

# BHU (Mains)

## Medical Entrance Exam

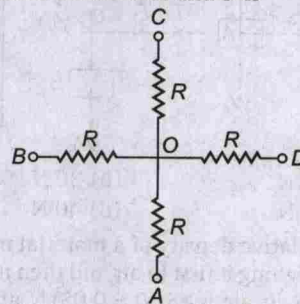
### Solved Paper 2009

#### Section A

- In a double slit experiment  $D = 1 \text{ m}$ ,  $d = 0.2 \text{ cm}$  and  $\lambda = 6000 \text{ \AA}$ . The distance of the point from the central maximum where intensity is 75% of that at the centre will be  
 (a) 0.01 mm (b) 0.03 mm  
 (c) 0.05 mm (d) 0.1 mm
- The transfer ratio  $\beta$  of a transistor is 50. The input resistance of the transistor when used in the common emitter mode is  $1 \text{ k}\Omega$ . The peak value of the collector alternating current for an input peak voltage of  $0.01 \text{ V}$  is  
 (a)  $100 \mu\text{A}$  (b)  $500 \mu\text{A}$   
 (c)  $0.01 \mu\text{A}$  (d)  $0.25 \mu\text{A}$
- The recoil speed of a hydrogen atom after it emits a photon in going from  $n = 5$  state to  $n = 1$  state is  
 (a)  $4.718 \text{ ms}^{-1}$  (b)  $7.418 \text{ ms}^{-1}$   
 (c)  $4.178 \text{ ms}^{-1}$  (d)  $7.148 \text{ ms}^{-1}$
- Ultraviolet light wavelength  $300 \text{ nm}$  and intensity  $1.0 \text{ Wm}^{-2}$  falls on the surface of a photoelectric material. If one percent of the incident photons produce photoelectrons, then the number of photoelectrons emitted per second from an area of  $1.0 \text{ cm}^2$  of the surface is nearly  
 (a)  $9.61 \times 10^{14}$  (b)  $4.12 \times 10^{13}$   
 (c)  $1.51 \times 10^{12}$  (d)  $2.13 \times 10^{11}$
- An LCR series circuit containing a resistance of  $120 \Omega$  has angular resonance frequency  $4 \times 10^5 \text{ rad s}^{-1}$ . At resonance the voltage across resistance and inductance are  $60 \text{ V}$  and  $40 \text{ V}$  respectively. The values of  $L$  and  $C$  are  
 (a)  $0.2 \text{ mH}$ ,  $\frac{1}{32} \mu\text{F}$  (b)  $0.4 \text{ mH}$ ,  $\frac{1}{16} \mu\text{F}$   
 (c)  $0.2 \text{ mH}$ ,  $\frac{1}{16} \mu\text{F}$  (d)  $0.4 \text{ mH}$ ,  $\frac{1}{32} \mu\text{F}$
- A toroidal solenoid with an air core has an average radius of  $15 \text{ cm}$ , area of cross-section  $12 \text{ cm}^2$  and  $1200$  turns. Ignoring the field variation across the cross-section of the toroid, the self-inductance of the toroid is  
 (a)  $4.6 \text{ mH}$  (b)  $6.9 \text{ mH}$   
 (c)  $2.3 \text{ mH}$  (d)  $9.2 \text{ mH}$

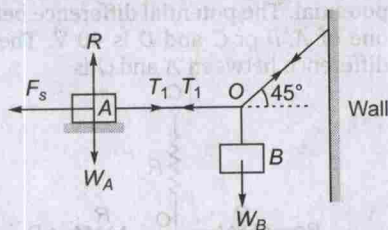
#### PHYSICS

- Each atom of an iron bar ( $5 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ ) has a magnetic moment  $1.8 \times 10^{-23} \text{ Am}^2$ . Knowing that the density of iron is  $7.78 \times 10^3 \text{ kg m}^{-3}$ , atomic weight is  $56$  and Avogadro's number is  $6.02 \times 10^{23}$  the magnetic moment of bar in the state of magnetic saturation will be  
 (a)  $4.75 \text{ Am}^2$  (b)  $5.74 \text{ Am}^2$   
 (c)  $7.54 \text{ Am}^2$  (d)  $75.4 \text{ Am}^2$
- A current of  $1 \text{ A}$  is flowing on the sides of an equilateral triangle of sides  $4.5 \times 10^{-2} \text{ m}$ . The magnetic field at the centroid of the triangle is  
 (a)  $2 \times 10^{-5} \text{ T}$  (b)  $4 \times 10^{-5} \text{ T}$   
 (c)  $8 \times 10^{-5} \text{ T}$  (d)  $1.2 \times 10^{-4} \text{ T}$
- The given four terminal network is part of a larger circuit. The points  $A, B, C$  are at the same potential. The potential difference between any one of  $A, B$  or  $C$  and  $D$  is  $40 \text{ V}$ . The potential difference between  $A$  and  $O$  is



- (a)  $10 \text{ V}$  (b)  $15 \text{ V}$   
 (c)  $18 \text{ V}$  (d)  $20 \text{ V}$
- A charged dust particle of radius  $5 \times 10^{-7} \text{ m}$  is located in a horizontal electric field having an intensity of  $6.28 \times 10^5 \text{ Vm}^{-1}$ . The surrounding medium is air with coefficient of viscosity  $\eta = 1.6 \times 10^{-5} \text{ N-sm}^{-2}$ . If this particle moves with a uniform horizontal speed  $0.02 \text{ ms}^{-1}$ . Find the number of electrons on it.  
 (a) 10 (b) 20  
 (c) 30 (d) 40

11. A and B are two points on a uniform metal ring whose centre is O. The angle  $AOB = \theta$ . A and B are maintained at two different constant temperatures. When  $\theta = 180^\circ$ , the rate of total heat flow from A to B is 1.2 W. When  $\theta = 90^\circ$ , this rate will be  
 (a) 0.6 W (b) 0.9 W  
 (c) 1.6 W (d) 1.8 W
12. 1 g of water on evaporation at atmospheric pressure forms  $1671 \text{ cm}^3$  of steam. Heat of vaporisation at this pressure is  $540 \text{ cal g}^{-1}$ . The increase in internal energy is  
 (a) 250 cal (b) 500 cal  
 (c) 1000 cal (d) 1500 cal
13. In a hall, a person receives direct sound waves from a source 120 m away. He also receives waves from the same source which reach him after being reflected from the 25 m high ceiling at a point half-way between them. The two waves interfere constructively for wavelengths (in metre) of  
 (a)  $10, 5, \frac{5}{2}$  (b)  $20, \frac{20}{3}, \frac{20}{5}$  ...  
 (c) 30, 20, 10 ... (d) 35, 25, 15 ...
14. The block A in figure weighs 100 N. The coefficient of static friction between the block and table is 0.25. The maximum weight of block B for which the system is in equilibrium is



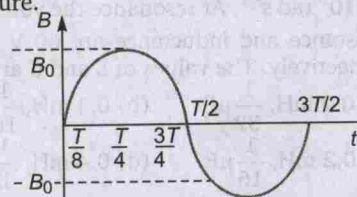
- (a) 25 N (b) 30 N  
 (c) 35 N (d) 40 N
15. The relative density of a material may be found by weighing it first in air and then in water. If its weight in air is  $(5.00 \pm 0.05) \text{ N}$  and weight in water is  $(4.00 \pm 0.05) \text{ N}$ . Then the relative density along with maximum permissible error will be quoted as  
 (a)  $5.0 \pm 11\%$  (b)  $5.0 \pm 6\%$   
 (c)  $5.0 \pm 1\%$  (d)  $1.25 \pm 5\%$
16. A parachutist drops freely from an airplane for 10 s before the parachute opens. He then descends with a uniform retardation of  $2.5 \text{ ms}^{-2}$ . If he bails out of the plane at a height of 2495 m and  $g$  is  $10 \text{ ms}^{-2}$ , his velocity on reaching the ground will be

- (a)  $5 \text{ ms}^{-1}$  (b)  $10 \text{ ms}^{-1}$   
 (c)  $15 \text{ ms}^{-1}$  (d)  $20 \text{ ms}^{-1}$

17. A man crosses a 320 m wide river perpendicular to the current in 4 min. If in still water he can swim with a speed  $5/3$  times that of the current, then the speed of the current, in  $\text{mm}^{-1}$  is  
 (a) 30 (b) 40  
 (c) 50 (d) 60
18. An aeroplane is flying in a horizontal direction with a velocity of  $600 \text{ kmh}^{-1}$  and at a height of 1960 m. When it is vertically above the point A, on the ground, a body is dropped from it. The body strikes the ground at point B. Then distance AB is  
 (a) 5.8 km (b) 4.7 km  
 (c) 3.3 km (d) 2.0 km
19. A horizontal heavy uniform bar of weight  $W$  is supported at its ends by two men. At the instant, one of the men lets go off his end of the rod, the other feels the force on his hand changed to  
 (a)  $w$  (b)  $w/2$   
 (c)  $3w/4$  (d)  $w/4$
20. The speed with which the earth have to rotate on its axis so that a person on the equator would weigh  $(3/5)^{\text{th}}$  as much as present.

[Radius of earth = 6400 km]

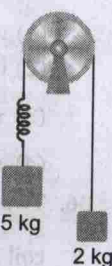
- (a)  $4.83 \times 10^{-3} \text{ rad s}^{-1}$  (b)  $5.41 \times 10^{-3} \text{ rad s}^{-1}$   
 (c)  $7.82 \times 10^{-4} \text{ rad s}^{-1}$  (d)  $8.88 \times 10^{-14} \text{ rad s}^{-1}$
21. The rate of flow of glycerine of density  $1.25 \times 10^3 \text{ kgm}^{-3}$  through the conical section of a pipe if the radii of its ends are 0.1 m and 0.04 m and the pressure drop across its length  $10 \text{ Nm}^{-2}$  is  
 (a)  $6.93 \times 10^{-4} \text{ m}^3 \text{ s}^{-1}$  (b)  $7.8 \times 10^{-4} \text{ m}^3 \text{ s}^{-1}$   
 (c)  $10.4 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$  (d)  $14.5 \times 10^{-5} \text{ m}^3 \text{ s}^{-1}$
22. A magnetic field is applied perpendicular to the plane of a flat coil of coppered wire. The time variation of the magnetic flux density is given by  $B_0 \sin(2\pi t/T)$ , as shown graphically in the figure.



At which of the following values of  $t$  is the magnitude of the emf induced in the coil is maximum?

- (a)  $\frac{T}{8}$  (b)  $\frac{T}{4}$   
 (c)  $\frac{3T}{8}$  (d)  $\frac{T}{2}$

23. System shown in the figure is released from rest with mass 2 kg in contact with ground. Pulley and spring are massless and the friction is absent everywhere. The speed of 5 kg block when 2 kg block leaves the contact with the ground is (force constant of spring  $k = 40 \text{ Nm}^{-1}$  and  $g = 10 \text{ ms}^{-2}$ )



- (a)  $\sqrt{2} \text{ ms}^{-1}$  (b)  $2\sqrt{2} \text{ ms}^{-1}$   
(c)  $2 \text{ ms}^{-1}$  (d)  $4\sqrt{2} \text{ ms}^{-1}$

24. If the intermolecular forces vanish away, the volume occupied by the molecules contained in 4.5 kg water of NTP will be given by

- (a)  $5.6 \text{ m}^3$  (b)  $4.5 \text{ m}^3$   
(c)  $11.2 \text{ m}^3$  (d)  $5.6 \text{ L}$

25. In a Young's double slit experiment, the source slit  $S$ , and the two slits  $A$  and  $B$  are horizontal. With slit  $A$  above  $B$ , the fringes are observed on a vertical screen  $k$ . The optical path length from  $S$  to  $B$  is increased very slightly (by introducing a transparent material of higher refractive index) and the optical path length from  $S$  to  $A$  is not changed. As a result the fringe system on  $k$  moves

- (a) vertically downward slightly  
(b) vertically upwards slightly  
(c) horizontally slightly to the left  
(d) horizontally slightly to the right

## Section B

**Directions** In the following items, more than one of the answers given may be correct. Select the correct answers and marks it according to the codes.

**Codes :**

- (a) 1, 2 and 3 are correct  
(b) 1 and 2 are correct  
(c) 2 and 4 are correct  
(d) 1 and 3 are correct

26. Which of the following are diamagnetic substances ?

- (1) Water (2) Bismuth  
(3) Copper (4) Calcium

27. When photons of energy 4.25 eV strike the surface of metal  $A$ , the ejected photoelectrons have maximum kinetic energy,  $T_A$  eV and de-Broglie wavelength  $\lambda_A$ . The maximum kinetic energy of photoelectrons liberated from another metal  $B$  by photons of energy 4.70 eV is  $T_B = (T_A - 1.50)$  eV. If the de-Broglie wavelength of these photoelectrons is  $\lambda_B = 2\lambda_A$ , then

- (1) the work function of  $A$  is 2.25 eV  
(2) the work function of  $B$  is 4.20 eV  
(3)  $T_A = 2.00$  eV  
(4)  $T_B = 2.75$  eV

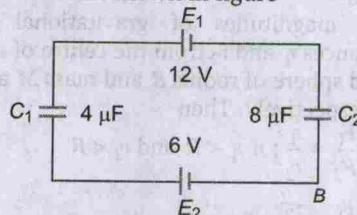
28. If two orthogonal SHM of same frequency having initial phase difference of  $\pi/2$  acts simultaneously on a particle free to move, the particle can move in a

- (1) straight line (2) circle  
(3) parabola (4) ellipse

29. In Young's double slit experiment, the interference pattern is found to have an intensity ratio between bright and dark fringe as 9. This implies

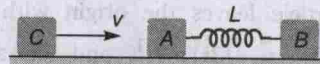
- (1) the intensities at the screen due to the two slits are 5 and 4 units  
(2) the intensities at the screen due to the two slits are 4 and 1 units  
(3) the amplitude ratio is 3  
(4) the amplitude ratio is 2

30. In the circuit shown in figure



- (1) the charge on  $C_2$  is greater than on  $C_1$   
(2) the charges on  $C_1$  and  $C_2$  are same  
(3) potential difference across  $C_1$  and  $C_2$  are same  
(4) potential difference across  $C_1$  is greater than across  $C_2$

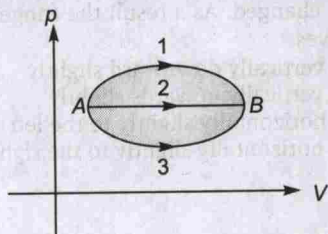
31. Two blocks  $A$  and  $B$  each of mass  $m$  are connected by massless spring of natural length  $L$  and spring constant  $k$ . The blocks are initially resting on a smooth horizontal floor with the spring at its natural length as shown in figure. A third identical block  $C$  also of mass  $m$  moves on the floor with a speed  $v$  along the line joining  $A$  and  $B$  and collides elastically with  $A$ , then



- (1) the maximum compression of the spring is  $v\sqrt{m/k}$   
(2) the maximum compression of the spring is  $v\sqrt{m/2k}$

- (3) the kinetic energy of the A-B system at maximum compression of the spring is zero  
 (4) the kinetic energy of the A-B system at maximum compression of the spring is  $\frac{mv^2}{4}$

32. A gas undergoes the change in its state from position A to position B via three different paths as shown in figure. Select the correct alternative(s).



- (1) temperature of the gas first increases and then decreases continuously in path 1  
 (2) heat absorbed/released by the gas is maximum in path 1  
 (3) change in internal energy in all the three paths is equal  
 (4) in all the three paths heat is absorbed by the gas

33. The magnitudes of gravitational field at distances  $r_1$  and  $r_2$  from the centre of a uniform solid sphere of radius  $R$  and mass  $M$  are  $F_1$  and  $F_2$  respectively. Then

(1)  $\frac{F_1}{F_2} = \frac{r_1}{r_2}$ ; if  $r_1 < R$  and  $r_2 < R$

(2)  $\frac{F_1}{F_2} = \frac{r_2^2}{r_1^2}$ ; if  $r_1 > R$  and  $r_2 > R$

(3)  $\frac{F_1}{F_2} = \frac{r_1}{r_2}$ ; if  $r_1 > R$  and  $r_2 > R$

(4)  $\frac{F_1}{F_2} = \frac{r_1^2}{r_2^2}$ ; if  $r_1 < R$  and  $r_2 < R$

34. Resolving power of reflecting type telescope increases with

- (1) decrease in wavelength of incident light  
 (2) increase in wavelength of incident light  
 (3) increase in diameter of objective mirror  
 (4) None of the above

35. A particle leaves the origin with an initial velocity  $\vec{u} = (3\hat{i}) \text{ ms}^{-1}$  and at a constant acceleration  $\vec{a} = (-1.0\hat{i} - 0.5\hat{j}) \text{ ms}^{-2}$ . Its velocity  $v$  and position vector  $\vec{r}$  when it reaches its maximum x-coordinate are

(1)  $v = -2\hat{j} \text{ ms}^{-1}$

(2)  $v = (-1.5\hat{j}) \text{ ms}^{-1}$

(3)  $\vec{r} = (4.5\hat{i} - 1.25\hat{j}) \text{ m}$

(4)  $\vec{r} = (4.5\hat{i} - 2.25\hat{j}) \text{ m}$

36. Two different coils have self-inductances,  $L_1 = 8 \text{ mH}$  and  $L_2 = 2 \text{ mH}$ . The current in one coil is increased at a constant rate. The current in the second coil is also increased at the same constant rate. At a certain instant of time, the power is given to the two coils is the same. At that time, the current, the induced voltage and the energy stored in the first coil are  $i_1$ ,  $V_1$  and  $W_1$  respectively. Corresponding values for the second coil at the same instant are  $i_2$ ,  $V_2$  and  $W_2$  respectively, Then

(1)  $\frac{i_1}{i_2} = \frac{1}{4}$                       (2)  $\frac{V_1}{V_2} = 4$

(3)  $\frac{W_1}{W_2} = \frac{1}{4}$                       (4)  $\frac{i_1}{i_2} = 4$

37. At ordinary temperatures, the molecules of an ideal gas have only translational and rotational kinetic energies. At high temperatures they may also have vibrational energy. As a result of this at higher temperatures ( $C_V =$  molar heat capacity at constant volume)

(1)  $C_V = \frac{3}{2}R$  for a monoatomic gas

(2)  $C_V > \frac{3}{2}R$  for a monoatomic gas

(3)  $C_V > \frac{5}{2}R$  for a diatomic gas

(4)  $C_V < \frac{5}{2}R$  for a diatomic gas

38. Let  $\bar{v}$ ,  $v_{\text{rms}}$  and  $v_{\text{mp}}$  respectively denote the mean speed, root mean square speed, and most probable speed of the molecules in an ideal monoatomic gas at absolute temperature  $T$ . The mass of a molecule is  $m$ . Then

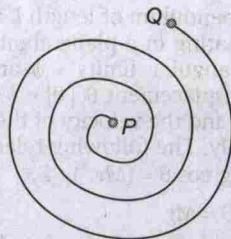
(1)  $v_{\text{mp}} < \bar{v} < v_{\text{rms}}$

(2) no molecule can have a speed greater than  $\sqrt{2}v_{\text{rms}}$

(3) the average kinetic energy of a molecule is  $\frac{3}{4}mv_{\text{mp}}^2$

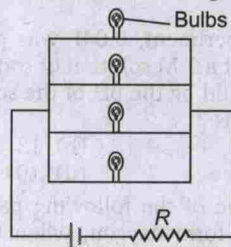
(4) no molecule can have a speed less than  $v_{\text{mp}}/\sqrt{2}$

39. A charged particle enters into a region which offers a resistance against its motion and uniform magnetic field exists in the region. The particle traces a spiral path as shown in the figure. Which of the following statements is/are correct ?



- (1) Component of the magnetic field in the plane of spiral is zero
- (2) Particle enters from region at Q
- (3) If the magnetic field is outward then the particle is positively charged
- (4) Since force exerted by magnetic field is always normal to the direction of motion, therefore, its angular momentum remains unchanged

40. Four identical electrical lamps are labelled 1.5 V, 0.5 A which describes the condition necessary for them to operate at normal brightness. A 12V battery of negligible internal resistance is connected to lamps as shown, then



- (1) the value of  $R$  for normal brightness of each lamp is  $(3/4) \Omega$
- (2) the value of  $R$  for normal brightness of each lamp is  $(21/4) \Omega$
- (3) total power dissipated in circuit when all lamps are normally bright is 24 W.
- (4) power dissipated in  $R$  is 21 W when all lamps are normally bright

41. The distance between two point object  $P$  and  $Q$  is 32 cm. A convex lens of focal length 15 cm is placed between them, so that the images of both the objects are formed at the same place. The distance of  $P$  from the lens could be
- (1) 20 cm
  - (2) 12 cm
  - (3) 18 cm
  - (4) 16 cm

42. Two bodies  $A$  and  $B$  have thermal emissivities of 0.01 and 0.81, respectively. The outer surface areas of two bodies are the same. The two bodies emit total radiant power at the same rate. The wavelength  $\lambda_B$  corresponding to maximum spherical spectral radiance in the radiation from  $B$  is shifted from the wavelength corresponding to the maximum spectral radiance in radiation  $A$  by  $1.00 \mu\text{m}$ . If the temperature of  $A$  is 5802 K, then

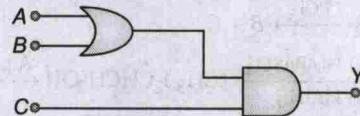
- (1) the temperature of  $B$  is 1934 K
- (2)  $\lambda_B = 1.5 \mu\text{m}$
- (3) the temperature of  $B$  is 11604 K
- (4) the temperature of  $B$  is 2901 K

43. A uniform cylinder of steel of mass  $M$ , radius  $R$  is placed on frictionless bearings and set to rotate about its vertical axis with angular velocity  $\omega_0$ . After the cylinder has reached the specified state of rotation. It is heated without any mechanical contact from temperature  $T_0$  to  $T_0 + \Delta T$ . If  $\frac{\Delta I}{I}$  is the fractional change in moment of inertia of the cylinder and  $\frac{\Delta \omega}{\omega_0}$  be the

fractional change in the angular velocity of the cylinder and  $\alpha$  be the coefficient of linear expansion, then

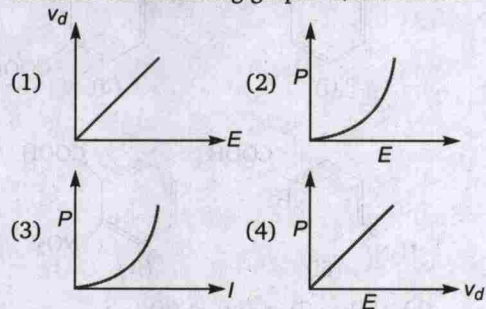
- (1)  $\frac{\Delta I}{I} = \frac{2\Delta R}{R}$
- (2)  $\frac{\Delta I}{I} = -\frac{\Delta \omega}{\omega_0}$
- (3)  $\frac{\Delta \omega}{\omega_0} = -2\alpha\Delta T$
- (4)  $\frac{\Delta I}{I} = -\frac{2\Delta R}{R}$

44. To get an output  $Y = 1$  from circuit of figure, the inputs must be



- |     | A | B | C |
|-----|---|---|---|
| (1) | 0 | 1 | 0 |
| (2) | 0 | 1 | 1 |
| (3) | 1 | 0 | 0 |
| (4) | 1 | 0 | 1 |

45. If  $E$  denotes electric field in a uniform conductor,  $I$  corresponding current through it,  $v_d$  drift velocity of electrons and  $P$  denotes thermal power produced in the conductor, then which of the following graphs is/are correct ?



46. Two particles are projected from the same point with the same speed at different angles  $\theta_1$  and  $\theta_2$  to horizontal. Their times of flight are  $t_1$  and  $t_2$  and they have the same horizontal range. Then

$$(1) \frac{t_1}{t_2} = \tan \theta_1 \quad (2) \theta_1 + \theta_2 = 90^\circ$$

$$(3) \frac{t_1}{\sin \theta_1} = \frac{t_2}{\sin \theta_2} \quad (4) \frac{t_1}{t_2} = \tan \theta_2$$

47. The pair of physical quantities that have the same dimensions are

- (1) Reynold number and coefficient of friction
- (2) Curie and frequency of light wave
- (3) Latent heat and gravitational potential
- (4) Planck's constant and torque

48. A particle of mass  $m$  is moved from the surface of the earth to a height  $h$ . The work done by an external agency to do this is

- (1)  $mgh$  for  $h \ll R$
- (2)  $mgh$  for all  $h$
- (3)  $\frac{1}{2}mgh$  for  $h = R$
- (4)  $-\frac{1}{2}mgh$  for  $h = R$

49. A simple pendulum of length  $L$  and mass (bob)  $M$  is oscillating in a plane about a vertical line between angular limits  $-\phi$  and  $+\phi$ . For an angular displacement  $\theta$  ( $|\theta| < \phi$ ), the tension in the string and the velocity of the bob at  $T$  and  $v$  respectively. The following relations hold good

- (1)  $T = Mg \cos \theta = (Mv^2)/L$
- (2)  $T \cos \theta = Mg$
- (3) The magnitude of the tangential acceleration of the bob  $|a_T| = g \sin \theta$
- (4)  $T = Mg \cos \theta$

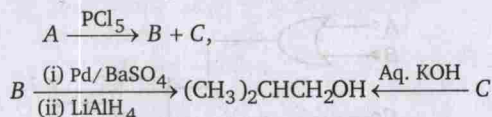
50. The torque required to produce a unit twist in a rod of length  $l$  and radius  $r$  is

- (1) directly proportional to  $r^2$
- (2) directly proportional to  $r^4$
- (3) inversely proportional to  $r^2$
- (4) inversely proportional to  $l$

## » CHEMISTRY

### ■ Section A

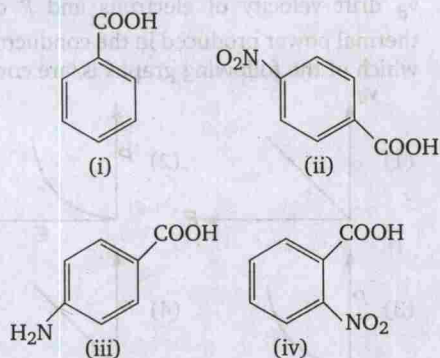
1. In the following reaction sequence,



the compound 'A' is

- (a)  $(\text{CH}_3)_2\text{CHCH}_2\text{COOCH}(\text{CH}_3)_2$
- (b)  $(\text{CH}_3)_2\text{CHCOOCH}_2\text{CH}(\text{CH}_3)_2$
- (c)  $(\text{CH}_3)_2\text{CHCOOC}_2\text{H}_5$
- (d) None of the above

2. The correct order of  $\text{p}K_a$  value of the given carboxylic acids is



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

3. In an experiment, 0.04F was passed, through 400 mL of a 1 M solution of sodium hydroxide. What would be the pH of the solution after the electrolysis ?

- (a) 6
- (b) 13
- (c) 8
- (d) 10

4. Which one of the following pairs of reactants does not form oxygen, when they react with each other ?

- (a)  $\text{F}_2$  + hot and conc. NaOH solution
- (b)  $\text{F}_2$  + water
- (c)  $\text{Cl}_2$  + NaOH solution (cold, dilute)
- (d)  $\text{CaOCl}_2 + \text{H}_2\text{SO}_4$  (dilute, small amount)

5. The pair having almost same ionic radii is

- (a) C, Al
- (b) Be, Mg
- (c) Li, Na
- (d) Ga, Al

6. Which of the following molecules is paramagnetic ?

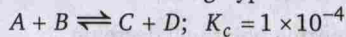
- (a)  $\text{B}_2$
- (b)  $\text{H}_2$
- (c)  $\text{Li}_2$
- (d)  $\text{N}_2$

7. The longest wavelength line in the Lyman series of the hydrogen spectrum is

- (a) 949.8 Å
- (b) 972.6 Å
- (c) 1215.8 Å
- (d) 1025.8 Å

8. If  $N_0$  represents Avogadro's number, the number of valence electrons in 4.2 g of nitride ion ( $\text{N}^{3-}$ ) is

- (a)  $2.4 N_0$
- (b)  $4.2 N_0$
- (c)  $1.6 N_0$
- (d)  $3.2 N_0$



Which of the following statements is true for this reaction? In this reaction,

- (a) products predominate  
 (b) reactants predominate  
 (c) equilibrium exists  
 (d) nothing can be said
10. Dissolution of ammonium chloride in water leads to a cooling sensation. At constant temperature, this process is accompanied by  
 (a) increase in entropy  
 (b) decrease in entropy  
 (c) decrease in enthalpy  
 (d) no change in entropy
11. The process of conversion of ozone into oxygen ( $2O_3 \longrightarrow 3O_2$ ) involves following steps
- $$O_3 \xrightarrow{\text{Fast}} O_2 + O$$
- $$O + O_3 \xrightarrow{\text{Slow}} 2O_2$$
- The rate law expression for this process is  
 (a)  $r = k [O_3]^2$  (b)  $r = k [O_3]^2 [O_2]^{-1}$   
 (c)  $r = k [O_3] [O_2]$  (d)  $r = k [O_3]^2 [O_2]^{-3}$
12. 0.42 g magnesium carbonate and 0.5 g calcium carbonate are heated strongly. What is the quantity left?  
 (a) 0.48 g (b) 0.80 g  
 (c) 0.42 g (d) 0.28 g
13. Chlorination of which of the following substance is a substitution reaction?  
 (a) 2-butene (b) 1-butyne  
 (c) *iso*-butane (d) *iso*-butylene
14. Which of the following acts as a reducing agent to reduce  $WO_3$ ,  $MoO_3$  and  $GeO_2$  into metals?  
 (a) Carbon  
 (b) Hydrogen  
 (c) Aluminium  
 (d) Carbon monoxide
15. The least stable free radical is  
 (a)  $CH_3CHCH(CH_3)_2$   
 (b)  $CH_2CH_2CH(CH_3)_2$   
 (c)  $CH_3$   
 (d)  $CH_3CH_2C(CH_3)_2$
16. The compound that can exhibit geometrical isomerism is  
 (a)  $CH_3(CH_2)_4CHO$   
 (b)  $(CH_2)_2(COOH)_2$   
 (c)  $(CH_2)_2(COOH)_2$   
 (d)  $(CH_3)_2C = CHCH_3$
17. The IUPAC name of ferric ferrocyanide is  
 (a) hexacyanoferrate (II)  
 (b) iron (II) hexacyanoferrate (III)  
 (d) iron (II) hexacyanoferrate (II)
18. A current of 2 A passed for 5 h through a molten metal salt, deposits 22.2 g of metal having atomic weight 177. The oxidation state of metal in metal salt is  
 (a) 1 (b) 2  
 (c) 3 (d) 4
19. Terylene is made by polymerisation of terephthalic acid with  
 (a) ethylene glycol  
 (b) phenol  
 (c) ethanol  
 (d) catechol
20. Select the incorrect statement.  
 (a) Aspirin is analgesic as well as antipyretic  
 (b) Teflon is used to make non-stick cookware  
 (c) Some disinfectant can be used as antiseptics  
 (d) Penicillin is a broad spectrum antibiotic
21. Among the following, the incorrect statement is  
 (a) Nitrous acid and acidified solutions of nitrites are oxidising agents  
 (b) Nitrous acid and acidified solutions of nitrites act as reducing agents in the presence of acidified hydrogen peroxide  
 (c)  $K_3C_{60}$  fullerene compound is not known  
 (d)  $C_{60}$  fullerene is a covalent material
22. Acetylene, carbon monoxide and ethyl alcohol react in the presence of nickel catalyst. The product will be  
 (a) ester of unsaturated acid  
 (b) ester of saturated acid  
 (c) R in the  $-COOH$  of ester is an unsymmetrical radical  
 (d) ester does not form at all
23. Which of the following is required in lowest concentration for coagulating gold sol?  
 (a)  $K_4[Fe(CN)_6]$   
 (b)  $Na_2PO_4$   
 (c)  $MgCl_2$   
 (d)  $AlCl_3$
24. In a solid, AB having the NaCl structure, 'A' atoms occupy the corners of the cubic unit cell. If all the face centred 'A' atoms along one of the axes are removed, the formula of the solid is  
 (a)  $A_2B$  (b)  $AB_2$   
 (c)  $A_3B_4$  (d)  $A_4B_3$
25. The structure of 2-methyl-2-butene is  
 (a)  $(CH_3)_2CHCH_2CH_3$   
 (b)  $(CH_3)_2CH - CH = CH_2$   
 (c)  $(CH_3)_2C = CHCH_3$   
 (d)  $CH_3 - CH_2C = CH_2$   
 $\quad \quad \quad |$   
 $\quad \quad \quad CH_3$

**Directions** In the following questions, more than one of the answers given may be correct. Select the correct answers and mark it according to the codes.

**Codes :**

- (a) 1, 2 and 3 are correct  
 (b) 1 and 2 are correct  
 (c) 2 and 4 are correct  
 (d) 1 and 3 are correct
26.  $R - \text{CH}_3 \xrightarrow{\text{CrO}_2\text{Cl}_2} A \xrightarrow{\text{H}_2\text{O}} B$
- Which of the statements about the reaction are correct ?
- (1) If R is phenyl group, compound A is of brown colour  
 (2) Compound B is an aldehyde  
 (3) The reaction is called oxo reaction  
 (4) Compound A is an acid
27. When a gas expands at constant temperature,
- (1) the kinetic energy of the molecules increases  
 (2) the kinetic energy of the molecules remains the same  
 (3) the number of molecules of the gas increases  
 (4) the pressure decreases
28. Potassium manganate ( $\text{K}_2\text{MnO}_4$ ) is obtained when
- (1) formaldehyde reacts with potassium permanganate in presence of a strong alkali  
 (2) chlorine is passed into the solution of potassium permanganate  
 (3)  $\text{MnO}_2$  is fused with KOH in air  
 (4)  $\text{KMnO}_4$  reacts with conc  $\text{H}_2\text{SO}_4$
29. Choose the correct statement about crotyl alcohol.
- (1) It is a primary alcohol  
 (2) It contains one  $-\text{CH}_2$  unit more, than allyl alcohol  
 (3) It gives test of unsaturation  
 (4) It is an isomer of allyl alcohol
30. 8g of oxygen molecule has the same number of molecules as in
- (1) 11 g carbon dioxide  
 (2) 11.2 L of  $\text{SO}_2$   
 (3) 5.6 L of oxygen  
 (4) 0.1 g atom of He
31. The polymer(s) having 1, 3-butadiene as one of the monomer units, is (are)
- (1) nitrile rubber (2) ABS rubber  
 (3) SBR (4) butyl rubber
32. To 10 mL of 5 M  $\text{BaCl}_2$  solution, 5 mL of 0.5 M  $\text{K}_2\text{SO}_4$  solution is added. Barium sulphate precipitates out, what will happen ?
- (1) Freezing point will decrease  
 (2) Freezing point will increase  
 (3) Boiling point will increase  
 (4) Boiling point will decrease
33. Which of the following statement(s) is (are) correct?
- (1)  $\text{HPO}_4^{2-}$  is the conjugate base of  $\text{H}_2\text{PO}_4^-$   
 (2) The pH of  $1.0 \times 10^{-8}$  M solution of HCl is 8  
 (3) Autoprotolysis constant of water increases with temperature  
 (4) When a solution of a weak monoprotic acid is treated against a strong base, at half-neutralisation point,  $\text{pH} = \frac{1}{2} \text{pK}_a$
34. Which among the following statements are correct with respect to adsorption of gases on a solid ?
- (1) The extent of adsorption is equal to  $k p^{1/n}$  according to Freundlich isotherm  
 (2) Freundlich adsorption isotherm fails at low pressure  
 (3) The extent of adsorption is equal to  $\left(\frac{ap}{1+bp}\right)$  according to Langmuir isotherm  
 (4) The extent of adsorption is equal to  $\left(\frac{1+bp}{ap}\right)$  according to Langmuir isotherm
35. Which of the following carbohydrates on treatment with excess of phenylhydrazine give the same osazone ?
- (1) Glucose (2) Mannose  
 (3) Fructose (4) Galactose
36. Benzyl amine may be prepared by
- (1)  $\text{C}_6\text{H}_5\text{CONH}_2 \xrightarrow{\text{LiAlH}_4/\text{ether}}$   
 (2)  $\text{C}_6\text{H}_5\text{CN} \xrightarrow{\text{LiAlH}_4/\text{ether}}$   
 (3)  $\text{C}_6\text{H}_5\text{CONH}_2 \xrightarrow{\text{NaOH} + \text{Br}_2}$   
 (4)  $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Sn}/\text{HCl}}$
37. The molecules that have non-zero dipole moment, are
- (1) *trans*-2-butene  
 (2) *trans*-2-pentene  
 (3) 2, 2, 3, 3-tetramethyl butane  
 (4) *cis*-3-hexene
38. In the electrolysis of alumina, cryolite is added to
- (1) lower the melting point of alumina  
 (2) increase the electrical conductivity  
 (3) minimise the anode effect  
 (4) remove impurities from alumina



- (1) Cyclopropenyl anion  
 (2) Cycloheptatrienyl cation  
 (3) Tropylium anion  
 (4) Cyclopentadienyl anion
40. For the following conversion,  
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl} \longrightarrow \text{C}_2\text{H}_5 - \text{C}_2\text{H}_5$   
 the Reagent used, are  
 (1) Mg, dry ether/ $\text{H}_2\text{O}$   
 (2)  $\text{LiAlH}_4$   
 (3)  $\text{Zn}/\text{HCl}$   
 (4)  $\text{B}_2\text{H}_6 / \text{THF}$
41. Carbon dioxide is isostructural with  
 (1)  $\text{HgCl}_2$  (2)  $\text{SnCl}_2$   
 (3)  $\text{C}_2\text{H}_2$  (4)  $\text{NO}_2$
42. For which of the following reactions, the value of  $K_p$  will be equal to  $K_c$  ?  
 (1)  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$   
 (2)  $\text{SO}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons \text{SO}_2\text{Cl}_2(\text{g})$   
 (3)  $\text{H}_2(\text{g}) + \text{S}(\text{s}) \rightleftharpoons \text{H}_2\text{S}(\text{g})$   
 (4)  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$
43. Only one monochloro derivative is formed by the monochlorination of  
 (1) butane (2) ethane  
 (3) *iso*-pentane (4) *neo*-pentane
44. Zwitter ion is formed in case of  
 (1) glycine  
 (2) sulphanilic acid  
 (3) salicylic acid  
 (4) picric acid
45. The value of  $\Delta S$  is positive for  
 (1) evaporation of water  
 (2) dissolution of sugar in water  
 (3) crystallisation of salt from brine  
 (4) stretching of rubber band
46. Select the correct statements.  
 (1) For  $2s$  orbital, the order of energy is as  $E_{2s}(\text{H}) > E_{2s}(\text{Li}) > E_{2s}(\text{Na}) > E_{2s}(\text{K})$   
 (2) For hydrogen atom, the order of energy is as  $1s < 2s = 2p < 3s = 3p = 3d$   
 (3) When an electron is free from the influence of electron, its energy is zero  
 (4) de-Broglie relationship is applicable only in case of macroscopic objects

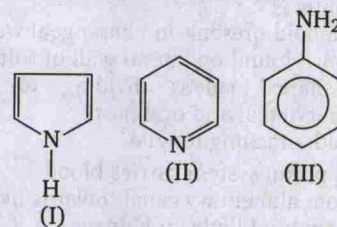
## Section A

1. Which of the following organisms is found in lymph nodes ?  
 (a) *Wuchereria*  
 (b) *Plasmodium*  
 (c) *Leishmania*  
 (d) *Diplococcus*

for complex  $[\text{Co}(\text{en})_2\text{Cl}_2]^+$  ?

- (1) The coordination number of Co is 6  
 (2) *trans*- form of the complex exhibits optical isomerism  
 (3) The oxidation number of Co is +3  
 (4) en is a monodentate ligand

48. Consider the following compounds.



Select the correct statement(s).

- (1) I is more basic than II  
 (2) II is more basic than I and III  
 (3) III is more basic than II  
 (4) I is weakly acidic
49. In a nuclear reactor, heavy water is used  
 (1) to transfer heat from the nuclear reactor  
 (2) to reduce speed of neutrons  
 (3) to capture neutrons produced by nuclear fission  
 (4) to provide high speed neutrons
50. Given,

$$E_{(\text{Ni}^{2+}/\text{Ni})}^{\circ} = 0.25 \text{ V}, E_{(\text{Cu}^{2+}/\text{Cu})}^{\circ} = 0.34 \text{ V};$$

$$E_{(\text{Ag}^+/\text{Ag})}^{\circ} = 0.80 \text{ V}$$

$$\text{and } E_{(\text{Zn}^{2+}/\text{Zn})}^{\circ} = -0.76 \text{ V};$$

Which of the following reactions under standard condition will not take place in the specified direction ?

- (1)  $\text{Ni}^{2+} + \text{Cu} \longrightarrow \text{Ni} + \text{Cu}^{2+}$   
 (2)  $\text{Cu} + 2\text{Ag}^+ \longrightarrow \text{Cu}^{2+} + 2\text{Ag}$   
 (3)  $\text{Cu} + 2\text{H}^+ \longrightarrow \text{Cu}^{2+} + \text{H}_2$   
 (4)  $\text{Zn} + 2\text{H}^+ \longrightarrow \text{Zn}^{2+} + 2\text{H}_2$

## ZOOLOGY

2. Brunner's glands are found in  
 (a) mucosa of intestine  
 (b) liver  
 (c) mucosa of duodenum  
 (d) submucosa of first part of intestine

3. Which law states that two species co-exist in the same locality, if they have identical ecological requirements ?  
 (a) Gloger's law (b) Cope's law  
 (c) Gause's law (d) Allan's rule
4. Colle's fracture is associated with  
 (a) femur (b) humerus  
 (c) ulna (d) radius
5. Frenulum is  
 (a) adenoid present on pharyngeal wall  
 (b) tonsil found on lateral wall of soft palate  
 (c) V-shaped sulcus dividing tongue into pharyngeal and oral parts  
 (d) fold attaching tongue
6. Renal portal system carries blood  
 (a) from alimentary canal towards liver  
 (b) from hind limbs to kidneys  
 (c) from liver to kidney  
 (d) from alimentary canal to liver
7. Black water fever is caused by  
 (a) *Plasmodium malariae*  
 (b) *Plasmodium ovale*  
 (c) *Plasmodium falciparum*  
 (d) *Plasmodium vivax*
8. Protistan protozoan having nuclear dimorphism is  
 (a) *Amoeba proteus*  
 (b) *Paramecium caudatum*  
 (c) *Plasmodium vivax*  
 (d) *Trypanosoma gambiense*
9. Pressure sensitive receptors in the dermis are  
 (a) Ruffini's corpuscles  
 (b) Meissner's corpuscles  
 (c) Pacini's corpuscles  
 (d) Krause's terminal bulbs
10. Ommatidia serve the purpose of photo reception in  
 (a) cockroach (b) frog  
 (c) molluscs (d) humans
11. Hypersecretion of mineralocorticoids leads to  
 (a) Conn's syndrome  
 (b) Simmond's disease  
 (c) Cushing's disease  
 (d) Addison's disease
12. The banding patterns of chromosomes 3 and 6 of man and chimpanzee show that  
 (a) they have common origin  
 (b) they have different origin  
 (c) they have similar blood groups  
 (d) they have same number of chromosomes
13. Process used for amplification or multiplication of DNA for finger printing is  
 (a) Polymerase chain reaction  
 (b) Nesslerisation  
 (c) Southern blotting  
 (d) Northern blotting
- (a) *Amoeba* (b) *Paramecium*  
 (c) *Hydra* (d) *Fasciola*
15. Ruminants belong to order  
 (a) Cetacea (b) Artiodactyla  
 (c) Perissodactyla (d) Rodentia
16. Protein present in cartilage is  
 (a) cartilagin (b) chondrin  
 (c) ossein (d) oesein
17. A bone kept in dilute HCl for three days shall  
 (a) break in pieces  
 (b) become soft  
 (c) remain unaltered  
 (d) dissolve completely
18. The fluid released from the vagina just prior to child birth is the  
 (a) babies' accumulated urine  
 (b) amniotic fluid  
 (c) mother's plasma from the umbilical cord  
 (d) baby's plasma from its foetal circulation
19. Mehlis's glands of tapeworm are associated with  
 (a) reproduction (b) excretion  
 (c) respiration (d) circulation
20. During normal respiration, without any effort, the volume of air inspired or expired is called  
 (a) tidal volume  
 (b) reserve volume  
 (c) residual volume  
 (d) None of the above
21. In insects, muscle contraction, oviposition, defecation and heartbeats are regulated by  
 (a) corpora allata (b) corpora cardiaca  
 (c) protocerebrum (d) thoracic ganglion
22. Which of the following pairs is not correct ?  
 (a) Foot and Mouth — Cattle  
 (b) Ranikhet — Fowl  
 (c) Pebrine — Silkworm  
 (d) Rinderpest — Honey bee
23. Lethal gene of *Drosophila* is  
 (a) curly wings (*Cy*) (b) plum eyes (*Pm*)  
 (c) stubbles (*Sub*) (d) All of these
24. Progesterone present in contraceptive pill is meant for  
 (a) checking ovulation  
 (b) preventing fertilization  
 (c) preventing implantation of zygote  
 (d) preventing cleavage
25. Treatment of snake bite by antivenin is providing  
 (a) artificial acquired active immunity  
 (b) artificial acquired passive immunity  
 (c) natural acquired passive immunity  
 (d) specific natural immunity

**Direction** In the following questions, more than one of the answers given may be correct. Select the correct answers and mark it according to the codes.

**Codes :**

- (a) 1, 2 and 3 are correct
- (b) 1 and 2 are correct
- (c) 2 and 4 are correct
- (d) 1 and 3 are correct

26. Which of the following is correct about urea cycle ?

- (1) Urea cycle takes place in the liver cells
- (2) Urea cycle involves the union of two molecules of ammonia and a molecule of carbon dioxide
- (3) Urea is produced by enzyme arginase
- (4) Three molecules of ammonia enter ornithine cycle

27. Connective tissue

- (1) transport various materials in the body
- (2) provide the body a supporting skeletal framework
- (3) act as packing material in various organs
- (4) allow the absorption of nutrients from the gut

28. Arthropods have

- (1) bilateral symmetry and segmented body plan
- (2) organ system of grade of body organization
- (3) jointed legs and division of labour
- (4) pseudocoelom and metamerism

29. Match List I and List II and select the answer using the codes.

List I	List II
1. Umbilical cord	A. The structure that acts as a bridge between foetus and placenta
2. Neural tube	B. The structure from which the central nervous system develops
3. Cervix	C. The neck of uterus
4. Trophoblast	D. Forms the embryo proper

30. Which of the following is true about preen gland ?

- (1) Occur in birds
- (2) Also known as uropygial gland
- (3) Occur in bats
- (4) help in digestion

31. Match List I and List II and select the answer using the codes

List I	List II
1. Cartilaginous fishes	A. Two groups of paired fins
2. Bony fishes	B. Have an operculum that helps to pump water over their gills
3. Amphibians	C. First vertebrates with amniotic eggs
4. Reptiles	D. First vertebrates with legs

32. The correct statement about antibodies is

- (1) antibodies are produced by lymphocytes
- (2) antibodies are carbohydrate molecules
- (3) antibody consists of two heavy chains and two light chains
- (4) characterized by the presence of antigenic determinant site

33. Which of the following pairs is correctly matched ?

- (1) Angiography — Magnetic field
- (2) Sonography — Ultrasound
- (3) NMR — Ionising radiations
- (4) CT scanning — X-rays

34. Example of an external prosthesis is

- (1) myoelectric arm
- (2) Jaipur foot
- (3) electronic hearing aids
- (4) nose implant for cosmetic reshaping

35. Which of the following is an autoimmune disease ?

- (1) Grave's disease
- (2) Hodgekin's disease
- (3) Rheumatoid arthritis
- (4) Asthma

36. Cellular activities are regulated through the

- (1) flow of energy
- (2) flow of material
- (3) flow of information
- (4) flow of organelles

37. Mitosis differs from meiosis in not having

- (1) duplication of DNA
- (2) synapsis
- (3) interphase
- (4) crossing over

38. Identify the correctly matched pair.

- (1) Nucleolus — RNA synthesis
- (2) Spherosome — Transport of macromolecules
- (3) Glyoxysome — Glyoxylate cycle
- (4) Plasmodesmata — Lipid storage

39. The diffusion of bicarbonate ions from RBCs into plasma and of chloride ions from plasma into RBCs to maintain ionic balance between RBCs and plasma is known as

- (1) Henry's rule
- (2) Chloride shift
- (3) Charle's law
- (4) Hamburger's phenomenon

- (1) marks the beginning of ventricular systole  
 (2) marks the end of ventricular systole  
 (3) is due to closure of atrioventricular valves  
 (4) is produced by the closure of semilunar valves
41. Identify the incorrectly matched pair related to vitamin deficiency.
- (1) Vitamin-K — Degeneration of muscles  
 (2) Vitamin-A — Xerophthalmia  
 (3) Vitamin-D — Keratomalacia  
 (4) Vitamin-E — Reproductive failure
42. The main function of bile is
- (1) emulsification of fat  
 (2) store bile pigments  
 (3) neutralise gastric HCl and provide alkaline medium in duodenum  
 (4) to stimulate secretion of pancreatic enzymes
43. Factor(s) that raises  $P_{50}$  value and shift the  $HbO_2$  dissociation curve to right and *vice versa* is/are
- (1) rise in  $P_{CO_2}$   
 (2) rise in  $H^+$  ions  
 (3) rise in diphosphoglyceric acid  
 (4) rise in pH but fall in temperature
44. Which of the following cranial nerve is sensory in function ?
- (1) Olfactory (2) Optic  
 (3) Oculomotor (4) Trochlear
45. The function of thyroid hormone is to
- (1) control the secretion of adrenal cortex  
 (2) increase the IQ and BMR  
 (3) increase the blood pressure by contracting blood vessels  
 (4) increase the production of energy by an increase in the oxidation of glucose
- origin ?
- (1) Blood, bone marrow and neural tube  
 (2) Skeletal muscles and reproductive ducts  
 (3) Parathyroid and enamel of teeth  
 (4) Kidney and endothelium of blood vessels
47. Menses occurs in
- (1) human beings only  
 (2) old world monkeys and apes (primates)  
 (3) every mammal  
 (4) pouched mammals (metatherians)
48. Which of the following metabolic activities occur due to sperm interaction into ovum ?
- (1) The vitelline membrane is lifted and is converted into fertilization membrane  
 (2) The permeability of plasma membrane increases  
 (3) The rate of protein synthesis increases  
 (4) The egg surface produces antifertilizin
49. The distinct features of extra nuclear inheritance are
- (1) only the female parent contributes towards inheritance  
 (2) both the parents contribute equally towards inheritance  
 (3) due to the participation of female only, the result of reciprocal crosses is not the same  
 (4) result of reciprocal crosses are same
50. Regulatory genes are the genes that
- (1) code for repressor proteins  
 (2) are transcribed continuously  
 (3) are not contained in the operon they control  
 (4) determine the primary structure of polypeptide chain

## » BOTANY

### ■ Section A

1. A dwarf pea plant in which bolting has occurred is crossed with a tall pure pea plant. What will be the phenotypic ratio in  $F_1$  generation?
- (a) 100% tall plants  
 (b) 100% dwarf plants  
 (c) 50% tall and 50% dwarf plants  
 (d) 75% tall and 25% dwarf plants
2. The formation of multivalents at meiosis in diploid organism is due to
- (a) terminalization  
 (b) reciprocal translocation  
 (c) monosomy  
 (d) inversion
3. The main character of plants of family-Cruciferae is the presence of
- (a) pectin (b) myrosin enzyme  
 (c) latex (d) alkaloids
4. Presence of basal rhizoidal cell in *Ulothrix* is an example of
- (a) dead cell  
 (b) vestigial cell  
 (c) accessory cell  
 (d) beginning of division of labour
5. One of the plants introduced from the new world to the old world is
- (a) wheat (b) potato  
 (c) rice (d) sugarcane

- progeny derived from a seed of cross pollinated plant was found to be completely uniform. One reason can be  
 (a) polyploidy (b) parthenocarpy  
 (c) induced mutation (d) apomixis
7. The crystals of calcium carbonate deposit in the cell is called  
 (a) crystalloid (b) aleurone  
 (c) cystolith (d) globoid
8. Sialic acid is a constituent of  
 (a) cell wall (b) dictyosome  
 (c) chromosome (d) cell membrane
9. Protoxylem lacunae occur in  
 (a) cladodes  
 (b) underground stems  
 (c) vascular bundles of grass stem  
 (d) climbers
10. Sac fungi belongs to  
 (a) Basidiomycetes (b) Phycomycetes  
 (c) Deuteromycetes (d) Ascomycetes
11. RQ is always less than one in  
 (a) millets (b) wheat  
 (c) bean (d) castor
12. An increase in  $O_2$  concentration results in a decrease in the rate of photosynthesis known as  
 (a) Warburg's effect (b) Malli's effect  
 (c) Ganong's effect (d) None of these
13. In a flower, androperianth represents  
 (a) bracts, sepals, petals and stamens  
 (b) differentiable sepals, petals and stamens  
 (c) undifferentiable sepals, petals and stamens  
 (d) petals and stamens only
14. In banana, edible part is  
 (a) fleshy epicarp  
 (b) rudimentary mesocarp and fleshy endocarp  
 (c) rudimentary endocarp and fleshy mesocarp  
 (d) pericarp
15. At the time of pollination, the pollen grain of *Pinus* are  
 (a) one celled  
 (b) two celled  
 (c) three celled  
 (d) four celled
16. In *Selaginella*, the adaxial outgrowth from the base of leaf is called
17. In bryophytes, the posterior part of archegonium grows to protect the embryo. It is  
 (a) paraphysis (b) apophysis  
 (c) hypophysis (d) calyptra
18. Which one has evergreen vegetation and drought adapted animals ?  
 (a) Chapparal (b) Savanna  
 (c) Tundra (d) Deciduous forest
19. Animals of colder areas have shorter extremities as compared to animals of warmer areas. This is  
 (a) Bergman's rule (b) Allen's rule  
 (c) Jordan's rule (d) Rensch's rule
20. Under anaerobic conditions, denitrifying bacterium *Pseudomonas* changes  
 (a) nitrate to molecular nitrogen  
 (b) nitrate to ammonia  
 (c) nitrate to nitrite  
 (d) nitrite to nitrate
21. Botanical name of groundnut is  
 (a) *Glycine max* (b) *Dolichos lablab*  
 (c) *Arachis hypogea* (d) *Faciolus radiatus*
22. If a tree flowers thrice in a year in October, January and July in Northern India, the plant is  
 (a) photo and thermo sensitive  
 (b) photo and thermo insensitive  
 (c) photo sensitive but thermo insensitive  
 (d) thermo sensitive but photo insensitive
23. In water logged soil, plants do not grow properly because  
 (a) the soil is physiologically dry  
 (b) the soil is physiologically wet  
 (c) of excessive water  
 (d) of shortage of water
24. Thick cuticle on the leaves are typical of plants growing in  
 (a) wet habitats (b) warm habitats  
 (c) dry habitats (d) cool habitats
25. Virus with nucleic acid but without protein coat is called  
 (a) virion (b) viroid  
 (c) capsid (d) prion

## ■ Section B

**Direction** In the following questions, more than one of the answers given may be correct. Select the correct answers and mark it according to the codes.

**Codes :**

- (a) 1, 2 and 3 are correct  
 (b) 1 and 2 are correct  
 (c) 2 and 4 are correct  
 (d) 1 and 3 are correct

26. Consider the following statements.

- (1) Copper is present in cytochrome oxidase  
 (2) Pantothenic acid is the precursor of Co-A  
 (3) Thiamine pyrophosphate is the prosthetic group in decarboxylases  
 (4) Zinc is present in RNA and DNA polymerases

- (1) Eastern Himalaya  
 (2) Western ghats  
 (3) Eastern ghats  
 (4) Western Himalaya
28. Select the correct statement about leghaemoglobin.  
 (1) Leghaemoglobin is a source of energy  
 (2) Leghaemoglobin is a pinkish coloured pigment found in the root nodules  
 (3) Leghaemoglobin is activated by the presence of  $Mg^{2+}$  ions  
 (4) Leghaemoglobin protects the nitrogen fixing enzyme nitrogenase from oxygen
29. Link between glycolysis, Krebs' cycle or  $\beta$ -oxidation of fatty acid or carbohydrate and fat metabolism is  
 (1) acetyl Co-A  
 (2) a compound formed by oxidative decarboxylation  
 (3) a 2-carbon compound  
 (4) oxaloacetic acid
30. The head inflorescence is considered as the most perfect type of inflorescence, because  
 (1) numerous small sized flowers occur on the receptacle  
 (2) flowers are protected by various structures like involucre  
 (3) single visit of insect is sufficient for pollination  
 (4) flowers are dull and colourless
31. Assimilary roots are present in  
 (1) *Loranthus* and *Viscum*  
 (2) *Tinospora* and *Trapa*  
 (3) *Saccharum* and *Pandanus*  
 (4) *Taeniophyllum* and *Podostemon*
32. The examples of cellular endosperm are  
 (1) *Citrus*, *Malea*, *Primula*  
 (2) *Adoxa*, *Cetranthus*, *Datura*  
 (3) *Phoenix*, *Acer*, *Arachis*  
 (4) *Impatiens*, *Magnolia*, *Cetranthus*
33. Consider the following statements.  
 (1) Negative geotropism in horizontal stems is caused by accumulation of auxins on the lower side  
 (2) Pineapple can be made to flower in off season by the application of ethylene  
 (3) The ratio of auxin to cytokinin controls cell differentiation  
 (4) Large sized grapes can be produced through cytokinin treatment
34. Which of the following pairs is correctly matched ?  
 (1) Stimulants — Benzadrine and methedrine  
 (2) Opiates — Ganja, charas

- (4) Hallucinogens — Opium and heroin
35. Lowering the oxygen concentration  
 (1) stimulates  $C_3$  photosynthesis  
 (2) inhibits  $C_3$  photosynthesis  
 (3) does not affect  $C_4$  photosynthesis  
 (4) stimulates  $C_4$  photosynthesis
36. In which of the following activities, ubisch bodies are not involved ?  
 (1) Initiating meiosis in pollen mother cell  
 (2) Providing nutrition to developing pollen  
 (3) Specific embryological functions  
 (4) Designing the external thickening of pollen
37. Match List I with List II and select the correct answer using the codes.

List I	List II
1. Complete linkage	A. Genes remain together for at least 2 generations
2. Incomplete linkage	B. Main cause is crossing over
3. Isoalleles	C. Alleles expressing themselves within same phenotypic range
4. Penetrance	D. Exchange between homologous parts of chromosomes during meiosis

38. Which of the following is a Hill oxidant ?  
 (1) DCMU (2) Dichlorophenol  
 (3) RUBISCO (4) Ferricyanide
39. The orthodox seed is found in  
 (1) coconut (2) legumes  
 (3) jack (4) cereals
40. Parachute mechanism occurs in  
 (1) *Sonchus* (2) *Helianthus*  
 (3) *Antirrhinum* (4) *Carthamus*
41. Which of the following characteristics are associated with hydrophytes ?  
 (1) Water and mineral nutrients are absorbed through general body surface  
 (2) Osmotic concentration or osmotic potential of cell is equal to or slightly higher than external water  
 (3) Presence of weak and negatively geotropic roots  
 (4) Presence of mucilage to hold water
42. Enzymes used in recombinant DNA technology are  
 (1) reverse transcriptase  
 (2) ligase  
 (3) phosphatase  
 (4) restriction endonucleases