

1. The twinkling effect of star light is due to
  - (a) total internal reflection
  - (b) high dense matter of star
  - (c) constant burning of hydrogen in the star
  - (d) the fluctuating apparent position of the star being slightly different from the actual position of the star
2. The width of the diffraction band varies
  - (a) inversely as the wavelength
  - (b) directly as the width of the slit
  - (c) directly as the distance between the slit and the screen
  - (d) inversely as the size of the source from which the slit is illuminated
3. An unpolarised beam of intensity  $I_0$  is incident on a pair of nicols making an angle of  $60^\circ$  with each other. The intensity of light emerging from the pair is
 

(a) $I_0$	(b) $I_0/2$
(c) $I_0/4$	(d) $I_0/8$
4. When a low flying aircraft passes over head, we sometimes notice a slight shaking of the picture on our TV screen. This is due to
  - (a) diffraction of the signal received from the antenna
  - (b) interference of the direct signal received by the antenna with the weak signal reflected by the passing aircraft
  - (c) change of magnetic flux occurring due to the passage of aircraft
  - (d) vibration created by the passage of aircraft
5. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringes on either side of the central bright fringe is
 

(a) 1.2 cm	(b) 1.2 mm
(c) 2.4 cm	(d) 2.4 mm
6. The physical quantity having the dimensions  $[M^{-1}L^{-3}T^3A^2]$  is
  - (a) resistance
  - (b) resistivity
  - (c) electrical conductivity
  - (d) electromotive force
7. A battery of emf 10 V and internal resistance  $3 \Omega$  is connected to a resistor. The current in the circuit is 0.5 A. The terminal voltage of the battery when the circuit is closed is
 

(a) 10 V	(b) 0 V
(c) 1.5 V	(d) 8.5 V
8. A galvanometer coil has a resistance of  $15 \Omega$  and gives full scale deflection for a current of 4 mA. To convert it to an ammeter of range 0 to 6 A
  - (a)  $10 \text{ m}\Omega$  resistance is to be connected in parallel to the galvanometer
  - (b)  $10 \text{ m}\Omega$  resistance is to be connected in series with the galvanometer
  - (c)  $0.1 \Omega$  resistance is to be connected in parallel to the galvanometer
  - (d)  $0.1 \Omega$  resistance is to be connected in series with the galvanometer
9. The electron drift speed is small and the charge of the electron is also small but still, we obtain large current in a conductor. This is due to
  - (a) the conducting property of the conductor
  - (b) the resistance of the conductor is small
  - (c) the electron number density of the conductor is small
  - (d) the electron number density of the conductor is enormous
10. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field  $B$ . The magnitude of  $B$  (in tesla) is (assume  $g = 9.8 \text{ ms}^{-2}$ )
 

(a) 2	(b) 1.5
(c) 0.55	(d) 0.65



11. A Gaussian sphere encloses an electric dipole within it. The total flux across the sphere is  
 (a) zero  
 (b) half that due to a single charge  
 (c) double that due to a single charge  
 (d) dependent on the position of the dipole
12. A parallel plate air capacitor has a capacitance  $C$ . When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be  
 (a) 400%  
 (b) 66.6%  
 (c) 33.3%  
 (d) 200%
13. A comb run through one's dry hair attracts small bits of paper. This is due to  
 (a) comb is a good conductor  
 (b) paper is a good conductor  
 (c) the atoms in the paper get polarised by the charged comb  
 (d) the comb possesses magnetic properties
14. The specific charge of a proton is  $9.6 \times 10^7 \text{ C kg}^{-1}$ . The specific charge of an alpha particle will be  
 (a)  $9.6 \times 10^7 \text{ C kg}^{-1}$   
 (b)  $19.2 \times 10^7 \text{ C kg}^{-1}$   
 (c)  $4.8 \times 10^7 \text{ C kg}^{-1}$   
 (d)  $2.4 \times 10^7 \text{ C kg}^{-1}$
15. When light of wavelength 300 nm falls on a photoelectric emitter, photoelectrons are liberated. For another emitter, light of wavelength 600 nm is sufficient for liberating photoelectrons. The ratio of the work function of the two emitters is  
 (a) 1 : 2  
 (b) 2 : 1  
 (c) 4 : 1  
 (d) 1 : 4
16. White light is passed through a dilute solution of potassium permanganate. The spectrum produced by the emergent light is  
 (a) band emission spectrum  
 (b) line emission spectrum  
 (c) band absorption spectrum  
 (d) line absorption spectrum
17. If  $\lambda_1$  and  $\lambda_2$  are the wavelengths of the first members of the Lyman and Paschen series respectively, then  $\lambda_1 : \lambda_2$  is  
 (a) 1 : 3  
 (b) 1 : 30  
 (c) 7 : 50  
 (d) 7 : 108
18. Activity of a radioactive sample decreases to  $(1/3)^{\text{rd}}$  of its original value in 3 days. Then, in 9 days its activity will become  
 (a)  $(1/27)$  of the original value  
 (b)  $(1/9)$  of the original value  
 (c)  $(1/18)$  of the original value  
 (d)  $(1/3)$  of the original value
19. The working of which of the following is similar to that of a slide projector?  
 (a) Electron microscope  
 (b) Scanning electron microscope  
 (c) Transmission electron microscope  
 (d) Atomic force microscope
20. In a transistor the collector current is always less than the emitter current because  
 (a) collector side is reverse biased and the emitter side is forward biased  
 (b) a few electrons are lost in the base and only remaining ones reach the collector  
 (c) collector being reverse biased, attracts less electrons  
 (d) collector side is forward biased and emitter side is reverse biased
21. A transparent cube of 0.21 m edge contains a small air bubble. Its apparent distance when viewed through one face of the cube is 0.10 m and when viewed from the opposite face is 0.04 m. The actual distance of the bubble from the second face of the cube is  
 (a) 0.06 m  
 (b) 0.17 m  
 (c) 0.05 m  
 (d) 0.04 m
22. To a fish under water, viewing obliquely a fisherman standing on the bank of a lake, the man looks  
 (a) taller than what he actually is  
 (b) shorter than what he actually is  
 (c) the same height as he actually is  
 (d) depends on the obliquity
23. If white light is used in the Newton's rings experiment, the colour observed in the reflected light is complementary to that observed in the transmitted light through the same point. This is due to  
 (a)  $90^\circ$  change of phase in one of the reflected waves  
 (b)  $180^\circ$  change of phase in one of the reflected waves  
 (c)  $145^\circ$  change of phase in one of the reflected waves  
 (d)  $45^\circ$  change of phase in one of the reflected waves

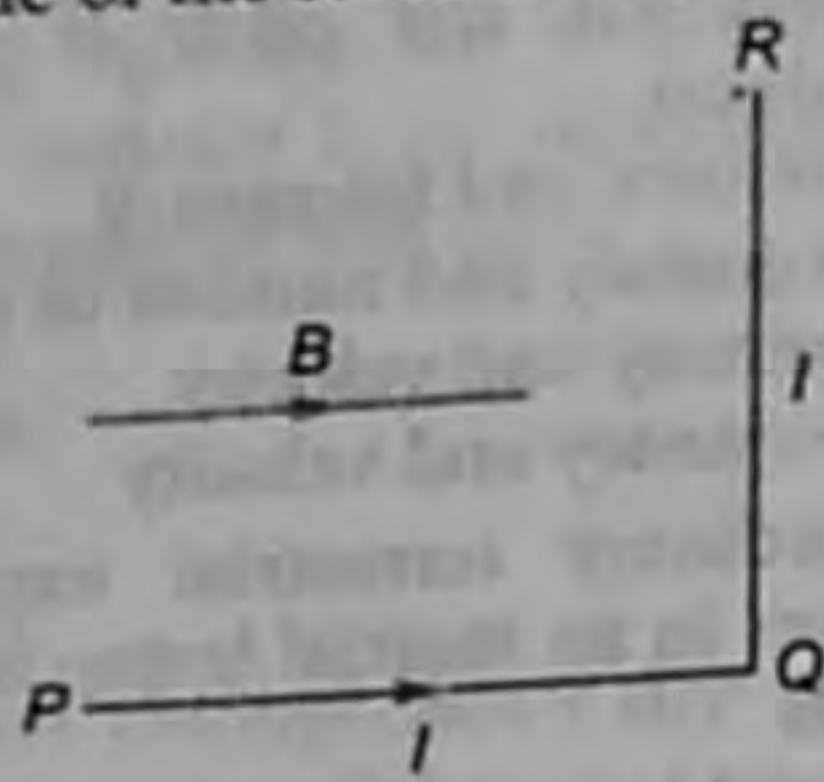


24. A satellite in a circular orbit of radius  $R$  has a period of 4 h. Another satellite with orbital radius  $3R$  around the same planet will have a period (in hours)
- (a) 16 (b) 4  
(c)  $4\sqrt{27}$  (d)  $4\sqrt{8}$
25. The freezer in a refrigerator is located at the top section so that
- (a) the entire chamber of the refrigerator is cooled quickly due to convection  
(b) the motor is not heated  
(c) the heat gained from the environment is high  
(d) the heat gained from the environment is low
26. A monoatomic gas is suddenly compressed to  $(1/8)^{\text{th}}$  of its initial volume adiabatically. The ratio of its final pressure to the initial pressure is (Given the ratio of the specific heats of the given gas to be  $5/3$ )
- (a) 32 (b)  $40/3$   
(c)  $24/5$  (d) 8
27. A Carnot engine takes heat from a reservoir at  $627^\circ\text{C}$  and rejects heat to a sink at  $27^\circ\text{C}$ . Its efficiency will be
- (a)  $3/5$  (b)  $1/3$   
(c)  $2/3$  (d)  $200/209$
28. A 30 V, 90 W lamp is to be operated on a 120 V DC line. For proper glow, a resistor of ...  $\Omega$  should be connected in series with the lamp.
- (a) 40 (b) 10  
(c) 20 (d) 30
29. A tuning fork A produces 4 beats  $\text{s}^{-1}$  with another tuning fork B of frequency 320 Hz. On filing one of the prongs of A, 4 beats  $\text{s}^{-1}$  are again heard when sounded with the same fork B. Then, the frequency of the fork A before filing is
- (a) 328 Hz (b) 316 Hz  
(c) 324 Hz (d) 320 Hz
30. The sprinkling of water reduces slightly the temperature of a closed room because
- (a) temperature of water is less than that of the room  
(b) specific heat of water is high  
(c) water has large latent heat of vaporisation  
(d) water is a bad conductor of heat
31. The equation of a simple harmonic wave is given by  $y = 5 \sin \frac{\pi}{2} (100t - x)$ , where  $x$  and  $y$  are in metre and time is in second. The period of the wave in second will be
- (a) 0.04 (b) 0.01  
(c) 1 (d) 5
32. The loudness and pitch of a sound note depends on
- (a) intensity and frequency  
(b) frequency and number of harmonics  
(c) intensity and velocity  
(d) frequency and velocity
33. For ordinary terrestrial experiments, the observer in an inertial frame in the following cases is
- (a) a child revolving in a giant wheel  
(b) a driver in a sports car moving with a constant high speed of  $200 \text{ kmh}^{-1}$  on a straight road  
(c) the pilot of an aeroplane which is taking off  
(d) a cyclist negotiating a sharp curve
34. A rectangular vessel when full of water, takes 10 min to be emptied through an orifice in its bottom. How much time will it take to be emptied when half filled with water?
- (a) 9 min (b) 7 min  
(c) 5 min (d) 3 min
35. If there were no gravity, which of the following will not be there for a fluid?
- (a) Viscosity  
(b) Surface tension  
(c) Pressure  
(d) Archimedes' upward thrust
36. In a  $LCR$  series circuit, the potential difference between the terminals of the inductance is 60 V, between the terminals of the capacitor is 30 V and that across the resistance is 40 V. Then, supply voltage will be equal to
- (a) 50 V (b) 70 V  
(c) 130 V (d) 10 V
37. When deuterium and helium are subjected to an accelerating field simultaneously then
- (a) both acquire same energy  
(b) deuterium accelerates faster  
(c) helium accelerates faster  
(d) neither of them is accelerated
38. A solenoid 1.5 m long and 0.4 cm in diameter possesses 10 turns per cm length. A current of 5 A flows through it. The magnetic field at the axis inside the solenoid is



- (a)  $2\pi \times 10^{-3} \text{ T}$       (b)  $2\pi \times 10^{-5} \text{ T}$   
 (c)  $4\pi \times 10^{-2} \text{ T}$       (d)  $4\pi \times 10^{-3} \text{ T}$

39. A wire PQR is bent as shown in figure and is placed in a region of uniform magnetic field  $B$ . The length of  $PQ = QR = l$ . A current  $I$  ampere flows through the wire as shown. The magnitude of the force on PQ and QR will be



- (a)  $BIl, 0$                       (b)  $2BIl, 0$   
 (c)  $0, BIl$                       (d)  $0, 0$

40. A choke is preferred to a resistance for limiting current in AC circuit because

- (a) choke is cheap  
 (b) there is no wastage of power  
 (c) choke is compact in size  
 (d) choke is a good absorber of heat

41. If  $r_1$  and  $r_2$  are the radii of the atomic nuclei of mass numbers 64 and 125 respectively, then the ratio ( $r_1/r_2$ ) is

- (a)  $\frac{64}{125}$                       (b)  $\sqrt{\frac{64}{125}}$   
 (c)  $\frac{5}{4}$                           (d)  $\frac{4}{5}$

42. A motor is used to deliver water at a certain rate through a given horizontal pipe. To deliver  $n$ -times the water through the same pipe in the same time the power of the motor must be increased as follows

- (a)  $n$ -times                      (b)  $n^2$ -times  
 (c)  $n^3$ -times                      (d)  $n^4$ -times

43. For a system to follow the law of conservation of linear momentum during a collision, the condition is

- (1) total external force acting on the system is zero.  
 (2) total external force acting on the system is finite and time of collision is negligible.  
 (3) total internal force acting on the system is zero.

- (a) (1) only                      (b) (2) only  
 (c) (3) only                      (d) (1) or (2)

44. An air bubble of radius 1 cm rises from the bottom portion through a liquid of density 1.5 g/cc at a constant speed of  $0.25 \text{ cm s}^{-1}$ . If the density of air is neglected, the coefficient of viscosity of the liquid is approximately, (In Pa)

- (a) 13000                      (b) 1300  
 (c) 130                          (d) 13

45. A given mass of a gas is compressed isothermally until its pressure is doubled. It is then allowed to expand adiabatically until its original volume is restored and its pressure is then found to be 0.75 of its initial pressure. The ratio of the specific heats of the gas is approximately

- (a) 1.20                          (b) 1.41  
 (c) 1.67                          (d) 1.83

46. Two solid spheres A and B made of the same material have radii  $r_A$  and  $r_B$  respectively. Both the spheres are cooled from the same temperature under the conditions valid for Newton's law of cooling. The ratio of the rate of change of temperature A and B is

- (a)  $\frac{r_A}{r_B}$                           (b)  $\frac{r_B}{r_A}$   
 (c)  $\frac{r_A^2}{r_B^2}$                           (d)  $\frac{r_B^2}{r_A^2}$

47. The effect due to uniform magnetic field on a freely suspended magnetic needle is as follows

- (a) both torque and net force are present  
 (b) torque is present but no net force  
 (c) both torque and net force are absent  
 (d) net force is present but not torque

48. When a positively charged particle enters a uniform magnetic field with uniform velocity, its trajectory can be

- (1) a straight line (2) a circle  
 (3) a helix  
 (a) (1) only  
 (b) (1) or (2)  
 (c) (1) or (3)  
 (d) any one of (1), (2) and (3)

49. A oil drop having a mass  $4.8 \times 10^{-10} \text{ g}$  and charge  $2.4 \times 10^{-18} \text{ C}$  stands still between two charged horizontal plates separated by a distance of 1 cm. If now the polarity of the plates is changed, instantaneous acceleration of the drop is ( $g = 10 \text{ ms}^{-2}$ )



- (a)  $5 \text{ ms}^{-2}$                       (b)  $10 \text{ ms}^{-2}$   
 (c)  $15 \text{ ms}^{-2}$                       (d)  $20 \text{ ms}^{-2}$

50. A free neutron decays spontaneously into  
 (a) a proton, an electron and anti-neutrino

- (b) a proton, an electron and a neutrino  
 (c) a proton and electron  
 (d) a proton, and electron, a neutrino and an anti-neutrino

## CHEMISTRY

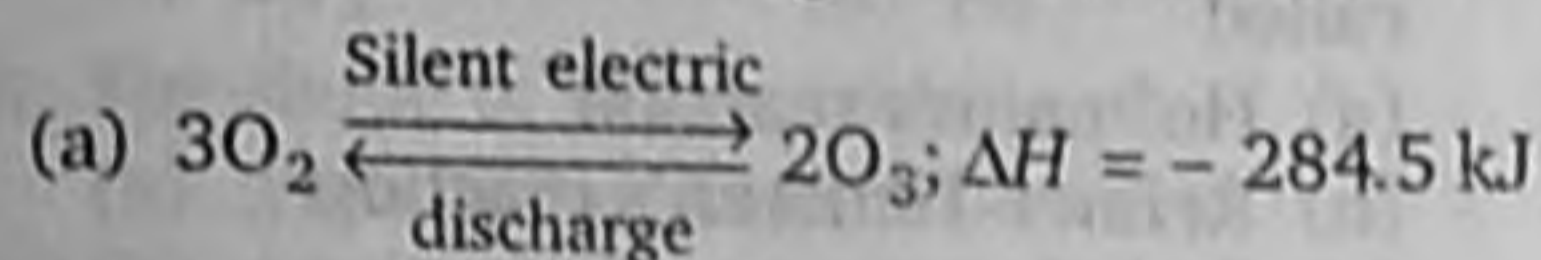
1. What is the correct order of spin only magnetic moment (in BM) of  $\text{Mn}^{2+}$ ,  $\text{Cr}^{2+}$  and  $\text{V}^{2+}$  ?

- (a)  $\text{Mn}^{2+} > \text{V}^{2+} > \text{Cr}^{2+}$   
 (b)  $\text{V}^{2+} > \text{Cr}^{2+} > \text{Mn}^{2+}$   
 (c)  $\text{Mn}^{2+} > \text{Cr}^{2+} > \text{V}^{2+}$   
 (d)  $\text{Cr}^{2+} > \text{V}^{2+} > \text{Mn}^{2+}$

2. Which of the following is used for making optical instruments ?

- (a)  $\text{SiO}_2$                               (b) Si  
 (c)  $\text{SiH}_4$                               (d) SiC

3. Which of the following is not correct ?



- (b) Ozone undergoes addition reaction with unsaturated carbon compounds  
 (c) Sodium thiosulphate reacts with  $\text{I}_2$  to form sodium tetrathionate and sodium iodide  
 (d) Ozone oxidises lead sulphide to lead sulphate

4. Which of the following reactions can produce aniline as main product ?

- (a)  $\text{C}_6\text{H}_5\text{NO}_2 + \text{Zn/KOH}$   
 (b)  $\text{C}_6\text{H}_5\text{NO}_2 + \text{Zn/NH}_4\text{Cl}$   
 (c)  $\text{C}_6\text{H}_5\text{NO}_2 + \text{LiAlH}_4$   
 (d)  $\text{C}_6\text{H}_5\text{NO}_2 + \text{Zn/HCl}$

5. Which of the following reagents when heated with ethyl chloride, forms ethylene ?

- (a) Aqueous KOH    (b) Zn/HCl  
 (c) Alcoholic KOH    (d) HI

6. The energy of a photon is  $3 \times 10^{-12}$  erg. What is its wavelength in nm ?

$(h = 6.62 \times 10^{-27} \text{ erg-s}; c = 3 \times 10^{10} \text{ cm/s})$

- (a) 662                              (b) 1324  
 (c) 66.2                              (d) 6.62

7. What is the time (in sec) required for depositing all the silver present in 125 mL of 1 M  $\text{AgNO}_3$  solution by passing a current of 241.25 A ? ( $1F = 96500 \text{ C}$ )

- (a) 10                              (b) 50  
 (c) 1000                              (d) 100

8. The disperse phase, dispersion medium and nature of colloidal solution (lyophilic or lyophobic) of 'gold sol' respectively, are

- (a) solid, solid, lyophobic  
 (b) liquid, liquid, lyophobic  
 (c) solid, liquid, lyophobic  
 (d) solid, liquid, lyophilic

9. The rate constant of a first order reaction at  $27^\circ\text{C}$  is  $10^{-3} \text{ min}^{-1}$ . The temperature coefficient of this reaction is 2. What is the rate constant (in  $\text{min}^{-1}$ ) at  $17^\circ\text{C}$  for this reaction ?

- (a)  $10^{-3}$                               (b)  $5 \times 10^{-4}$   
 (c)  $2 \times 10^{-3}$                               (d)  $10^{-2}$

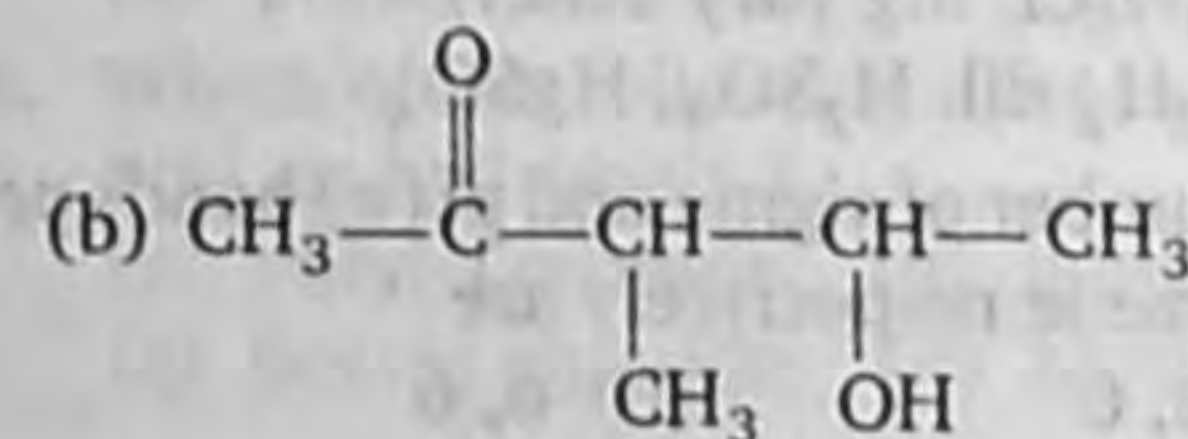
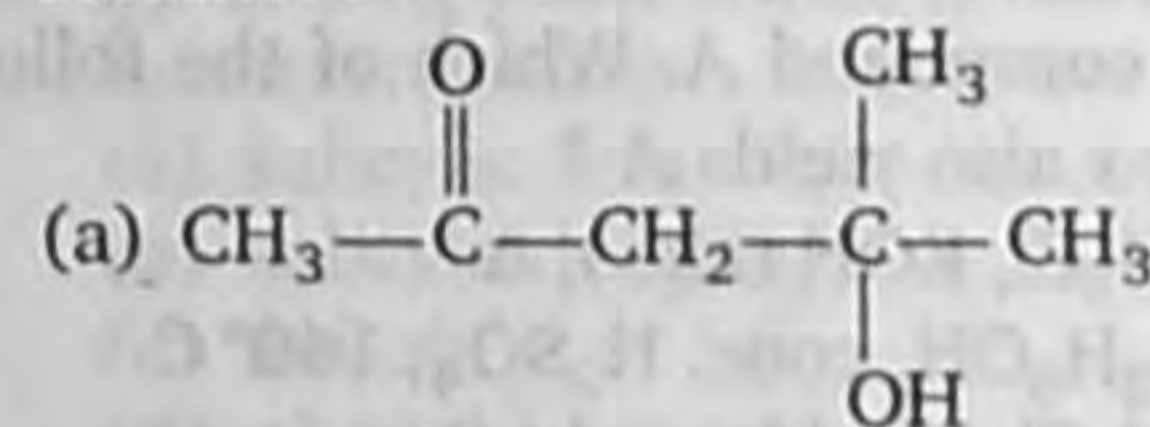
10. A solution of an acid has  $[\text{H}^+] = 2 \times 10^{-5}$ . Find out the concentration of  $\text{OH}^-$  ions.

- (a)  $5 \times 10^{-10} \text{ N}$                               (b)  $4 \times 10^{-10} \text{ N}$   
 (c)  $2 \times 10^{-5} \text{ N}$                               (d)  $9 \times 10^{-4} \text{ N}$

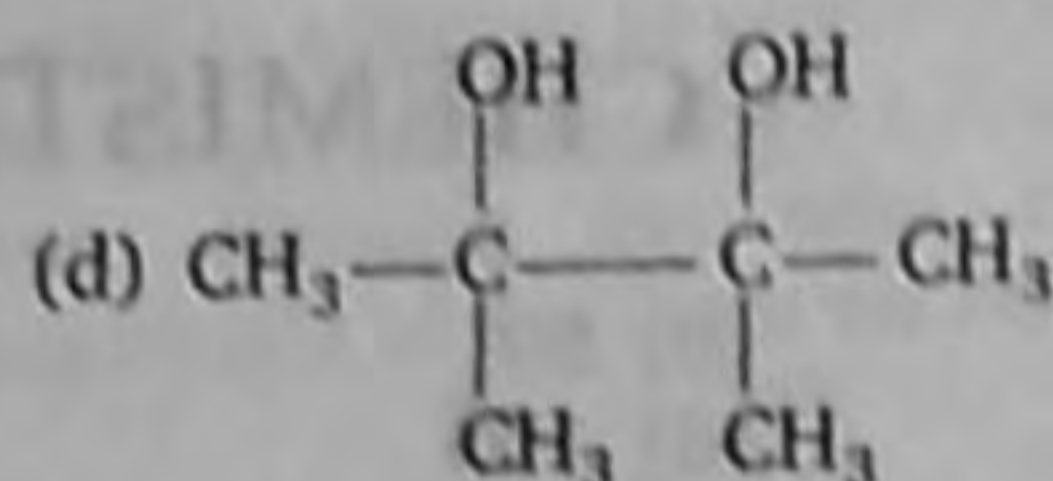
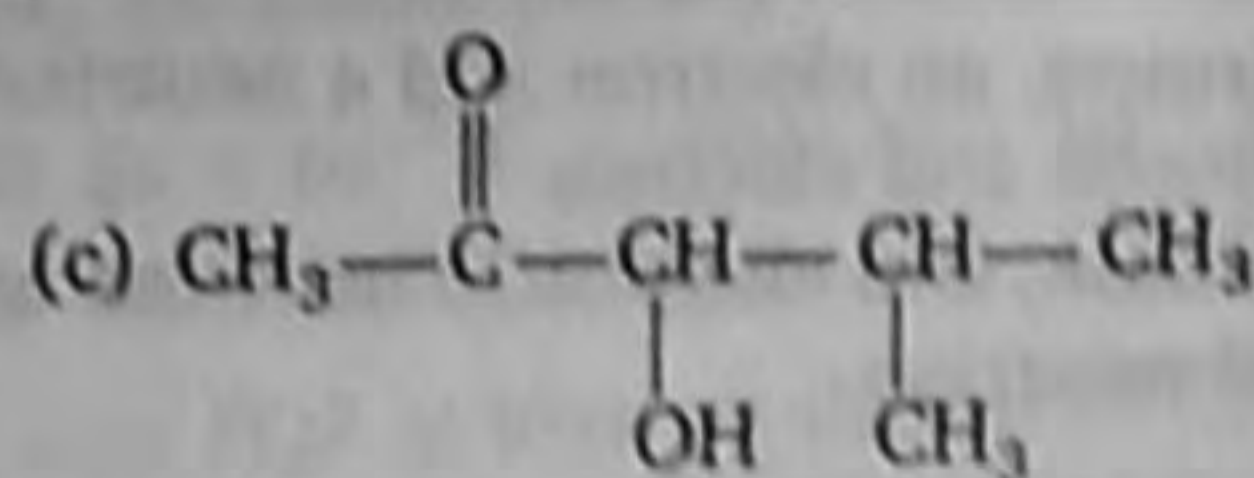
11. Which of the following is added to chloroform to slow down its aerial oxidation in presence of light ?

- (a) Carbonyl chloride  
 (b) Ethyl alcohol  
 (c) Sodium hydroxide  
 (d) Nitric acid

12. Which of the products is formed when acetone is reacted with barium hydroxide solution ?

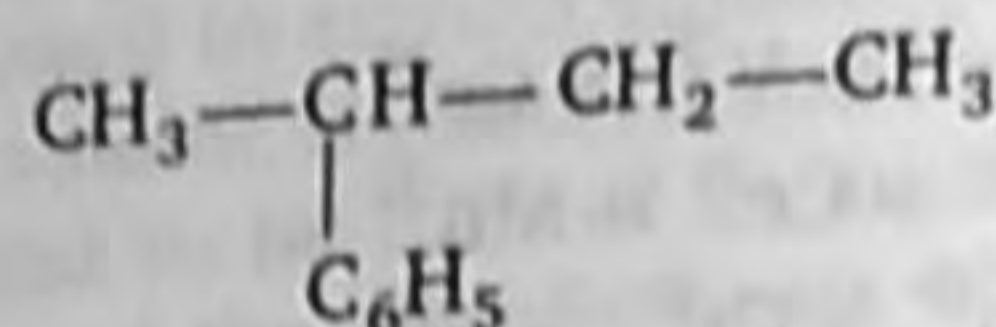






13. When acetaldehyde is heated with Fehling solution, a red precipitate is formed. Which of the following is that ?  
 (a)  $\text{Cu}_2\text{O}$  (b)  $\text{Cu}$   
 (c)  $\text{CuO}$  (d)  $\text{CuSO}_4$
14. What is the correct order of occurrence (% by weight) in air of Ne, Ar and Kr ?  
 (a)  $\text{Ne} > \text{Ar} > \text{Kr}$  (b)  $\text{Ar} > \text{Ne} > \text{Kr}$   
 (c)  $\text{Ar} > \text{Kr} > \text{Ne}$  (d)  $\text{Ne} > \text{Kr} > \text{Ar}$
15. Which of the following compounds when heated with CO at  $150^\circ\text{C}$  and 500 atm pressure in presence of  $\text{BF}_3$  forms ethyl propionate ?  
 (a)  $\text{C}_2\text{H}_5\text{OH}$  (b)  $\text{CH}_3\text{OCH}_3$   
 (c)  $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$  (d)  $\text{CH}_3\text{OC}_2\text{H}_5$
16. Identify the reaction for which  $\Delta H \neq \Delta E$ .  
 (a)  $\text{S (rhombic)} + \text{O}_2(\text{g}) \longrightarrow \text{SO}_2(\text{g})$   
 (b)  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{NO}(\text{g})$   
 (c)  $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{HCl}(\text{g})$   
 (d)  $\text{CO}(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{CO}_2(\text{g})$
17. Hydrolysis of  $\text{NCl}_3$  gives  $\text{NH}_3$  and X. Which of the following is X ?  
 (a)  $\text{HClO}_4$  (b)  $\text{HClO}_3$   
 (c)  $\text{HOCl}$  (d)  $\text{HClO}_2$
18. What are the metal ions present in carnallite ?  
 (a) Mg, K (b) Al, Na  
 (c) Na, Mg (d) Zn, Mg
19. Ethyl chloride reacts with sodium ethoxide to form a compound A. Which of the following reactions also yields A ?  
 (a)  $\text{C}_2\text{H}_5\text{Cl}$ ,  $\text{KOH (alc.)}$ ,  $\Delta$   
 (b)  $2\text{C}_2\text{H}_5\text{OH}$ , conc.  $\text{H}_2\text{SO}_4$ ,  $140^\circ\text{C}$   
 (c)  $\text{C}_2\text{H}_5\text{Cl}$ , Mg (dry ether)  
 (d)  $\text{C}_2\text{H}_2$  dil.  $\text{H}_2\text{SO}_4$ ,  $\text{HgSO}_4$
20. The number of sigma and pi ( $\pi$ ) bonds present in benzene respectively are  
 (a) 12, 6 (b) 6, 6  
 (c) 6, 12 (d) 12, 3

21. Edge length of a cube is 400 pm, its body diagonal would be  
 (a) 566 pm (b) 600 pm  
 (c) 500 pm (d) 693 pm
22. The number of  $\alpha$ -particles emitted by  ${}_{84}\text{Ra}^{218} \longrightarrow {}_{82}\text{Pb}^{206}$  is  
 (a) 3 (b) 4  
 (c) 6 (d) 2
23. The IUPAC name of the following compound is



- (a) 2-cyclohexylbutane  
 (b) *sec*-butylbenzene  
 (c) 3-cyclohexylbutane  
 (d) 2-phenylbutane
24. The reaction of primary amine with chloroform and ethanolic solution of  $\text{KOH}$  is called  
 (a) Hofmann's reaction  
 (b) Reimer-Tiemann's reaction  
 (c) Carbylamine reaction  
 (d) Kolbe's reaction
25. 0.01 mole of a non-electrolyte is dissolved in 10 g of water. The molality of the solution is  
 (a) 0.1 m (b) 0.5 m  
 (c) 1.0 m (d) 0.18 m
26. Atoms with same atomic number and different mass numbers are called  
 (a) isobars (b) isomers  
 (c) isotones (d) isotopes
27. The shape of the orbital with the value of  $l = 2$  and  $m = 0$  is  
 (a) spherical  
 (b) dumb-bell  
 (c) trigonal planar  
 (d) square-planar
28. In the following, the element with the highest ionisation energy is  
 (a)  $[\text{Ne}] 3s^2 3p^1$  (b)  $[\text{Ne}] 3s^2 3p^3$   
 (c)  $[\text{Ne}] 3s^2 3p^2$  (d)  $[\text{Ne}] 3s^2 3p^4$
29. In the conversion of  $\text{Br}_2$  to  $\text{BrO}_3^-$ , the oxidation number of Br changes from  
 (a) zero to +5 (b) +1 to +5  
 (c) zero to -3 (d) +2 to +5
30. Among the alkali metals cesium is the most reactive because



- (a) its incomplete shell is nearest to the nucleus  
 (b) it has a single electron in the valence shell  
 (c) it is the heaviest alkali metal  
 (d) the outermost electron is more loosely bound than the outermost electron of the other alkali metals
31. Which of the following represents the Lewis structure of  $N_2$  molecule ?
- (a)  $\begin{array}{c} \times \\ \times \end{array} N \equiv \begin{array}{c} \times \\ \times \end{array} N$       (b)  $\begin{array}{c} \times \times \\ \times \times \end{array} N \equiv \begin{array}{c} \times \times \\ \times \times \end{array} N$   
 (c)  $\begin{array}{c} \times \times \\ \times \times \end{array} N \times - \begin{array}{c} \times \times \\ \times \times \end{array} N$       (d)  $\begin{array}{c} \times \times \\ \times \times \end{array} N = \begin{array}{c} \times \times \\ \times \times \end{array} N$
32. Hydrogen bond is strongest in  
 (a)  $S-H \cdots O$       (b)  $O-H \cdots S$   
 (c)  $F-H \cdots F$       (d)  $O-H \cdots N$
33. The density of a gas is  $1.964 \text{ g dm}^{-3}$  at 273 K and 76 cm Hg. The gas is  
 (a)  $CH_4$       (b)  $C_2H_6$   
 (c)  $CO_2$       (d) Xe
34. The shape of  $PCl_3$  molecule is  
 (a) trigonal bipyramidal  
 (b) tetrahedral  
 (c) pyramidal  
 (d) square planar
35. The concentration of a reactant X decreases from 0.1 M to 0.005 M in 40 min. If the reaction follows first order kinetics, the rate of the reaction when the concentration of X is 0.01 M will be  
 (a)  $1.73 \times 10^{-4} \text{ M min}^{-1}$   
 (b)  $3.47 \times 10^{-4} \text{ M min}^{-1}$   
 (c)  $3.47 \times 10^{-5} \text{ M min}^{-1}$   
 (d)  $7.5 \times 10^{-4} \text{ M min}^{-1}$
36. Which of the following does not conduct electricity ?  
 (a) Fused NaCl      (b) Solid NaCl  
 (c) Brine solution      (d) Copper
37. Solubility product of a salt AB is  $1 \times 10^{-8} \text{ M}^2$  in a solution in which the concentration of  $A^+$  ions is  $10^{-3} \text{ M}$ . The salt will precipitate when the concentration of  $B^-$  ions is kept  
 (a) between  $10^{-8} \text{ M}$  to  $10^{-7} \text{ M}$   
 (b) between  $10^{-7} \text{ M}$  to  $10^{-8} \text{ M}$   
 (c)  $> 10^{-5} \text{ M}$   
 (d)  $< 10^{-8} \text{ M}$
38. The pH of  $10^{-8} \text{ M}$  HCl solution is  
 (a) 8  
 (b) more than 8  
 (c) between 6 and 7  
 (d) slightly more than 7
39. For a reaction to be spontaneous at all temperatures  
 (a)  $\Delta G$  and  $\Delta H$  should be negative  
 (b)  $\Delta G$  and  $\Delta H$  should be positive  
 (c)  $\Delta G = \Delta S = 0$   
 (d)  $\Delta H < \Delta G$
40. Which of the following electrolytes will have maximum flocculation value for  $Fe(OH)_3$  sol ?  
 (a) NaCl      (b)  $Na_2S$   
 (c)  $(NH_4)_3PO_4$       (d)  $K_2SO_4$
41. What is the order of a reaction which has a rate expression  

$$\text{rate} = k[A]^{3/2}[B]^{-1} ?$$
  
 (a)  $\frac{3}{2}$       (b)  $\frac{1}{2}$   
 (c) 0      (d)  $\frac{4}{2}$
42. Inductive effect involves  
 (a) displacement of  $\sigma$ -electrons  
 (b) delocalisation of  $\pi$ -electrons  
 (c) delocalisation of  $\sigma$ -electrons  
 (d) displacement of  $\pi$ -electrons
43. Which of the following compound is expected to be optically active ?  
 (a)  $(CH_3)_2CHCHO$   
 (b)  $CH_3CH_2CH_2CHO$   
 (c)  $CH_3CH_2CHBrCHO$   
 (d)  $CH_3CH_2CBr_2CHO$
44. The catalyst used in the preparation of an alkyl chloride by the action of dry HCl on an alcohol is  
 (a) anhydrous  $AlCl_3$       (b)  $FeCl_3$   
 (c) anhydrous  $ZnCl_2$       (d) Cu
45. By heating phenol with chloroform in alkali, it is converted into  
 (a) salicylic acid  
 (b) salicylaldehyde  
 (c) anisole  
 (d) phenyl benzoate
46. Which of the following does not give benzoic acid on hydrolysis ?  
 (a) Phenyl cyanide      (b) Benzoyl chloride  
 (c) Benzyl chloride      (d) Methyl benzoate



47. Glucose contains in addition to aldehyde group  
 (a) one secondary —OH and four primary —OH groups  
 (b) one primary —OH and four secondary —OH groups  
 (c) two primary —OH and three secondary —OH groups  
 (d) three primary —OH and two secondary —OH groups
48. The formula mass of Mohr's salt is 392. The iron present in it is oxidised by  $\text{KMnO}_4$  in acid medium. The equivalent mass of Mohr's salt is

- (a) 392 (b) 31.6  
 (c) 278 (d) 156
49. The brown ring test for nitrates depends on  
 (a) the reduction of nitrate to nitric oxide  
 (b) oxidation of nitric oxide to nitrogen dioxide  
 (c) reduction of ferrous sulphate to iron  
 (d) oxidising action of sulphuric acid
50. Which of the following solutions will exhibit highest boiling point ?  
 (a) 0.01 M  $\text{Na}_2\text{SO}_4$  (aq)  
 (b) 0.01 M  $\text{KNO}_3$  (aq)  
 (c) 0.015 M urea (aq)  
 (d) 0.015 M glucose (aq)

## BIOLOGY

1. When  $\text{CO}_2$  concentration in blood increases, breathing becomes  
 (a) shallower and slow  
 (b) there is no effect on breathing  
 (c) slow and deep  
 (d) faster and deeper
2. Cancer cells are more easily damaged by radiation than normal cells because they are  
 (a) starved of mutation  
 (b) undergoing rapid division  
 (c) different in structure  
 (d) non-dividing
3. Which one of the following is not correctly matched ?  
 (a) *Glossina palpalis* — Sleeping sickness  
 (b) *Culex* — Filariasis  
 (c) *Aedes aegypti* — Yellow fever  
 (d) *Anopheles culifacies* — Leishmaniasis
4. A free living nitrogen fixing cyanobacterium, which can also form symbiotic association with the water fern *Azolla* is  
 (a) *Tolypothrix* (b) *Chlorella*  
 (c) *Nostoc* (d) *Anabaena*
5. Which of the following hormones is not a secretion product of human placenta ?  
 (a) Human chorionic gonadotropin  
 (b) Prolactin  
 (c) Oestrogen  
 (d) Progesterone
6. The cardiac pace maker in a patient fails to function normally. The doctors find that an artificial pace maker is to be grafted in him. It is likely that it will be grafted at the site of  
 (a) atrioventricular bundle  
 (b) Purkinje system  
 (c) sinuatrial node  
 (d) atrioventricular node
7. Flagella of prokaryotic and eukaryotic cells differ in  
 (a) type of movement and placement in cell  
 (b) location in cell and mode of functioning  
 (c) micro-tubular organization and type of movement  
 (d) micro-tubular organization and function
8. The animal with bilateral symmetry in young stage, and radial pentamerous symmetry in the adult stage belongs to the phylum  
 (a) Annelida (b) Mollusca  
 (c) Cnidaria (d) Echinodermata
9. Lack of independent assortment of two genes-A and B in fruitfly-*Drosophila* is due to  
 (a) repulsion (b) recombination  
 (c) linkage (d) crossing over
10. Which of the following is expected to have the highest value ( $\text{gm}/\text{m}^2/\text{yr}$ ) in a grassland ecosystem ?  
 (a) Secondary Production (SP)  
 (b) Tertiary Production (TP)  
 (c) Gross Production (GP)  
 (d) Net Production (NP)
11. In 1984, the Bhopal gas tragedy took place because methyl isocyanate  
 (a) reacted with DDT  
 (b) reacted with ammonia  
 (c) reacted with  $\text{CO}_2$   
 (d) reacted with water



12. The technique of obtaining large number of plantlets by tissue culture method is called  
 (a) plantlet culture  
 (b) organ culture  
 (c) micro-propagation  
 (d) All of the above
13. One set of a plant was grown at 12 hours day and 12 hours night period cycles and it flowered, while in the other set night phase was interrupted by flash of light and it did not produce flower. Under which one of the following categories will you place this plant?  
 (a) Long day  
 (b) Darkness neutral  
 (c) Day neutral  
 (d) Short day
14. Which one of the following hormone is a modified amino acid?  
 (a) Epinephrine (b) Progesterone  
 (c) Prostaglandin (d) Oestrogen
15. In  $C_3$  plants, the first stable product of photosynthesis during the dark reaction is  
 (a) malic acid  
 (b) oxaloacetic acid  
 (c) 3-phosphoglyceric acid  
 (d) phosphoglyceraldehyde
16. The maximum growth rate occurs in  
 (a) stationary phase  
 (b) senescent phase  
 (c) lag phase  
 (d) exponential phase
17. Anthesis is a phenomenon which refers to  
 (a) reception of pollen by stigma  
 (b) formation of pollen  
 (c) development of anther  
 (d) opening of flower bud
18. Cell elongation in internodal regions of the green plants takes place due to  
 (a) indole acetic acid  
 (b) cytokinins  
 (c) gibberellins  
 (d) ethylene
19. A nutritionally wild type organism, which does not require any additional growth supplement is known as  
 (a) phenotype (b) holotype  
 (c) auxotroph (d) prototroph
20. Which of the following propagates through leaf-tip?  
 (a) Walking fern  
 (b) Sprout-leaf plant  
 (c) *Marchantia*  
 (d) Moss
21. Common indicator organism of water pollution is  
 (a) *Lemna paucicostata*  
 (b) *Eichhornia crassipes*  
 (c) *Escherichia coli*  
 (d) *Entamoeba histolytica*
22. According to Oparin, which one of the following was not present in the primitive atmosphere of the earth?  
 (a) Methane (b) Oxygen  
 (c) Hydrogen (d) Water vapour
23. Which one of the following precedes re-formation of the nuclear envelope during M-phase of the cell cycle?  
 (a) Decondensation from chromosomes and reassembly of the nuclear lamina  
 (b) Transcription from chromosomes and reassembly of the nuclear lamina  
 (c) Formation of the contractile ring and formation of the phragmoplast  
 (d) Formation of the contractile ring and transcription from chromosomes
24. In transgenics, expression of transgene in target tissue is determined by  
 (a) enhancer (b) transgene  
 (c) promoter (d) reporter
25. One of the *ex situ* conservation method for endangered species is  
 (a) wild-life sanctuaries  
 (b) biosphere reserves  
 (c) cryopreservation  
 (d) national parks
26. The "Cri-du-chat" syndrome is caused by change in chromosome structure involving  
 (a) deletion (b) duplication  
 (c) inversion (d) translocation
27. When synapsis is complete all along the chromosome, the cell is said to have entered a stage called  
 (a) zygotene (b) pachytene  
 (c) diplotene (d) diakinesis
28. How does pruning help in making the hedge dense?  
 (a) It induces the differentiation of new shoots from the rootstock  
 (b) It frees axillary buds from apical dominance



- (c) The apical shoot grows faster after pruning  
(d) It releases wound hormones
29. Which one of the following statements is correct ?  
(a) Neurons regulate endocrine activity, but not *vice versa*  
(b) Endocrine glands regulate neural activity and nervous system regulates endocrine glands  
(c) Neither hormones control neural activity nor the neurons control endocrine activity  
(d) Endocrine glands regulate neural activity but not *vice versa*
30. Examination of blood of a person suspected of having anaemia, shows large, immature, nucleated erythrocytes without haemoglobin. Supplementing his diet with which of the following, is likely to alleviate his symptoms ?  
(a) Thiamine  
(b) Folic acid and cobalamine  
(c) Riboflavin  
(d) Iron compounds
31. In which of the following fruit, the edible part is the aril ?  
(a) Apple (b) Pomegranate  
(c) Orange (d) Litchi
32. Which one of the following amino acid was not found to be synthesized in Miller's experiment ?  
(a) Glycine (b) Aspartic acid  
(c) Glutamic acid (d) Alanine
33. Which one of the following is not used for construction of ecological pyramids ?  
(a) Dry weight  
(b) Number of individuals  
(c) Rate of energy flow  
(d) Fresh weight
34. Treatment of seed at low temperature under moist conditions to break its dormancy is called  
(a) scarification (b) vernalization  
(c) chelation (d) stratification
35. Which one of the following is the most suitable medium for culture of *Drosophila melanogaster* ?  
(a) Moist-bread (b) Agar agar  
(c) Ripe banana (d) Cow dung
36. The thalloid body of a slime mold (Myxomycetes) is known as  
(a) protonema (b) Plasmodium  
(c) fruiting body (d) mycelium
37. In which mode of inheritance, do you expect more maternal influence among the offspring ?  
(a) Autosomal (b) Cytoplasmic  
(c) Y-linked (d) X-linked
38. What type of placentation is seen in sweet pea ?  
(a) Basal (b) Axile  
(c) Free central (d) Marginal
39. An organic substance bound to an enzyme and essential for its activity is called  
(a) coenzyme (b) holoenzyme  
(c) apoenzyme (d) isoenzyme
40. Evolutionary history of an organism is known as  
(a) phylogeny (b) ancestry  
(c) palaeontology (d) ontogeny
41. Sertoli cells are regulated by the pituitary hormone known as  
(a) FSH (b) GH  
(c) prolactin (d) LH
42. Antiparallel strands of a DNA molecule means that  
(a) one strand turns anti-clockwise  
(b) the phosphate groups of two DNA strands at their ends, share the same position  
(c) the phosphate groups at the start of two DNA strands are in opposite position (pole)  
(d) one strand turns clockwise
43. Restriction endonuclease  
(a) cuts the DNA molecule randomly  
(b) cuts the DNA molecule at specific sites  
(c) restricts the synthesis of DNA inside the nucleus  
(d) synthesizes DNA
44. Earthworms are  
(a) ureotelic when plenty of water is available  
(b) uricotelic when plenty of water is available  
(c) uricotelic under conditions of water scarcity  
(d) ammonotelic when plenty of water is available



45. Which one of the following has an open circulatory system ?  
(a) *Pheretima*  
(b) *Periplaneta*  
(c) *Hirudinaria*  
(d) *Octopus*
46. Biradial symmetry and lack of cnidoblasts are the characteristics of  
(a) Starfish and sea anemone  
(b) *Ctenoplana* and *Beroe*  
(c) *Aurelia* and *Paramecium*  
(d) *Hydra* and starfish
47. In order to obtain virus-free plants through tissue culture, the best method is  
(a) protoplast culture  
(b) embryo rescue  
(c) anther culture  
(d) meristem culture
48. Both sickle-cell anaemia and Huntington's chorea are  
(a) bacteria-related diseases  
(b) congenital disorders  
(c) pollutant-induced disorders  
(d) virus-related diseases
49. Which one of the following pairs is not correctly matched ?  
(a) Vitamin B<sub>12</sub> — Pernicious anaemia  
(b) Vitamin B<sub>6</sub> — Loss of appetite  
(c) Vitamin B<sub>1</sub> — Beri-beri  
(d) Vitamin B<sub>2</sub> — Pellagra
50. Injury to vagus nerve in human is not likely to affect  
(a) tongue movements  
(b) gastrointestinal movements  
(c) pancreatic secretion  
(d) cardiac movements