

## PHYSICS

1) The number of photons of wavelength 6600 nm must strike a totally reflecting screen per second at normal incidence so as to exert a force of 1 N.

- (1)  $5 \times 10^{26}$  photon/sec
- (2)  $5 \times 10^{28}$  photon/sec
- (3)  $5 \times 10^{27}$  photon/sec
- (4)  $5 \times 10^{25}$  photon/sec

2) The work function of a surface of a photosensitive material is 1.8 eV. The wavelength of the incident radiation for which the stopping potential is 0.7 V lies in the -

- (1) Ultraviolet Region
- (2) Visible Region
- (3) Infrared Region
- (4) X-rays Region

3) A source  $S_1$  is producing  $x$  photons/sec of wavelength  $2000\text{\AA}$ . Another source  $S_2$  is producing  $2x$  photons per second of wavelength  $8000\text{\AA}$ . Then, (Power of  $S_2$ ) (power of  $S_1$ ) is equal to-

- (1) 1 : 1
- (2) 2 : 1
- (3) 1 : 2
- (4) 1 : 4

4)

When a monochromatic point source of light is at a distance of 0.2 m from a photoelectric cell, the cut-off voltage and the saturation current are respectively 0.6 volt and 18.0 mA. If the same source is placed 0.6 m away from the photoelectric cell, then

- (1) the stopping potential will be 0.2 volt
- (2) the stopping potential will be 0.6 volt
- (3) the saturation current will be 0.6 mA
- (4) the saturation current will be 3.0 mA.

5) The de-Broglie wavelength of a particle accelerated with 150 volt potential is  $10^{-10}$  m. If it is accelerated by 600 volts p.d. its wavelength will be-

- (1)  $0.25\text{\AA}$
- (2)  $0.5\text{\AA}$

(3)  $1.5 \text{ \AA}$

(4)  $2 \text{ \AA}$

6) If K.E. of a particle is increased 16 times the percentage change in the de-Broglie wavelength of particle is :-

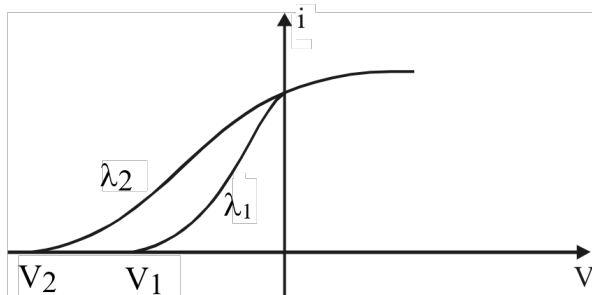
(1) 25%

(2) 75%

(3) 60%

(4) 50%

7) If in diagram  $V_2 > V_1$  then :-



(1)  $\lambda_1 = \sqrt{\lambda_2}$

(2)  $\lambda_1 < \lambda_2$

(3)  $\lambda_1 = \lambda_2$

(4)  $\lambda_1 > \lambda_2$

8) In third orbit of hydrogen atom, de Broglie wavelength of electron is  $\lambda$  then radius of third orbit is :-

(1)  $3\lambda$

(2)  $\lambda$

(3)  $\frac{3\lambda}{2\pi}$

(4)  $\frac{\lambda}{2\pi}$

9) Which metal can't emit photo electrons when visible light fall on it :-

(1) Cs

(2) Na

(3) Fe

(4) K

10) The mass defect for the nucleus of helium is 0.0303 a.m.u. What is the binding energy per nucleon for helium in MeV ?

(1) 28

- (2) 7
- (3) 4
- (4) 1

11) Consider the following reaction  ${}_1^1\text{H} + {}_1^3\text{H} \rightarrow {}_1^2\text{H} + {}_1^2\text{H}$

The atomic masses are given as  $m({}_1^1\text{H}) = 1.007825 \text{ u}$

$$m({}_1^2\text{H}) = 2.014102 \text{ u}$$

$m({}_1^3\text{H}) = 3.016049 \text{ u}$  The Q- value of the above reaction will be :-

- (1) -4.03 MeV
- (2) -2.01 MeV
- (3) 2.01 MeV
- (4) 4.03 MeV

12) If binding energies per nucleon of X, B and A are 7.4 MeV, 8.2 MeV and 8.2 MeV respectively, then the energy released in the reaction :  $X^{200} \rightarrow A^{110} + B^{90} + \text{energy}$  will be-

- (1) 160 MeV
- (2) 200 MeV
- (3) 110 MeV
- (4) 90 MeV

13) The number of  $\alpha$  and  $\beta^-$  emitted during the radioactive decay chain starting from  ${}_{88}^{226}\text{Ra}$  and ending at  ${}_{82}^{206}\text{Pb}$  is

- (1)  $3\alpha$  &  $6\beta^-$
- (2)  $4\alpha$  &  $5\beta^-$
- (3)  $5\alpha$  &  $4\beta^-$
- (4)  $6\alpha$  &  $6\beta^-$

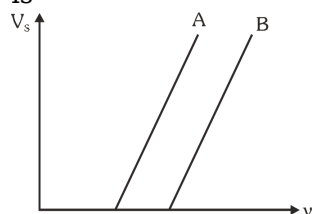
14) A radioactive nucleus  ${}_Z^AX^A$  emit  $3\alpha$ -particles and  $5\beta^-$ -particles. The ratio of number of neutrons to that of protons in the product nucleus will be :-

- (1)  $\frac{A-Z-12}{Z-6}$
- (2)  $\frac{A-Z}{Z-1}$
- (3)  $\frac{A-Z-11}{Z-6}$
- (4)  $\frac{A-Z-11}{Z-1}$

15)  ${}_{100}X^{244} \xrightarrow{\alpha} \xrightarrow{\alpha} \xrightarrow{2\beta^-} \xrightarrow{\alpha} {}_QY^P$ , P & Q will be :-

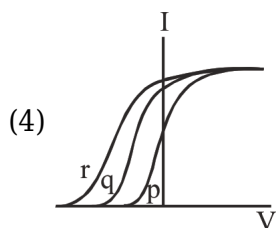
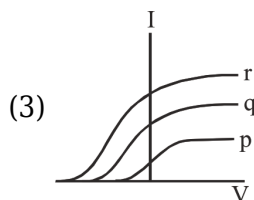
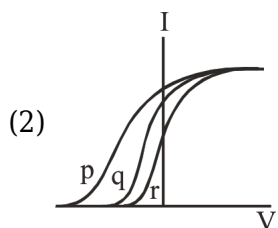
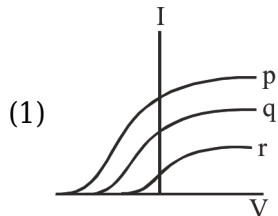
- (1) 232, 96
- (2) 230 ,98
- (3) 230, 96
- (4) 232, 98

16) In the given figure the stopping potential as a function of frequency of incident radiation is plotted for two different photoelectric surface A and B. The graphs shows that the work function of A is



- (1) greater than that of B
- (2) smaller than that of B
- (3) same as that of B
- (4) data insufficient

17) Photoelectric effect experiments are performed using three different metal plates p, q and r having work functions  $\phi_p = 2.0$  eV,  $\phi_q = 2.5$  eV and  $\phi_r = 3.0$  eV, respectively. A light beam containing wavelengths of 550 nm, 450 nm and 350 nm with equal intensities illuminates each of the plates. The correct I-V graph for the experiment is. (Take  $hc = 1240$  eV nm)



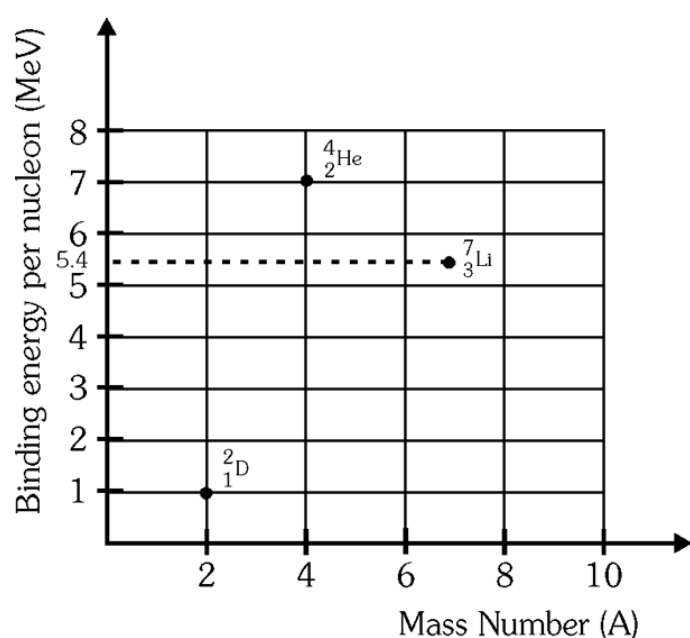
18) When a metallic surface is illuminated with monochromatic light of wavelength  $\lambda$ , the stopping

potential is  $5 V_0$ . When the same surface is illuminated with light of wavelength  $3\lambda$ , the stopping potential is  $V_0$ . Then the work function of the metallic surface is :

- (1)  $\frac{hc}{6\lambda}$
- (2)  $\frac{hc}{5\lambda}$
- (3)  $\frac{hc}{4\lambda}$
- (4)  $\frac{2hc}{4\lambda}$

19)

The positions of  ${}^2_1\text{D}$ ,  ${}^4_2\text{He}$  and  ${}^7_3\text{Li}$  are shown on the binding energy curve as shown in figure. The energy released in the fusion reaction,  ${}^2_1\text{D} + {}^7_3\text{Li} \rightarrow 2 {}^4_2\text{He} + {}^1_0\text{n}$



- (1) 2MeV
- (2) 4 MeV
- (3) 8MeV
- (4) 16MeV

20) Electromagnetic wave of intensity  $1400 \text{ W/m}^2$  falls on metal surface on area  $1.5 \text{ m}^2$  and completely absorbed by it. Find out force exerted by beam :-

- (1)  $14 \times 10^{-5} \text{ N}$
- (2)  $14 \times 10^{-6} \text{ N}$
- (3)  $7 \times 10^{-5} \text{ N}$
- (4)  $7 \times 10^{-6} \text{ N}$

21) An electron of mass  $m$  and a photon have same energy  $E$ . The ratio of de-Broglie wavelengths associated with them is :

$$(1) \frac{1}{c} \left( \frac{E}{2m} \right)^{\frac{1}{2}}$$

$$(2) \left( \frac{E}{2m} \right)^{\frac{1}{2}}$$

$$(3) c(2mE)^{\frac{1}{2}}$$

$$(4) \frac{1}{c} \left( \frac{2m}{E} \right)^{\frac{1}{2}}$$

22) If the nucleus  ${}_{13}^{27}\text{Al}$  has a nuclear radius of about 3.6 fm, the  ${}_{52}^{125}\text{Te}$  would have its radius approximately as:-

- (1) 4.8 fm
- (2) 6.0 fm
- (3) 9.6 fm
- (4) 12.0 fm

23) Light of wavelength 500 nm is incident on a metal with work function 2.28 eV. The de-Broglie wavelength of the emitted  $e^-$ s is :-

- (1)  $\leq 2.8 \times 10^{-12}$  m
- (2)  $< 2.8 \times 10^{-10}$  m
- (3)  $< 2.8 \times 10^{-9}$  m
- (4)  $\geq 2.8 \times 10^{-9}$  m

24) An electron with (rest mass  $m_0$ ) moves with a speed of  $0.8c$ . Its mass when it moves with this speed is :

- (1)  $m_0$
- (2)  $\frac{m_0}{6}$
- (3)  $\frac{5m_0}{3}$
- (4)  $\frac{3m_0}{5}$

25) If  $\lambda_p$  and  $\lambda_\alpha$  be the wavelengths of protons and  $\alpha$ -particles of equal kinetic energies, then

- (1)  $\lambda_p = \frac{\lambda_\alpha}{4}$
- (2)  $\lambda_p = \frac{\lambda_\alpha}{2}$
- (3)  $\lambda_p = \lambda_\alpha$
- (4)  $\lambda_p = 2\lambda_\alpha$

26) The potential energy of a particle of mass  $m$  is given by

$$U(x) \begin{cases} 2E_0 & , \quad 0 \leq x \leq 1 \\ 0 & , \quad x > 1 \end{cases}$$

$\lambda_1$  and  $\lambda_2$  are the De-broglie wavelength of the particle when  $0 \leq x \leq 1$  and  $x > 1$  respectively. If the total energy of particle is  $4E_0$ . The ratio  $\frac{\lambda_2}{\lambda_1}$  will be :-

- (1) 2
- (2) 1
- (3)  $\sqrt{2}$
- (4)  $\frac{1}{\sqrt{2}}$

27) When the momentum of a photon is changed by an amount  $P_0$ , the change in de-broglie wavelength is found to be 0.25%. Then, the original momentum of the proton was :-

- (1)  $P_0$
- (2)  $100 P_0$
- (3)  $400 P_0$
- (4)  $4 P_0$

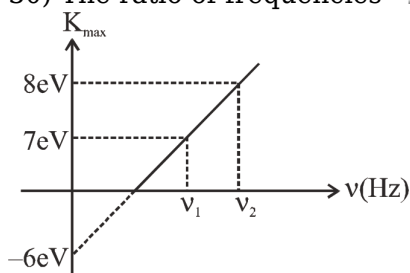
28) A beam of light is incident normally on a plane surface absorbing 70% of the light and reflecting the rest. If the incident beam carries 10W of power. Find force exerted by it on the surface :-

- (1)  $4 \times 10^{-20} \text{ N}$
- (2)  $4.3 \times 10^{-2} \text{ N}$
- (3)  $4.3 \times 10^{-8} \text{ N}$
- (4)  $4.3 \times 10^{-12} \text{ N}$

29) The energy that should be added to an electron to reduce its de Broglie wavelength from one nm to 0.5 nm is -

- (1) Four times the initial energy
- (2) Equal to the initial energy
- (3) Twice the initial energy
- (4) Thrice the initial energy

30) The ratio of frequencies  $\frac{\nu_1}{\nu_2}$  of incident photons in graph shown will be :



- (1)  $\frac{12}{13}$
- (2)  $\frac{13}{14}$
- (3)  $\frac{14}{13}$
- (4)  $\frac{13}{12}$

31) A photo-cell is illuminated by a source of light, which is placed at a distance  $d$  from the cell, If the distance become  $d/2$ , then number of electrons emitted per second will be :-

- (1) Remain same
- (2) Four times
- (3) Two times
- (4) One-fourth

32) A silver ball of radius 4.8 cm is suspended by a thread in the vacuum chamber. UV light of wavelength 200 nm is incident on the ball for some times during which a total energy of  $1 \times 10^{-7}$  J falls on the surface. Assuming on an average one out of  $10^3$  photons incident is able to eject electron. The potential on sphere will be :-

- (1) 1 V
- (2) 2 V
- (3) 3 V
- (4) Zero

33) A caesium photocell, with a steady potential difference of 60 V across, is illuminated by a bright point sources of light 50 cm away. When the same light is placed 1m away the photoelectrons emitted from the cell

- (1) Are one quarter as numerous
- (2) Are half as numerous
- (3) Each carry one quarter of their previous momentum
- (4) Each carry one quarter of their previous energy

34) Let  $F_{pp}$ ,  $F_{PN}$  and  $F_{NN}$  denote the nuclear force between proton-proton, proton-neutron and neutron-neutron pair respectively. When separation is 1 fm :-

- (1)  $F_{pp} < F_{PN} = F_{NN}$
- (2)  $F_{pp} > F_{PN} = F_{NN}$
- (3)  $F_{pp} = F_{PN} = F_{NN}$
- (4)  $F_{pp} < F_{PN} < F_{NN}$

35) The maximum velocity of an electron emitted by light of wavelength  $\lambda$  incident on the surface of a metal of work function  $\phi$  is

Where  $h$  = Planck's constant,  $m$  = mass of electron and  $c$  = speed of light.



- (1)  $\left[ \frac{2(hc + \lambda\phi)}{m\lambda} \right]^{1/2}$   
 (2)  $\frac{2(hc - \lambda\phi)}{m}$   
 (3)  $\left[ \frac{2(hc - \lambda\phi)}{m\lambda} \right]^{1/2}$   
 (4)  $\left[ \frac{2(h\lambda - \phi)}{m} \right]^{1/2}$

36) In the reaction  ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0\text{n}$ . If the Binding energies of  ${}^2_1\text{H}$ ,  ${}^3_1\text{H}$  and  ${}^4_2\text{He}$  are respectively a, b and c (in MeV), then the energy (in MeV) released in this reaction is

- (1)  $c + a - b$   
 (2)  $c - a - b$   
 (3)  $a + b + c$   
 (4)  $a + b - c$

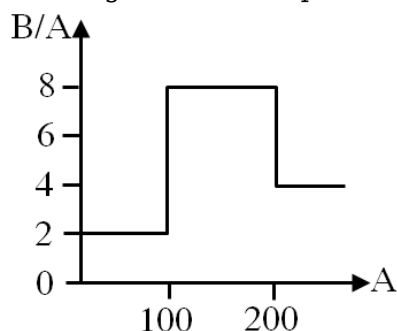
37) The ratio of de-Broglie wavelengths of molecules of hydrogen and helium which are at temperature  $27^\circ\text{C}$  and  $127^\circ\text{C}$  respectively is

- (1)  $\frac{1}{2}$   
 (2)  $\sqrt{\frac{3}{8}}$   
 (3)  $\sqrt{\frac{8}{3}}$   
 (4) 1

38) An atomic power nuclear reactor can deliver 300 MW. The energy released due to fission of each nucleus of uranium atom  $\text{U}^{238}$  is 170 MeV. The number of uranium atoms fissioned per hour will be:-

- (1)  $30 \times 10^{25}$   
 (2)  $4 \times 10^{22}$   
 (3)  $10 \times 10^{20}$   
 (4)  $5 \times 10^{15}$

39) Assume that the nuclear binding energy per nucleon (B/A) versus mass number (A) is as shown in the figure. Use this plot to choose the correct choice(s) given below.



(A) Fusion of two nuclei with mass numbers lying in the range of  $1 < A$

< 50 will release energy

(B) Fusion of two nuclei with mass numbers lying in the range of  $51 < A < 100$  will release energy

(C) Fission of a nucleus lying in the mass range of  $100 < A < 200$  will release energy when broken into two equal fragments

(D) Fission of a nucleus lying in the mass range of  $200 < A < 260$  will release energy when broken into two equal fragments

(1) A & B

(2) A & D

(3) B & D

(4) C & D

40) A photon of wavelength  $4400 \text{ \AA}$  is passing through vacuum. The effective mass and momentum of the photon are respectively :-

(1)  $5 \times 10^{-36} \text{ kg}$ ,  $1.5 \times 10^{-27} \text{ kg -m/s}$

(2)  $5 \times 10^{-35} \text{ kg}$ ,  $1.5 \times 10^{-26} \text{ kg -m/s}$

(3) Zero,  $1.5 \times 10^{-26} \text{ kg -m/s}$

(4)  $5 \times 10^{-36} \text{ kg}$ ,  $1.67 \times 10^{-43} \text{ kg -m/s}$

41) The de-Broglie wavelength associated with a hydrogen molecule moving with a thermal velocity of  $3 \text{ km/s}$  will be:-

(1)  $1 \text{ \AA}$

(2)  $0.66 \text{ \AA}$

(3)  $6.6 \text{ \AA}$

(4)  $66 \text{ \AA}$

42) An AIR station is broadcasting the waves of wavelength  $300 \text{ metres}$ . If the radiating power of the transmitter is  $10 \text{ kW}$ , then the number of photons radiated per second is :-

(1)  $1.5 \times 10^{29}$

(2)  $1.5 \times 10^{31}$

(3)  $1.5 \times 10^{33}$

(4)  $1.5 \times 10^{35}$

43) When the light source is kept  $20 \text{ cm}$  away from a photo cell, stopping potential  $0.6 \text{ V}$  is obtained. When source is kept  $40 \text{ cm}$  away, the stopping potential will be:-

(1)  $0.3 \text{ V}$

(2)  $0.6 \text{ V}$

(3)  $1.2 \text{ V}$

(4)  $2.4 \text{ V}$

44) Energy released in the fission of a single  ${}_{92}\text{U}^{235}$  nucleus is  $200 \text{ MeV}$ . The fission rate of fuelled reactor operating at a power level of  $5 \text{ W}$  is:

- (1)  $1.56 \times 10^{+10} \text{ s}^{-1}$   
 (2)  $1.56 \times 10^{+11} \text{ s}^{-1}$   
 (3)  $1.56 \times 10^{+16} \text{ s}^{-1}$   
 (4)  $1.56 \times 10^{+17} \text{ s}^{-1}$

45) An electron of stationary hydrogen atom passes from the fifth energy level to the ground level. The velocity that the atom acquired as a result of photon emission will be :  
 (m is the mass of the atom, R, Rydberg constant and h Planck's constant)

- (1)  $\frac{25m}{24hR}$   
 (2)  $\frac{24m}{25hR}$   
 (3)  $\frac{24hR}{25m}$   
 (4)  $\frac{25hR}{24m}$

## CHEMISTRY

1) If 30 mL of  $\text{H}_2$  and 20 ml of  $\text{O}_2$  react to form water, what is left at the end of the reaction?

- (1) 10 mL of  $\text{H}_2$   
 (2) 5 mL of  $\text{H}_2$   
 (3) 10 mL of  $\text{O}_2$   
 (4) 5 mL of  $\text{O}_2$

2)

Which of the following contain maximum no. of atoms :-

- (1) 36 gm  $\text{H}_2\text{O}$   
 (2) 28 gm  $\text{CO}_2$   
 (3) 46 gm  $\text{CH}_3\text{OH}$   
 (4) 54 gm  $\text{N}_2\text{O}_5$

3) Match the column -

List-I (Amount of substance)		List-II (No. of moles of particular atoms in the given substance)	
(P)	$6.022 \times 10^{24}$ molecules of $\text{Al}_2(\text{SO}_4)_3 \cdot 3\text{H}_2\text{O}$	(1)	15 mole O-atoms
(Q)	90 gm $\text{C}_6\text{H}_{12}\text{O}_6$	(2)	60 mole H-atoms
(R)	112 litre $\text{SO}_3(\text{g})$ at 1 atm and $0^\circ\text{C}$	(3)	3 mole O-atoms

(S)	3.75 mole $\text{N}_2\text{O}_4$ (g)	(4)	30 mole S-atoms
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- (1) P-2; Q-3; R-1; S-1
- (2) P-2,4; Q-3; R-1; S-1
- (3) P-4; Q-1; R-3; S-1
- (4) P-2,4; Q-3; R-1; S-3

4) Which of the following has highest mass :

- (1) 1 g molecule of  $\text{CO}_2$
- (2) 0.5 mole of  $\text{CH}_4$
- (3) 1 mole of  $\text{H}_2\text{O}$
- (4)  $6.023 \times 10^{23}$  atoms of oxygen

5) At room temperature and pressure, two flask of equal volume are filled with  $\text{H}_2$  and  $\text{SO}_2$  separately. Particles which are equal in number in the flasks are :-

- (1) Atoms
- (2) Electrons
- (3) Molecules
- (4) Neutrons

6) Three 10 ml flask contain  $\text{He}$ ,  $\text{H}_2$  &  $\text{O}_3$  gas under identical conditions. Then the ratio of number of atoms of these gases would be :-

- (1) 1 : 1 : 1
- (2) 1 : 2 : 3
- (3) 3 : 2 : 1
- (4) Can't predict

7) Which of the following contain least number of oxygen atoms ?

- (1) 14 gm of O
- (2) 14 gm of  $\text{O}_2$
- (3) 14 gm of  $\text{O}_3$
- (4) All have the same number of atoms

8) Number of electrons present in 1.6 gm methane would be :-

- (1)  $1.6 N_A$
- (2)  $0.1 N_A$
- (3)  $N_A$
- (4)  $16 N_A$

9) Number of mole of  $1\text{m}^3$  gas at NTP are :-

- (1) 44.6
- (2) 22.4
- (3) 100
- (4) 50

10) How many grams of  $\text{CaCO}_3$  contain the same number of protons as the number of atoms in 10 mol  $\text{HClO}_3$ ?

- (1) 1 g
- (2) 10 g
- (3) 100 g
- (4) 1000 g

11) Mass of one atom of the element A is  $3.9854 \times 10^{-23}$  g. How many atoms are contained in 1g of the element A :-

- (1)  $2.509 \times 10^{23}$
- (2)  $6.022 \times 10^{23}$
- (3)  $12.044 \times 10^{23}$
- (4)  $2.512 \times 10^{22}$

12) What is the charge of 96 amu of  $\text{S}^{2-}$  ?

- (1) 2C
- (2)  $3.2 \times 10^{-19}\text{C}$
- (3)  $9.6 \times 10^{-19}\text{C}$
- (4) 6C

13) The number of neutrons in 5 g of  $\text{D}_2\text{O}$  (D is  ${}^2_1\text{H}$ ) are:

- (1)  $0.25 N_A$
- (2)  $2.5 N_A$
- (3)  $1.1 N_A$
- (4) none of these

14) Density of  $\text{N}_2$  gas at STP would be :-

- (1)  $14 \text{ gL}^{-1}$
- (2)  $28 \text{ gL}^{-1}$
- (3)  $1.25 \text{ gL}^{-1}$
- (4)  $2.5 \text{ gL}^{-1}$

15) Find out vapour density of gas if 2.8L of gas has mass of 5g at STP :-

- (1) 10

- (2) 20
- (3) 30
- (4) 40

16) The volume of a drop of water is 0.0018 ml then the number of water molecules present in two drop of water at room temperature is :-

- (1)  $12.046 \times 10^{19}$
- (2)  $1.084 \times 10^{18}$
- (3)  $4.84 \times 10^{17}$
- (4)  $6.023 \times 10^{23}$

17) The mass of one mole of a substance in grams is called its

- (1) molecular mass
- (2) molar mass
- (3) Avogadro's mass
- (4) formula mass

18) The volume of a gas at 0°C and 700 mm pressure is 760 cc. The no. of molecules present in this volume is

- (1)  $1.88 \times 10^{22}$
- (2)  $6.022 \times 10^{23}$
- (3)  $18.8 \times 10^{23}$
- (4)  $18.8 \times 10^{22}$

19) The number of atoms present in 0.5 g atom of nitrogen is same as the atoms in

- (1) 12 g of C
- (2) 32 g of S
- (3) 8 g of oxygen
- (4) 24 g of Mg

20) Gram atoms of hydrogen present in 0.02 mole of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  are :-

- (1) 0.1 gm atom of hydrogen
- (2) 0.2 gm atom of hydrogen
- (3) 0.002 gm atom of hydrogen
- (4) 0.01 gm atom of hydrogen

21) How many moles of electron weigh 1kg ?

- (1)  $9.1 \times 10^{-31} \times N_A$
- (2)  $\frac{1}{9.1 \times 10^{-31}} \times N_A$

(3)  $\frac{1}{9.1 \times 10^{-31} \times N_A}$

(4) None of these

22) Determine the molecular formula of compound of X & Y. If it contain 20g of X(at wt = 20) & 40g of Y (at wt = 20) and its molecular mass is 120.

(1) XY

(2) XY<sub>2</sub>

(3) X<sub>2</sub>Y

(4) X<sub>2</sub>Y<sub>4</sub>

23) The mass of 1atom of sodium is

(1) 23 amu

(2)  $\frac{23}{N_A}$  gm

(3)  $23 \times 1.67 \times 10^{-24}$  gm

(4) All of these

24)

Percentage of Se in peroxidase anhydrous enzyme is 0.5% by weight (At. wt. = 78.4). The minimum molecular weight of peroxidase anhydrous enzyme is:

(1)  $1.568 \times 10^4$

(2)  $1.568 \times 10^3$

(3) 15.68

(4)  $3.136 \times 10^4$

25) Given below are two statement:

**Statement-I:** The number of atoms in a given mass of dioxygen (oxygen ) and trioxxygen (ozone) gases is same.

**Statement-II:** The number of atoms depends on atomic mass, not on molecular mass.

In the light of the above statements. Choose the most appropriate answer form the options given below.

(1) Both statement I and statement II are incorrect

(2) Statement I is correct and statement II is incorrect

(3) Statement I is incorrect and statement II is correct

(4) Both statement I and statement II are correct

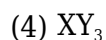
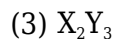
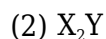
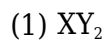
26) The empirical formula of a compound is CH. Its molecular weight is 78. The molecular formula of the compound will be :

(1) C<sub>2</sub>H<sub>2</sub>

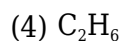
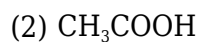
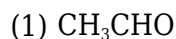
(2) C<sub>3</sub>H<sub>3</sub>



27) The empirical formula of the compound containing 50% 'X' (Atomic mass 10 amu) and 50%Y (Atomic mass 20 amu) is :-



28) Which of the following compounds has same empirical formula as that of glucose :-



29) An organic compound contains 4% sulphur. It's minimum molecular weight is :-

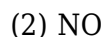
(1) 200

(2) 400

(3) 800

(4) 1600

30) The mass ratio of N and O in a compound is 7 : 20. Compound is :-



31)

200 gm  $CaCO_3$  heated and it decomposed into  $CaO$  and  $CO_2$ . What is the weight of residue -(Atomic weight of Ca= 40)

(1) 56 gm

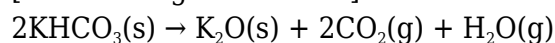
(2) 200 gm

(3) 100 gm

(4) 112 gm

32) What volume of  $CO_2$  at STP is obtained by thermal decomposition of 20 g  $KHCO_3$  ?

[Atomic weight of K = 39]





- (1) 44.8 L
- (2) 4.48 L
- (3) 22.4 L
- (4) None of the above

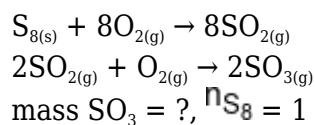
33) 20cc of CO<sub>2</sub> are passed over red hot coke. The volume of CO evolved is -

- (1) 10 cc
- (2) 20 cc
- (3) 30 cc
- (4) 40 cc

34) A gaseous alkane was exploded with oxygen. The volume of O<sub>2</sub> for complete combustion to CO<sub>2</sub> formed was in the ratio of 7 : 4. The molecular formula of alkane is :-

- (1) CH<sub>4</sub>
- (2) C<sub>2</sub>H<sub>6</sub>
- (3) C<sub>3</sub>H<sub>6</sub>
- (4) C<sub>4</sub>H<sub>10</sub>

35)



Calculate the mass of SO<sub>3</sub> through 1 mole of S<sub>8</sub> in given reaction :

- (1) 320 g
- (2) 640 gm
- (3) 1280 g
- (4) None

36) What volume of O<sub>2</sub>(g) is required to burn completely 2L of propene gas measured under same conditions ?

- (1) 5L
- (2) 9L
- (3) 6L
- (4) None of these

37) The volume of air (O<sub>2</sub> = 20%) necessary for the complete combustion of 20 L of propane is :-

- (1) 500 L
- (2) 60 L
- (3) 80 L
- (4) 100 L

38) Initially at similar temperature and pressure, 30 ml of each  $N_2$  and  $H_2$  were taken, then the volume of unreacted reagent will be :

- (1) 10 ml
- (2) 20 ml
- (3) 30 ml
- (4) 5 ml

39) On heating 150 g  $CaCO_3$  (80% pure), the weight of  $CaO$  obtained is :-

- (1) 56 g
- (2) 67.2 g
- (3) 84 g
- (4) 80 g

40) 500 mL of a gaseous hydrocarbon when burnt in excess of  $O_2$  gave 2.5 L of  $CO_2$  and 3.0L of water vapours under same conditions. Molecular formula of the hydrocarbon is -

- (1)  $C_4H_8$
- (2)  $C_4H_{10}$
- (3)  $C_5H_{10}$
- (4)  $C_5H_{12}$

41) In the decomposition of  $CaCO_3(S)$  if % purity and % yeilding of reaction is 40% & 60% respectively. What is the amount of  $CO_2(g)$  obtained if 100 gm  $CaCO_3$  sample is taken.

- (1) 10.56 g
- (2) 17.6 gm
- (3) 26.4 gm
- (4) 22 gm

42) If water sample are taken from river, ponds or pipe. They contain hydrogen and oxygen in the ratio of 1 : 8 by mass. This law is :-

- (1) Multiple proportion
- (2) Mass conservation
- (3) Definite proportion
- (4) Gaseous volume

43) Chemical equation is balanced according to the law of

- (1) Multiple proportion
- (2) Reciprocal proportion
- (3) Conservation of mass
- (4) Definite proportions

44) **Assertion** : 16 g of  $O_2$  and 16 g of  $O_3$  has same number of atoms.

**Reason** : Both  $O_2$  and  $O_3$  have same atomicity of oxygen.

- (1) Both assertion and reason are true and reason is the correct explanation of assertion
- (2) Both assertion and reason are true but reason is not the correct explanation of assertion
- (3) Assertion is true but reason is false
- (4) Both assertion and reason are false

45) Which of the following pairs of compound illustrated the law of multiple proportions ?

- (1)  $H_2O$ ,  $HCl$
- (2)  $CO$  and  $CO_2$
- (3)  $H_2O$ ,  $H_2O_2$
- (4) 2 & 3 both

## BIOLOGY

1) Given below are two statement -

**Statement I** : Meiosis I involves two sequential cycles of nuclear and cell division but only a single cycle of DNA replication.

**Statement II** : The stage between the two meiotic division is called interkinesis and is generally long lived.

Choose the correct answer from the option given below

- (1) Both statement I and statement II are incorrect
- (2) Both statement I and statement II are correct
- (3) Statement I is incorrect but statement II is correct
- (4) Statement I is correct but statement II is incorrect

2) The beginning of diplotene stage is recognized by :-

- (1) Formation of synaptonemal complex
- (2) Dissolution of synaptonemal complex
- (3) Appearance of recombination nodules
- (4) Both (2) and (3)

3) Which one of the following events is **incorrect** for cell cycle ?

- (1) Tubulin protein synthesis occurs in  $G_2$ -phase
- (2) Centriole duplication occurs in S-phase of mango cell
- (3) DNA synthesis occurs only during one specific stage
- (4) M-phase consume 5% duration of cell cycle

4) The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis ?

- (1) Pachytene
- (2) Diplotene
- (3) Diakinesis
- (4) Zygotene

5) Which of the following stages of meiosis involves division of centromere ?

- (1) Metaphase II
- (2) Anaphase II
- (3) Telophase
- (4) Metaphase I

6) Pick the correct match/(es)

- (i) Duplicated centrioles begin to move towards opposite poles - transition to metaphase
- (ii) Spindle fibres attach to kinetochores of chromosome - Early Prophase
- (iii) Chromosomes are moved to equator- Metaphase
- (iv) Daughter chromosomes move away from equatorial plate - Anaphase

- (1) All statements
- (2) All except (ii)
- (3) (iii) & (iv)
- (4) (i) & (ii)

7) Following are the characteristics of which phase of cell division:

- (i) Follows the S & G<sub>2</sub> phases
- (ii) Initiation of the assembly of mitotic spindle, microtubules & proteins
- (iii) Disappearance of golgi, E.R, nucleous & nuclear membrane
- (iv) Chromosomal material becomes untangled

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

8) **Statement I :** The chromosomes are spread through the cytoplasm of the cell in metaphase

**Statement II :** Complete disintegration of the nuclear membrane marks the start of the metaphase

- (1) Both statements I and II are correct
- (2) Both statements I and II are incorrect
- (3) Only statement I is correct
- (4) Only statement II is correct

9) The chromosomes become gradually visible under the light microscope during which stage of meiosis-I?

- (1) Leptotene
- (2) Diakinesis

- (3) Metaphase-I
- (4) Telophase-I

10) **Statement-I** : Leptotene is the first phase of prophase-I

**Statement-II** : The compaction of chromosome continues throughout leptotene.

- (1) Both statements I and II are correct
- (2) Both statements I and II are incorrect
- (3) Only statement I is correct
- (4) Only statement II is correct

11) Match the following :

	Column-I		Column-II
a.	Zygotene	p.	Chromosomes fully condensed
b.	Pachytene	q.	Synaptonemal complex
c.	Diplotene	r.	Recombinase
d.	Diakinesis	s.	X-shaped structures

- (1) a-r, b-q, c-p, d-s
- (2) a-s, b-p, c-q, d-r
- (3) a-q, b-r, c-s, d-p
- (4) a-p, b-q, c-s, d-r

12) **Statement-I** : Recombination between homologous chromosomes is completed at the beginning of third phase of prophase-I.

**Statement-II** : Diplotene begins with dissolution of synaptonemal complex and the tendency of recombined homologous chromosomes of the bivalents to separate from each other completely throughout its length.

- (1) I is true; II is false
- (2) Both are true
- (3) Only II is true
- (4) Both are false

13) "Terminalization of Chiasmata" takes place at which phase ?

- (1) Diplotene
- (2) Metaphase-I
- (3) Pachytene
- (4) Diakinesis

14) A bivalent in pachytene stage consists of :-

- (1) 2 chromatids & 1 centromeres

- (2) 2 chromatids & 2 centromeres
- (3) 4 chromatids & 2 centromeres
- (4) 4 chromatids & 4 centromeres

15) How many kinetochores remain engaged with microtubules during Metaphase-I of a cell of an organism whose egg cell has 8 chromosomes.

- (1) 8
- (2) 32
- (3) 16
- (4) 4

16) **A** : Meiosis leads to recombination of genes.

**R** : Crossing over occurs in pachytene substage of prophase-I of Meiosis-I

- (1) Both A & R are true; R explains A
- (2) Both A & R are true; R does not explain A
- (3) A is true; R is false
- (4) Both A & R are false.

17) **A** : In mitotic metaphase, morphology of chromosomes can be most easily studied.

**R** : Condensation of chromosomes is completed in prophase.

- (1) Both A & R are true; R explains A
- (2) Both A & R are true; R does not explain A
- (3) A is true; R is false
- (4) Both A & R are false.

18) If the  $n = 8$  in plant cell then what is possible in pachytene of meiosis ?

	<b>Tetrad of chromatids</b>	<b>Centrioles</b>	<b>Chromatids</b>
(1)	16	1 Pair	16
(2)	8	2 Pair	32
(3)	8	1 Pair	16
(4)	16	0	32

- (1) 1
- (2) 2
- (3) 3
- (4) 4

19) The two asters together with spindle fibres form:-

- (1) Mitotic apparatus

- (2) Centromere
- (3) Astral fibres
- (4) Centrosome

20) **Assertion :-** If initial amount of DNA is denoted as 2C then it increases to 4C in S phase.

**Reason :-** S or synthesis phase marks the period during which DNA synthesis or replication take place.

- (1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion
- (2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion
- (3) Assertion is True but the Reason is False
- (4) Both Assertion & Reason are False

21) Choose the incorrect statement :-

- (1) M-phase is the most dramatic period of cell cycle
- (2) The metacentric chromosome has middle centromere forming two equal arms of the chromosome.
- (3) The content of nucleolus is continuous with the rest of the nucleoplasm
- (4) The ribosomes of the chloroplasts are smaller than the mitochondrial ribosomes.

22) Match the Column I with Column II

	Column-I		Column II
(a)	Fat storage	(i)	Tubulin
(b)	Cilia	(ii)	Elaioplast
(c)	Mitochondria	(iii)	Contractile
(d)	Microfilaments	(iv)	Oxysomes

- (1) a(ii), b(i), c(iv), d(iii)
- (2) a(ii), b(i), c(iii), d(iv)
- (3) a(iii), b(i), c(iv), d(ii)
- (4) a(i), b(ii), c(iv), d(iii)

23) The names of different cell organelles / structures are given below -

Mitochondria, Cell wall, Ribosomes, Centrioles, Microbodies, Plastids, Endoplasmic Reticulum

How many of the above are present in both higher plant and animal cells?

- (1) 3
- (2) 4
- (3) 5
- (4) 6

24) Select the **correct** match:

- (1) Ribosomes - Non-membrane bound and made up of DNA & proteins

- (2) Golgi apparatus - Important site for formation of glycolipids and glycoproteins  
 (3) Secondary wall - Capable of extension  
 (4) Endomembrane system - Organelles whose Functions are not co-ordinated

25) Cell wall of algae is rich in \_\_\_\_\_

- (1) Cellulose, Hemicellulose, Pectins and proteins  
 (2) Cellulose, Galactans, Mannans and Minerals like  $\text{CaCO}_3$   
 (3) Cellulose, Lignin, Pectin and  $\text{CaCO}_3$   
 (4) Cellulose, Pectin, Galactans and Lignin

26) Match the column-I and column-II and choose the correct option.

Column-I		Column-II	
(A)	Thylakoid	(I)	Infolding of inner mitochondrial membrane
(B)	Matrix	(II)	Flat membranous sac in the stroma
(C)	Cisternae	(III)	Inner compartment of mitochondria
(D)	Cristae	(IV)	Disc-shaped sac in Golgi bodies

- (1) A-I, B-II, C-III, D-IV  
 (2) A-III, B-II, C-IV, D-I  
 (3) A-II, B-III, C-IV, D-I  
 (4) A-III, B-I, C-II, D-IV

27) **Assertion** : Metacentric chromosome has middle centromere forming two equal arms of the chromatid.

**Reason** : Duration of cell cycle can vary from organism to organism and also from cell type to cell type.

- (1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.  
 (2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.  
 (3) Assertion is True but the Reason is False.  
 (4) Both Assertion & Reason are False.

28) **Assertion** : The endomembrane system includes endoplasmic reticulum (ER), Golgi complex, lysosomes and vacuoles.

**Reason** : Mitochondria, chloroplast and peroxisomes are not the part of endomembrane system.

- (1) Assertion & Reason are True & the Reason is a correct explanation of the Assertion.  
 (2) Assertion & Reason are True but Reason is not a correct explanation of the Assertion.



(3) Assertion is True but the Reason is False.

(4) Both Assertion & Reason are False.

29) (a) Centrioles are found only in animal cells.

(b) During cell divisions, chromosomes are best visible in anaphase stage.

(c) Nucleus may contain haploid, diploid or polyploid genome.

In given statement which of the following is **correct**.

(1) Only (a) is correct

(2) Only (c) is correct

(3) All are correct

(4) (a) & (c) both are correct

30) What is the diameter of Cisternae of golgi body ?

(1) 0.5 - 1  $\mu\text{m}$

(2) 0.5 - 1 nm

(3) 0.5 - 1 mm

(4) 0.5 - 2  $\mu\text{m}$

31) Identify the **correct** match and select the correct option from options given below:

A. Mitosis : Equational division

B. Meiosis: Reductional division

C. Mitochondria: Organelle within organelle

D. Lysosomes : Digestion of macromolecules

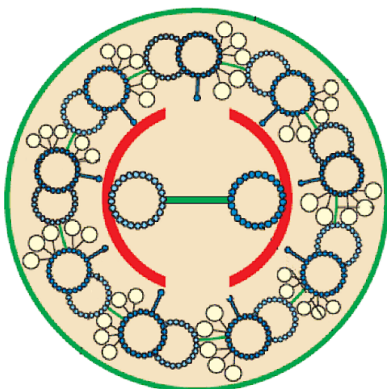
E. Contractile vacuole: *Amoeba*

(1) A, B, C and D

(2) A, B, C and E

(3) A, B, D and E

(4) A, B, C, D and E



32)

Identify the given diagram and choose the correct option :

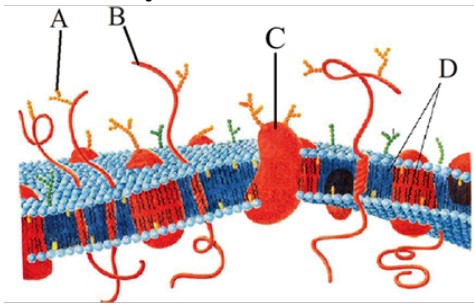
(1) This organelle was discovered by George Palade

(2) Hair like outgrowth of cell membrane known as cilia/flagella

(3) Contain hydrolytic enzyme

(4) Show 9+0 arrangement

33) Identify the structures marked as A, B, C and D and choose the correct option :



	A	B	C	D
(1)	Protein	Sugar	Peripheral protein	Lipid monolayer
(2)	Sugar	Protein	Integral protein	Lipid bilayer
(3)	Protein	Sugar	Integral protein	Lipid bilayer
(4)	Sugar	Protein	Peripheral protein	Lipid bilayer

(1) 1

(2) 2

(3) 3

(4) 4

34) Select the incorrect match :

(1) Camillo Golgi - Golgi bodies

(2) Robert Brown - Nucleus

(3) Flemming - Chromatin

(4) George Palade - Mitochondria

35) In plasma membrane, lipids have their polar heads towards?

(1) Outer side

(2) Inner side

(3) In the middle

(4) There is no polar head.

36) For what reason, fluid nature of membrane is important ?

(1) Cell growth

(2) Secretions

(3) Endocytosis

(4) All of the above

37) Which of the following pairs is correct ?

(1) Cisternae - outer membrane of mitochondria

(2)  $\beta$ -oxidation - outer chamber of mitochondria

- (3) Photophosphorylation - mitochondria
- (4) Porin - outer membrane of mitochondria

38) Which face of Golgi apparatus receives vesicles from endoplasmic Reticulum ?

- (1) Trans
- (2) Cis
- (3) Both (1) & (2)
- (4) Face associated with ribosome

39) Ribosome is present inside :-

- (1) Mitochondria
- (2) Nucleus
- (3) RER
- (4) Golgi body

40) Which maintains cell shape and associated with cellular movements and intracellular transport ?

- (1) Cytoplasm
- (2) Golgibody
- (3) Cytoskeleton
- (4) ER

41) In human beings, the membrane of the erythrocyte has approximately :-

- (1) 52% lipid and 40% protein
- (2) 58-59% protein and 40% lipid
- (3) 52% protein and 40% lipid
- (4) 40% protein and 50% lipid

42) Cilium and flagellum emerge from centriole like structure called the :-

- (1) Centrosome
- (2) Kinetochore
- (3) Basal body
- (4) Centromere

43) Cholesterol is the starting point for synthesis of steroid hormones which include the male and female sex hormones. These hormones are synthesized by :-

- (1) Golgi body
- (2) SER
- (3) RER
- (4) Plastid

44) Which of the following statement is correct regarding vacuole ?

- (1) It is membrane-bound and contains storage proteins and glycolipids
- (2) It is membrane-bound and contains water and excretory substances
- (3) It lacks membrane and contains air
- (4) It lacks membrane and contains water and excretory substances

45) Which one of the following is correct ?

- (A) Nuclear matrix or nucleoplasm contains nucleolus and chromatin
- (B) Outer nuclear membrane usually remains continuous with the ER and also bears ribosomes on it
- (C) Small and less number of nucleoli are present in cells actively carrying out protein synthesis
- (D) Nuclear pores are the passage through which movement of RNA and protein take place in both direction.

- (1) A and B
- (2) A, B and D
- (3) A, B, C and D
- (4) B, C and D

46) The kinetochore serves which of the following function ?

- (1) They act as site of cytokinesis
- (2) They are site of DNA synthesis
- (3) They act as site of attachment of spindle fibres
- (4) They act as site of r-RNA synthesis

47) Select the **incorrect** statement w.r.t plasma membrane

- (1) Phospholipids are main membrane lipids
- (2) Tails of membrane lipids are hydrophilic
- (3) Heads of membrane lipids are found on exterior side
- (4) Intrinsic proteins are embedded in the plasma membrane

48) The concept of "*omnis cellula-e-cellula*" regarding cell division was first proposed by :-

- (1) Rudolf Virchow
- (2) Theodore Schwann
- (3) Schleiden
- (4) Aristotle

49) A. Unicellular organisms are capable of independent existence.

B. Cell is the fundamental structural and functional unit of all unicellular organisms.

C. All cells arise from pre-existing cells.

D. The cytoplasm is the main arena of cellular activities in prokaryotic cells only.

Options :-

- (1) Statement A, C and D are wrong

- (2) Statement A, B and D are not correct
- (3) Statement A, B and C are not wrong
- (4) Statement B, C and D are not correct

50) Choose the **correct** option.

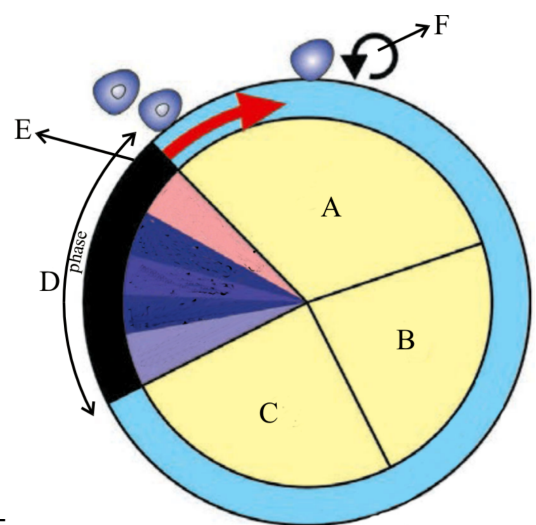
- (i) Lysosomes are double membranous vesicles budded off from Golgi apparatus and contain digestive enzymes.
- (ii) Endoplasmic reticulum consists of a network of membranous tubule and helps in transport, synthesis and secretion.
- (iii) Leucoplasts are bound by two membranes, lack pigment but contain their own DNA and protein synthesising machinery.
- (iv) Sphaerosomes are single membrane bound organelle which are associated with synthesis and storage of lipids,

- (1) (i) only
- (2) (i) and (ii)
- (3) (ii),(iii) and (iv)
- (4) All of these

51) How many statement are correct about axoneme ?

- (A) Made up of microtubule which arranged radially to long Axis.
- (B) Doublet microtubule have nine pair.
- (C) Axonemal microtubule is referred to 9 + 2 arrangement.
- (D) Axoneme emerge from basal body.

- (1) One
- (2) Two
- (3) Three
- (4) Four



52) Study the given diagram and mark the **correct** option :-

- (1) F : Cell in this stage remain metabolically active but no longer proliferate
- (2) A : DNA replicates in nucleus and centriole duplicates in the cytoplasm
- (3) D : Constitutes more than 95% duration of cell cycle
- (4) C : Interval between mitosis and initiation of DNA replication

53) Match the column-I with column-II

Column-I		Column-II	
(I)	S phase	(i)	Most of organelles duplication
(II)	G <sub>1</sub> phase	(ii)	Tubulin proteins are synthesised
(III)	Anaphase	(iii)	DNA replication
(IV)	G <sub>2</sub> phase	(iv)	Centromere split

- (1) I-ii, II-iii, III-iv, IV-i
- (2) I-i, II-iv, III-ii, IV-iii
- (3) I-iii, II-i, III-iv, IV-ii
- (4) I-iii, II-ii, III-i, IV-iv

54) If in a cell at G<sub>1</sub> stage total amount of DNA is 2C then at the G<sub>2</sub> stage total amount of DNA will be :-

- (1) 2C
- (2) C
- (3) 4C
- (4) 3C

55) The sequence of events by which a cell duplicates its genome, synthesise the other constituents of cells and eventually divides into two daughter cells is termed as

- (1) Cytology
- (2) Cell division
- (3) Cell cycle
- (4) Cell biology

56) Once heart cells become mature, they do not usually undergo cell division. The cell cycle of the mature heart cells become arrested and this phase of cell cycle is known as :-

- (1) G<sub>2</sub> phase
- (2) M-phase
- (3) G<sub>1</sub> phase
- (4) G<sub>0</sub> phase

57) First gap phase in cell cycle is :-

- (1) Interval between mitotic phase and initiation of DNA replication
- (2) Interval between end of DNA replication and DNA separation phase
- (3) Interval between karyokinesis and cytokinesis
- (4) Interval between DNA replication phase and second gap phase

58) Find out the correct statement :

- (a) Division of centromeres takes place during anaphase-1 of meiosis  
(b) Spindle fibres start to disappear in telophase of mitosis  
(c) Nucleoli reappears at telophase of mitosis (d) Synapsis of homologous chromosomes takes place during prophase-1 of meiosis

- (1) only b  
(2) a, b, c only  
(3) a, b, d only  
(4) b, c, d, only

59)

Reformation of nucleolus, golgi complex and ER occurs in

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

60) In which phase initiation of the assembly of mitotic spindle takes place :

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

61) All are the significance of mitosis, except :-

- (1) Production of daughter cells with identical genetic complement  
(2) Restoration of nucleocytoplasmic ratio  
(3) Plays important role in evolution by inducing variations  
(4) Responsible for growth of multicellular organism



62) Identify the stage of cell division shown in given figure :-

- (1) Early prophase  
(2) Transition stage between  $G_2$  and early prophase  
(3) Prophase-I  
(4) Late prophase

63) A. Centromere split and chromatids separate

B. Chromatids move to opposite poles.

These statements are correct for which stage of cell division :-

- (1) Interkinesis
- (2) Interphase
- (3) Telophase
- (4) Anaphase

64) Match Column I with Column II :-

<b>Column-I (Sub phases of Prophase I)</b>		<b>Column II (Specific characters)</b>	
(a)	Diakinesis	(i)	Synaptonemal complex formation
(b)	Pachytene	(ii)	Terminalisation of chiasmata
(c)	Zygotene	(iii)	Chromosomes look like thin threads
(d)	Laptotene	(iv)	Appearance of recombination nodules

Choose the correct answer from the options given below:

- (1) a - (ii), b - (iv), c - (i), d - (iii)
- (2) a - (iv), b - (iii), c - (ii), d - (i)
- (3) a - (iv), b - (ii), c - (iii), d - (i)
- (4) a - (i), b - (ii), c - (iv), d - (iii)

65) Recombintaion between homologous chromosomes is occur in :-

- (1) Diplotene
- (2) Diakinesis
- (3) Zygotene
- (4) Pachytene

66) Which of the following are characteristics of zygotene stage of prophase I of meiosis ?

- (i) Chromosomes start pairing.
- (ii) Non-homologous chromosomes pair.
- (iii) Synapsis occurs between non - homologous chromosomes.
- (iv) Formation of synaptonemal complex occurs between homologous chromosomes.
- (v) Formation of synaptonemal complex occurs between non-homologous chrmosomes.

- (1) (i), (iv), (v)
- (2) (i), (iii), (iv)
- (3) (i), (iv)
- (4) (i), (ii), (iii), (v)

67) **Statement-I** : Meiosis causes variations in population from one generation to the next.

**Statement-II** : Variations are very important for the process of evolution.



- (1) Only statement-I is correct
- (2) Only statement-II is correct
- (3) Both statement-I & II are correct
- (4) Both statement-I & II are incorrect

68) In which phase of cell division chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles ?

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

69) Given below are two statements :

One is labelled as Assertion (A) and other is labelled as Reason (R).

**Assertion (A)** : Metaphasic chromosome is made up of two sister chromatids which are held together by centromere.

**Reason (R)** : Condensation of chromosomes is completed and they can be observed clearly under the microscope.

In the light of above statements, choose the correct answer from the option given below :

- (1) Both **Assertion** and **Reason** are true but **Reason** is NOT the correct explanation of **Assertion**.
- (2) **Assertion** is true but **Reason** is false.
- (3) **Assertion** is false but **Reason** is true.
- (4) Both **Assertion** and **Reason** are true and **Reason** is the correct explanation of **Assertion**.

70) At which stage of cell cycle, organelles like mitochondria and plastids get distributed between the two daughter cells ?

- (1) Anaphase
- (2) Metaphase
- (3) Interphase
- (4) Cytokinesis

71) During which stages of meiosis and mitosis respectively does the centromere of each chromosome split ?

- (1) Anaphase I , Anaphase
- (2) Anaphase II , Anaphase
- (3) Anaphase , Anaphase II
- (4) Metaphase II , Metaphase

72) Given below are two statements :

**Statement-I** : The complete disintegration of the nuclear envelop marks the start of Anaphase.

**Statement-II** : Meiosis involves two sequential cycles of nuclear and cell division called meiosis I and meiosis II but only a single cycle of DNA replication.

In the light of above statements, choose the correct answer from the options given below :

- (1) **Statement I** and **Statement II** both are true
- (2) **Statement I** is true but **Statement II** is false
- (3) **Statement I** is false but **Statement II** is true
- (4) **Statement I** and **Statement II** both are false

73) In which phase of meiosis, the homologous chromosomes separate, while sister chromatids remains associated at their centromeres ?

- (1) Anaphase I
- (2) Anaphase II
- (3) Metaphase I
- (4) Telophase I

74) **Assertion** : The organisation of prokaryotic cell is fundamentally similar even though prokaryotes exhibit a wide variety of shapes and functions

**Reason** : In eukaryotic cells there is an extensive compartmentalisation of cytoplasm through the presence of nonmembrane bound organelles.

- (1) Both **Assertion** and **Reason** are correct but **Reason** is correct explanation of **Assertion**.
- (2) **Assertion** is correct but **Reason** is incorrect.
- (3) **Assertion** is incorrect but **Reason** is correct.
- (4) Both **Assertion** and **Reason** are correct but **Reason** is NOT correct explanation of **Assertion**.

75) **Statement-1** : In prokaryotes, ribosomes are associated with the plasma membrane of the cell.

**Statement-2** : Eukaryotes are generally larger and multiply slowly than the prokaryotic cell.

- (1) Both Statements are correct
- (2) Both Statements are incorrect
- (3) Statement 1 is correct but Statement 2 is incorrect
- (4) Statement 1 is incorrect but Statement 2 is correct

76) Which of the following statement is correct ?

- (1) All prokaryotes have a cell wall surrounding the cell membrane
- (2) The cell membrane provides a strong structural support to prevent the bacterium from bursting or collapsing
- (3) Animal cells have centrioles which are absent in all plant cells
- (4) All eukaryotic cells are not identical

77) The organisation of the A cell is fundamentally similar while all B cells are not identical. Identify A and B respectively?

- (1) A : Prokaryotic B : Eukaryotic
- (2) A : Eukaryotic B : Prokaryotic
- (3) A : Plant B : Animal

(4) A : Animal B : Plant

78) Match column-I with column-II and select correct option :

	Column-I		Column-II
(A)	Mesosome	(I)	Extension of plasma membrane into the cells
(B)	Polysome	(II)	Translation of mRNA into proteins
(C)	Centriole	(III)	Nonmembranous cell organelle
(D)	Nuclear envelop presence	(IV)	Eukaryotic cell

(1) (A)→I ; (B)→II ; (C)→III ; (D)→IV

(2) (A)→II ; (B)→I ; (C)→III ; (D)→IV

(3) (A)→I ; (B)→II ; (C)→IV ; (D)→III

(4) (A)→II ; (B)→I ; (C)→IV ; (D)→III

79) **Statement 1** : Many molecules can move briefly across the membrane without any requirement of energy and this is called active transport.

**Statement 2** : Secondary wall is formed on the outer (towards middle lamella) side of the cell

(1) Statement 1 is incorrect but statement 2 is correct

(2) Statement 1 is correct but statement 2 is incorrect

(3) Both statements are correct

(4) Both statements are incorrect

80)  $\text{Na}^+/\text{K}^+$  pump which is responsible for active transport, an energy dependent process, is found in :

(1) Cell wall of bacteria

(2) Cell wall of fungi

(3) Cell wall of mycoplasma

(4) Cell membrane of animal cell

81) Select the correct statement ?

(1) According to fluid mosaic model, the quasi fluid nature of protein enables the lateral movement of lipids within the overall bilayer

(2) One of the most important functions of the cell wall is the transport of the molecules across it

(3) In cell membrane of different organisms, the ratio of protein and lipid varies considerably in different cell types

(4) The cell membrane and middle lamella may be traversed by plasmodesmata which connect the cytoplasm of neighbouring cells.

82) Match the column-I with column-II and select correct option :

	Column-I		Column-II
(A)	Osmosis	(I)	Energy independent process
(B)	Passive transport	(II)	Diffusion of water
(C)	Active transport	(III)	Energy dependent process
(D)	Cell to cell interaction	(IV)	Cell wall

(1) (A)→II ; (B)→I ; (C)→III ; (D)→IV

(2) (A)→III ; (B)→I ; (C)→II ; (D)→IV

(3) (A)→IV ; (B)→III ; (C)→II ; (D)→I

(4) (A)→IV ; (B)→II ; (C)→III ; (D)→I

83) Select the incorrect statement ?

(1) Organelles having co-ordinated functions are part of endomembranous system

(2) Smooth endoplasmic reticulum is the major site for synthesis of cellulose

(3) Varied number of cisternae are present in a Golgi complex

(4) The vacuole is the membrane bound space found in the cytoplasm

84) **Assertion** : Concentration of ions and minerals is significantly higher in the cytoplasm than in the vacuole

**Reason** : Materials to be packaged in the form of vesicles from ER fuse with the cis-face of the Golgi apparatus and move towards the maturing face.

(1) Assertion is correct but reason is incorrect

(2) Assertion is incorrect but reason is correct

(3) Both assertion and reason are correct and reason is the correct explanation of assertion

(4) Both assertion and reason are correct and reason is the not correct explanation of assertion

85) **Statement 1** : Each of the membranous organelles is distinct in terms of its structure and function

**Statement 2** : The cis and trans faces of the Golgi apparatus entirely different, but interconnected.

(1) Statement 1 is correct but statement 2 is incorrect

(2) Statement 1 is incorrect but statement 2 is correct

(3) Both the statement are incorrect

(4) Both the statement are correct

86) Match the given organelle in column-I with their related functions in column-II and select correct option -

	Column-I		Column-II
(A)	Golgi apparatus	(I)	Packaging of materials
(B)	Lysosome	(II)	Hydrolysis of food

(C)	Vacuole	(III)	Storage of secretory & waste product
(D)	Rough endoplasmic reticulum	(IV)	Actively involved in protein synthesis and secretion

- (1) (A)→I ; (B)→II ; (C)→III ; (D)→IV  
 (2) (A)→III ; (B)→IV ; (C)→I ; (D)→II  
 (3) (A)→IV ; (B)→III ; (C)→II ; (D)→I  
 (4) (A)→II ; (B)→I ; (C)→III ; (D)→IV

87) A contains water, sap, excretory product and other materials not useful for the cell. B is the important site of formation of glycoproteins and glycolipids. C is the major site for synthesis of lipid. Identify A, B and C?

- (1) A - Lysosome B - RER C - SER  
 (2) A - Vacuole B - RER C - SER  
 (3) A - Vacuole B - Golgi apparatus C - SER  
 (4) A - Vacuole B - Golgi apparatus C - RER

88) Which of the following function is not carried out by cytoskeleton in a cell ?

- (1) Motility  
 (2) Mechanical support  
 (3) Nuclear division  
 (4) Maintenance of the shape of the cell

89) Given below are two statements :

**Statement 1 :** The cytoskeleton in a cell are involved in mechanical support, nuclear division, motility etc.

**Statement 2 :** An elaborate network of filamentous proteinaceous structures consisting of microtubules, microfilaments and intermediate filaments present in the cytoplasm is collectively referred to as the cytoskeleton.

In the light of above statements, choose the correct answer from the options given below :

- (1) **Statement 1** is incorrect but **Statement 2** is correct  
 (2) **Statement 1** is correct but **Statement 2** is incorrect  
 (3) Both **Statement 1** and **Statement 2** are correct  
 (4) Both **Statement 1** and **Statement 2** are incorrect

90) The stroma of chloroplast does not contain ?

- (1) Enzymes for the synthesis of carbohydrates and proteins  
 (2) Small, double stranded, linear DNA  
 (3) Ribosomes  
 (4) Granum

## ANSWER KEYS

## PHYSICS

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A.	3	2	3	2	2	2	4	3	3	2	1	1	3	4	1	2	1	1	4	4
Q.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A.	1	2	4	3	4	4	3	3	4	2	2	3	1	3	3	2	3	2	3	1
Q.	41	42	43	44	45															
A.	2	2	2	2	3															

## CHEMISTRY

Q.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
A.	4	3	2	1	3	2	4	3	1	3	4	3	2	3	2	1	2	1	3	2
Q.	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
A.	3	4	4	1	4	4	2	2	3	4	4	2	4	2	2	2	1	2	2	4
Q.	86	87	88	89	90															
A.	1	3	3	3	4															

# BIOLOGY

Q.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
A.	1	2	2	1	2	3	1	1	1	1	3	4	4	3	2	1	3	2	1	1
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	4	1	2	2	2	3	2	2	2	1	3	2	2	4	1	4	4	2	1	3
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	3	3	2	2	2	3	2	1	3	3	2	1	3	3	3	4	1	4	3	1
Q.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
A.	3	4	4	1	4	3	3	4	1	4	2	3	1	2	1	4	1	1	4	4
Q.	171	172	173	174	175	176	177	178	179	180										
A.	3	1	2	2	4	1	3	3	1	2										

## SOLUTIONS

### PHYSICS

$$1) F = n \left( \frac{2h}{\lambda} \right)$$

$$n = \frac{F\lambda}{2h} = 5 \times 10^{27} \text{ photon/sec}$$

$$2) E = KE_{\max} + \phi_0 = 0.7 \text{ eV} + 1.8 \text{ eV} = 2.5 \text{ eV}$$

$$\therefore \lambda = \frac{hc}{E} = \frac{12400 \text{ Å eV}}{2.5 \text{ eV}} \approx 4960 \text{ Å}$$

$\Rightarrow$  Visible region

$$3) n = \frac{P\lambda}{hc}$$

$$n \propto P\lambda$$

$$\frac{n_1}{n_2} = \frac{P_1 \lambda_1}{P_2 \lambda_2}$$

$$\frac{P_2}{P_1} = \frac{n_2 \lambda_1}{n_1 \lambda_2} = \frac{2x}{x} \times \frac{2000 \text{ Å}}{8000 \text{ Å}}$$

$$\frac{P_2}{P_1} = \frac{4}{8} = \frac{1}{2}$$

4)

Stopping potential depends on the wavelength of the radiation and does not change with distance between the source and the photoelectric cell. Intensity of illumination varies inversely as the square of distance.

Therefore  $I = 18.0 \times \left( \frac{0.2}{0.6} \right)^2 \text{ mA} = 2.0 \text{ mA}$

$$5) \lambda \propto \frac{1}{\sqrt{V}} \Rightarrow \frac{\lambda_2}{\lambda_1} = \sqrt{\frac{V_1}{V_2}}$$

$$\frac{\lambda_2}{10^{-10}} = \sqrt{\frac{150}{600}} = 0.5$$

$$\lambda_2 = 0.5 \times 10^{-10} \text{ m} = 0.5 \text{ Å}$$

$$6) \lambda = \frac{h}{\sqrt{2mE}} \propto \frac{1}{\sqrt{E}} \Rightarrow \frac{\lambda'}{\lambda} = \sqrt{\frac{E}{E'}} = \frac{1}{4}$$

7)

We know 
$$eV_1 = \frac{hc}{\lambda_1} - \phi$$

$$eV_2 = \frac{hc}{\lambda_2} - \phi$$

if  $v_2 > v_1 \Rightarrow \lambda_1 > \lambda_2$

8)

$$2\pi r_n = n\lambda \Rightarrow r_n = \frac{n\lambda}{2\pi}$$

$$r_3 = \frac{3\lambda}{2\pi}$$

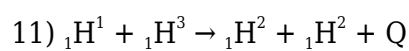
9) Fe has highest work function

10) 1 amu = 931 MeV.

Hence  $0.0303 \text{ amu} = 0.0303 \times 931 \text{ MeV}$   
 $= 28.2 \text{ MeV} \cong 28 \text{ MeV}$ .

Binding energy per nucleon for helium

$$= \frac{28}{4} = 7 \text{ MeV}$$



$$Q = \Delta m \times 931.5 \text{ MeV}$$

$$\Delta m = [m({}_1\text{H}^1) + m({}_1\text{H}^3) - 2m({}_1\text{H}^2)]$$

$$\Delta m = [4.023874 - 2 \times 2.014102] \text{ u}$$

$$Q = \Delta m \times 931.5 \text{ MeV}$$

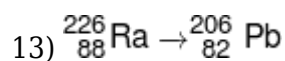
$$Q = -4.03 \text{ MeV}$$

12)

Energy released = B.E. of (A + B) - BE of (X)

$$= 110 \times 8.2 + 90 \times 8.2 - 200 \times 7.4$$

$$= 160 \text{ MeV}$$



$$\text{no. of } \alpha = \frac{226 - 206}{4} = 5$$

$$\text{no. of } \beta = 82 - (88 - 5 \times 2) = 4$$

14)

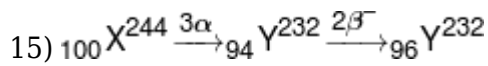
Atomic mass of product = A - 12

Atomic number of product = Z - 6 + 5 = Z - 1

No. of neutrons = (A - 12) - (Z - 1) = A - Z - 11

No. of protons = Z - 1





16) By using  $h\nu = \phi_0 + eV_s$

we have  $V_s = \frac{h\nu}{e} - \frac{\phi_0}{e}$

from graph it is clear that  $(\phi_0)_A < (\phi_0)_B$

17)  $E_{\lambda_1=550\text{nm}} = \frac{1240}{550} \text{eV} = 2.25 \text{eV}$

$E_{\lambda_2=450\text{nm}} = \frac{1240}{450} \text{eV} = 2.8 \text{eV}$

$E_{\lambda_3=350\text{nm}} = \frac{1240}{350} \text{eV} = 3.5 \text{eV}$

For metal r;  $\lambda_3$  is able to generate photoelectron.

For metal q;  $\lambda_2$  and  $\lambda_3$  are able to generate photoelectron

For metal p; all wavelength are able to generate photoelectron.

Hence photoelectric current will be maximum for p and least for r.

18)  $\frac{hc}{\lambda} = 5 \text{ eV} + \phi$   
 $\frac{hc}{3\lambda} = \text{eV} + \phi \Rightarrow \frac{2hc}{3\lambda} = 4\text{eV} \Rightarrow \phi = \frac{hc}{6\lambda}$

19)

Released energy =  $2 \times 4 \times 7 - 2 \times 1 - 7 \times 5.4$   
 $= 16 \text{ MeV}$

20)

$F = \frac{P}{C}$

$= \frac{IA}{C} = \frac{1400 \times 1.5}{3 \times 10^8} = 7 \times 10^{-6} \text{N}$

21) For electron  $\lambda_e = \frac{h}{\sqrt{2mE}}$

for Photon  $E = pc$

$\Rightarrow \lambda_{Ph} = \frac{hc}{E}$

$\Rightarrow \frac{\lambda_e}{\lambda_{Ph}} = \frac{h}{\sqrt{2mE}} \times \frac{E}{hc} = \left( \frac{E}{2m} \right)^{1/2} \frac{1}{c}$

22)  $\square R = R_0 A^{1/3} \Rightarrow R \propto A^{1/3}$

$$\square \quad \frac{R_{Te}}{R_{Al}} = \left(\frac{125}{27}\right)^{1/3} = \left(\frac{5^3}{3^3}\right)^{1/3} = \frac{5}{3}$$

$$\Rightarrow R_{Te} = \left(\frac{5}{3}\right)(3.6) = 6 \text{ fm}$$

23) Given;  $\phi = 2.28 \text{ eV}$  &  $\lambda = 500 \text{ nm}$

$$\Rightarrow E = \frac{1240}{500} = 2.8 \text{ eV}$$

$\square$  for  $e^-$ s having max K.E

$$K_{\max} = E - \phi = 2.8 - 2.28$$

$$\text{or } eV_0 = 0.52 \text{ eV}$$

$$V_0 = 0.52 \text{ volts}$$

$\square$  its wavelength  $\lambda = \frac{12.27}{\sqrt{0.52}} \text{ \AA} \approx 28 \text{ \AA} \approx 2.8 \text{ nm}$   
for other  $e^-$ s

$$E_k \leq K_{\max} \Rightarrow \nu_{\text{acc.}} \leq V_0$$

$$\therefore \lambda_e \geq 2.8 \times 10^{-9} \text{ m.}$$

$$24) \quad m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{m_0}{\sqrt{1 - \left(\frac{0.8c}{c}\right)^2}} = \frac{m_0}{\sqrt{1 - 0.64}} = \frac{5m_0}{3}$$

$$25) \lambda = \frac{h}{\sqrt{2mk}}$$

$$\text{For protons } \lambda_p = \frac{h}{\sqrt{2m_p \cdot k_p}} \quad \dots(i)$$

$$\text{For } \alpha \text{ - particle } \lambda_\alpha = \frac{h}{\sqrt{2m_\alpha \cdot k_\alpha}}$$

$$\lambda_\alpha = \frac{h}{\sqrt{2 \cdot (4m_p) \cdot k_p}} \quad (\square k_p = k_\alpha) \text{ given}$$

$$\lambda_\alpha = \frac{h}{2\sqrt{2m_p k_p}} \quad \dots(ii)$$

$$\frac{\lambda_p}{\lambda_\alpha} = \frac{\frac{h}{\sqrt{2m_p k_p}}}{\frac{h}{2\sqrt{2m_p k_p}}}$$

Dividing (i) by (ii) we get

$$\frac{\lambda_p}{\lambda_\alpha} = 2, \lambda_p = 2\lambda_\alpha$$

$$26) \square T.E = U + K.E \Rightarrow K.E = T.E - U$$

$$\text{for } 0 \leq x \leq 1, K.E_1 = 4\epsilon_0 - 2\epsilon_0 = 2\epsilon_0$$

$$\text{for } x > 1, K.E_2 = 4\epsilon_0$$

$$\lambda = \frac{h}{\sqrt{2mE}} \Rightarrow \lambda \propto \frac{1}{\sqrt{E}}$$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{E_2}{E_1}} = \sqrt{\frac{4\epsilon_0}{2\epsilon_0}} = \sqrt{2}$$

so,  $\frac{\lambda_1}{\lambda_2} = \frac{1}{\sqrt{2}}$

$$27) \frac{\Delta P}{P} = \frac{\Delta \lambda}{\lambda} \Rightarrow \frac{P_0}{P_i} = \frac{0.25}{100} = \frac{1}{400}$$

$P_i = 400 P_0$

28)

Change in momentum  $p = 0.7 \frac{E}{C} + 2 \times 0.3 \frac{E}{C}$

Net force  $F = \left(1.3 \frac{E}{C}\right) N$

$$= 1.3 \frac{\text{Power}}{C} = 4.3 \times 10^{-8} N$$

$$29) \lambda = \frac{h}{\sqrt{2mE}}; \frac{\lambda'}{\lambda} = \sqrt{\frac{E}{E'}} \Rightarrow \frac{E}{E'} = \left(\frac{0.5}{1}\right)^2$$

$$\Rightarrow E' = \frac{E}{0.25} = 4E$$

The energy should be added to decrease wavelength  $= E' - E = 3E$

$$30) K_{\max} = h\nu - \phi_0$$

$$7 = h\nu_1 - 6$$

$$h\nu_1 = 13$$

$$h\nu_2 = 14$$

$$\frac{\nu_1}{\nu_2} = \frac{13}{14}$$

$$31) n_e \propto \frac{1}{d^2}$$

$$32) n = \frac{E\lambda}{hc} = \frac{1 \times 10^{-7} \times 200 \times 10^{-9}}{6.6 \times 10^{-34} \times 3 \times 10^8} = 1 \times 10^{11}$$

So no. of  $e^- = \frac{1 \times 10^{11}}{10^3} = 10^8 e^-$

$$V = \frac{q}{4\pi\epsilon_0 r} = \frac{(10^8 \times 1.6 \times 10^{-19}) \times 9 \times 10^9}{4.8 \times 10^{-2}} = 3V$$

33) Number of photo electrons

$$(N) \propto \text{Intensity} \propto \frac{1}{d^2} \Rightarrow \frac{N_1}{N_2} = \left(\frac{d_2}{d_1}\right)^2$$

$$\Rightarrow \frac{N_1}{N_2} = \left(\frac{100}{50}\right)^2 = \frac{4}{1} \Rightarrow N_2 = \frac{N_1}{4}.$$

34) Nuclear force between nucleons is independent of charge so force is same for all nucleons

$$F_{N-N} = F_{N-P} = F_{P-P}$$

35) According to Einstein's photoelectric equation

$$\frac{hc}{\lambda} = \phi + \frac{1}{2}mv^2 \Rightarrow v = \left[ \frac{2(hc - \lambda\phi)}{m\lambda} \right]^{1/2}$$

36) During fusion binding energy of daughter nucleus is always greater than the total energy of the parent nuclei so energy released

$$= c - (a + b) = c - a - b$$

37) de-Broglie wavelength  $\lambda = \frac{h}{mv_{rms}}$ , rms velocity of a gas particle at the given temperature (T) is given as

$$\frac{1}{2}mv_{rms}^2 = \frac{3}{2}kT \Rightarrow v_{rms} = \sqrt{\frac{3kT}{m}} \Rightarrow mv_{rms} = \sqrt{3mkT}$$

$$\lambda = \frac{h}{mv_{rms}} = \frac{h}{\sqrt{3mkT}}$$

$$\Rightarrow \frac{\lambda_H}{\lambda_{He}} = \sqrt{\frac{m_{He}T_{He}}{m_H T_H}} = \sqrt{\frac{4(273 + 127)}{2(273 + 27)}} = \sqrt{\frac{8}{3}}$$

$$38) P = \frac{NE}{t}$$

$$\Rightarrow 300 \times 10^6 = \frac{N \times 170 \times 10^6 \times 1.6 \times 10^{-19}}{t}$$

$$\Rightarrow \frac{N}{t} = 1.102 \times 10^{19}$$

□ Number of atoms per sec

Number of atoms per hour

$$= 1.102 \times 10^{19} \times 3600 = 3.97 \times 10^{22}.$$

$$= 4 \times 10^{22}$$

39) (1) For  $1 < A < 50$ , on fusion mass number

for compound nucleus is less than 100

$\Rightarrow$  Binding energy per nucleon remains

same  $\Rightarrow$  No energy is released

(2) For  $51 < A < 100$ , on fusion mass

number for compound nucleus is

between 100 & 200

$\Rightarrow$  Binding energy per nucleon increases

$\Rightarrow$  Energy is released.

(3) For  $100 < A < 200$ , on fission, the mass

number of product nuclei will be  
between 50 & 100  
 $\Rightarrow$  Binding energy per nucleon decreases  
 $\Rightarrow$  No energy is released

- (4) For  $200 < A < 260$ , on fission, the mass number of product nuclei will be between 100 & 130  
 $\Rightarrow$  Binding energy per nucleon increases  
 $\Rightarrow$  Energy is released.

$$40) p = \frac{h}{\lambda} = \frac{6.6 \times 10^{-34}}{4400 \times 10^{-10}} = 1.5 \times 10^{-27} \text{ kg.m/s}$$

$$\text{and mass } m = \frac{p}{c} = \frac{1.5 \times 10^{-27}}{3 \times 10^8} = 5 \times 10^{-36} \text{ kg}$$

$$41) \lambda = \frac{h}{mv_{\text{rms}}}$$

$$\Rightarrow \lambda = \frac{6.6 \times 10^{-34}}{2 \times 1.67 \times 10^{-27} \times 3 \times 10^3} = 0.66 \text{ \AA}$$

$$42) P = \frac{W}{t} = \frac{nhc}{\lambda t}$$

$$\Rightarrow \left(\frac{n}{t}\right) = \frac{P\lambda}{hc} = \frac{10 \times 10^3 \times 300}{6.6 \times 10^{-34} \times 3 \times 10^8}$$

$$= 1.5 \times 10^{31}$$

43) Stopping potential does not depend on the relative distance between the source and the photo cell.

Energy

$$44) \text{Fission} = 200 \text{ MeV} = 200 \times 10^6 \times 1.6 \times 10^{-19} \text{ J}$$

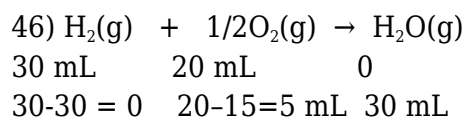
$$\text{Fission rate} = \frac{5}{200 \text{ MeV}} = 1.56 \times 10^{11} \text{ fission/sec.}$$

$$45) \text{Energy of photon} = \frac{hc}{\lambda} = hcR \left( \frac{1}{1^2} - \frac{1}{5^2} \right) = \frac{24hcR}{25}$$

$$\text{Momentum of photon} = \frac{E}{c} = \frac{24hR}{25}$$

$$= \text{Momentum of atom}$$

$$\text{Velocity of atom} = \frac{24hR}{25m} \text{ where } m = \text{mass of atom.}$$



$\text{CaCO}_3$	P	$\text{HClO}_3$	atoms
1 mol	50 mol	1 mol	5 mol
?	50 mol	10 mol	? = 50 mol

55) = 1 mol

$$\text{MM}_{\text{mix}} = \frac{2 \times 92 + 3 \times 46}{5} = \frac{7 \times 46}{5} = 64.4 \text{ g mol}^{-1}$$

59)

### A. Question

Density of  $\text{N}_2$  gas at STP would be:

### B. Given Data

- A. Molecular weight of  $\text{N}_2$ : 28 g/mol
- B. Volume of 1 mole of gas at STP: 22.4 L

### C. Concept

- A. Density is defined as the mass of a substance per unit volume.
- B. At STP (Standard Temperature and Pressure), 1 mole of any ideal gas occupies 22.4 L.
- C. Therefore, the density of a gas can be calculated using the formula:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

### D. Mathematical Calculation

- A. For  $\text{N}_2$ :

$$\text{Density} = 28 \text{ g} / 22.4 \text{ L} \approx 1.25 \text{ g L}^{-1}$$

### E. Final Answer

The density of  $\text{N}_2$  gas at STP is  $1.25 \text{ g L}^{-1}$ .  
(Option 3)

### F. Question Level

Easy

69)

$$\% \text{ of atom} = \frac{n \times \text{atomic mass} \times 100}{\text{mole wt.}}$$

$$\text{Mol. wt.} = \frac{1 \times 78.4 \times 100}{0.5}$$

$$= 1.568 \times 10^4$$

$$71) \text{ Molecular formula} = (\text{empirical formula})_n \therefore n = \frac{78}{13} = 6$$

75)

### A. Question

The mass ratio of N and O in a compound is 7 : 20. Identify the compound.

### B. Given Data

- A. Atomic mass of Nitrogen (N)  $\approx$  14 g/mol
- B. Atomic mass of Oxygen (O)  $\approx$  16 g/mol
- C. The given mass ratio for N and O is 7 : 20.

### C. Concept

- A. The mass ratio between nitrogen and oxygen in a compound can be derived by summing the masses of nitrogen and oxygen atoms in the formula.
- B. For a compound with the formula  $N_xO_y$ , the mass contributed by nitrogen is  $14x$  and by oxygen is  $16y$ .
- C. The ratio given (7 : 20) simplifies the relationship between the mass of nitrogen and oxygen:  
 $(14x / 16y) = (7 / 20)$ .

### D. Mathematical Calculation

- A. For each option, calculate the mass contribution of nitrogen and oxygen:
  - A. Option 1:  $N_2O_3$ 
    - A. N:  $2 \times 14 = 28$
    - B. O:  $3 \times 16 = 48$
    - C. Mass ratio =  $28 : 48 = 7 : 12$  (after dividing by 4)
  - B. Option 2: NO
    - A. N:  $1 \times 14 = 14$
    - B. O:  $1 \times 16 = 16$
    - C. Mass ratio =  $14 : 16 = 7 : 8$  (after dividing by 2)
  - C. Option 3:  $N_2O_4$ 
    - A. N:  $2 \times 14 = 28$
    - B. O:  $4 \times 16 = 64$
    - C. Mass ratio =  $28 : 64 = 7 : 16$  (after dividing by 4)
  - D. Option 4:  $N_2O_5$ 
    - A. N:  $2 \times 14 = 28$
    - B. O:  $5 \times 16 = 80$
    - C. Mass ratio =  $28 : 80 = 7 : 20$  (after dividing by 4)
- B. The only compound that gives a nitrogen to oxygen mass ratio of 7 : 20 is  $N_2O_5$ .

### E. Final Answer

The compound is  $N_2O_5$ .  
 (Option 4)

### F. Question Level

Easy

78)  $\text{CO}_2(\text{g}) + \text{C}(\text{g}) \rightarrow 2\text{CO}$   
 1 cc  $\text{CO}_2$  given = 2 cc  $\text{CO}$   
 20 cc  $\text{CO}_2$  given = 40 cc  $\text{CO}$

86)  $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$   
 Mole  $\frac{100}{100} = 1$                       0.4 mole theoretical  
 Pure mole = 0.4                       $0.60 = \frac{n_{\text{actual}}}{0.4}$   
     $n_{\text{actual}} = 0.24$   
    Mass =  $0.24 \times 44 = 10.56 \text{ gm}$

87) **Explanation:** It Water Sample are taken from river, Ponds or Pipe. They Contain hydrogen and oxygen in the ratio of 1:8 by mass.

**Concept:** A/c to law of definite proportion a Sample taken in different sources, and ratio of element by mass is Constant it's follow law of definite Proportion.

**Final answer:** option (3)

## BIOLOGY

91) NCERT XI, Pg. # 127

92)

NCERT-XI, Pg. # 126

93) **Correct Answer: 2. Centriole duplication occurs in S-phase of mango cell**  
**(Incorrect statement)**

**Explanation:**

1. Tubulin protein synthesis occurs in  $G_2$ -phase → Correct

A. Tubulin is needed for spindle fiber formation, which occurs in  $G_2$ -phase to prepare for mitosis.

2. Centriole duplication occurs in S-phase of mango cell → Incorrect

A. Mango is a plant, and most higher plants lack centrioles.

B. In animal cells, centrioles duplicate in the S-phase, but since mango is a plant, this statement is incorrect.

3. DNA synthesis occurs only during one specific stage → Correct

A. DNA replication occurs only in S-phase, not in  $G_1$ ,  $G_2$ , or M-phase.

4. M-phase consumes 5% duration of the cell cycle → Correct

A. The M-phase (mitosis+ cytokinesis) is much shorter than interphase, typically around 5-10% of the total cell cycle duration.



**Final Answer:**

Option 2 (Centriole duplication In S-phase of mango cell) is incorrect, making it the correct choice.

94) **SOLUTION** -The process of appearance of recombination nodules occurs during the pachytene stage of prophase I in meiosis.

**Explanation :**

- A. During pachytene, homologous chromosomes are fully paired, and crossing over occurs between them. Recombination nodules are protein structures that form at the sites of crossing over, where genetic material is exchanged between the homologous chromosomes.

95)

**SOLUTION —**

The correct answer is Anaphase II.

**Explanation :**

- A. The division of the centromere occurs during Anaphase II of meiosis. In this stage, the sister chromatids of each chromosome are pulled apart toward opposite poles, and the centromere divides, allowing the chromatids to separate.

96) NCERT PG. 164

97) NCERT 10.2.1 PG. 164

98) NCERT 10.2.2 PG. 165

99) NCERT 10.4.1 PG. 168

100) NCERT PG: 168

101) NCERT PG. 168

102)

NCERT PG. 165

103) NCERT PG. 168

104) NCERT PG. 168

105) NCERT PG. 168

106) NCERT PG. 168

107) NCERT 10.2.2 PG. 165

108)

Ncert Page 126.

109)

Allen module.

110)

NCERT, Pg. # 121

111) NCERT-XI, Page # 169, (Fig. 10.3), 166 (Fig. 10.2)

112)

NCERT-XI, Pg. # 99

113)

NCERT Pg. # 129, 2021 - 22

114)

NCERT-XI, Pg. # 147

115)

NCERT-XI, Pg. # 94

116)

NCERT - XI Pg # 97, 98

117) NCERT Page No. 139,163

118)

NCERT-XI, Pg. # 95

119) NCERT based

120)

NCERT pg no. 133

121) NCERT-XI, Pg. # 88, 96

122)

The given diagram shows the cross-sectional structure of cilia/flagella, characterized by the 9 + 2 arrangement of microtubules (9 outer doublets + 2 central singlets).

A. Correct answer is option 2. Hair like outgrowth of cell membrane known as cilia/flagella

A. The structure is typical of eukaryotic cilia/flagella

B. It is not the 9+0 arrangement (which is found in basal bodies or centrioles)

C. It does not contain hydrolytic enzymes (those are found in lysosomes)

D. It was not discovered by George Palade (he discovered ribosomes)

123)

NCERT Pg. # 93

124)

NCERT-XI, Pg. # 100

125) NCERT Pg.# 131

126) NCERT Pg.#132

127) Module 6 Pg. # 187

128) NCERT (XI) Pg. # 134

129) NCERT (XI) Pg. # 126, 8.3

130) NCERT XI Pg # 136

131) NCERT, Pg#131, para-8.5.1

132) NCERT, Pg#137, para-8.5.8

133) NCERT XI, Pg. # 133, Para 05

134) NCERT XIth Pg.#134

135) NCERT (XI) Pg. # 138

136) NCERT XI (E/H) Pg # 165 (10.2.2)

137) Tails of membrane lipids are hydrophobic.

138)

The concept of "omnis cellula-e-cellula", which means "all cells arise from pre-existing cells," was first proposed by Rudolf Virchow.

- A. Rudolf Virchow, a German physician, made this statement in 1855, emphasizing that new cells are produced from the division of existing cells, which was a key idea in the development of cell theory.

Therefore, the correct answer is: Rudolf Virchow.

139) NCERT-XI Pg. # 125, 126

140)

NCERT Page No. 94

141)

NCERT XI, Topic # 8.5.8

142) NCERT XI pg.# 163

143) NCERT XI Pg. No. # 163,164

144)

The correct answer is: 3. 4C

**Explanation:**

- A. During the  $G_1$  stage, the DNA content is 2C because no replication has occurred yet.
- B. During the S phase, DNA replication occurs, doubling the DNA content while the number of chromosomes remains the same.
- C. By the  $G_2$  stage, the total DNA content becomes 4C ( each chromosome now consists of two identical sister chromatids).

**Key Point:**

- A.  $G_1$  stage: 2C
- B. After S phase and in  $G_2$  stage: 4C

145) NCERT (XI) Pg. # 162

146) NCERT XI pg.# 122

147) NCERT Pg. # 103

148) Module # 1, Pg.# 207,210

149) NCERT XI Pg.#164

150) NCERT XI Pg.#164 (2 last line from bottom)

151)

Mitosis is essential for growth, development, and maintenance of organisms. Let's analyze each option:

**1. Production of daughter cells with identical genetic complement →True**

- A. Mitosis ensures that daughter cells are genetically identical to the parent cell.

**2. Restoration of nucleocytoplasmic ratio →True**

- A. After cell growth, mitosis helps maintain a balanced nucleus-to-cytoplasm ratio.

**3. Plays an important role in evolution by inducing variations →False**

- A. **Mitosis does not create genetic variations;** it produces genetically identical cells.
- B. **Meiosis**, not mitosis, introduces variations through crossing over and independent assortment.

**4. Responsible for growth of multicellular organisms →True**

- A. Mitosis is crucial for tissue growth, repair, and maintenance in multicellular organisms.

**Correct Answer: Option 3 (Plays an important role in evolution by inducing variations).**

152)

NCERT Page # 123

153) NCERT-XI Pg. # 166, II<sup>nd</sup>, III<sup>rd</sup> line

154)

NEET 2024

155) NCERT Pg # 126

156)

NCERT Pg No: 168, 2021-22

157) NCERT-XII, Pg. # 128

158) NCERT Page No. # 123

159) NCERT Pg. No. # 123

160) NCERT Pg. No. # 124

161) NCERT Pg. No. 123, 127

162)

NCERT Pg. No. # 123, 125

163) NCERT Pg. No. 127

164) NCERT Pg. No. 89, 90

165) NCERT Pg. No. 90, 91

167)

NCERT Pg. No. 89

168) NCERT Pg. No. 89, 90 91

169) NCERT Pg. No. 93, 94

170) NCERT Pg. No. 93, 94

171) NCERT Pg. No. 93, 94

172) NCERT Pg. No. 93, 94

173) NCERT Pg. No. 94, 95, 96

174) NCERT Pg. No. 96

175) NCERT Pg. No. 94, 95

176) NCERT Pg. No. 95, 96

177) NCERT Pg. No. 95, 96

178) NCERT Pg. No. 98

179) NCERT Pg. No. 98

180) NCERT Pg. No. 98