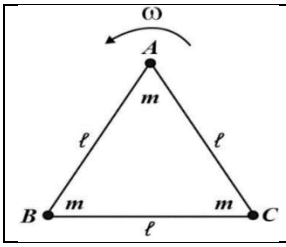
SECTION-A

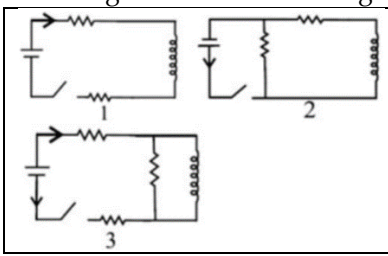
1. An equilateral triangular frame is made of three thin massless rods. Three points masses of mass m each are fixed at vertices of the frame as shown. The system is rotated with uniform angular speed ω about a fixed axis passing through A and normal to the plane of triangular frame. Neglect the effect of gravity. The tension in rod connecting mass B and C is



(a) $m\omega^2 l$ (b) $\frac{m\omega^2 l}{2}$

(c) $\frac{\sqrt{3}}{2}m\omega^2 l$ (d) zero

2. The figure shows three circuits with identical batteries, inductors and resistance. Rank the circuits in decreasing order, according to the current through the battery just after the switch is closed



(a) $i_2 > i_3 > i_1$
(b) $i_2 > i_1 > i_3$
(c) $i_1 > i_2 > i_3$
(d) $i_1 > i_3 > i_2$

3. A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10^0C, and the coefficient of linear expansion of the metal of the rod is $2\times10^{-6o}C^{-1}$, the period of the pendulum will have a percentage increase of

(a) -2×10^{-3} (b) -1×10^{-3} (c) 2×10^{-3} (d) 1×10^{-3}

4. A particle of mass m is located in a field such that its potential energy is given by $U(x)=U_0(1-\cos ax)$ where U_0 and *a* are positive constants. The period of small oscillations is

(a) $2\pi\sqrt{\frac{U_0}{ma^2}}$ (b) $2\pi\sqrt{\frac{mU_0}{a^2}}$ (c) $2\pi\sqrt{\frac{a_0}{mU_0}}$ (d) $2\pi\sqrt{\frac{m}{U_0a^2}}$

5. A rod of mass m and length l is lying on a horizontal table. The work done in making it stand on one end will be

(a) mgl (b) $\frac{mgl}{2}$ (c) $\frac{mgl}{4}$ (d) 2mgl

6. If an alpha particle and a proton are accelerated from rest by a potential difference of 1 MeV, then the ratio of their kinetic energies will be

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

7. When a certain weight is suspended from a long uniform wire, it length increases by 1cm. If the same weight is suspended from another wire of the same material and length but having a diameter half of the first one then the increase in length will be

(a) 0.5 cm (b) 2 cm (c) 4 cm (d) 8 cm

8. In the combination of resistances shown in the figure the potential difference between *B* and *D* is zero, when unknown resistance (*x*) is

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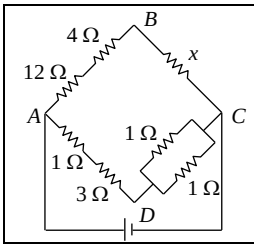


(a) 4 Ω
(b) 2 Ω
(c) 3 Ω
(d) The emf of the cell is require

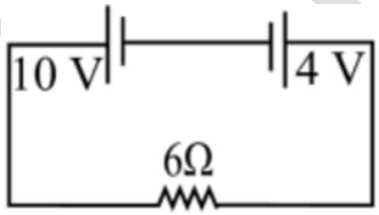
9. A pulley fixed with ceiling carries a string with blocks of mass m and 3m attached to its ends. The masses of string and pulley are negligible. When the system is released, its centre of mass moves with acceleration
(a) g (b) g/5 (c) g/4 (d) zero

10. Two photons having
(a) equal wavelengths have equal linear momenta (b) equal energies have equal linear momenta
(c) equal frequencies have equal linear momenta (d) equal linear momenta have equal wavelengths

11. A gas in an airtight container is heated from 25^0C to 90^0C. The density of the gas will
(a) increase slightly (b) increase considerably (c) remain the same (d) decrease slightly

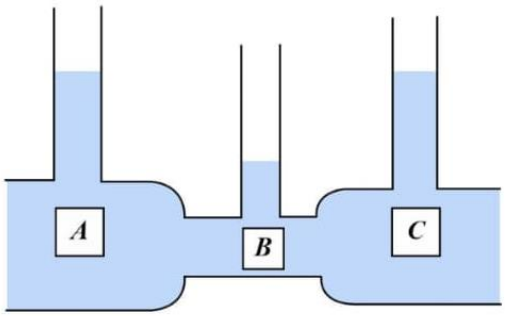
12. A square conducting loop of side length L carries a current I. The magnetic field at the centre of the loop is
(a) independent of L (b) proportional to L^2
(c) inversely proportional to L (d) linearly proportional to L

13. The power consumed by the 4V battery is



(a) 4W (b) 8W (c) 7W (d) cannot be calculated

14. A non-viscous liquid is flowing through a horizontal pipe as shown in the figure. Three tubes A, B and C are connected to the pipe. The radii of the tubes A, B and C at the junction are 2cm, 1cm, and 2cm respectively. It can be said that the



(a) height of the liquid in the tube A is maximum

(b) height of the liquid in the tubes A and B is the same

(c) height of the liquid in all the three tubes is the same

(d) height of the liquid in the tubes A and C is the same

15. Three objects of different materials but of equal masses are kept in a heating chamber where all three receive energy at a same constant rate. During heating each object starts with liquid state and finally gets converted in the gaseous state. For each of the object, temperature T versus time t graph is plotted, as shown and marked I, II and III.

I. If S_I, S_{II}, and S_{III} are their respective specific heats in liquid state then

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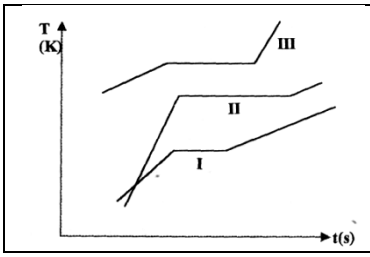
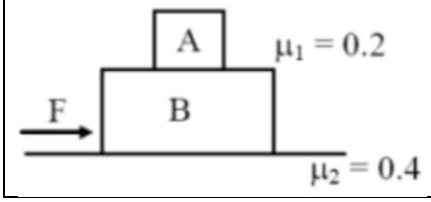


(a) $S_I > S_{II} > S_{Lii}$
(b) $S_I > S_{III} > S_I$
(c) $S_{II} > S_I > S_{Lii}$
(d) $S_{II} > S_I > S_{II}$

16. The force required to row a boat over the sea is proportional to the square of the speed of the boat. It is found that it takes 24 hp to row a certain boat at a speed of 8 km hr^{-1}, the horsepower required when speed is doubled
(a) 12 hp (b) 48 hp (c) 96 hp (d) 192 hp

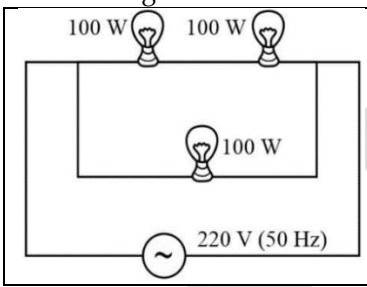
17. In the figure, m_A = 2kg and m_B = 4kg. For what minimum value of force F, A starts slipping over B (g = 10 $m/s^{(b)}$



(a) 24 N
(b) 36 N
(c) 12 N
(d) 20 N

18. Three charges $-q, Q$ and $-q$ are placed at equal distances on a straight line. If the potential energy of the system of charges is zero, then the ratio $Q:q$ is
(a) 1 : 1 (b) 1 : 2 (c) 1 : 3 (d) 1 : 4

19. In the arrangement of 3 bulbs of 100W each as shown in the figure, total power consumption will be



(a) 300W
(b) 50W
(c) 150W
(d) 25W

20. Which one of the following is a simple harmonic motion?
(a) wave moving through a string fixed at both ends (b) earth spinning about its own axis
(c) ball bouncing between two rigid (d) particle moving in a circle with uniform speed

21. A Newtonian fluid fills the clearance between a shaft and a sleeve. When a force of 800N is applied to the shaft, parallel to the sleeve, the shaft attains a speed of 2 cm s^{-1}. If a force of 2.4 kN is applied instead, the shaft would move with a speed of
(a) 2 cm s^{-1} (b) 15 cm s^{-1} (c) 6 cm s^{-1} (d) none of these

22. The resistance of metal sheet 1 between A and B is R_1 and the resistance of sheet 2 between $A^{|}$ and $B^{|}$ is R_2. The value of the ratio $\frac{R_1}{R_2}$ is

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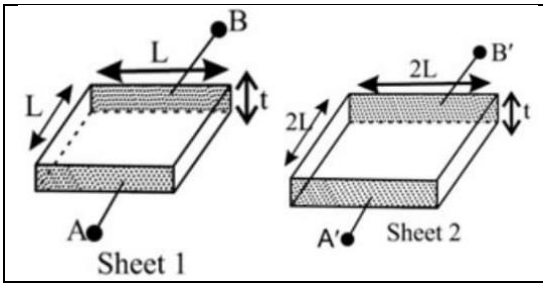


(a) 1
(b) 1/2
(c) 2
(d) 4

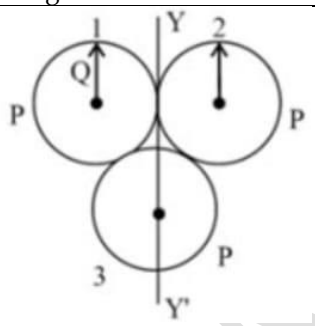
23. Equal molecules of two gases are in thermal equilibrium. If P_a, P_b and V_a, V_b are their respective pressures and volumes, then which of the following relation is true?

(a) $P_a \neq P_b; V_a = V_b$ (b) $P_a = P_b; V_a \neq V_b$ (c) $\frac{P_a}{V_a} = \frac{P_b}{V_b}$ (d) $P_a V_a = P_b V_b$

24. Two rectangular blocks A and B of different metals have the same length and same area of cross-section. They are kept in such a way that their cross-sectional areas are in contact. The temperature at one end to A is 100^0C and that of B at the other end is 0^0C. If the ratio of their thermal conductivity is 1 : 3, then under steady-state, the temperature of the junction in contact will be

(a) 25^0C (b) 50^0C (c) 75^0C (d) 100^0C

25. Three rings, each of mass P and radius Q are arranged as shown in the figure. The moment of inertia of the arrangement about YY′ axis will be



(a) $\frac{7}{2}PQ^2$
(b) $\frac{2}{7}PQ^2$
(c) $\frac{2}{5}PQ^2$
(d) $\frac{5}{2}PQ^2$

26. Force necessary to pull a circular plate of 5cm radius from water surface for which surface tension is 75 dynes cm^{-1}, is

(a) 30 dynes (b) 60 dynes (c) 750 dynes (d) 750π dynes

27. A beam of monochromatic blue light of wavelength 4200 Å in air travels in water $(\mu = 4/3)$. Its wavelength in water will be

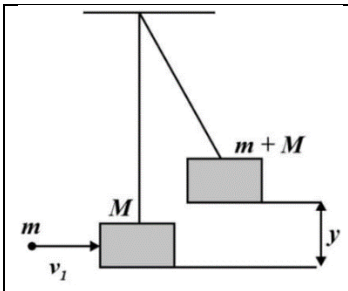
(a) 2800 Å (b) 5600 Å (c) 3150 Å (d) 4000 Å

28. The mass and diameter of a planet have twice the value of the corresponding parameters of earth. Acceleration due to gravity on the surface of the planet is

(a) 9.8 ms^{-2} (b) 4.9 ms^{-2} (c) 980 ms^{-2} (d) 19.6 ms^{-2}

29. A bullet of mass m moving with velocity v_1 strikes a suspended wooden block of mass M as shown in the figure and sticks to it. If the block rises to a height y, the initial velocity of the bullet is

Space for rough work



(a) $v_1 = \frac{m+M}{m}\sqrt{2gy}$

(b) $v_1 = \sqrt{2gy}$

(c) $v_1 = \frac{M+m}{M}\sqrt{2gy}$

(d) $v_1 = \frac{m}{m+M}\sqrt{2gy}$

30. Heavy water is used as moderator in a nuclear reactor. The function of the moderator is
(a) to control the energy released in the reactor
(b) to absorb neutrons and stop chain reaction
(c) to cool the factor reactor
(d) to slow down the neutrons to thermal energies

31. The third line of Balmer series of an ion equivalent to hydrogen atom has wavelength of 108.5 nm. The ground state energy of an electron of this ion will be
(a) 3.4 Ev (b) 13.6 eV (c) 54.4 Ev (d) 122.4 eV

32. If two tuning forks A and B are sounded together, they produce 4 beats per second. A is then slightly loaded with wax, they produce 2 beats when sounded again. The frequency of A is 256. The frequency of B will be
(a) 250 (b) 252 (c) 260 (d) 262

33. A flux of $10^{-3} Wb$ passes through a strip having an area $A = 0.02\, m^2$. The plane of the strip is at an angle of 60^o to the direction of a uniform field B. The value of B is
(a) 0.1 T (b) 0.058 T (c) 4.0 mT (d) none of the above

34. A body of mass m collides against a wall with the velocity v and rebounds with the same speed. Its magnitude of change of momentum is
(a) 2 mv (b) mv (c) 1/2 mv (d) 0

35. Check up the only correct statement in the following
(a) a body has a constant velocity and still it can have a varying speed
(b) a body has a constant speed but it can have a varying velocity
(c) a body having constant speed cannot have any acceleration
(d) a body in motion under a force acting upon it must always have work done upon it

SECTION -B

36. 300 g of water at 25^0C is added to 100 g of ice at 0^0C. The final temperature of mixture is
(a) $-5/3^0$C (b) $-5/4^0$C (c) -5^0C (d) 0^0C

37. A thin spherical conducting shell of radius R is given a charge q. Another charge Q is placed at the centre of the shell. The electrostatic potential at the point P at a distance R/2 from the centre of the shell is
(a) $\frac{2Q}{4\pi\varepsilon_0 R} - \frac{2q}{4\pi\varepsilon_0 R}$ (b) $\frac{2Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 R}$ (c) $\frac{(q+Q)}{4\pi\varepsilon_0} + \frac{2}{R}$ (d) $\frac{2Q}{4\pi\varepsilon_0 R}$

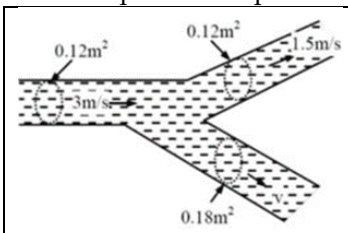
38. In α decay the kinetic energy of α particle is 48 MeV and Q value of the reaction is 50 MeV. The mass number of the mother nucleus is (Assume that the daughter nucleus is in the ground state)
(a) 96 (b) 100 (c) 104 (d) none of these

Space for rough work

39. If the de-Broglie wavelength is λ_0 for protons accelerated through 100V, then the de-Broglie wavelength for alpha particles accelerated through the same voltage will be

(a) λ_0 (b) $\frac{\lambda_0}{2}$ (c) $\frac{\lambda_0}{2\sqrt{2}}$ (d) None of these

40. An incompressible liquid flows in tube, as shown in the figure. The speed of the liquid in the lower branch will be



(a) 1.0 ms^{-1}
(b) 1.5 ms^{-1}
(c) 2.5 ms^{-1}
(d) 3.0 ms^{-1}

41. A force acts on a 30g particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$ where x is in meters and t is in seconds. The work done during the first 4 seconds is

(a) 5.28 J (b) 450 mJ (c) 490 mJ (d) 560 mJ

42. A particle is moving along a circular path with a constant speed. The acceleration of the particle is constant in

(a) magnitude (b) direction (c) both magnitude and direction (d) neither magnitude and direction

43. Equal masses of water and a liquid of density 2g/cc are mixed together, then the mixture has a density of

(a) 2/3 g/cc (b) 4/3 g/cc (c) 3/2 g/cc (d) 3 g/cc

44. The superposition takes place between two waves of frequency f and amplitude a. The maximum intensity Imax = constant ×____

(a) a (b) $2a$ (c) $2a^2$ (d) $4a^2$

45. A dip needle vibrates in the vertical plane perpendicular to the magnetic meridian. The time period of vibration is found to be 2s. The same needle is then allowed, to vibrate in the horizontal plane, and the time period is again found to be 2s. Then the angle of dip is

(a) 0^o (b) 30^o (c) 45^o (d) 90^o

46. An object will continue moving uniformly until

(a) the resultant force acting on it begins to decrease (b) the resultant force on it is zero
(c) the resultant force is at right angle to its rotation (d) the resultant force in it is increased continuously

47. The half- life period of a radioactive substance is 140 days. After how much time, 15g will decay from a 16g sample of the substance?

(a) 140 days (b) 560 days (c) 420 days (d) 280 days

48. The magnitude of electric field intensity at point B (2, 0, 0) due to a dipole of dipole moment $\vec{p} = \hat{i} + 3\hat{j}$ kept at origin is (assume that the point B is at a large distance from the dipole and $K = \frac{1}{4\pi\varepsilon_0}$)

(a) $\frac{\sqrt{13}K}{8}$ (b) $\frac{\sqrt{13}K}{4}$ (c) $\frac{\sqrt{7}K}{8}$ (d) $\frac{\sqrt{7}K}{4}$

49. There is a rough black spot on a polished metallic plate. If the plate is heated up to 1400K (approximately) and then at once taken in a dark room then

(a) in comparison with the plate, the spot will shine more
(b) in comparison with the plate, the spot will appear more black
(c) the spot and the plate will be equality bright

Space for rough work

(d) the plate and the black spot cannot be seen in the dark room

50. The temperature gradient in a 0.5m long rod is 80^0Cm^{-1}. If the temperature of the hotter end of the rod is 30^0C, then the temperature of the cooler end is

(a) 40^0C (b) -10^0C (c) 10^0C (d) 0^0C

Space for rough work

1. The oxidation state of sulphur in the anions SO_3^{2-}, $SO_4^{2-}, S_2O_4^{2-}, S_2O_6^{2-}$ is in the order of

(a) $S_2O_4^{2-} > S_2O_6^{2-} > SO_4^{2-} > SO_3^{2-}$ (b) $S_2O_6^{2-} > SO_3^{2-} > S_2O_4^{2-} > SO_4^{2-}$

(c) $SO_4^{2-} > S_2O_6^{2-} > SO_3^{2-} > S_2O_4^{2-}$ (d) $SO_3^{2-} > SO_4^{2-} > S_2O_4^{2-} > S_2O_6^{2-}$

2. Which of the following properties don't help in differentiating, different hydrated isomers of $CrCl_3.6H_2O$?

(a) Conductivity measurements (b) Precipitation by $AgNO_3$

(c) Dipole moment (d) Magnetic moment

3. The important step in the extraction of metal from carbonate ore is

(a) Calcination (b) Roasting (c) Electro – reduction (d) Cupellation

4. A tetra –atomic molecule X on reaction with nitrogen oxide (Oxidation State = (a) produces two substances Y and Z. y is a dehydrating agent while compound Z is a diatomic gas which shows almost inert gas behavior. The substances X, Y and Z are

(a) P_4, N_2O_5, O_2 (b) P_4, P_4O_{10}, Ar (c) P_4, P_2O_3, O_2 (d) P_4, P_4O_{10}, N_2

5. The electron was shown experimentally to have wave properties by

(a) de Broglie (b) Davisson and Germer (c) N. Bohr (d) Schrodinger

6. Molecular weight of oxalic acid is 126. The weight of oxalic acid required to neturalise 100cc of normal solution of $NaOH$ is

(a) 6.3 gm (b) 126 gm (c) 530 gm (d) 63 gm

7. In the estimation of sulphur organic compound on treating with conc. HNO_3 is converted to

(a) SO_2 (b) H_2S (c) H_2SO_4 (d) SO_3

8. ΔU is equal to

(a) isobaric work (b) Adiabatic work (c) Isothermal work (d) Isochoric work

9. For the decomposition of HI at $1000K\left(2HI \rightarrow H_2 + I_2\right)$, the following data were obtained

Conc. Of HI(M)	Rate of decomposition of HI(mole/unit sec)
0.1	2.75×10^{-8}
0.2	11×10^{-8}
0.3	24.75×10^{-8}

(a) 1 (b) 2 (c) 0 (d) 1.5

10. By adding inert gas at a constant volume, which of the following equilibrium will not be affected?

(a) $H_2(g) + I_2(g) \rightleftarrows 2H\,\mathrm{l(g)}$ (b) $3H_2(g) + N_2(g) \rightleftarrows 2\,NH_3(\mathrm{g})$

(c) $PCl_5(g)$ $PCl_3(g) + Cl_2(g)$ (d) All the above

Space for rough work

11. The energy of second Bohr orbit of the hydrogen atom -328 kJ mol^{-1}; hence the energy of fourth Bohr orbit would be

(a) $-41 kJ\ mol^{-1}$ (b) $-1312 kJ\ mol^{-1}$ (c) $-164 kJ\ mol^{-1}$ (d) $-82 kJ\ mol^{-1}$

12. Which substance would give a solution with a boiling point below that of pure water rather than above?

(a) Sodium chloride (solid) (b) Ethyl alcohol (liquid, b.p. $61^0 C$)

(c) Sulphuric acid (liquid, b.p.> $300^0 C$) (d) Sucrose sugar (solid)

13. For the closest packing of atoms A (radius, r_A), the maximum radius of atom B that can be fitted into Octahdral void is

(a) $0.155 r_A$ (b) $0.125 r_A$ (c) $0.414 r_A$ (d) $0.732 r_A$

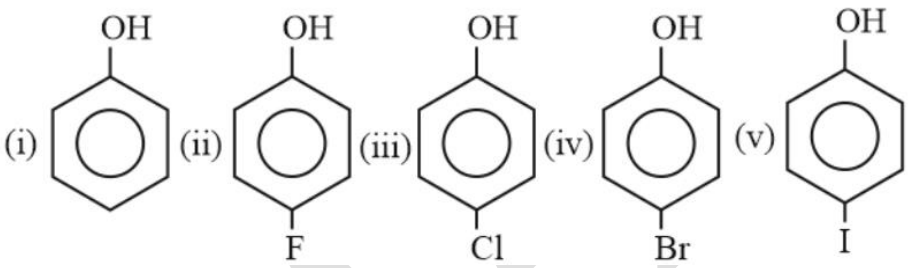
14. Marsh gas mainly contains

(a) C_2H_2 (b) CH_4 (c) H_2S (d) CO

15. The properties of the elements are the periodic function of their atomic number. The statement is given by

(a) N. Bohr (b) J. W. Dobereiner (c) D.I. Mendeleev (d) H.G.J.Mosley

16. Arrange the following structure according to their increasing order of acidic behavior in polar solvent :



(a) i<ii<v<ii<iii (b) i<v<iv<iii<ii (c) i<v<iv<ii<iii (d) ii<v<iv<iii<i

17. Which of the following is not an example of disproportionation reaction?

(a) $4ClO_3^- \rightarrow Cl^- + 3ClO_4^-$ (b) $2H_2O_2 \rightarrow 2H_2O + O_2$

(c) $2NO_2 + 2OH^- \rightarrow NO_2^- + NO_3^- + H_2O$ (d) $TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$

18. A salt MA_2 ionizes as $MA_2 \rightleftarrows M^2 + 2A^-$

It was found that a given solution of the salt had the same freezing point as solution of glucose of twice the molality. The apparent degree of ionization of the salt is

(a) 0.25 (b) 0.33 (c) 0.50 (d) 0.67

19. Calculate the number of atoms in each of the following

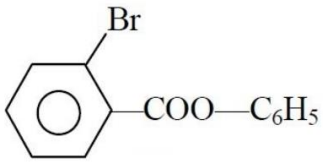
i) 52 moles of Ar ii) 52 u of He iii) 52 g of He {NA= 6.022×10^{23} }

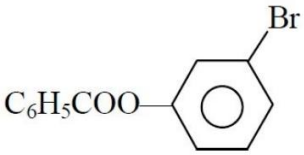
(a) $3.130 \times 10^{23}, 12, 6.8284 \times 10^{20}$ (b) $3.138 \times 10^{22}, 12, 6.7854 \times 10^{28}$

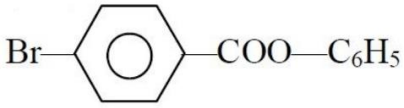
(c) $3.131 \times 10^{25}, 13, 7.8286 \times 10^{24}$ (d) $3.135 \times 10^{28}, 15, 6.7288 \times 10^{20}$

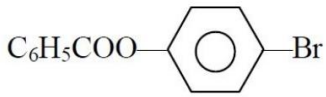
Space for rough work

20. This major product from by the monobromination of phenyl benzoate is

(a) 

(b) 

(c) 

(d) 

21. The resistance of 1N solution of acetic acid is 250 ohm, when measure in a cell having a cell constant of $1.15\,cm^{-1}$. The equivalent conduction (in $\left(\Omega^{-1}\,cm^{2}\,eq^{-1}\right)$ of 1N acetic acid is …..

(a) 18.4 (b) 9.2 (c) 4.6 (d) 2.3

22. In how many of the following molecules, all atoms are in same plane?

ClF_3	H_2O	PCl_3	BF_3
SF_4	H_2S	OCl_2	SO_3
XeF_6	NH_3	C_6H_6	XeF_2
XeF_4	PCl_5	I_2Cl_6	PH_3

(a) 12 (b) 0 (c) 10 (d) 11

23. Sodium extract is heated with concentrated HNO_3 before testing for halogens because :

(a) Ag_2S *and* $AgCN$ are soluble in acidic medium

(b) Silver halides are totally insoluble in nitric acid

(c) S^{2-} *and* CN^{-}, if present, are decomposed by conc. HNO_3 and hence do not interfere in the test

(d) Ag reacts faster with halides in acidic medium

24. The ability of an ion to bring about coagulation of a given colloid depends upon

(a) Its size (b) the magnitude of its charge only

(c) the sign of its charge (d) both the magnitude and the sign of its charge

25. If 200 mL of He at 0.66 atm and 400 mL of O_2 at 0.52 atm pressure are raised in 400 mL vessel at 20^0C then find the partial pressure of He and O_2

(a) 0.33 and 0.55 (b) 0.33 and 0.52 (c) 0.38 and 0.52 (d) 0.25 and 0.45

Space for rough work

26. The increasing order of stability of the following radicals is.

(a) $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$ (b) $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$

(c) $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$ (d) $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H$

27. For the gaseous reaction, $C_2H_4 + H_2 \rightleftarrows C_6H_6, \Delta H = -130\,kJ\,mol^{-1}$ carried n a closed vessel, the equilibrium concentration of the C_2H_6 can definitely be increased by

(a) increasing temperature and decreasing pressure
(b) decreasing temperature and increasing pressure
(c) increasing temperature and pressure both
(d) decreasing temperature and pressure both

28. In van der Waals equation of state for a real gas, the term accounts for intermolecular forces is

(a) $V_m - b$ (b) $P + \frac{a}{V_m^2}$ (c) RT (d) 1/RT

29. Addition of sodium hydroxide solution to a weak acid (HA) results in a buffer of pH 6. If ionization constant of HA is 10^{-5}, the ratio of salt to acid concentration in the buffer solution will be :

(a) 10:1 (b) 4:5 (c) 5:4 (d) 1:10

30. Identify the correct statements about borazine, $B_3N_3H_6$:

i) Borazine is aromatic
ii) There are four isomers of bi substituted molecule of Borazine molecules, $(B_3N_3H_4X_2)$.
iii) Borazine is more reactive towards addition reactions than benzene

(a) only (i) (b) (i) and (ii) (c) (ii) and (iii) (d) (i), (ii) and (iii)

31. Acetonitrile on reduction gives

(a) Proapnamine (b) methanamine (c) Ethanamine (d) Propane nitrile

32. Compound (P) forms a precipitate with $AgNO_3$. The precipitate dissolves in excess reagent (P). (P) cannot be

(a) KOH (b) KCN (c) $Na_2S_2O_3$ (d) NH_3

33. A metallic carbide on reaction with water gives a colourless gas which burns readily in air and gives a precipitate with ammonical silver nitrate solution. What is the gas evolved in reaction?

(a) CH_4 (b) C_2H_6 (c) C_2H_4 (d) C_2H_2

34. In which of the following compounds carbon is in highest oxidation state?

(a) CH_3Cl (b) CCl_4 (c) $CHCl_3$ (d) CH_2Cl_2

35. The starting material used in Solvay's process are

(a) sodium sulphate (b) Brine solution (c) Carnallite (d) All of these

Space for rough work

SECTION B

36. When $CH_2 = CH - COOH$ is reduced with $LiAlH_4$, the compound obtained will be

(a) $CH_3 - CH_2 - COOH$ (b) $CH_2 = CH - CH_2OH$

(c) $CH_3 - CH_2 - CH_2OH$ (d) $CH_3 - CH_2 - CHO$

37. What amount of bomine will be required to convert 2g of phenol into 2, 4, 6 – tribromophenol

(a) 4.00 (b) 6.00 (c) 10.22 (d) 20.44

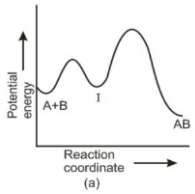
38. The natural rubber is the polymer of

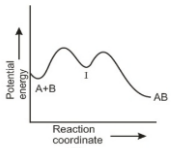
(a) 1, 3 – butadiene (b) Polyamide (c) Isoprene (d) None of these

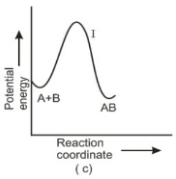
39. For an exothermic reaction, following two steps are involved.

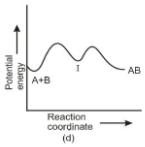
Step 1 . A+B $\rightarrow$ I (slow) Step 2. I $\rightarrow$ AB (fast)

Which of the following graphs correctly represent this reaction?

(a) 

(b) 

(c) 

(d) 

40. The solubility product of $AgCl$ is 1.8×10^{-10}. Precepitation of $AgCl$ will occur only when equal volumes of which of the following solutions are mixed?

(a) $10^{-4} M\ Ag^+ and\ 10^{-4} M\ Cl^-$ (b) $10^{-7} M\ Ag^+ and\ 10^{-7} M\ Cl^-$

(c) $10^{-5} M\ Ag^+ and\ 10^{-5} M\ Cl^-$ (d) $10^{-10} M\ Ag^+ and\ 10^{-10} M\ Cl^-$

41. Amoxicillin is semi – synthetic modification of

(a) Penicillin (b) Streptomycin (c) Tetracycline (d) Chloramphenicol

42. Which one of the following octahedral complexes will not show geometrical isomerism? (A and B are monodentate ligands)

(a) $[MA_4B_2]$ (b) $[MA_5B]$ (c) $[MA_2B_4]$ (d) $[MA_3B_3]$

43. The gas evolved on heating CH_3MgBr in methanol is :

(a) Methane (b) Ethane (c) Propane (d) HBr

44. A 0.016M of an acid solution in benzene is dropped on a water surface, the benzene evaporates and the acid forms a monomolecular film of solid type. What volume of the above solution would be required to cover a 500 surface area of water with monomolecular layer of acid? Area covered by single acid molecule is 0.2.

(a) $24.94 \times 10^{-3} ml$ (b) $25.94 \times 10^{-3} ml$ (c) $3.67 \times 10^{-3} ml$ (d) $20.78 \times 10^{6} ml$

Space for rough work

45. In the following reaction, $CH_3COCl \xrightarrow[Pd/H_2]{BaSO_4} X$ Identify X out of the following

(a) Acetaldehyde (b) Propionaldehyde (c) Acetone (d) Acetic anhydride

46. Free radicals can undergo.

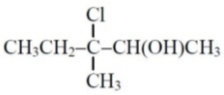
(a) Rearrangement to a more stable free radical

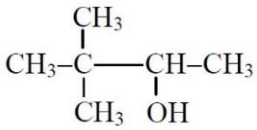
(b) Decomposition to give another free radical

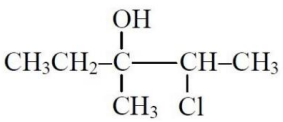
(c)Combination with other free radical

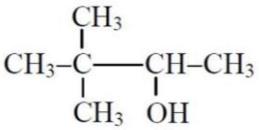
(d) All are correct.

47. The major product formed when 3 – methyl – 2 – pentene reacts with **chlorine water is**

(a) 

(b) 

(c) 

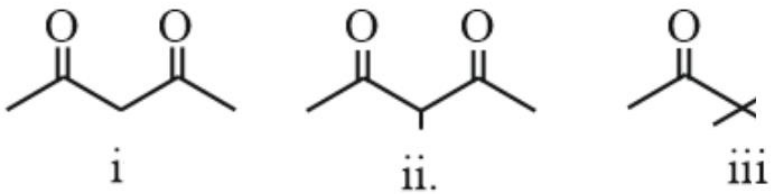
(d) 

48. Consider the reaction, $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$

What is the quantity of electricity in coulombs needed to reduce 1 mole of $Cr_2O_7^{2-}$? (Given : 1F=96500C)

(a) 5.79×10^5 (b) 5.69×10^5 (c) 5.59×10^5 (d) 5.49×10^5

49. Arrange in the order stability of enol form of the compounds:



(a) iii>ii>i (b) i>ii>iii (c) ii>i>iii (d) ii>iii>i

50. Among the following sets of bases, which set of bases is present both in DNA and RNA?

(a) Adenine, uracil, thymine (b) Adenine, guanine, cytosine

(c) Addenine, guanine, uracil (d) Adenien, guanine, thymine

Space for rough work

Section- A

01. The cross between recessive to it's hybrid or it's F_1 plant is called :-
(a) Back cross (b) Test cross (c) Monohybrid cross (d) Dihybrid cross

02. Compensation point means
(a) When the rate of photosynthesis is equal to rate of respiration
(b) When there is neither photosynthesis nor respiration
(c) When the entire food manufactured in photosynthesis remains unutilized
(d) When availability of water equalise with necessity of water.

03. The pyruvic acid formed in glycolysis is oxidized to CO_2 and H_2O in a cycle called
(a) Calvin cycle (b) Hill reaction (c) Krebs cycle (d) Nitrogen cycle

04. Which of the four couples claiming the baby with O+ blood type are possibly the biological parents of it?
(a)AB^- and A^+ (b) A+ and O^- (c) O^+ and AB^+ (d) B^- and O^-

05. Which of the following groups of marine algae is used as food?
(a) *Chlamydomonas*, *Volvox* and *Gracilaria* (b) *Porphyra*, *Laminaria* and *Sargassum*
(c) *Laminaria* and *Gracilaria* (d) *Porphyra* and *Chlamydomonas*

06. Which of the following compounds is used directly to build proteins –
(a) NH_3 (b) N_2 (c) Nitrate (d) Nitrite

07. Which pigment system immediately donates e– for the reduction of NADP.
(a) PS II (b) PS I (c) CO_2 (d) Plastoquinone

08. Photosynthetic pigment(s) of class–Rhodophyceae (red algae) is/are
(a) chlorophyll-*a* and *b* (b) chlorophyll-*a* and *c* (c) chlorophyll-*a* only (d) chlorophyll-*a* and *d*

09. Permanent localised qualitative change in size, biochemistry, structure and function of cells, tissues or organs is called
(a) cell division (b) meristematic division (c) differentiation (d) dedifferentiation

10. Which gases are responsible for increasing the temperature of atmosphere?
(a) CO, NO_2, H_2S (b) CO_2, CO, NO (c) CH_4, CO_2, N_2O (d) NO_2, H_2S, CO_2

11. Carbohydrates, the most abundant biomolecules on earth, are produced by :
(a) all bacteria, fungi and algae (b) fungi, algae and green plant cells
(c) some bacteria, algae and green plants cells (d) viruses, fungi and bacteria

12. FADH2 produced in Kreb's-cycle from –
(a) Isocitrate (b) a - ketoglutarate (c) succinate (d) malate

13. Microbes are diverse which include
A. Bacteria B. Mosses C. Protozoans D. Fungi
(a) A, C, D (b) A, D (c) A, B (d) C, D

14. The termI' antibioticI' was coined by: -
(a) Edward Jenner (b) Louis Pasteur (c) Selman Waksman (d) Alexander Fleming

15. Edible part of Ginger is
(a) Corm (b) Rhizome (c) Bulb (d) Tuber

16. Which two of the, following changes (A - D) usually tend to occur in the plain dwellers when they move to high altitudes (3,500 m or more)?
(A) Increase in red blood cell size. (B) Increase in red blood cell production
(C) Increased breathing rate (D) Increase in thrombocyte count

Space for rough work

Changes occurring are :
(a) (A) and (B) (b) (B) and (C) (c) (C) and (D) (d) (A) and (D)

17. Increasing skin cancer and high mutation rate are the result of
(a) Ozone depletion (b) Acid rain (c) CO pollution (d) CO_2 pollution

18. Difference between kinetin and zeatin is
(a) kinetin is active, while zeatin is non-active (b) zeatin is active, while kinetin is non-active
(c) zeatin is synthetic, while kinetin is natural (d) zeatin is natural, while kinetin is synthetic

19. If 25 ppm amount of 2, 4 - D is required to perform a plant function, what amounts of 2, 4 - D are require for making 5 litre, 10 litre and 15 litre solutions respectively? (Molecular weight of 2, 4 - D= Approx 220)
(a) 0.125 g, 0.250 g, 0.375 g (b) 0.250 g, 0.500 g, 1.000 g
(c) 1.000 g, 0.500 g, 0.250 g (d) 0.375 g, 0.250 g, 0.125 g

20. Penicillin is obtained from : -
(a) Yeast (b) Bacteria (c) Fungi (d) Algae

21. Active loading of sugar into a sieve tube is probably driven by
(a) Gravity (b) Water flow (c) Proton pumps (d) Solar radiation

22. DNA recombinent technique can be
(a) Harmful (b) Useful (c) Both, harmful and useful (d) Neither harmful nor useful

23. Water potential can be calculated by
(a) OP + TP (b) π + WP (c) Ψ + PW (d) π + TP

24. Which one prevents premature fall of fruits
(a) NAA (b) Ethylene (c) GA_3 (d) Zeatin

25. Quarantine regulation is meant for
(a) Preventing entry of diseased plants/pathogen/wild plants of the country
(b) Spraying diseased plants with insecticides
(c) Promoting dry farming
(d) Growing fruit trees in all the states

26. Which one is false?
(a) GA_3 is used to speed up the malting process in brewing industry
(b) Spraying juvenile conifers with Gas hastens the maturity, thus leading to early seed production
(c) GA_3 is a commercially available gibberellin
(d) GA_3 cannot increase the length of internode in sugarcane

27. Auxenic culture is
(a) Pure culture without any contamination (b) Pure culture without any nutrient
(c) Culture of a tissue (d) Culture of gene

28. Xylem translocates
(a) water and mineral salts only
(b) water, mineral salts and some organic nitrogen only
(c) water, mineral salts, some organic nitrogen and hormoens
(d) water only

Space for rough work

29. A compound leaf which appears simple due to suppression of 1-2 lateral leaflets is found in
(a) *Hardwickia* (b) *Parkinsonia* (c) *Citrus* (d) *Coriandrum*

30. Widening of tree trunk is mostly due to the activity of
(a) Phelloderm (b) Fascicular cambium (c) 1^0 xylem (d) 2^0 phloem

31. The most abundant prokaryotes helpful to humans in making curd from milk and in production of antibiotics are ones categorised as :
(a) Chemosynthetic autotrophs (b) Heterotrophic bacteria (c) Cyanobacteria (d) Archaebacteria

32. Total number of centres of origin of crop plants given by Vavilov is
(a) 2 (b) 4 (c) 8 (d) 11

33. Chernobyl nuclear tragedy occurred in
(a) April 26, 1986 (b) August 6, 1945 (c) August 9, 1945 (d) December 3, 1984

34. Green revolution started in
(a) 1970 (b) 1960 (c) 1950 (d) 1975

35. During secondary growth, a complete ring is formed by
(a) Only fascicular cambia
(b) Only interfascicular cambia
(c) Fascicular (vascular) cambia and interfascicular cambia
(d) Fascicular cambia + Phellogen

Section B

36. Two allelic genes are located on :
(a) The same chromosome (b) Two homologous chromosomes
(c) Two-non-homologous chromosomes (d) Any two chromosomes

37. "Molecular scissors" used in genetic engineering is
(a) Helicase (b) DNA ligase (c)DNA polymerase (d) Restriction endonuclease

38. Monocot root differ from dicot root in having
(a) Polyarch xylem bundles (b) Large and well developed pith
(c) Both (d) Radial vascular Bundle and exarch xylem

39. The zone of atmosphere in which the ozone layer is present is called : -
(a) Ionosphere (b) Mesosphere (c) Stratosphere (d) Troposphere

40. Bryophytes are of
(a) Great economic value (b) No value at all
(c) Great ecological importance (d) A lot of aesthetic value

41. Unidirectional flow of electrons in photophosphorylation takes place in
(a) Cyclic (b) Non-cyclic (c) Pseudocyclic (d) All the above

42. Stomata open because of
(a) Oxygen in the air
(b) Increased turgidity of the guard cells brought about by exposure to light
(c) Vacuoles in guard cells
(d) All the above

Space for rough work

43. What is the probability of homozygous plants for both dominant characters in F_2 generation of a dihybrid cross :-
(a) 1/16 (b) 3/16 (c) 4/16 (d) 9/16

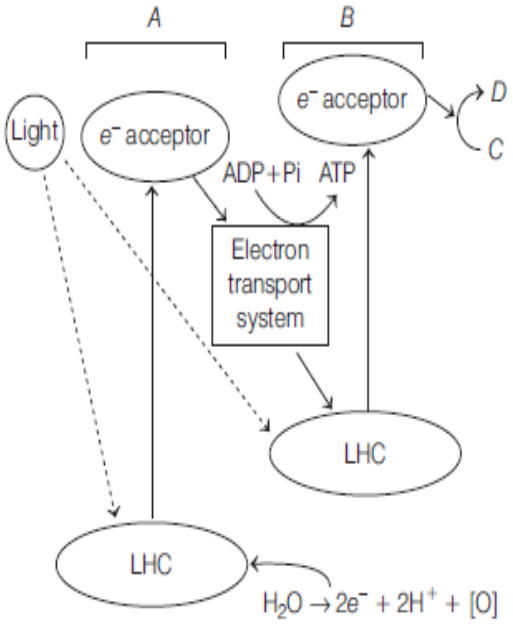
44. C4 plants are found among
(a) Only Gramineae (b) Only monocot (c) Only dicot (d) Monocots as well as dicots

45. RQ is less than one for :-
(a) Proteins and organic acids (b) Fatty acids and organic acids
(c) Fatty acids and proteins (d) Proteins and carbohydrates

46. Example of coenocytic algae is
(a) Vaucheria (b) Chara (c) Nostoc (d) Polysiphonia

47. Active absorption of water be lower & NaCI solution would be greater
(a) Tension in cell sap due to transpiration (b) Hydrophobic nature of root hair
(c) Typical tissue organization (d) Osmotic concentration of cell sap

48. Given below is the diagrammatic representation of the Z-scheme of light reaction of photosynthesis. Identify *A, B, C* and *D* select the correct option accordingly.



	A	B	C	D
(a)	Photosystem -I	Photosystem -II	$NADP^+$	NADPH
(b)	Photosystem-II	Photosystem-I	$NADP^+$	NADPH
(c)	Photosystem-I	Photosystem-II	NADPH	$NADP^+$
(d)	Photosystem-II	Photosystem-I	NADPH	$NADP^+$

49. Superority of hybrid over parent is
(a) Heterosis (b) Selection
(c) Hybridized progeny (d) Hybrid vigour

50. Calculate total production of ATP in aerobic glycolysis
(a) Two (b) four (c) Eight (d) Ten

Space for rough work

Section A

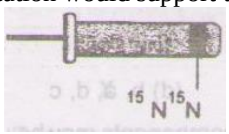
01. Which of the following are protozoans?
(a) Diatoms, flagellates, ciliates
(b) Desmids, flagellates, ciliates
(c) Amoeboid, flagellates, ciliates, sporozoans
(d) Amoeba, Paramecium, dinoflagellates, Plasmodium

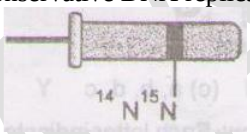
02. One of the primary character of chordates is
(a) Solid ventral nerve cord (b) Dorsal tubular nerve cord
(c) Paired nerve cord (d) Ganglionated nerve cord

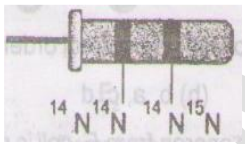
03. The part of fallopian tube closer to the ovary is
(a) Isthmus (b) Funnel shaped infundibulum
(c) Vestibule (d) Ampulla

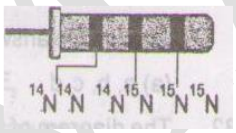
04. Vasectomy is :-
(a) Cutting of fallopian tube
(b) Cutting of vasdeferens
(c) Factor of population growth
(d) None of these

05. You tkae E. Coli that has grown in a medium containing only heavy nitrogen (^{15}N) and transfer a smaple to a medium containing light nitrogen (^{14}N). After allowing time for generation, you centrifuge the sample in cesium chloride density gradient. Which band location would support the semiconservative DNA replication after two generation..

(a) 

(b) 

(c) 

(d) 

06. A cross between F_1 hybrid and a recessive parent (Tt x tt) gives a ratio of –
(a) 1 : 1 (b) 2 : 1 (c) 3 : 1 (d) 4 : 1

07. Human foot consists of 26 bones. What are the number of tarsals (anlde bones), metatarsals and phalanges?
(a) 7, 5, 14 (b) 5, 7, 14 (c) 1, 1, 5 (d) 5, 5, 5

08. Oxygen dissociation curve is-
(a) J-shaped (b) S-shaped (c) L-shaped (d) Zig-zag

09. Mitotic telophase shows which of the following events -
(a) Arrival of chromosomes cluster at opposite pole and loss of their identify as discrete elements
(b) NM assembles around each chromosomes clusters
(c) Nucleolus, GB and ER form

Space for rough work

(d) All

10. Euglenoids e.g. Euglena are found
(a) In fresh running water
(b) In fresh stragnant water
(c) In marine environment
(d) In both fresh and marine water

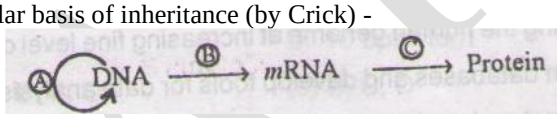
11. An allergic reaction is initiated by antibodies of the
(a) IgG group (b) IgM group (c) IgA group (d) IgE group
12. Of the 4 most abundant elements in most plants [C, H, O and N], which does a terrestrial green plant procure mainly through its roots from the soil?
(a) H and O (b) H and N (c) C and O (d) O and N

13. All Bowman's capsules of the kidney are found in
(a) Pelvis (b) Cortex (c) Medulla (d) None of these

14. Which of the following is not a part of respiratory tract
(a) Nasal chamber (b) Oesophagus (c) Pharynx (d) Trachea

15. The effect of mineral deficiencies involving fairly mobile nutrients will be observed in –
(a) Older portions of the plant (b) New leaves and shoot
(c) The root system (d) The color of leaves

16. Complete the central dogma of molecular basis of inheritance (by Crick) -



(a) A - Replication, B - Transcription, C - Translation
(b) A - Replication, B - Termination, C - Translation
(c) A - Replication, B - Translocation, C - Translation
(d) A - Replication, B - Transposition, C – Translation

17. How many pairs of autosomes are found in human?
(a) 46 (b) 23 (c) 1 (d) 22

18. In fluid mosaic model of plasma membrane : -
(a) Upper layer is non - polar and hydrophilic (b) Polar layer is hydrophobic
(c) Phospholipids form a bimolecular layer in middle part (d) Proteins form a middle layer

19. Number of the bones in human appendicular skeleton is-
(a) 80 (b) 120 (c) 126 (d) 206

20. The glomerular capillaries cause filtration of blood through _____ layers-
(a) 1 (b) 2 (c) 3 (d) 6

21. Hierarchy of categories of Carolus Linnaeus had categories except
(a) Genus and species (b) Order and class
(c) Kingdom and class (d) Phylum and family

22. Receptors for protein hormones are located
(a) In cytoplasm (b) On cell surface

Space for rough work

(c) In nucleus (d) On endoplasmic reticulum

23. Cavity of vitreous humour in the eyes are situated
(a) Behind the lens (b) Infront of the lens
(c) Behind the retina (d) Between the retina and sclerotic

24. Gestation period is the duration
(a) of fertilization (b) Between egg growth and ovulation
(c) Between fertilization and parturition (d) None of the above

25. Given below are four methods (A–D) and their modes of action (a–d) in achieving contraception. Select their correct matching from the four options that follow Method Mode of Action A. The pill (a) Prevents sperms reaching cervix B. Condom (b) Prevents implantation C. Vasectomy (c) Prevents ovulation D. Copper T (d) Semen contains no sperms Matching :-

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

26. If heart of a mammal was injected with 2% $CaCl_2$ solution, then
(a) Heart beat will increase (b) Heart beat will decrease
(c) Heart beat will stop (d) No effect

27. During copulation in earthworms, the sperms are transferred between copulating individuals from -
(a) Female genital pore to spermathecae (b) Male pores to spermathecae
(c) Spermathecae to cocoons (d) Male pores to outside

28. Golgibody orginates from : -
(a) E. R. (b) Mitochondria (c) Nucleus (d)Proplastid

29. Which of the following statement are correct about the forewings in cockroach?
(a) They are mesothoracic
(b) They are opaque, dark and leathery and cover hindwing when at rest
(c) They are not used in flight
(d) All

30. Which of the following organs has 3 parts (ascending, transverse and descending parts)
(a) Colon (b) Caecum (c) Small intestine (d) Large intestine

31. The functioning of the kidneys is efficiently monitored and regulated by hormonal feedback mechanisms involving -
(a) Hypothalamus only (b) JGA only (c) The heart only (d) Hypothalamus, JGA and heart (to certain extent)

32. In male cockroach, genital pouch / chamber lies at the hind end of abdomen bounded dorsally by _____ and _____ and ventrally by _____ sternum
(a) 9th, 10th, 11^{th} (b) 9th, 10th, 12^{th} (c) 8th, 9th, 13^{th} (d) 9th, 10th, 9^{th}

33. Perception of colour is possible among
(a) Birds (b) Reptiles (c) Men (d) Both (a) and (c)

Space for rough work

34. Absorption of digested food is carried out by -
(a) Passive method (b) Active transport (c) Facilitated transport (d) All

35. Endocrine glands produce or Action of endocrine glands is mediated through
(a) Hormones (b) Enzymes (c) Minerals (d) Vitamins

Section B

36. What is the work of copper T-
(a) To inhibit ovulation (b) To prevent fertilization
(c) To inhibit implantation of blastocyst (d) To inhibit gametogenesis

37. Inadequate production of STH in early life may result in
(a) Gigantism (b) Acromegaly (c) Sterility (d) Dwarfism

38. Which of the following groups of animals is uricotelic?
(a) Reptiles (b) Insects (c) Birds and land snailC (d) All

39. Expiration is related to
(a) Apneustic nucleus & external intercostal muscle
(b) Pneumotaxis nucleus & external intercostal muscle
(c) Apneustic nucleus & internal intercostal muscal
(d) Pneumotaxis nucleus & internal intercostal muscle

40. All of the following structures are situated in the renal cortex except-
(a) Loop of Henle (b) Malpighian corpuscle
(c) PCT (d) DCT

41. Which hormone is secreted more in dark condition
(a) Insulin (b) Adrenalin (c) Thyroxine (d) Melatonin

42. Arrangement of microtubules in centriole is :
(a) 9 + 2 (b) 2 + 9 (c) 11 + 0 (d) 9 + 0

43. Vegetation of any place is primarily determined by
(a) Rainfall (b) Amount of soil water (c) Soil type (d) Amount of light

44. DNA is not found in : -
(a) Nucleus (b) Mitochondria (c) Chloroplast (d) Ribosome

45. Which of following is a true fish
(a) Dog fish (b) Silver fish (c) Star fish (d) Whale

46. Haemophilia is more common in males because it is a –
(a) Recessive trait carried by X chromosome (b) Dominant trait carried by X chromosome
(c) Recessive character carried by Y chromosomes (d) Dominant character carried by Y chromosome

47. Which of the following is false regarding the respiratory system of cockroach?
(a) Opening of spiracles is regulated by sphincters (b) Exchange of gases take place at the tracheoles by diffusion
(c) Oxygen carrying respiratory pigment is haemoerythrin (d) Trachea has non-collapsible wall

Space for rough work

48. Conduction of an impulse along the axon is associated with the
(a) Resting potential (b) Cl^- concentration (c) Strength of an impulse (d) Action potential

49. Select the Incorrect statement:
(a) In developing countries, agrochemicals are very expensive to farmers.
(b) During green revolution, food production was tripled.
(c) Bt toxin is carbohydrate by nature.
(d) Post harvest losses can be reduced by genetic modification of plants.

50. Which microbial product in related with monascus purpureus?
(a) Statins (b) Cyclosporin
(c) Acetic acid (d) Butyric acid

Space for rough work