{\sqrt{3}}\right)^{1/2}$

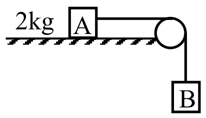
(2) A + B

(3) $(A^2 + B^2 + \sqrt{3}\ AB)^{1/2}$

(4) $(A^2 + B^2 + AB)^{1/2}$

Q.40 The coefficient of static friction, μ_s, between block A of mass 2 kg and the table as shown in the figure is 0.2. What would be the maximum mass value of block B so that the two blocks do not move ? The string and the pulley are assumed to be smooth and massless.

(g = 10 m/s^2)



(1) 4.0 kg (2) 0.2 kg (3) 0.4 kg (4) 2.0 kg

Q.41 In a p–n junction photo cell, the value of the photo electromotive force produced by monochromatic light is proportional to: -

(1) The intensity of the light falling on the cell

(2) The frequency of the light falling on the cell

(3) The voltage applied at the p–n junction

(4) The barrier voltage at the p–n junction

Q.42 The Bohr model of atoms :-

(1) Uses Einstein's photo electric equation

(2) Predicts continuous emission spectra for atoms

(3) Predicts the same emission spectra for all types of atoms

(4) Assumes that the angular momentum of electrons is quantized

Q.43 The output of OR gate is 1 :-

(1) If either or both inputs are 1

(2) Only if both inputs are 1

(3) If either input is zero

(4) If both inputs are zero

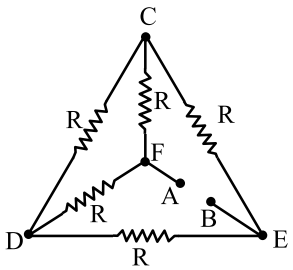
Q.44 An electric dipole has the magnitude of its charge as q and its dipole moment is p. It is placed in a uniform electric field E. If its dipole moment is along the direction of the field, the force on it and its potential energy are respectively :-
(1) q. E and p. E
(2) zero and minimum
(3) q. E and maximum
(4) 2q. E and minimum

Q.45 A coil of 40 henry inductance is connected in series with a resistance of 8 ohm and the combination is joined to the terminals of a 2 volt battery. The time constant of the circuit is :-
(1) 1/5 seconds (2) 40 seconds
(3) 20 seconds (4) 5 seconds

Q.46 One mole of an ideal gas at an initial temperature of T K does 6 R joules of work adiabatically. If the ratio of specific heats of this gas at constant pressure and at constant volume is $\frac{5}{3}$, the final temperature of gas will be :-
(1) (T –2.4) K (2) (T + 4)K
(3) (T – 4) K (4) (T + 2.4)K

Q.47 A battery is charged at a potential of 15V for 8 hours when the current flowing is 10A. The battery on discharge supplies a current of 5A for 15 hours. The mean terminal voltage during discharges is 14 V. The "Watt hour" efficiency of the battery is :-
(1) 80% (2) 90% (3) 87.5% (4)82.5%

Q.48 Five equal resistances each of resistance R are connected as shown in the Figure. A battery of V volts is connected between A and B. The current flowing in AFCEB will be



(1) V/R (2) V/2R (3) 2V/R (4) 3V/R

Q.49 A galvanometer of 50 ohm resistance has 25 divisions. A current of 4×10^{-4} ampere gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25 volts, it should be connected with a resistance of :-
(1) 245 Ω as a shunt
(2) 2550 Ω in series
(3) 2450 Ω in series
(4) 2500 Ω as a shunt

Q.50 A 6 volt battery is connected to the terminals of a three metre long wire of uniform thickness and resistance of 100 ohm. The difference of potential between two points on the wire separated by a distance of 50 cm will be :-
(1) 3 v (2) 1v (3) 1.5 v (4) 2 v

Q.51 Lanthanoids are :-
(1) 14 elements in the seventh period (atomic no. = 90 to 103) that are filling 5f sublevel.
(2) 14 elements in the sixth period (atomic no. 58 to 71) that are filling 4f sublevel
(3) 14 elements in the seventh period (atomic no. = 58 to 71) that are filling 4f sublevel
(4) 14 elements in the sixth period (atomic no. 90 to 103) that are filling 4f sublevel

Q.52 Which of the following forms cationic micelles above certain concentration :-
(1) sodium acetate
(2) Urea
(3) Cetyl trimethylammonium chloride
(4) Sodium dodecyl sulphonate

Q.53 Which of the following does not have a metal-carbon bond :-
(1) C_2H_5MgBr (2) $K[Pt(C_2H_4)Cl_3]$
(3) $Ni(CO)_4$ (4) $Al(OC_2H_5)_3$

Q.54 Which one of the following is a chain growth polymer :-
(1) Nucleic acid (2) Polystyrene
(3) protein (4) Starch

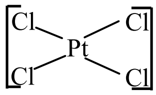
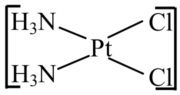
Q.55 The correct statement in respect of protein haemoglobin is that it :-
(1) Maintains blood sugar level
(2) Acts as an oxygen carrier in the blood
(3) Forms antibodies and offers resistance to diseases
(4) Functions as a catalyst for biological reactions

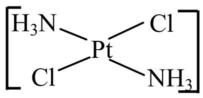
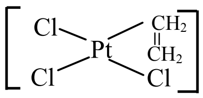
Q.56 A sequence of how many nucleotides in messenger RNA makes a codon for an amino acid :-
(1) Four (2) One (3) Two (4) Three

Q.57 The hormone that helps in the conversion of glucose to glycogen is :-

(1) Bile acids (2) Adrenaline
(3) insulin (4) Cortisone

Q.58 Which of the following is considered to be an anticancer species :-

(1)  (2) 

(3)  (4) 

Q.59 If the bond energies of H–H, Br – Br and H –Br are 433, 192 and 364 kJ mol^{-1} respectively the ΔH^{o} for the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$ is-

(1) + 103 kJ (2) +261kJ
(3) –103 kJ (4) –261 kJ

Q.60 Which of the following is responsible for depletion of the ozone layer in the upper strata of the atmosphere :-

(1) Ferrocene (2) Fullerenes
(3) Freons (4) Polyhalogens

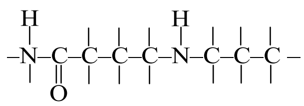
Q.61 Among the following, the pair in which the two species are not isostructural is :-

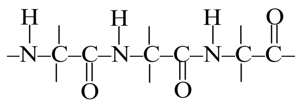
(1) IO_3^- and XeO_3 (2) BH_4^- and NH_4^+
(3) PF_6^- and SF_6 (4) SiF_4 and SF_4

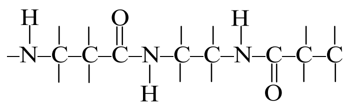
Q.62 The rate of a first order reaction is 1.5×10^{-2} mol L^{-1} min^{-1}at 0.5 M concentration of the reactant. The half life of the reaction is :-

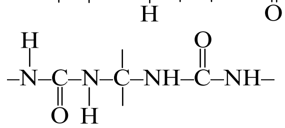
(1) 23. 1min (2) 8.73 min
(3) 7.53 min (4) 0.383 min

Q.63 Which one of the following structures represents the peptide chain :-

(1) 

(2) 

(3) 

(4) 

Q.64 Which one of the following can be oxidised to the corresponding carbonyl compound :-

(1) o-Nitrophenol
(2) Phenol
(3) 2-methyl-2-hydroxy propane
(4) 2-hydroxy propane

Q.65 In an octahedral structure, the pair of d orbitals involved involved in d^2sp^3 hybridization is :-

(1) $d_{xz}, d_{x^2-y^2}$ (2) d_{z^2}, d_{xz}
(3) d_{xy}, d_{yz} (4) $d_{x^2-y^2}, d_{z^2}$

Q.66 The frequency of radiation emitted when the electron falls from n = 4 to n = 1 in a hydrogen atom will be (Given ionization energy of H = 2.18×10^{-18} J $atom^{-1}$ and h = 6.625×10^{-34} Js):

(1) 1.03×10^{15} s^{-1} (2) 3.08×10^{15} s^{-1}
(3) 2.00×10^{15} s^{-1} (4) 1.54×10^{15} s^{-1}

Q.67 Camphor is often used in molecular mass determination because :-

(1) It has a very high cryoscopic constant
(2) It is volatile
(3) It is solvent for organic substances
(4) It is readily available

Q.68 Number of chiral carbons in β–D–(+)– glucose is: -

(1) Six (2) Three (3) Four (4) Five

Q.69 The helical structure of protein is stabilized by:-

(1) Hydrogen bonds (2) Ether bonds
(3) Peptide bonds (4) Dipeptide bonds

Q.70 Which of the following is least reactive in a nucleophilic substitution reaction :-

(1) $CH_2 = CHCl$ (2) CH_3CH_2Cl
(3) $CH_2 = CHCH_2Cl$ (4) $(CH_3)_3C–Cl$

Q.71 H_2O is dipolar, whereas BeF_2 is not. It is because:-

(1) H_2O involves hydrogen bonding whereas BeF_2 is a discrete molecule
(2) H_2O is linear and BeF_2 is angular
(3) H_2O is angular and BeF_2 is linear
(4) The electronegativity of F is greater than that of O

Q.72 Considering entropy (S) as a thermodynamic parameter, the criterion for the spontaneity of any process is :-

(1) $\Delta S_{system} - \Delta S_{surrounding} > 0$
(2) $\Delta S_{system} > 0$ only
(3) $\Delta S_{surroundings} > O$ only
(4) $\Delta S_{system} + \Delta S_{surrounding} > 0$

Q.73 Ionic radii are :-

(1) Inversely proportional to square of effective nuclear charge
(2) Directly proportional to effective nuclear charge
(3) Directly proportional to square of effective nuclear charge
(4) Inversely proportional to effective nuclear charge

Q.74 CN^- is a strong field ligand. This is due to the fact that :-

(1) It is a pseudohalide
(2) It can accept electrons from metal species
(3) It forms high spin complexes with metal species
(4) It carries negative charge

Q.75 Considering H_2O as a weak field ligand, the number of unpaired electrons in $[Mn(H_2O_6)]^{2+}$ will be –
(At. no. of Mn = 25)

(1) Five (2) Two (3) Four (4) Three

Q.76 The –OH group of an alcohol or the carboxylic acid can be replaced by – Cl, using :-

(1) Hypochlorous acid
(2) Chlorine
(3) Hydrochloric acid
(4) Phosphorous pentachloride

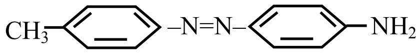
Q.77 Reaction of HBr with propene in the presence of peroxide gives :-

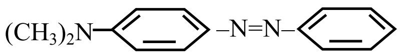
(1) 3-bromo propane (2) Allyl bromide
(3) n-propyl bromide (4) Isopropyl bromide

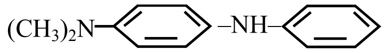
Q.78 Chloropicrin is obtained by the reaction of

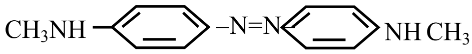
(1) Nitric acid on chlorobenzene
(2) Chlorine on picric acid
(3) Nitric acid on chloroform
(4) Steam on carbon tetrachloride

Q.79 Aniline when diazotized in cold and then treated with dimethyl aniline gives a coloured product. Its structure would be :-

(1) 

(2) 

(3) 

(4) 

Q.80 In a regular octahedral molecule, MX_6 the number of X–M–X bonds at 180º is :-

(1) Two (2) Six (3) Four (4) Three

Q.81 Which is the best description of the behavior of bromine in the reaction given below:-
$H_2O + Br_2 \rightarrow HOBr + HBr$

(1) Both oxidized and reduced
(2) Oxidized only
(3) Reduced only
(4) Proton acceptor only

Q.82 The maximum number of molecules is present in:-

(1) 5L of N_2 gas at STP
(2) 0.5 g of H_2 gas
(3) 10g of O_2 gas
(4) 15 L of H_2 gas at STP

Q.83 A compound formed by elements X and Y crystallizes in a cubic structure in which the X atoms are at the corners of a cube and the Y atoms are at the face-centers. The formula of the compound is :-

(1) X_3Y (2) XY (3) XY_2 (4) XY_3

Q.84 The radioactive isotope ${}^{60}_{27}Co$ which is used in the treatment of cancer can be made by (n, p) reaction. For this reaction the target nucleus is :-

(1) ${}^{59}_{27}Co$ (2) ${}^{60}_{28}Ni$ (3) ${}^{60}_{27}Co$ (4) ${}^{59}_{28}Ni$

Q.85 The enzyme which hydrolysis triglycerides to fatty acids and glycerol is called :-

(1) Lipase (2) Zymase
(3) Pepsin (4) Maltase

Q.86 Standard enthalpy and standard entropy changes for the oxidation of ammonia at 298 K are –382.64 kJ mol^{-1} and –145.6 JK^{-1} mol^{-1}, respectively. Standard Gibbs energy change for the same reaction at 298 K is :-

(1) –339.3 kJ mol^{-1} (2) – 439.3 kJ mol^{-1}
(3) –523.2 kJ mol^{-1} (4) –221.1 kJ mol^{-1}

Q.87 The solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility (in moles/litre) is:-

(1) 3.1×10^{-4} (2) 2×10^{-4}
(3) 4×10^{-4} (4) 5.6×10^{-6}

Q.88 Among K, Ca Fe and Zn, the element which can form more than one binary compound with chlorine is :-

(1) Zn (2) K (3) Ca (4) Fe

Q.89 The standard e.m.f. of a galvanic cell involving cell reaction with n = 2 is found to be 0.295 V at 25ºC. The equilibrium constant of the reaction would be :-

(1) 4.0×10^{12} (2) 1.0×10^{2}
(3) 1.0×10^{10} (4) 2.0×10^{11}

(Given F = 96500 C mol^{-1};
R = 8.314 JK^{-1} mol^{-1})

Q.90 Which one of the following statements about the zeolites is false :-

(1) They have open structure which enables them to take up small molecules
(2) Zeolites are aluminosilicates having three dimensional network
(3) Some of the SiO_4^{4-} units are replaced by AlO_4^{5-} and AlO_6^{9-} ions in zeolites
(4) They are used as cation exchangers.

Q.91 Which of the following will not form a yellow precipitate on heating with an alkaline solution of iodine :-

(1) $CH_3CH_2CH(OH)CH_3$
(2) CH_3OH
(3) CH_3CH_2OH
(4) $CH_3CH(OH)CH_3$

Q.92 Among $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ species, the hybridization states at the Ni atom are, respectively :- (At. No. of Ni = 28)

(1) sp^3, dsp^2, sp^3 (2) sp^3, sp^3, dsp^2
(3) dsp^2, sp^3, sp^3 (4) sp^3, dsp^2, dsp^2

Q.93 Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is :-

(1) Ti^{+}, V^{4+}, Cr^{6+}, Mn^{7+}
(2) Ti^{4+}, V^{3+}, Cr^{2+}, Mn^{3+}
(3) Ti^{2+}, V^{3+}, Cr^{4+}, Mn^{5+}
(4) Ti^{3+}, V^{2+}, Cr^{3+}, Mn^{4+}

Q.94 Which of the following coordination compounds would exhibit optical isomerism

(1) Diamminedichloroplatinum (II)
(2) Trans-dicyanobis (ethylenediamine) chromium (III) chloride
(3) Tris – (ethylenediamine) cobalt (III) bromide
(4) Pentaamminenitrocobalt (III) iodide

Q.95 The rapid change of pH near the stoichiometric point of an acid-base titration is the basis of indicator detection. pH of the solution is related to ratio of the concentrations of the conjugate acid (HIn) and base (In–) forms of the indicator by the expression -

(1) $\log \frac{[HIn]}{[In^-]} = pK_{In} - pH$

(2) $\log \frac{[HIn]}{[In^-]} = pH - pK_{In}$

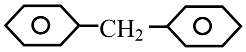
(3) $\log \frac{[In^-]}{[HIn]} = pH - pK_{In}$

(4) $\log \frac{[In^-]}{[HIn]} = pK_{In} - pH$

Q.96 Using anhydrous $AlCl_3$ as catalyst, which one of the following reactions produces ethylbenzene (PhEt) :-

(1) $CH_3–CH = CH_2 + C_6H_6$
(2) $H_2C = CH_2 + C_6H_6$
(3) $H_3C – CH_3 + C_6H_6$
(4) $H_3C – CH_2OH + C_6H_6$

Q.97 The molecular formula of diphenyl methane,



, is $C_{13}H_{12}$.

How many structural isomers are possible when one of the hydrogens is replaced by a chlorine atom :-

(1) 4 (2) 8 (3) 7 (4) 6

Q.98 A solid compound 'X' on heating gives CO_2 gas and a residue. The residue mixed with water forms 'Y'. On passing an excess of CO_2 through 'Y' in water, a clear solution, 'Z' is obtained. On boiling 'Z', compound 'X' is reformed. The compound 'X' is :-

(1) $CaCO_3$ (2) Na_2CO_3 (3) K_2CO_3 (4) $Ca(HCO_3)_2$

Q.99 The work done during the expansion of a gas from a volume of 4 dm^3 to 6 dm^3 against a constant external pressure of 3 atm is :-

(1) –608 J (2) + 304 J (3) –304 J (4) –6 J

Q.100 In BrF_3 molecule, the lone pairs occupy equatorial positions to minimize :-

(1) Bond pair – bond pair repulsion only

(2) Lone pair – lone pair repulsion and lone pair–bond pair repulsion

(3) Lone pair–lone pair repulsion only

(4) Lone pair–bond pair repulsion ony

Q.101 Blood analysis of a patient reveals an unusually high quantity of carboxy-haemoglobin content. Which of the following conclusions is most likely to be correct ? The patient has been inhaling polluted air containing unusually high content of -

(1) Chloroform (2) Carbon dioxide

(3) Carbon monoxide (4) carbon disulphide

Q.102 You are required to draw blood from a patient and to keep it in a test tube for analysis of blood corpuscles and plasma. You are also provided with the following four types of test tubes. Which of them will you not use for the purpose?

(1) Chilled test tube

(2) Test tube containing heparin

(3) Test tube containing sodium oxalate

(4) Test tube containing calcium bicarbonate

Q.103 The cardiac pacemaker in a patient fails to function normally. The doctors find that an artificial pacemaker is to be grafted in him. It is likely that it will be grafted at the site of -

(1) Purkinje system

(2) Sinuatrial node

(3) Atrioventricular node

(4) Atrioventricular bundle

Q.104 What is a keystone species ?

(1) A common species that has plenty of biomass, yet has a fairly low impact on the community's organization

(2) A rare species that has minimal impact on the biomass and on other species in the community

(3) A dominant species that constitutes a large proportion of the biomass and which affects many other species

(4) A species which makes up only a small proportion of the total biomass of a community, yet has a huge impact on the community's organization and survival

Q.105 The most thoroughly studied of the known bacteria-plant interactions is the :-

(1) Gall formation on certain angiosperms by Agrobacterium

(2) Nodulation of Sesbania stems by nitrogen fixing bacteria

(3) Plant growth stimulation by phosphate–solubilising bacteria

(4) Cyanobacterial symbiosis with some aquatic ferns

Q.106 Which one of the following preceeds re-formation of the nuclear envelope during M phase of the cell cycle :-

(1) Transcription from chromosomes and reassembly of the nuclear lamina

(2) Formation of the contractile ring and formation of the phragmoplast

(3) Formation of the contractile ring and transcription from chromosomes

(4) Decondensation from chromosomes and reassembly of the nuclear lamina

Q.107 The richest sources of vitamin B_{12} are :-
(1) Chocolate and green gram
(2) Rice and hen's egg
(3) Carrot and chicken's breast
(4) Goat's liver and Spirulina

Q.108 In transgenics expression of transgene in target tissue is determined by :-
(1) Transgene (2) Promoter
(3) Reporter (4) Enhancer

Q.109 A normal woman, whose father was colour-blind is married to a normal man. The sons would be :-
(1) 50% colour-blind
(2) All normal
(3) All colour-blind
(4) 75 % colour-blind

Q.110 Age of fossils in the past was generally determined by radio-carbon method and other methods involving radioactive elements found in the rocks. More precise methods, which were used recently and led to the revision of the evolutionary periods for different groups of organisms includes -
(1) Study of the conditions of fossilization
(2) Electron spin resonance (ESR) & fossil DNA
(3) Study of carbohydrates/proteins in rocks
(4) Study of carbohydrates/proteins in fossils

Q.111 What kind of evidence suggested that man is more closely related with chimpanzee than with other hominoid apes ?
(1) Comparison of chromosomes morphology only
(2) Evidence from fossil remains and the fossil mitochondrial DNA alone
(3) Evidence from DNA extracted from sex chromosomes, autosomes & mitochondria
(4) Evidence from DNA from sex chromosomes only

Q.112 Anthesis is a phenomenon which refers to -
(1) formation of pollen
(2) Development of anther
(3) Opening of flower bud
(4) Reception of pollen by stigma

Q.113 One set of a plant was grown at 12 hours day and 12 hours night period cycles and it flowered while in the other set night phase was interrupted by flash of light and it did not produce flower. Under which one of the following categories will you place this plant ?
(1) Darkness neutral (2) Day neutral
(3) Short day (4) Long day

Q.114 Lead concentration in blood is considered alarming if it is -
(1) 30 μg/100 ml (2) 4-6 μg/100 ml
(3) 10 μg/100 ml (4) 20 μg/100 ml

Q.115 In which one of the following enzymes, is copper necessarily associated as an activator -
(1) Tryptophanase (2) Lactic dehydrogenase
(3) Tyrosinase (4) Carbonic anhydrase

Q.116 DNA fingerprinting refers to :-
(1) Anlysis of DNA samples using imprinting devices
(2) Techniques used for molecular analysis of different specimens of DNA
(3) Techniques used for identification of fingerprints of individuals
(4) Molecular analysis of profiles of DNA samples

Q.117 Flagella of prokaryotic and eukaryotic cells differ in :-
(1) Location in cell and mode of functioning
(2) Microtubular organization and type of movement
(3) Microtubular organization and function
(4) Type of movement & placement in cell

Q.118 The animals with bilateral symmetry in young stage and radial pentamerous symmetry in the adult stage, belong to the phylum -
(1) Mollusca (2) Cnidaria
(3) Echinodermata (4) Annelida

Q.119 In Arthopoda, head and thorax are often fused to form cephalothorax, but in which one of the following classes, is the body divided into head, thorax and abdomen ?
(1) Myriapoda
(2) Crustacea
(3) Arachnida and Crustacea
(4) Insecta

Q.120 During transcription, if the nucleotide sequence of the DNA strand that is being coded is ATACG, then the nucleotide sequence in the mRNA would be -
(1) TCTGG (2) UAUGC
(3) UATGC (4) TATGC

Q.121 In C_3 plants, the first stable product of photosynthesis during the dark reaction is :-
(1) Oxaloacetic acid
(2) 3-phosphoglyceric acid
(3) Phosphoglyceraldehyde
(4) Malic acid

Q.122 Extranuclear inheritance is a consequence of presence of genes in -
(1) Endoplasmic reticulum & mitochondria
(2) Ribosomes and chloroplast
(3) Lysosomes and ribosomes
(4) Mitochondria and chloroplasts

Q.123 Which one of the following hormones is a modified amino acid ?
(1) Progesterone (2) Prostaglandin
(3) Estrogen (4) Epinephrine

Q.124 Viruses that infect bacteria, multiply and cause their lysis are called -
(1) Lipolytic (2) Lytic
(3) Lysogenic (4) Lysozymes

Q.125 The recessive genes located on X-chromosomes in humans are always-
(1) Sub-lethal
(2) Expressed in males
(3) Expressed in females
(4) Lethal

Q.126 The maximum growth rate occurs in :-
(1) Senescent phase
(2) Lag phase
(3) Exponential phase
(4) Stationary phase

Q.127 Restriction endonucleases :-
(1) Are used in genetic engineering for ligating two DNA molecules
(2) Are used for in vitro DNA synthesis
(3) Are synthesized by bacteria as part of their defense mechanism
(4) Are present in mammalian cells for degradation of DNA when the cell dies

Q.128 In the resting state of the neural membrane, diffusion due to concentration gradients, if allowed, would drive :-
(1) K^+ and Na^+ out of the cell
(2) Na^+ into the cell
(3) Na^+ out of the cell
(4) K^+ into the cell

Q.129 Crossing over that results in genetic recombination in higher organisms occurs between :-
(1) Non-sister chromatids of a bivalent
(2) Two daughter nuclei
(3) Two different bivalents
(4) Sister chromatids of a bivalents

Q.130 Which of the following statements is not true for retroviruses :-
(1) Retroviruses carry gene for RNA-dependent DNA polymerase
(2) The genetic material in mature retroviruses is RNA
(3) Retroviruses are causative agents for certain kinds of cancer in man
(4) DNA is not present at any stage in the life cycle of retroviruses.

Q.131 In a mutational event, when adenine is replaced by guanine, it is a case of -
(1) Transcription (2) Transition
(3) Transversion (4) Frameshift mutation

Q.132 Ovulation in the human female normally takes place during the menstrual cycle -
(1) Just before the end of the secretory cycle
(2) At the beginning of the proliferative phase
(3) At the end of the proliferative phase
(4) At the mid secretory phase

Q.133 Injury to vagus nerve in humans is not likely to affect -
(1) Gastrointestinal movements
(2) Pancreatic secretion
(3) Cardiac movements
(4) Tongue movements

Q.134 Which of the following hormones is not a secretion product of human placenta -
(1) Prolactin
(2) Estrogen
(3) Progesterone
(4) Human chorionic gonadotropin

Q.135 An ovule which becomes curved so that the nucellus and embryo sac lie at right angles to the funicle is :-
(1) Campylotropous (2) Anatropous
(3) Orthotropous (4) Hemitropous

Q.136 Angiosperms have dominated the land flora primarily because of their -
(1) Property of producing large number of seeds
(2) Nature of self pollination
(3) Domestication by man
(4) Power of adaptability in diverse habitat

Q.137 Edible part of mango is :-
(1) Receptacle (2) Epicarp
(3) Mesocarp (4) Endocarp

Q.138 In chloroplasts, chlorophyll is present in the :-
(1) Inner membrane (2) Thylakoids
(3) Stroma (4) Outer membrane

Q.139 In glycolysis, during oxidation electrons are removed by -
(1) Glyceraldehyde-3-phosphate
(2) NAD^+
(3) Molecular oxygen
(4) ATP

Q.140 Dough kept overnight in warm weather becomes soft and spongy becauses of :-
(1) Fermentation
(2) Cohesion
(3) Osmosis
(4) Absorption of carbon dioxide from atmosphere

Q.141 In the somatic cell cycle :-
(1) DNA replication takes place in S-phase
(2) A short interphase is followed by a long mitotic phase
(3) G_2 phase follows mitotic phase
(4) In G_1 phase DNA content is double the amount of DNA present in the original cell

Q.142 A male human is heterozygous for autosomal genes A and B and is also hemizygous for hemophilic gene h. What proportion of his sperms will be abh :-
(1) 1/32 (2) 1/16 (3) 1/4 (4) 1/8

Q.143 India's wheat yield revolution in the 1960s was possible primarily due to :-
(1) Increased chlorophyll content
(2) Mutations resulting in plant height reduction
(3) Quantitative trait mutations
(4) Hybrid seeds

Q.144 The most likely reason for the development of resistance against pesticides in insects damaging a crop is :-
(1) Genetic recombination
(2) Directed mutations
(3) Acquired heritable changes
(4) Random mutations

Q.145 The following ratio is generally constant for a given species :-
(1) T + C / G + A
(2) G + C / A+ T
(3) A + C / T + G
(4) A + G / C +T

Q.146 A self-fertilizing trihybrid plant forms :-
(1) 4 different gametes and 16 different zygotes
(2) 8 different gametes and 16 different zygotes
(3) 8 different gametes and 32 different zygotes
(4) 8 different gametes and 64 different zygotes

Q.147 Lichens are well known combination of an alga and a fungus where fungus has :-
(1) An epiphytic relationship with the alga
(2) A parasitic relationship with the alga
(3) A symbiotic relationship with the alga
(4) A saprophytic relationship with the alga

Q.148 Which of the following is expected to have the highest value ($gm/m^2/yr$) in a grassland ecosystem : -
(1) Tertiary production
(2) Gross production (GP)
(3) Net production (NP)
(4) Secondary production

Q.149 Lack of independent assortment of two genes A and B in fruit fly Drosophila is due to :-
(1) Recombination
(2) Linkage
(3) Crossing over
(4) Repulsion

Q.150 In your opinion, which is the most effective way to conserve the plant diversity of an area :-
(1) By creating biosphere reserve
(2) By creating botanical garden
(3) By developing seed bank
(4) By tissue culture method

Q.151 If by radiation all nitrogenase enzyme are inactivated, then there will be no :-
(1) Fixation of atmospheric nitrogen
(2) Conversion from nitrate to nitrite in legumes
(3) Conversion from ammonium to nitrate in soil
(4) Fixation of nitrogen in legumes

Q.152 In 1984, the Bhopal gas tragedy took place because methyl isocyanate :-
(1) Reacted with ammonia
(2) Reacted with CO_2
(3) Reacted with water
(4) Reacted with DDT

Q.153 Which one of the following is the correct matching of a vitamin, its nature and its deficiency disease :
(1) Vitamin K–Fat soluble Beri Beri
(2) Vitamin A–Fat soluble Beri Beri
(3) Vitamin K–Water soluble Pellagra
(4) Vitamin A–Fat soluble Night blindness

Q.154 Photosynthetically active radiation (PAR) represents the following range of wave length
(1) 450-950 nm (2) 340-450 nm
(3) 400-700 nm (4) 500-600 nm

Q.155 The technique of obtaining large number of plantlets by tissue culture method is called –
(1) Organ culture (2) Micropropagation
(3) Macropropagation (4) Plantlet culture

Q.156 The most abundant element present in the plant is :-
(1) Nitrogen (2) Manganese
(3) Iron (4) Carbon

Q.157 Cell elongation in internodal regions of the green plants takes place due to :-
(1) Cytokinins (2) Gibberellins
(3) Ethylene (4) Indole acetic acid

Q.158 Diversification in plant life appeared :-
(1) Due to abrupt mutations
(2) Suddenly on earth
(3) By seed dispersal
(4) Due to long periods of evolutionary changes

Q.159 A terrestrial animal must be able to -
(1) Conserve water
(2) Actively pump salts out through the skin
(3) Excrete large amounts of salts in urine
(4) Excrete large amounts of water in urine

Q.160 Mast cells of connective tissue contain -
(1) Heparin and histamine
(2) Heparin and calcitonin
(3) Serotonin and melanin
(4) Vasopressin and relaxin

Q.161 Uricotelism is found in -
(1) Fishes and Fresh water protozoans
(2) Birds, reptiles and insects
(3) Frogs and toads
(4) Mammals and birds

Q.162 ATPase enzyme needed for muscle contraction is located in -
(1) Troponin (2) Myosin
(3) Actin (4) Actinin

Q.163 Certain characteristic demographic features of developing countries are -
(1) High fertility, high density, rapidly rising mortality rate and very young age distribution
(2) High infant mortality, low fertility, uneven population growth and a very young age distribution
(3) High mortality high density, uneven population growth and a very old age distribution
(4) High fertility, low or rapidly falling mortality rate, rapid population growth and a very young age distribution

Q.164 Duodenum has characteristic Brunner's glands which secrete two hormones called -
(1) Secretin, Cholecystokinin
(2) Prolactin, parathormone
(3) Extradiol, progesterone
(4) Kinase, estrogen

Q.165 Cancer cells are more easily damaged by radiation than normal cells because they are -
(1) Undergoing rapid division
(2) Different in structure
(3) Non-dividing
(4) Starved of mutation

Q.166 Which one of the following is not correctly matched
(1) ***Culex pipiens*** – Filariasis
(2) ***Aedes aegypti*** – Yellow fever
(3) ***Anopheles culifaciens*** – Leishmaniasis
(4) ***Glossina palpalis*** – Sleeping sickness

Q.167 Which one of the following pairs is not correctly matched :-
(1) ***Serratia*** – Drug addiction
(2) ***Spirulina*** – Single cell protein
(3) ***Rhizobium*** – Biofertilizer
(4) ***Streptomyces*** – Antibiotic

Q.168 Which one of the following pair's correctly matches a hormone with a disease resulting from its deficiency :-
(1) Insulin – Diabetes insipidus
(2) Thyroxine – Tetany
(3) Parathyroid hormone – Diabetes mellitus
(4) Luteinizing hormone – Failure of ovulation

Q.169 A major component of gobar gas is :-
(1) Methane (2) Ethane
(3) Butane (4) Ammonia

Q.170 A free living nitrogen-fixing cyanobacterium which can also form symbiotic association with the water fern ***Azolla*** is :-
(1) ***Chlorella*** (2) ***Nostoc***
(3) ***Anabaena*** (4) ***Tolypothrix***

Q.171 In the ABO system of blood groups if both antigens are present but no antibody, the blood group of the individual would be :-
(1) O (2) AB (3) A (4) B

Q.172 Plants adapted to low light intensity have :-
(1) Higher rate of CO_2 fixation than the sun plants
(2) More extended root system
(3) Leaves modified to spines
(4) Larger photosynthetic unit size than the sun plants

Q.173 The Ti plasmid is often used for making transgenic plants. This plasmid is found in
(1) Rhizobium of the roots of leguminous plants
(2) Agrobacterium
(3) Yeast as a 2 μm plasmid
(4) Azotobacter

Q.174 During replication of a bacterial chromosomes DNA synthesis starts from a replication origin site and :-
(1) Is facilitated by telomerase
(2) Moves in one direction of the size
(3) Moves in bi-directional way
(4) RNA primers are involved

Q.175 In a plant red fruit (R) is dominant over yellow fruit (r) and tallness (T) is dominant over shortness (t). If a plant with RRTt genotype is crossed with a plant that is rrtt
(1) 50% will be tall with red fruit
(2) 75% will be tall with red fruit
(3) All the offspring will be tall with red fruit
(4) 25% will be tall with red fruit

Q.176 After a mutation at a genetic locus the character of an organism changes due to the change in :-
(1) DNA replication
(2) Protein synthesis pattern
(3) RNA transcription pattern
(4) Protein structure

Q.177 According to oparin, which one of the following was not present in the primitive atmosphere of the earth :-
(1) Oxygen (2) Hydrogen
(3) Water vapour (4) Methane

Q.178 When CO_2 concentration in blood increases, breathing becomes -
(1) There is no effect on breathing
(2) Slow and deep
(3) Faster and deeper
(4) Shallower and slow

Q.179 Which one of the following pairs is **not** correctly matched ?
(1) Vitamin B_6 – Loss of appetite
(2) Vitamin B_1 – Beri-beri
(3) Vitamin B_2 – Pellagra
(4) Vitamin B_{12} – Pernicious annemia

Q.180 One of the following is a very unique feature of the mammalian body -
(1) Presence of diaphragm
(2) Four chambered heart
(3) Rib cage
(4) Homeothermy

Q.181 Chemically hormones are :-
(1) Proteins, steroids & biogenic amines
(2) Proteins only
(3) Steroids only
(4) Biogenic amines only

Q.182 When a fresh water protozoan possessing a contractile vacuole, is placed in a glass containing marine water, the vacuole will-
(1) Disappear (2) Increase in size
(3) Decrease in size (4) Increase in number

Q.183 One of the parents of a cross has a mutation in its mitochondria. In that cross, that parent is taken as a male. During segregation of F_2 progenies that mutation is found in -
(1) None of the progenies
(2) All the progenies
(3) 50% of the progenies
(4) 1/3 of the progenies

Q.184 An ecosystem which can be easily damaged but can recover after some time if damaging effect stops will be having -
(1) High stability and low resilience
(2) Low stability and low resilience
(3) High stability and high resilience
(4) Low stability and high resilience

Q.185 In which of the following pairs is the specific characteristic of a soil not correctly matched :-
(1) Terra rossa – Most suitable for roses
(2) Chernozems – Richest soil in the world
(3) Black soil – Rich in calcium carbonate
(4) Laterite – Contains aluminium compound

Q.186 Recently Govt. of India has allowed mixing of alcohol in petrol. What is the amount of alcohol permitted for mixing in petrol :-
(1) 10–15% (2) 10%
(3) 5% (4) 2.5%

Q.187 In a longitudinal section of a root, starting from the tip upward, the four zones occur in the following order :-

(1) Root cap, cell division, cell maturation, cell enlargement
(2) Cell division, cell enlargement, cell maturation, root cap
(3) Cell division, cell maturation, cell enlargement, root cap
(4) Root cap, cell division, cell enlargement, cell maturation

Q.188 Presence of gills in the tadpole of frog indicates that :-

(1) Fishes evolved from frog like ancestors
(2) Frogs will have gills in future
(3) Frogs evolved from gilled ancestors
(4) Fishes were amphibious in the past

Q.189 In oogamy fertilization involves -

(1) A large non-motile female gamete and a small motile male gamete
(2) A large non-motile female gamete and a small non-motile male gamete
(3) A large motile female gamete and a small non-motile male gamete
(4) A small non-motile female gamete and a large motile male gamete

Q.190 Which one of the following is living fossil -

(1) Moss (2) Saccharomyces
(3) spirogyra (4) Cycas

Q.191 In which one of the following habitats does the diurnal temperature of soil surface vary most ?

(1) Forest (2) Desert
(3) Grassland (4) Shrub land

Q.192 The telomeres of eukaryotic chromosomes consist of short sequences of -

(1) Cytosine rich repeats
(2) Adenine rich repeats
(3) Guanine rich repeats
(4) Thymine rich repeats

Q.193 Which form of RNA has a structure resembling clover leaf ?

(1) hn-RNA (2) m-RNA
(3) t-RNA (4) r-RNA

Q.194 A nutritionally wild type organism, which does not require any additional growth supplement is known as :-

(1) Holotype (2) Auxotroph
(3) Prototroph (4) Phenotype

Q.195 Which of the following propagates through leaf-tip :-

(1) Sprout-leaf plant (2) Marchantia
(3) Moss (4) Walking fern

Q.196 Common indicator organism of water pollution is :-

(1) *Eichhornia crassipes*
(2) *Escherichia coli*
(3) *Entamoeba histolytica*
(4) *Lemna pancicostata*

Q.197 ELISA is used to detect viruses, where :-

(1) Southern blotting is done
(2) Alkaline phosphatase is the key reagent
(3) Catalase is the key reagent
(4) DNA-probes are required

Q.198 Phenetic classification of organisms is based on:-

(1) The ancestral lineage of existing organisms
(2) Dendogram based on DNA characteristics
(3) Sexual characteristics
(4) Observable characteristics of existing organisms

Q.199 If you are provided with root-tips of onion in your class and are asked to count the chromosomes which of the following stages can you most conveniently look into :-

(1) Telophase (2) Anaphase
(3) Prophase (4) Metaphase

Q.200 When a diploid female plant is crossed with a tetraploid male, the ploidy of endosperm cells in the resulting seed is :-

(1) Pentaploidy (2) Diploidy
(3) Triploidy (4) Tetraploidy

ANSWER KEY (AIPMT-2004)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans	3	1	4	2	1	3	3	2	1	3	1	4	4	4	4	1	4	2	3	1
Ques.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Ans	4	2	1	1	4	3	2	2	2	3	2	2	4	3	2	3	2	1	4	3
Ques.	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans	1	4	1	2	4	3	3	2	3	2	2	3	4	2	2	4	3	2	3	3
Ques.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
Ans	4	1	2	4	4	2	1	4	1	1	3	4	4	2	1	4	3	3	2	4
Ques.	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
Ans	1	4	4	2	1	1	2	4	3	3	2	1	3	3	1,3	2	1	1	1	2
Ques.	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
Ans	3	4	2	4	1	2	4	2	1	2	3	3	3	3	3	4	2	3	4	2
Ques.	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**
Ans	2	4	4	2	2	3	3	2	1	4	2	3	4	1	4	4	3	2	2	1
Ques.	**141**	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**	**160**
Ans	1	4	3	4	2	4	3	2	2	1	4	3	4	3	2	4	2	4	1	1
Ques.	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**	**177**	**178**	**179**	**180**
Ans	2	2	4	1	1	3	1	4	1	3	2	4	2	3	1	4	1	3	1	1
Ques.	**181**	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**	**197**	**198**	**199**	**200**
Ans	1	1	1	4	1	3	4	3	1	4	2	3	3	3	4	2	2	4	4	4

HINTS & SOLUTIONS

1. If rated voltage = supply voltage then in series combination of bulbs

$$\frac{1}{P_{eq}} = \frac{1}{P_1} + \frac{1}{P_2} + \frac{1}{P_3} + ...$$

For this question

$$\frac{1}{P_{eq}} = \frac{1}{60} + \frac{1}{60} + \frac{1}{60} = \frac{3}{60} = \frac{1}{20} \Rightarrow P_{eq} = 20\text{watt}$$

2. Material same $\Rightarrow \rho$ unchanged

$$R = \frac{\rho\ell}{A} = \frac{\rho\ell}{\pi a^2} \Rightarrow R \propto \frac{\ell}{a^2}$$

therefore $R' \propto \dfrac{2\ell}{(2a)^2}$

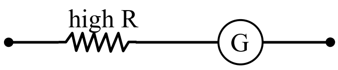
$$\Rightarrow R' = \frac{R}{2}$$

3. According to question $R = \dfrac{r}{n} \Rightarrow r = nR$

$R_{series} = nr = n^2R$

4. $F = \dfrac{q_1 q_2}{4\pi \in_0 r^2} \Rightarrow [\in_0] = \dfrac{\text{Coulomb}^2}{\text{Newton Meter}^2}$

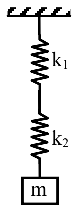
5. Voltmeter →



6. IN SHM if $v = v_{max}$ then $a = 0$

$v = 0$ then $a = a_{max}$

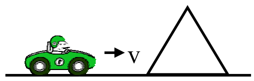
7. In series $\dfrac{1}{k_{eff}} = \dfrac{1}{k_1} + \dfrac{1}{k_2} + ...$



8. Diode is in FB if $V_1 > V_2$

Diode is in RB if $V_2 > V_1$

9. According to given condition



cliff is stationary source of freq. f' where

$$f' = \left(\frac{v}{v - v_{car}}\right)f$$

Freq. heard by the driver

$$f'' = \left(\frac{v + v_{car}}{v}\right)f' = \left(\frac{v + v_{car}}{v - v_{car}}\right)f = 2f$$

$\Rightarrow v + v_{car} = 2v - 2v_{car} \Rightarrow 3v_{car} = v$

$\Rightarrow v_{car} = v/3$

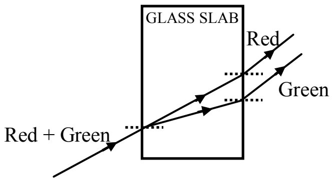
10. $g = \dfrac{GM}{R^2} = \dfrac{G\frac{4}{3}\pi R^3 \rho}{R^2} = \dfrac{4}{3}\pi G\rho R$

Now according to question $g_{planet} = g_{earth}$

$\Rightarrow \dfrac{4}{3}\pi G\rho_{planet} \times R_{planet} = \dfrac{4}{3}\pi G\rho_{earth} \times R_{earth}$

$\Rightarrow R_{planet} = \dfrac{R_{earth}}{2}$ $(\because \rho_{planet} = 2\rho_{earth})$

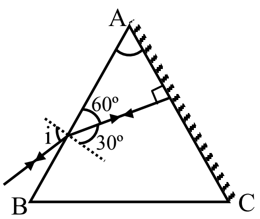
11.



Red and green rays emerge from two points, propagating in two different parallel directions.

12. $\because E = \dfrac{P^2}{2m}$ $\therefore E \propto \dfrac{1}{m}$ if $m_1 > m_2$ then $E_1 < E_2$

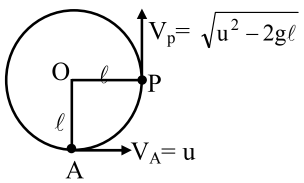
13. According to question from snaell's law



$1. \sin i = \mu \sin 30^o \Rightarrow \sin i = \sqrt{2} \times \dfrac{1}{2} = \dfrac{1}{\sqrt{2}}$

$\Rightarrow i = 45^o$

14.



Magnitude of change in velocity = $|\vec{V}_p - \vec{V}_A|$

$= \sqrt{V_p^2 + V_A^2}$ ($\because$angle between $\vec{V}_p$ and $\vec{V}_A$ is 90º)

$= \sqrt{u^2 - 2g\ell + u^2} = \sqrt{2(u^2 - g\ell)}$

16. For half wave diode rectifier (HWR)

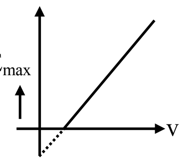
$V_{dc} = \dfrac{V_0}{\pi} = \dfrac{10}{\pi}$ volts

17. According to question

$\dfrac{1}{2}mv^2 = \dfrac{1}{2}kx^2 \Rightarrow x = v\sqrt{\dfrac{m}{k}} = 1.5\sqrt{\dfrac{0.5}{50}} =$ 0.15m

18. Product is more stable so that its mass is less than the sum of masses of reactants i.e. $m_3 < (m_1 + m_2)$

19. $h\nu = \phi + KE_{max} \Rightarrow$



20. Z = number of protons

In $^A_Z X$

A-Z = number of neutrons

21. $\because F = \dfrac{Gm_1m_2}{r^2}$

$\therefore [G] = \left[\dfrac{Fr^2}{m^2}\right] \equiv \dfrac{MLT^{-2}L^2}{M^2}$

$= M^{-1}L^3T^{-2}$

22. Use power $\left(P = \dfrac{V^2}{R}\right)$ and get required result

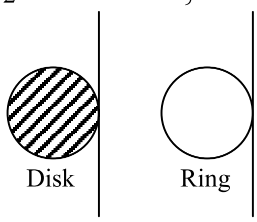
23. $I = \dfrac{e}{R} = \dfrac{1}{R}\left(\dfrac{\Delta\phi}{\Delta t}\right) = \dfrac{\Delta Q}{\Delta t} \Rightarrow Q = \dfrac{\Delta\phi}{R}$

24. Use $qV_{acc} = \dfrac{1}{2}mv^2$ and get required result

25. $PV = \mu RT$ where $\mu = \dfrac{5}{32}$ moles

26. Wien's displacement law $\lambda_m T = b$

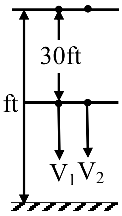
27. $\left.\begin{array}{l} I_{disk} = \frac{5}{4}MR^2 = MK_{disk}^2 \\ I_{ring} = \frac{3}{2}MR^2 = MK_{ring}^2 \end{array}\right\} \Rightarrow \dfrac{K_{disk}}{K_{ring}} = \sqrt{\dfrac{5}{6}}$



28. form conservation of angular momentum

$I_1\omega = (I_1 + I_2)\omega' \Rightarrow \omega' = \dfrac{I_1\omega}{I_1 + I_2}$

29.



Here $V_1 = V_2 = \sqrt{2gh}$

$$\frac{KE_1}{KE_2} = \frac{\frac{1}{2}m_1v_1^2}{\frac{1}{2}m_2v_2^2} = \frac{m_1}{m_2} = \frac{2}{4} = \frac{1}{2}$$

30. $\left.\begin{array}{l} M_0 = 100\text{g (initial mass)} \\ M = 25\text{g (active mass)}\end{array}\right\} \Rightarrow \dfrac{N_0}{N} = \dfrac{100}{25}$

$\Delta = 2^2 \Rightarrow n = 2$

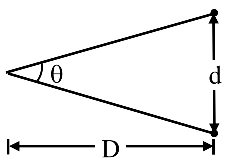
Therefore required time = $2\times T_{1/2}$ = 3200 yrs

31. Mass of nucleus is slightly less than sum of masses of its constituents. This mass difference is equivalent to binding energy.

$\therefore\ \Delta m = \dfrac{E}{C^2} = (ZM_P + NM_n) - M(N,Z)$

Hence $M(N, Z) = NM_n + ZM_P - \dfrac{B}{C^2}$

32.



$\theta = \dfrac{d}{D}$ but $\theta \approx \dfrac{\lambda}{a}$

(Note : - exact relation $\theta = \dfrac{1.22}{a}\lambda$)

$\dfrac{d}{D} = \dfrac{\lambda}{a} \Rightarrow d = \dfrac{\lambda D}{a}$

$\Rightarrow d = \dfrac{5000\times10^{-10}\times10^{3}}{10\times10^{-2}}$ = 5 mm

33. $y_1 = 10^{-6}\sin\{100t + \dfrac{x}{50} + 0.5\}$

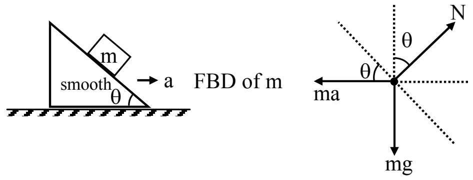
$y_2 = 10^{-6}\cos\{100t + \dfrac{x}{50}\}$

$= 10^{-6}\sin\{\dfrac{\pi}{2} + 100t + \dfrac{x}{50}\}$

Phase difference between y_1 & y_2 = $\dfrac{\pi}{2} - 0.5$

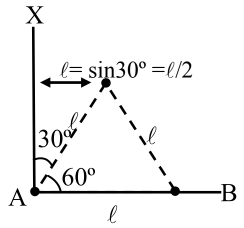
= 1.58 – 0.5 = 1.08 radians.

34.



Here $N\cos\theta = mg \Rightarrow N = \dfrac{mg}{\cos\theta}$

35.



$$I_{AX} = m\ell^2 + m\left(\frac{\ell}{2}\right)^2 = m\ell^2 + \frac{m\ell^2}{4} = \frac{5}{4}m\ell^2$$

36. Energy of photon = $E_3 - E_2$

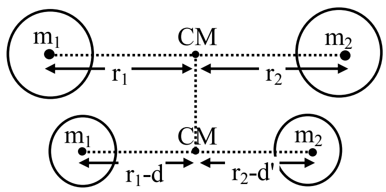
$= \dfrac{-13.6}{9} - \left(\dfrac{-13.6}{4}\right) = \dfrac{5}{36}\times13.6$ = 1.9 eV

37. From $\tau = I\alpha$ and $\omega = \omega_0 + \alpha t$

Here $\omega_0 = \dfrac{60\times2\pi}{60}$ rad/sec. = 2π rad/sec.

$\tau = I\left(\dfrac{\omega_0}{I}\right) = 2\times\dfrac{2\pi}{60} = \dfrac{\pi}{15}$ N–m

38.



$m_1r_1 = m_2r_2$ …(1)

$m_1(r_1 - d) = m_2(r_2 - d')$ ….. (2)

from (1) and (2) we get $d' = \dfrac{m_1}{m_2}d$

39. $|\vec{A}\times\vec{B}| = \sqrt{3}\,\vec{A}.\vec{B}$

$\Rightarrow AB\sin\theta = \sqrt{3}\,AB\cos\theta$

$\Rightarrow \tan\theta = \sqrt{3}$

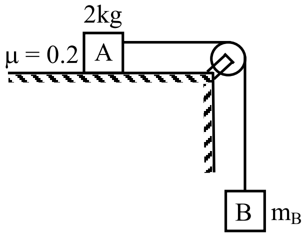
$\theta = 60^\circ$

therefore $|\vec{A}+\vec{B}| = \sqrt{A^2 + B^2 + 2AB\cos\theta}$

$= \sqrt{A^2 + B^2 + 2AB\cos60^\circ}$

$= \sqrt{A^2 + B^2 + AB}$

40.



According to question

$T = m_Bg = \mu(m_Ag)$

$\Rightarrow m_B = \mu m_A = 0.2 \times 2 = 0.4$ kg

41. Photo emf $\propto$ Current through cell

But current $\propto$ Intensity

so photo emf $\propto$ Intensity of light falling on the cell.

42. Bohr model of atoms assumes that the angular momentum of electrons is quantised.

43. The output of OR gate is 1 if either or both inputs are 1.

44. $F = p\dfrac{dE}{dr} = 0$ ($\because$ E = constant)

$u = -\vec{p}.\vec{E} = -PE$ (minimum)

45. Time constant $= \dfrac{L}{R} = \dfrac{40}{8} = 5$ seconds.

46. $\Delta U = \mu C_V \Delta T$ and $0 = W + \Delta U$

$\Rightarrow \Delta U = -6R$ ($\therefore$ W = 6R)

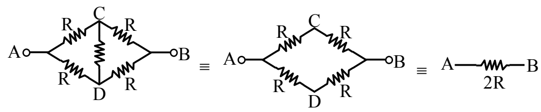
Therefore $-6R = 1\left(\dfrac{R}{\gamma - 1}\right)\Delta T = \dfrac{3}{2}R\Delta T$

$= \Delta T = -4 \Rightarrow T_{final} = (T - 4)K$

47. % Watt hour efficiency $= \dfrac{E_{out}}{E_{in}} \times 100$

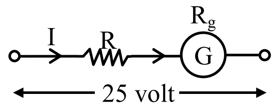
$= \dfrac{(14)(5)(15)}{(15)(10)(8)} \times 100 = 87.5\%$

48. Given circuit can be reduced to



required current $= \dfrac{V}{2R}$

49.

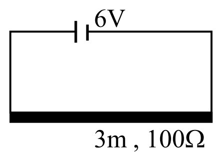


According to question $25 = I(R + Rg)$

$= (4 \times 10^{-4} \times 25)(R + 50)$

$\Rightarrow R + 50 = 2500 \Rightarrow R = 2450\Omega$

50.



Voltage on 50 cm. $= \dfrac{6}{300} \times 50 = 1$ volt.