

Physics : Section-A (Q. No. 1 to 35)

- 1 At any instant of time  $t$ , the displacement of any particle is given by  $2t - 1$  (SI unit) under the influence of force of  $5\text{ N}$ . The value of instantaneous power is (in SI unit):  $P = F \cdot v$   
 (1) 5 (2) 7  $= 5 \times 2$   
 (3) 6 (4) 10  $= 10$

- 2 If the monochromatic source in Young's double slit experiment is replaced by white light, then  
 (1) there will be a central dark fringe surrounded by a few coloured fringes.  
 (2) there will be a central bright white fringe surrounded by a few coloured fringes.  
 (3) all bright fringes will be of equal width.  
 (4) interference pattern will disappear.

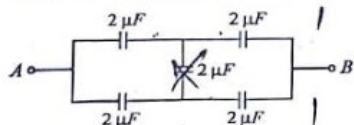
- 3  ${}_{82}^{290}\text{X} \xrightarrow{\alpha} {}_{80}^{286}\text{Y} \xrightarrow{e^+} {}_{79}^{286}\text{Z} \xrightarrow{\beta^-} {}_{80}^{286}\text{P} \xrightarrow{e^-} {}_{81}^{286}\text{Q}$   
 In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are :  
 (1) 286, 80 (2) 288, 82  
 (3) 286, 81 (4) 280, 81

- 4 Match List-I with List-II.

| List-I<br>(Material) | List-II<br>(Susceptibility ( $\chi$ ))              |
|----------------------|-----------------------------------------------------|
| A. Diamagnetic       | I. $\chi = 0$                                       |
| B. Ferromagnetic     | II. $0 > \chi \geq -1$                              |
| C. Paramagnetic      | III. $\chi \gg 1$                                   |
| D. Non-magnetic      | IV. $0 < \chi < \epsilon$ (a small positive number) |

Choose the correct answer from the options given below:

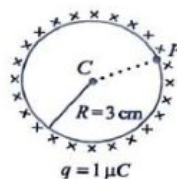
- (1) A-II, B-I, C-III, D-IV  
 (2) A-III, B-II, C-I, D-IV  
 (3) A-IV, B-III, C-II, D-I  
 (4) A-II, B-III, C-IV, D-I
- 5 In the following circuit, the equivalent capacitance between terminal A and terminal B is :



- (1)  $1 \mu\text{F}$  (2)  $0.5 \mu\text{F}$   
 (3)  $4 \mu\text{F}$  (4)  $2 \mu\text{F}$

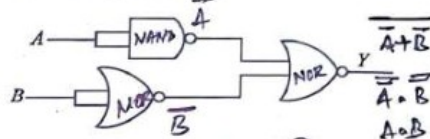
- 6 A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is:

(Take  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$  SI units)



- (1)  $1 \times 10^5$  (2)  $0.5 \times 10^5$   
 (3) Zero (4)  $3 \times 10^5$

- 7 The output (Y) of the given logic gate is similar to the output of an/a :



- (1) NOR gate (2) OR gate  
 (3) AND gate (4) NAND gate

- 8 An unpolarised light beam strikes a glass surface at Brewster's angle. Then

- (1) the refracted light will be completely polarised.  
 (2) both the reflected and refracted light will be completely polarised.  
 (3) the reflected light will be completely polarised but the refracted light will be partially polarised.  
 (4) the reflected light will be partially polarised.

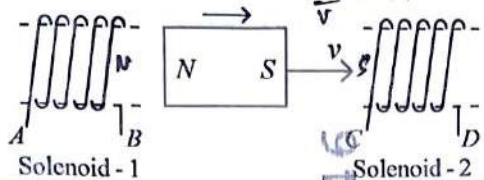
- 9 A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as  $4\pi \times 10^{-7}$  SI units):

- (1) 4.4 T (2) 4.4 mT  
 (3) 44 T (4) 44 mT

2  $B = \frac{\mu_0 n I}{2r} = \frac{4\pi \times 10^{-7} \times 100 \times 7}{2 \times 0.1} = 44 \times 10^{-4} \text{ T}$  | Contd...

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In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions:

- (1) BA and CD (2) AB and CD  
(3) BA and DC (4) AB and DC

- 11 Two bodies A and B of same mass undergo completely inelastic one dimensional collision. The body A moves with velocity  $v_1$  while body B is at rest before collision. The velocity of the system after collision is  $v_2$ . The ratio  $v_1 : v_2$  is:

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

- 12 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

**Assertion A:** The potential ( $V$ ) at any axial point, at 2 m distance ( $r$ ) from the centre of the dipole of dipole moment vector  $\vec{P}$  of magnitude,  $4 \times 10^{-6} \text{ C m}$ , is  $\pm 9 \times 10^3 \text{ V}$ .

(Take  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ SI units}$ )

**Reason R:**  $V = \pm \frac{2P}{4\pi\epsilon_0 r^2}$ , where  $r$  is the

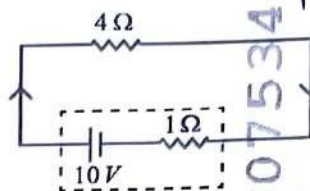
distance of any axial point, situated at 2 m from the centre of the dipole.

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

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

13

The terminal voltage of the battery, whose emf is 10V and internal resistance  $1 \Omega$ , when connected through an external resistance of  $4 \Omega$  as shown in the figure is:

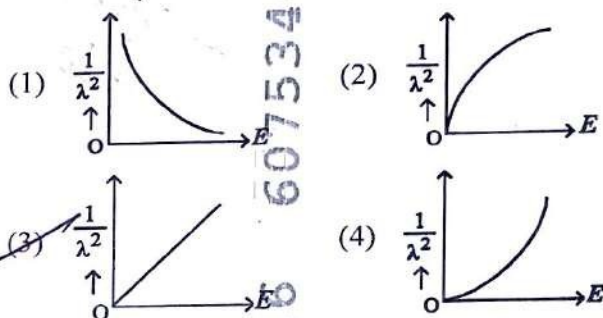


- (1) 6 V (2) 8 V  
(3) 10 V (4) 4 V

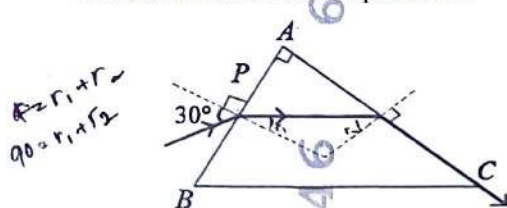
- 14 A particle moving with uniform speed in a circular path maintains:

- (1) constant acceleration.  
(2) constant velocity but varying acceleration.  
(3) varying velocity and varying acceleration.  
(4) constant velocity.

The graph which shows the variation of  $\left(\frac{1}{\lambda}\right)$  and its kinetic energy,  $E$  is (where  $\lambda$  is de Broglie wavelength of a free particle):



A light ray enters through a right angled prism at point P with the angle of incidence  $30^\circ$  as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is:

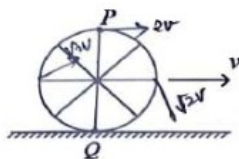


- (1)  $\frac{\sqrt{5}}{2}$  (2)  $\frac{\sqrt{3}}{4}$   
(3)  $\frac{\sqrt{3}}{2}$  (4)  $\frac{\sqrt{5}}{4}$

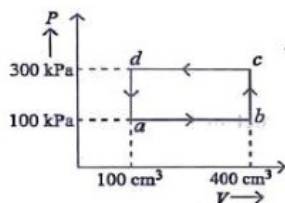
$$\Delta l = \frac{F \cdot L}{Y \cdot A}$$

$$= \frac{k \cdot L}{Y \cdot A}$$

- 17 A wheel of a bullock cart is rolling on a level road as shown in the figure below. If its linear speed is  $v$  in the direction shown, which one of the following options is correct ( $P$  and  $Q$  are any highest and lowest points on the wheel, respectively)?



- (1) Point  $P$  moves faster than point  $Q$ .  
 (2) Both the points  $P$  and  $Q$  move with equal speed.  
 (3) Point  $P$  has zero speed.  
 (4) Point  $P$  moves slower than point  $Q$ .
- 18 A thermodynamic system is taken through the cycle  $abcd$ . The work done by the gas along the path  $bc$  is:



- (1) 30 J  
 (2) -90 J  
 (3) -60 J  
 (4) zero
- 19 In an ideal transformer, the turns ratio is  $\frac{N_p}{N_s} = \frac{1}{2}$ .

The ratio  $V_s : V_p$  is equal to (the symbols carry their usual meaning):

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

- 20 A thin flat circular disc of radius 4.5 cm is placed gently over the surface of water. If surface tension of water is  $0.07 \text{ Nm}^{-1}$ , then the excess force required to take it away from the surface is:

- (1) 198 N  
 (2) 1.98 mN  
 (3) 99 N  
 (4) 19.8 mN

- 21 The maximum elongation of a steel wire of 1 m length if the elastic limit of steel and its Young's modulus, respectively, are  $8 \times 10^8 \text{ N m}^{-2}$  and  $2 \times 10^{11} \text{ N m}^{-2}$ , is:

- (1) 0.4 mm  
 (2) 40 mm  
 (3) 8 mm  
 (4) 4 mm

- 22 The mass of a planet is  $\frac{1}{10}$ th that of the earth and

its diameter is half that of the earth. The acceleration due to gravity on that planet is:

- (1)  $9.8 \text{ m s}^{-2}$   
 (2)  $4.9 \text{ m s}^{-2}$   
 (3)  $3.92 \text{ m s}^{-2}$   
 (4)  $19.6 \text{ m s}^{-2}$

- 23 In a vernier calipers,  $(N + 1)$  divisions of vernier scale coincide with  $N$  divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is:

- (1)  $\frac{1}{100(N+1)}$   
 (2)  $100N$   
 (3)  $10(N+1)$   
 (4)  $\frac{1}{10N}$

- 24 Given below are two statements:

**Statement I:** Atoms are electrically neutral as they contain equal number of positive and negative charges.

**Statement II:** Atoms of each element are stable and emit their characteristic spectrum.

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

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

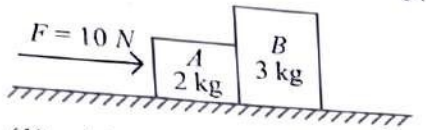
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$$T = \frac{F}{L}$$

$$T \times 2\pi R = F$$

$$0.07 \times 2 \times \frac{3.14}{100} \times \frac{4.5}{1000} = F$$

- 25 A horizontal force 10 N is applied to a block A as shown in figure. The mass of blocks A and B are 2 kg and 3 kg, respectively. The blocks slide over a frictionless surface. The force exerted by block A on block B is :



- (1) 4 N  
(2) 6 N  
(3) 10 N  
(4) zero

$$a = \frac{F}{m} = \frac{10}{5} = 2 \text{ m/s}^2$$

- 26 The quantities which have the same dimensions as those of solid angle are :

- (1) stress and angle  $\times$   
(2) strain and arc  
(3) angular speed and stress  $\frac{F}{A} \times$   
(4) strain and angle

- 27 The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 g cm<sup>2</sup>. The length of the 400 g rod is nearly :

- (1) 17.5 cm  
(2) 20.7 cm  
(3) 72.0 cm  $\times$   
(4) 8.5 cm

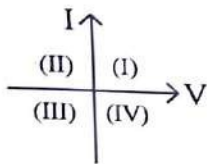
$$\frac{ML^2}{12} = 2400$$

$$\frac{400 \times L^2}{12} = 2400$$

$$L^2 = \frac{24 \times 12}{400} = \frac{72}{100}$$

$$L = \sqrt{\frac{72}{100}} = \frac{\sqrt{72}}{10}$$

- 28 Consider the following statements A and B and identify the correct answer :



- A. For a solar-cell, the I-V characteristics lies in the IV quadrant of the given graph.  
B. In a reverse biased pn junction diode, the current measured in ( $\mu A$ ), is due to majority charge carriers.  $\times$

- (1) A is incorrect but B is correct.  
(2) Both A and B are correct.  
(3) Both A and B are incorrect.  
(4) A is correct but B is incorrect.

- 29 A wire of length 'l' and resistance 100 divided into 10 equal parts. The first 5 parts connected in series while the next 5 parts connected in parallel. The two combinations again connected in series. The resistance of final combination is:

- (1) 52  $\Omega$   
(2) 55  $\Omega$   
(3) 60  $\Omega$   
(4) 26  $\Omega$

- 30 If  $x = 5 \sin\left(\pi t + \frac{\pi}{3}\right)$  m represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively are :

- (1) 5 m, 2 s  
(2) 5 cm, 1 s  $\times$   
(3) 5 m, 1 s  
(4) 5 cm, 2 s  $\times$

- 31 If c is the velocity of light in free space, the statements about photon among the following are :

- A. The energy of a photon is  $E = h\nu$ .  
B. The velocity of a photon is c.  $\checkmark$   
C. The momentum of a photon,  $p = \frac{h\nu}{c}$   
D. In a photon-electron collision, both energy and total momentum are conserved.  
E. Photon possesses positive charge.  $\times$

Choose the correct answer from the options below :

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

- 32 Match List I with List II.

List I  
(Spectral Lines of Hydrogen for transitions from)

- A.  $n_2 = 3$  to  $n_1 = 2$   
B.  $n_2 = 4$  to  $n_1 = 2$   
C.  $n_2 = 5$  to  $n_1 = 2$   
D.  $n_2 = 6$  to  $n_1 = 2$

List II  
(Wavelengths in  $\text{\AA}$ )  
I. 410.2  
II. 434.1  
III. 656.3  
IV. 486.1

Choose the correct answer from the options below :

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

114 Which of the following is an example of actinomorphic flower?

- (1) *Cassia* (2) *Pisum*  
(3) *Sesbania* (4) *Datura*

115 Identify the type of flowers based on the position of calyx, corolla and androecium with respect to the ovary from the given figures (a) and (b)



- (1) (a) Hypogynous; (b) Epigynous  
(2) (a) Perigynous; (b) Epigynous  
(3) (a) Perigynous; (b) Perigynous  
(4) (a) Epigynous; (b) Hypogynous

116 Match List I with List II

**List I**

- A. Nucleolus  
B. Centriole  
C. Leucoplasts  
D. Golgi apparatus

**List II**

- I. Site of formation of glycolipid  
II. Organization like the cartwheel  
III. Site for active ribosomal RNA synthesis  
IV. For storing nutrients

Choose the correct answer from the options given below:

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

117 What is the fate of a piece of DNA carrying a gene of interest which is transferred into an alien organism?

- A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.  
B. It may get integrated into the genome of the recipient.  
C. It may multiply and be inherited along with the host DNA.  
D. The alien piece of DNA is not an integral part of chromosome.  
E. It shows ability to replicate.

Choose the correct answer from the options given below:

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

118 Hind II always cuts DNA molecules at a particular point called recognition sequence and it consists of:

- (1) 6 bp (2) 4 bp  
(3) 10 bp (4) 8 bp

119 The cofactor of the enzyme carboxypeptidase is:

- (1) Niacin (2) Flavin  
(3) Haem (4) Zinc

120 Which of the following are required for the reaction of photosynthesis?

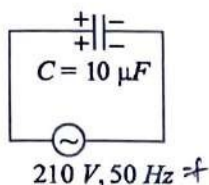
- A. Light  
B. Chlorophyll  
C.  $\text{CO}_2$   
D. ATP  
E. NADPH

Choose the correct answer from the options given below:

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

$$I_{rms} = \frac{I_0}{\sqrt{2}}$$

- 40 A  $10 \mu F$  capacitor is connected to a  $210 V, 50 Hz$  source as shown in figure. The peak current in the circuit is nearly ( $\pi = 3.14$ ):



$$I_{rms} = \frac{V_{rms}}{X_C}$$

$$= \frac{210 \times 2\pi f C}{1}$$

$$I_0 = 210 \times 2 \times 3.14 \times 50 \times 10 \times 10^{-6}$$

$$= 210 \times 2 \times 3.14 \times 5 \times 10^{-3} \times 1.4$$

$$= 42 \times 3.14 \times 5 \times 10^{-3} \times 1.4$$

$$= 210 \times 3.14 \times 1.4$$

$$= 210 \times 4.396$$

$$= 923.16$$

- (1) 0.93 A  
(3) 0.35 A  
(2) 1.20 A  
(4) 0.58 A
- 41 Two heaters A and B have power rating of 1 kW and 2 kW, respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:

- (1) 2 : 9  
(3) 2 : 3  
(2) 1 : 2  
(4) 1 : 1

- 42 If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time

period of oscillation is  $\frac{x}{2}$  times its original time period. Then the value of  $x$  is:

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

- 43 The property which is not of an electromagnetic wave travelling in free space is that :

- (1) the energy density in electric field is equal to energy density in magnetic field.  
(2) they travel with a speed equal to  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$ .  
(3) they originate from charges moving with uniform speed.  
(4) they are transverse in nature.

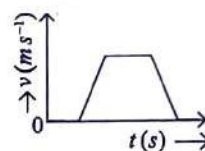
- 44 A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to :

- A. hold the sheet there if it is magnetic.  
B. hold the sheet there if it is non-magnetic.  
C. move the sheet away from the pole with uniform velocity if it is conducting.  
D. move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.

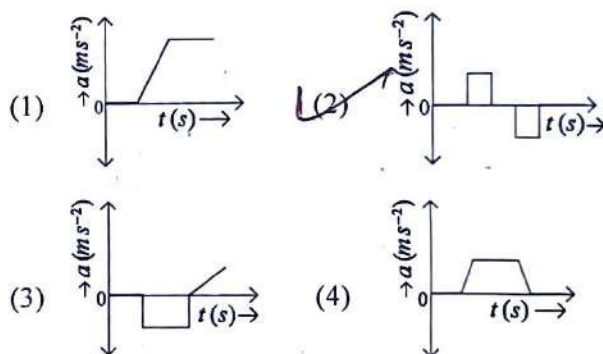
Choose the correct statement(s) from the options given below:

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

- 45 The velocity ( $v$ ) – time ( $t$ ) plot of the motion of a body is shown below :



The acceleration ( $a$ ) – time ( $t$ ) graph that best suits this motion is :



- 46 A parallel plate capacitor is charged by connecting it to a battery through a resistor. If  $I$  is the current in the circuit, then in the gap between the plates :

- (1) displacement current of magnitude equal to  $I$  flows in the same direction as  $I$ .  
(2) displacement current of magnitude equal to  $I$  flows in a direction opposite to that of  $I$ .  
(3) displacement current of magnitude greater than  $I$  flows but can be in any direction.  
(4) there is no current.

220.2 x 165

202  
11 4 3 4 5  
220.2

202  
57  
230

329.50 x 10<sup>4</sup>  
10<sup>3</sup>

Botany : Section-A (Q. No. 101 to 135)

- 97 The rate of a reaction quadruples when temperature changes from 27°C to 57°C. Calculate the energy of activation.

Given  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ,  $\log 4 = 0.6021$

- (1) 380.4 kJ/mol  
(2) 3.80 kJ/mol  
(3) 3804 kJ/mol  
(4) 38.04 kJ/mol

$$\log \frac{r_2}{r_1} = \frac{E_a}{2.303R} \left[ \frac{T_2 - T_1}{T_1 T_2} \right]$$

$$\log 4 = \frac{E_a \times 2}{2.303 \times 27 \times 330}$$

$$0.6021 \times 2.303 \times 27 \times 330 = E_a$$

$$2 \times 2.303 \times 27 \times 330 = E_a$$

- 98 During the preparation of Mohr's salt solution (Ferrous ammonium sulphate), which of the following acid is added to prevent hydrolysis of  $\text{Fe}^{2+}$  ion?

- (1) concentrated sulphuric acid  
(2) dilute nitric acid  
(3) dilute sulphuric acid  
(4) dilute hydrochloric acid

- 99 The plot of osmotic pressure ( $\Pi$ ) vs concentration ( $\text{mol L}^{-1}$ ) for a solution gives a straight line with slope  $25.73 \text{ L bar mol}^{-1}$ . The temperature at which the osmotic pressure measurement is done is:

(Use  $R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$ )

- (1) 310°C  
(2) 25.73°C  
(3) 12.05°C  
(4) 37°C

$$RT = 25.73$$

$$T = \frac{25.73 \times 10}{0.083}$$

$$= 310 \text{ K}$$

- 100 Identify the correct answer.

- (1)  $\text{BF}_3$  has non-zero dipole moment  
(2) Dipole moment of  $\text{NF}_3$  is greater than that of  $\text{NH}_3$   
(3) Three canonical forms can be drawn for  $\text{CO}_3^{2-}$  ion.  
(4) Three resonance structures can be drawn for ozone.

- 101 A transcription unit in DNA is defined primarily by the three regions in DNA and these are with respect to upstream and down stream end;

- (1) Structural gene, Transposons, Operator gene  
(2) Inducer, Repressor, Structural gene  
(3) Promotor, Structural gene, Terminator  
(4) Repressor, Operator gene, Structural gene

Identify the set of correct statements:

- A. The flowers of *Vallisneria* are colourful and produce nectar.  
B. The flowers of waterlily are not pollinated by water.  
C. In most of water-pollinated species, the pollen grains are protected from wetting.  
D. Pollen grains of some hydrophytes are long and ribbon like.  
E. In some hydrophytes, the pollen grains are carried passively inside water.

Choose the correct answer from the options given below:

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

- 103 Lecithin, a small molecular weight organic compound found in living tissues, is an example of:

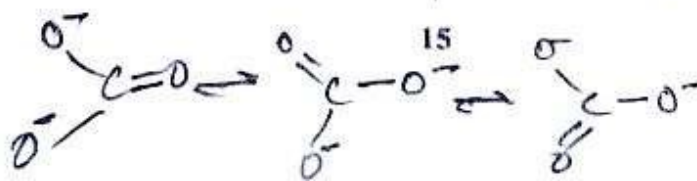
- (1) Phospholipids  
(2) Glycerides  
(3) Carbohydrates  
(4) Amino acids

- 104 These are regarded as major causes of biodiversity loss:

- A. Over exploitation  
B. Co-extinction  
C. Mutation  
D. Habitat loss and fragmentation  
E. Migration

Choose the correct option:

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



12 Match List I with List II

**List I**

A. Robert May

B. Alexander von Humboldt

C. Paul Ehrlich

D. David Tilman

**List II**

I. Species-Area relationship

II. Long term ecosystem experiment using out door plots

III. Global species diversity at about 7 million

IV. Rivet popper hypothesis

Choose the correct answer from the options given below:

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

(2) A-I, B-III, C-II, D-IV ✗

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

(4) A-II, B-III, C-I, D-IV ✗

13 Identify the correct description about the given figure:



(1) Water pollinated flowers showing stamens with mucilaginous covering.

(2) Cleistogamous flowers showing autogamy.

(3) Compact inflorescence showing complete autogamy.

(4) Wind pollinated plant inflorescence showing flowers with well exposed stamens.

144 In an ecosystem if the Net Primary Productivity (NPP) of first trophic level is

$100x \text{ (kcal m}^{-2} \text{) yr}^{-1}$ , what would be the GPP (Gross Primary Productivity) of the third trophic level of the same ecosystem?

(1)  $x \text{ (kcal m}^{-2} \text{) yr}^{-1}$

(2)  $10x \text{ (kcal m}^{-2} \text{) yr}^{-1}$

(3)  $\frac{100x}{3x} \text{ (kcal m}^{-2} \text{) yr}^{-1}$

(4)  $\frac{x}{10} \text{ (kcal m}^{-2} \text{) yr}^{-1}$

145 Match List I with List II

**List I**

A. Rose

B. Pea

C. Cotton

D. Mango

**List II**

I. Twisted aestivation

II. Perigynous flower

III. Drupe

IV. Marginal placentation

Choose the correct answer from the options given below:

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

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

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

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

146 Match List I with List II

**List I**

(Types of Stamens)

A. Monadelphous

B. Diadelphous

C. Polyadelphous

D. Epiphyllous

**List II**

(Example)

I. Citrus

II. Pea

III. Lily

IV. China-rose

Choose the correct answer from the options given below:

(1) A-IV, B-I, C-II, D-III ✗

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

(3) A-III, B-I, C-IV, D-II ✗

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

180 Given below are two statements :

**Statement I :** In the nephron, the descending limb of loop of Henle is impermeable to water and permeable to electrolytes. ✗

**Statement II :** The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption. ✗

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

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

181 Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

**Assertion A :** Breast-feeding during initial period of infant growth is recommended by doctors for bringing a healthy baby. ✓

**Reason R :** Colostrum contains several antibodies absolutely essential to develop resistance for the new born baby.

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

- (1) Both A and R are correct but R is NOT the correct explanation of A.  
(2) A is correct but R is not correct.  
(3) A is not correct but R is correct.  
✓ (4) Both A and R are correct and R is the correct explanation of A.

182 Following are the stages of pathway for conduction of an action potential through the heart:

- A. AV bundle  
B. Purkinje fibres ✓  
C. AV node  
D. Bundle branches  
E. SA node

Choose the correct sequence of pathway from the options given below :

- (1) A-E-C-B-D (2) B-D-E-C-A  
(3) E-A-D-B-C ✓ (4) E-C-A-D-B

183 Which one is the correct product of DNA dependent RNA polymerase to the given template?

3' AUGUACCGUUAUAGGUAAGU3' ✗  
3' TACATGGCAAATATCCATTCATCA5' ✓

- (1) 5' AUGUAAAAGUUUAUAGGUAAGU3' ✗  
(2) 5' AUGUACCGUUUAUAGGUAAGU3' ✓  
(3) 5' ATGTACCGTTTATAGGTAAGT3' ✗  
✓ (4) 5' AUGUACCGUUUAUAGGUAAGU3' ✗

184 Match List I with List II :

- | List I                        | List II            |
|-------------------------------|--------------------|
| A. $\alpha$ -1 antitrypsin    | I. Cotton bollworm |
| B. Cry IaB                    | II. ADA deficiency |
| C. Cry IAc                    | III. Emphysema     |
| D. Enzyme replacement therapy | IV. Corn borer     |

Choose the correct answer from the options given below :

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

185 The "Ti plasmid" of *Agrobacterium tumefaciens* stands for

- (1) Tumor independent plasmid  
✓ (2) Tumor inducing plasmid  
(3) Temperature independent plasmid  
(4) Tumour inhibiting plasmid

147 Which of the following are fused in somatic hybridization involving two varieties of plants?

- (1) Somatic embryos
- (2) Protoplasts
- (3) Pollens
- (4) Callus

148 Match List I with List II

**List I**  
A. Frederick Griffith

B. Francois Jacob & Jacques Monod

C. Har Gobind Khorana

D. Meselson & Stahl

**List II**

I. Genetic code

II. Semi-conservative mode of DNA replication

III. Transformation

IV. Lac operon

Choose the correct answer from the options given below:

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

149 The DNA present in chloroplast is:

- (1) Circular, double stranded
- (2) Linear, single stranded
- (3) Circular, single stranded
- (4) Linear, double stranded

150 Match List I with List II

**List I**

A. Citric acid cycle

B. Glycolysis

C. Electron transport system

D. Proton gradient

**List II**

I. Cytoplasm

II. Mitochondrial matrix

III. Intermembrane space of mitochondria

IV. Inner mitochondrial membrane

Choose the correct answer from the options given below:

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

151 Which of the following is not a natural contraceptive method?

- (1) Periodic abstinence
- (2) Lactational amenorrhea
- (3) Vaults
- (4) Coitus interruptus

152 Match List I with List II

**List I**

A. Common cold

B. Haemozoin

C. Widal test

D. Allergy

**List II**

I. Plasmodium

II. Typhoid

III. Rhinorrhea

IV. Dusk

Choose the correct answer from the below:

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

153 Which of the following statements is correct?

- (1) Most commonly used bio-reactor is stirred type.
- (2) Bio-reactors are used to produce bacterial cultures.
- (3) Bio-reactors have an agitator, an oxygen delivery system and a cooling system.
- (4) A bio-reactor provides optimum conditions for achieving the desired product.

154 Which of the following are autoimmune disorders?

- A. Myasthenia gravis
- B. Rheumatoid arthritis
- C. Gout
- D. Muscular dystrophy
- E. Systemic Lupus Erythematosus

Choose the most appropriate answer from the options given below:

- (1) A, B & E only
- (2) B, C & E only
- (3) C, D & E only
- (4) A, B & D only

55 Which reaction is **NOT** a redox reaction?

- (1)  $2 \text{KClO}_3 + \text{I}_2 \rightarrow 2 \text{KIO}_3 + \text{Cl}_2$   
 (2)  $\text{H}_2 + \text{Cl}_2 \rightarrow 2 \text{HCl}$  ✓  
 (3)  $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2 \text{NaCl}$   
 (4)  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$  ✓  
 0 +2 +2 0

56 Match List I with List II.

| List I<br>(Molecule)                               | List II<br>(Number and types of bond/s between two carbon atoms) |
|----------------------------------------------------|------------------------------------------------------------------|
| A. ethane<br>$\text{H}-\text{C}-\text{C}-\text{H}$ | I. one $\sigma$ -bond and two $\pi$ -bonds                       |
| B. ethene<br>$\text{C}=\text{C}$                   | II. two $\pi$ -bonds                                             |
| C. carbon molecule, $\text{C}_2$                   | III. one $\sigma$ -bond                                          |
| D. ethyne<br>$\text{C}\equiv\text{C}$              | IV. one $\sigma$ -bond and one $\pi$ -bond                       |

Choose the correct answer from the options given below:

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

57 Match List I with List II.

| List I (Complex)                                        | List II (Type of isomerism) |
|---------------------------------------------------------|-----------------------------|
| A. $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$ | I. Solvate isomerism        |
| B. $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$   | II. Linkage isomerism       |
| C. $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ | III. Ionization isomerism   |
| D. $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$       | IV. Coordination isomerism  |

Choose the correct answer from the options given below:

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

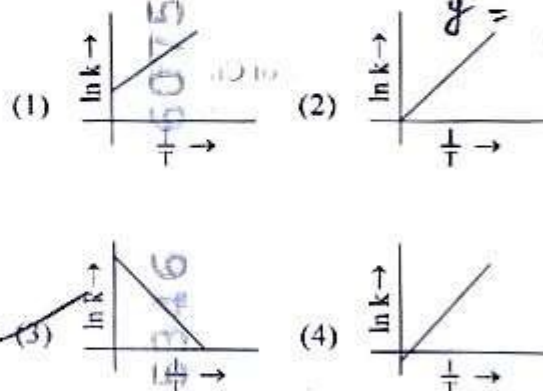
58 The  $E^\circ$  value for the  $\text{Mn}^{3+}/\text{Mn}^{2+}$  couple is more positive than that of  $\text{Cr}^{3+}/\text{Cr}^{2+}$  or  $\text{Fe}^{3+}/\text{Fe}^{2+}$  due to change of

- (1)  $d^5$  to  $d^2$  configuration  
 (2)  $d^4$  to  $d^5$  configuration ✓  
 (3)  $d^3$  to  $d^5$  configuration  
 (4)  $d^5$  to  $d^3$  configuration

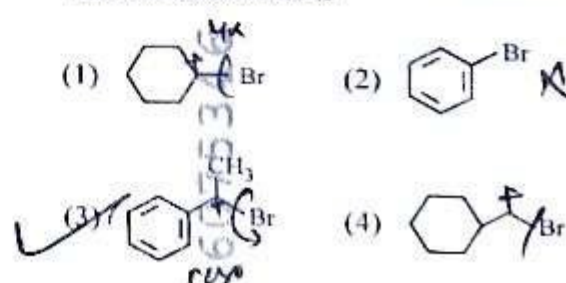
59 The highest number of helium atoms is in

- (1) 4 u of helium  
 (2) 4 g of helium  
 (3) 2.271098 L of helium at STP  
 (4) 4 mol of helium ✓

60 Which plot of  $\ln k$  vs  $\frac{1}{T}$  is consistent with Arrhenius equation?



61 The compound that will undergo  $\text{S}_\text{N}1$  reaction with the fastest rate is



**Botany : Section-B (Q. No. 136 to 150)**

136 Spraying sugarcane crop with which of the following plant growth regulators, increases the length of stem, thus, increasing the yield?

- (1) Gibberellin
- (2) Cytokinin
- (3) Abscissic acid
- (4) Auxin

137 Given below are two statements:

**Statement I :** In  $C_3$  plants, some  $O_2$  binds to RuBisCO, hence  $CO_2$  fixation is decreased.

**Statement II :** In  $C_4$  plants, mesophyll cells show very little photorespiration while bundle sheath cells do not show photorespiration.

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

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

138 Match List I with List II

**List I**

- A. GLUT-4
- B. Insulin
- C. Trypsin
- D. Collagen

**List II**

- I. Hormone
- II. Enzyme
- III. Intercellular ground substance
- IV. Enables glucose transport into cells

Choose the correct answer from the options given below:

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

139 Read the following statements and of correct statements:

In the members of Phaeophyceae:

- A. Asexual reproduction occurs by biflagellate zoospores.
- B. Sexual reproduction is by oogamy only.
- C. Stored food is in the form of mannitol or laminarin which is either mannitol or laminarin.
- D. The major pigments found are chlorophyll a, c and carotenoids and xanthophylls.
- E. Vegetative cells have a cell wall usually covered on the outside by a coating of algin.

Choose the correct answer from the options given below:

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

140 Which of the following statements regarding the process of replication is correct?

- (1) The DNA dependent RNA polymerase catalyses polymerization in 5' → 3' direction.
- (2) The DNA dependent DNA polymerase catalyses polymerization in 5' → 3' direction.
- (3) The DNA dependent DNA polymerase catalyses polymerization in 3' → 5' direction.
- (4) The DNA dependent DNA polymerase catalyses polymerization in 5' → 3' direction.

141 Identify the step in tricarboxylic acid cycle which does not involve oxidation of substrate.

- (1) Succinic acid → Malic acid
- (2) Succinyl-CoA → Succinic acid
- (3) Isocitrate →  $\alpha$ -ketoglutaric acid
- (4) Malic acid → Oxaloacetic acid

191 Match List I with List II :

| List I                                | List II                                      |
|---------------------------------------|----------------------------------------------|
| A. Unicellular glandular epithelium   | I. Salivary glands                           |
| B. Compound epithelium                | II. Pancreas                                 |
| C. Multicellular glandular epithelium | III. <u>Goblet cells of alimentary canal</u> |
| D. Endocrine glandular epithelium     | IV. Moist surface of buccal cavity           |

Choose the correct answer from the options given below :

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

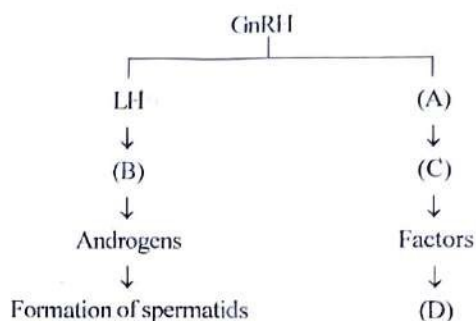
192 Match List I with List II :

| List I                          | List II          |
|---------------------------------|------------------|
| A. RNA polymerase III           | I. snRNPs        |
| B. Termination of transcription | II. Promotor     |
| C. Splicing of Exons            | III. Rho factor  |
| D. TATA box                     | IV. SnRNAs, tRNA |

Choose the correct answer from the options given below :

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

193 Identify the correct option (A), (B), (C), (D) with respect to spermatogenesis.



- (1) ICSH, Interstitial cells, Leydig cells, spermiogenesis.
- (2) FSH, Sertoli cells, Leydig cells, spermatogenesis.
- (3) ICSH, Leydig cells, Sertoli cells, spermatogenesis.
- (4) FSH, Leydig cells, Sertoli cells, spermiogenesis

194 Regarding catalytic cycle of an enzyme action, select the correct sequential steps :

- A. Substrate enzyme complex formation.
- B. Free enzyme ready to bind with another substrate.
- C. Release of products.
- D. Chemical bonds of the substrate broken.
- E. Substrate binding to active site.

Choose the correct answer from the options given below :

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

195 The following are the statements about non-chordates :

- A. Pharynx is perforated by gill slits. ✗
- B. Notochord is absent. ✓
- C. Central nervous system is dorsal.
- D. Heart is dorsal if present. ✓
- E. Post anal tail is absent. ✓

Choose the most appropriate answer from the options given below :

- (1) A, B & D only
- (2) ~~B, D & E only~~
- (3) B, C & D only
- (4) A & C only

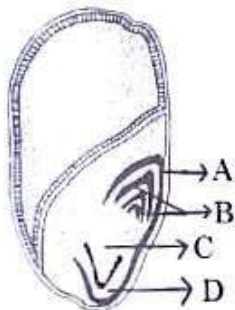
Which one of the following can be explained on the basis of Mendel's Law of Dominance?

- A. Out of one pair of factors one is dominant and the other is recessive. ✓
- B. Alleles do not show any expression and both the characters appear as such in  $F_2$  generation. ✗
- C. Factors occur in pairs in normal diploid plants. ✓
- D. The discrete unit controlling a particular character is called factor. ✓
- E. The expression of only one of the parental characters is found in a monohybrid cross. ✓

Choose the correct answer from the options given below:

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

31 Identify the part of the seed from the given figure which is destined to form root when the seed germinates.



- (1) B
- ✓ (2) C
- (3) D
- (4) A

32 Auxin is used by gardeners to prepare weed-free lawns. But no damage is caused to grass as auxin

- (1) promotes abscission of mature leaves only.
- ✓ (2) does not affect mature monocotyledonous plants.
- (3) can help in cell division in grasses, to produce growth.
- (4) promotes apical dominance.

133 Given below are two statements:

**Statement I :** Chromosomes become gradually visible under light microscope during leptotene stage. ✗

**Statement II :** The beginning of diplotene stage is recognized by dissolution of synaptonemal complex. ✓

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

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

134 The capacity to generate a whole plant from any cell of the plant is called:

- (1) Micropropagation
- (2) Differentiation ✗
- (3) Somatic hybridization ✗
- ✓ (4) Totipotency

135 Given below are two statements:

**Statement I :** Parenchyma is living but collenchyma is dead tissue. ✗

**Statement II :** Gymnosperms lack xylem vessels but presence of xylem vessels is the characteristic of angiosperms. ✓

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

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

- 121 The type of conservation in which the threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care is called:

(1) Biodiversity conservation  
(2) Semi-conservative method  
(3) Sustainable development  
(4) *in-situ* conservation X

- 122 Match List I with List II

**List I**

- A. Two or more alternative forms of a gene  
B. Cross of  $F_1$  progeny with homozygous recessive parent  
C. Cross of  $F_1$  progeny with any of the parents  
D. Number of chromosome sets in plant

**List II**

- I. Back cross  
II. Ploidy  
III. Allele  
IV. Test cross

Choose the correct answer from the options given below:

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

- 123 Formation of interfascicular cambium from fully developed parenchyma cells is an example for

- (1) Redifferentiation  
(2) Dedifferentiation  
(3) Maturation  
(4) Differentiation

- 124 Spindle fibers attach to kinetochores of chromosomes during

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

R3\_English I

- 125 In a plant, black seed color (BB/Bb) is over white seed color (bb). In order to determine the genotype of the black seed plant, which of the following genotype will you cross?

(1)  $bb$   
(2)  $Bb$   
(3)  $BB/Bb$   
(4)  $BB$

- 126 A pink flowered Snapdragon plant with a red flowered Snapdragon plant. Which of phenotype/s is/are expected in the progeny?

(1) Red flowered as well as pink flowered  
(2) Only pink flowered plants  
(3) Red, Pink as well as white flowered  
(4) Only red flowered plants

- 127 Inhibition of Succinic dehydrogenase by malonate is a classical example of:

(1) Feedback inhibition  
(2) Competitive inhibition  
(3) Enzyme activation  
(4) Cofactor inhibition

- 128 Given below are two statements:

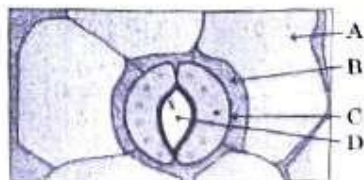
**Statement I :** Bt toxins are insect growth inhibitors and coded by a gene *cry IAc*.

**Statement II :** Bt toxin exists as protoxin in *B. thuringiensis*. However, after ingestion by the insect the inactive protoxin is converted into active form due to action of the insect gut.

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

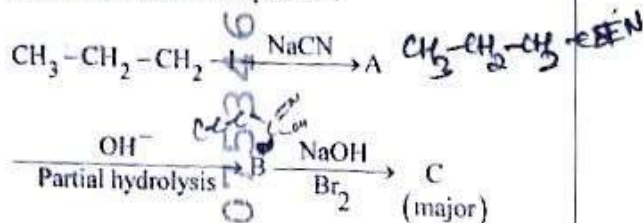
(1) Both Statement I and Statement II are true  
(2) Statement I is true but Statement II is false  
(3) Statement I is false but Statement II is true  
(4) Both Statement I and Statement II are false

- 129 In the given figure, which component is responsible for the formation of outer walls and highly thickened inner walls?



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

- 90 Identify the major product C formed in the following reaction sequence :

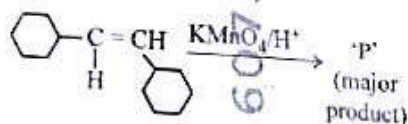


- (1) butylamine
- (2) butanamide
- (3)  $\alpha$ -bromobutanoic acid
- (4) propylamine

- 91 The pair of lanthanoid ions which are diamagnetic is

- (1)  $\text{Ce}^{3+}$  and  $\text{Eu}^{2+}$
- (2)  $\text{Gd}^{3+}$  and  $\text{Eu}^{3+}$
- (3)  $\text{Pm}^{3+}$  and  $\text{Sm}^{3+}$
- (4)  $\text{Ce}^{4+}$  and  $\text{Yb}^{2+}$

- 92 For the given reaction:



'P' is

- (1)  $\text{Cyclohexyl-COOH}$
- (2)  $\text{Cyclohexyl-CH(OH)-CH(OH)-Cyclohexyl}$
- (3)  $\text{Cyclohexyl-C(=O)-C(=O)-Cyclohexyl}$
- (4)  $\text{Cyclohexyl-CHO}$

- 93 A compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is :

(Given atomic masses of A = 64; B = 40; C = 32 u)

- (1)  $\text{ABC}_3$
- (2)  $\text{AB}_2\text{C}_2$
- (3)  $\text{ABC}_4$
- (4)  $\text{A}_2\text{BC}_2$

- 94 Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing order of group number from 0 to VI.

- A.  $\text{Al}^{3+}$  B.  $\text{Cu}^{2+}$   
C.  $\text{Ba}^{2+}$  D.  $\text{Co}^{2+}$   
E.  $\text{Mg}^{2+}$

Choose the correct answer from the options given below:

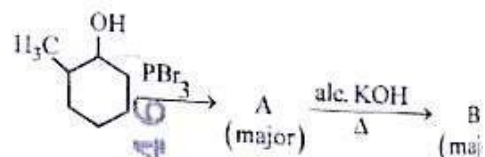
- (1) B, C, A, D, E
- (2) E, C, D, B, A
- (3) E, A, B, C, D
- (4) B, A, D, C, E

- 95 The work done during reversible isothermal expansion of one mole of hydrogen gas at 25°C from pressure of 20 atmosphere to 10 atmosphere is:

(Given  $R = 2.0 \text{ cal K}^{-1} \text{ mol}^{-1}$ )

- (1) -413.14 calories
- (2) 413.14 calories
- (3) 100 calories
- (4) 0 calories

- 96 Major products A and B formed in the following reaction sequence, are



- (1) A =  $\text{1-bromo-1-methylcyclohexane}$  ; B =  $\text{1-methylcyclohexene}$
- (2) A =  $\text{3-bromo-1-methylcyclohexanol}$  ; B =  $\text{3-methylcyclohexenol}$
- (3) A =  $\text{3-bromo-1-methylcyclohexanol}$  ; B =  $\text{3-methylcyclohexanone}$
- (4) A =  $\text{1-bromo-1-methylcyclohexane}$  ; B =  $\text{1-methylcyclohexene}$

R3 English I

$$\frac{A}{B} = \frac{32 \times 64}{20 \times 40} = \frac{8}{5}$$

$$\frac{A}{B} = \frac{8}{5} \Rightarrow \text{Empirical formula is } \text{A}_8\text{B}_5\text{C}_{12}$$

**186** Match List I with List II :

- | List I         | List II                                   |
|----------------|-------------------------------------------|
| A. P wave      | I. Heart muscles are electrically silent. |
| B. QRS complex | II. Depolarisation of ventricles.         |
| C. T wave      | III. Depolarisation of atria.             |
| D. T-P gap     | IV. Repolarisation of ventricles.         |

Choose the correct answer from the options given below :

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

**187** Given below are two statements :

**Statement I :** Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely. X

**Statement II :** According to Gause's principle, during competition, the inferior will be eliminated. This may be true if resources are limiting. ✓

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

- (1) Both Statement I and Statement II are false.  
 (2) Statement I is true but Statement II is false.  
 (3) Statement I is false but Statement II is true. ✓  
 (4) Both Statement I and Statement II are true.

**188** Given below are two statements :

**Statement I :** Mitochondria and chloroplasts are both double membrane bound organelles.

**Statement II :** Inner membrane of chloroplast is relatively less permeable, than outer membrane.

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

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

**189** Choose the correct statement regarding juxta medullary nephrons :

- (1) Renal corpuscle of juxta medullary nephrons lies in the outer portion of the medulla.  
 (2) Loop of Henle of juxta medullary nephrons runs deep into medulla. ✓  
 (3) Juxta medullary nephrons are more numerous than cortical nephrons. X  
 (4) Juxta medullary nephrons are located in columns of Bertini.

**190** Match List I with List II :

- | List I                 | List II                                |
|------------------------|----------------------------------------|
| A. Exophthalmic goiter | I. Excess secretion of thyroid hormone |
| B. Acromegaly          | II. Hyposecretion of thyroid hormone   |
| C. Cushing's syndrome  | III. Hypersecretion of thyroid hormone |
| D. Cretinism           | IV. Excess secretion of growth hormone |

Choose the correct answer from the options given below :

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

161 Match List I with List II :

**List I**

- A. Fibrous joints
- B. Cartilaginous joints
- C. Hinge joints
- D. Ball and socket joints

**List II**

- I. Adjacent vertebrae, limited movement
- II. Humerus and Pectoral girdle, rotational movement
- III. Skull, don't allow any movement
- IV. Knee, help in locomotion

Choose the correct answer from the options given below :

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

162 Which of the following is not a steroid hormone?

- (1) Testosterone
- (2) Progesterone
- (3) ~~Glucagon~~
- (4) Cortisol

163 In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on :

- (1) ~~10<sup>th</sup> segment~~
- (2) 8<sup>th</sup> and 9<sup>th</sup> segment
- (3) 11<sup>th</sup> segment
- (4) 5<sup>th</sup> segment

164 Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

**Assertion A :** FSH acts upon ovarian follicles in female and Leydig cells in male. ~~X~~

**Reason R :** Growing ovarian follicles secrete estrogen in female while interstitial cells secrete androgen in male human being.

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

- (1) Both A and R are true but R is NOT the correct explanation of A.
- (2) A is true but R is false
- (3) ~~A is false but R is true~~
- (4) Both A and R are true and R is the correct explanation of A.

165 Match List I with List II :

**List I**

- A. Expiratory capacity
- B. Functional residual capacity
- C. Vital capacity
- D. Inspiratory capacity

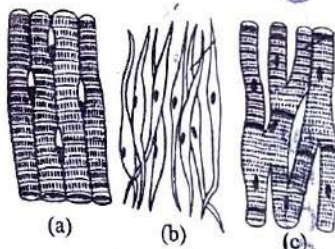
**List II**

- I. Expiratory reserve volume + Tidal volume + Inspiratory reserve volume
- II. Tidal volume + Expiratory reserve volume
- III. Tidal volume + Inspiratory reserve volume
- IV. Expiratory reserve volume + Residual volume

Choose the correct answer from the options given below :

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

166 Three types of muscles are given as a, b and c. Identify the correct matching pair along with their location in human body.



**Name of muscle/location**

- (1) (a) Skeletal - Triceps
- (b) Smooth - Stomach
- (c) Cardiac - Heart.
- (2) (a) Skeletal - Biceps
- (b) Involuntary - Intestine ~~X~~
- (c) Smooth - Heart ~~X~~
- (3) (a) Involuntary - Nose tip
- (b) Skeletal - Bone ~~X~~
- (c) Cardiac - Heart.
- (4) (a) Smooth - Toes ~~X~~
- (b) Skeletal - Legs ~~X~~
- (c) Cardiac - Heart.

196 Match List I with List II related to digestive system of cockroach.

| List I                                                                               | List II                 |
|--------------------------------------------------------------------------------------|-------------------------|
| A. The structures used for storing of food.                                          | I. <u>Gizzard</u>       |
| B. Ring of 6-8 blind tubules at junction of foregut and midgut.                      | II. Gastric Caeca       |
| C. Ring of 100-150 yellow coloured thin filaments at junction of midgut and hindgut. | III. Malpighian tubules |
| D. The structures used for <u>grinding the food</u> .                                | IV. Crop                |

Choose the correct answer from the options given below :

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

197 Given below are two statements :

**Statement I :** The cerebral hemispheres are connected by nerve tract known as corpus callosum. ✓

**Statement II :** The brain stem consists of the medulla oblongata, pons and cerebrum. ✗

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

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

198 Match List I with List II :

| List I             | List II                |
|--------------------|------------------------|
| A. Mesozoic Era    | I. Lower invertebrates |
| B. Proterozoic Era | II. Fish & Amphibians  |
| C. Cenozoic Era    | III. Birds & Reptiles  |
| D. Paleozoic Era   | IV. Mammals            |

Choose the correct answer from the options given below :

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

199 As per ABO blood grouping system, the group of father is B<sup>+</sup>, mother is A<sup>+</sup> and O<sup>+</sup>. Their respective genotype can be

- A. I<sup>B</sup>i / I<sup>A</sup>i / ii ✓  
 B. I<sup>B</sup>I<sup>B</sup> / I<sup>A</sup>I<sup>A</sup> / ii ✗  
 C. I<sup>A</sup>I<sup>B</sup> / iiI<sup>A</sup> / I<sup>B</sup>i ✗  
 D. I<sup>A</sup>i / I<sup>B</sup>i / I<sup>A</sup>i ✗  
 E. iiI<sup>B</sup> / iiI<sup>A</sup> / I<sup>A</sup>I<sup>B</sup> ✗

Choose the most appropriate answer from the options given below :

- (1) B only (2) C & B only  
 (3) D & E only (4) A only

200 Given below are two statements :

**Statement I :** Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.

**Statement II :** Both bone marrow and thymus provide micro environments for the development and maturation of T-lymphocytes.

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

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

167 Match List I with List II :

| List I      | List II                 |
|-------------|-------------------------|
| A. Lipase   | I. Peptide bond         |
| B. Nuclease | II. Ester bond          |
| C. Protease | III. Glycosidic bond    |
| D. Amylase  | IV. Phosphodiester bond |

Choose the correct answer from the options given below :

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

168 The flippers of the Penguins and Dolphins are the example of the

*Analogy*

- (1) Natural selection  
(2) Convergent evolution  
(3) Divergent evolution  
(4) Adaptive radiation

169 Following are the stages of cell division :

- A. Gap 2 phase  
B. Cytokinesis  
C. Synthesis phase  
D. Karyokinesis  
E. Gap 1 phase

Choose the correct sequence of stages from the options given below :

- (1) E-B-D-A-C (2) B-D-E-A-C  
(3) E-C-A-D-B (4) C-E-D-A-B

170 Which one of the following factors will not affect the Hardy-Weinberg equilibrium?

- (1) Genetic drift  
(2) Gene migration  
(3) Constant gene pool  
(4) Genetic recombination

171 Given below are two statements :

**Statement I :** The presence or absence of hymen is not a reliable indicator of virginity. ✓

**Statement II :** The hymen is torn during the first coitus only. ✗

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

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

172 Match List I with List II :

| List I           | List II       |
|------------------|---------------|
| A. Typhoid       | I. Fungus     |
| B. Leishmaniasis | II. Nematode  |
| C. Ringworm      | III. Protozoa |
| D. Filariasis    | IV. Bacteria  |

Choose the correct answer from the options given below :

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

173 Given below are some stages of human evolution. Arrange them in correct sequence. (Past to Recent)

- A. *Homo habilis*  
B. *Homo sapiens*  
C. *Homo neanderthalensis*  
D. *Homo erectus*

Choose the correct sequence of human evolution from the options given below :

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

174 Which of the following is not a component of Fallopian tube?

- (1) Isthmus (2) Infundibulum  
(3) Ampulla (4) Uterine fundus

175 Consider the following statements :

- A. Annelids are true coelomates ✓
- B. Poriferans are pseudocoelomates ✗
- C. Aschelminthes are acoelomates ✗
- D. Platyhelminthes are pseudocoelomates ✗

Choose the correct answer from the options given below :

- (1) A only
- (2) C only
- (3) D only
- (4) B only

176 Match List I with List II :

| List I               | List II                |
|----------------------|------------------------|
| A. Axoneme           | I. Centriole           |
| B. Cartwheel pattern | II. Cilia and flagella |
| C. Crista            | III. Chromosome        |
| D. Satellite         | IV. Mitochondria       |

Choose the correct answer from the options given below :

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

177 Match List I with List II :

| List I                 | List II         |
|------------------------|-----------------|
| A. <i>Pterophyllum</i> | I. Hag fish     |
| B. <i>Myxine</i>       | II. Saw fish    |
| C. <i>Pristis</i>      | III. Angel fish |
| D. <i>Exocoetus</i>    | IV. Flying fish |

Choose the correct answer from the options given below :

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

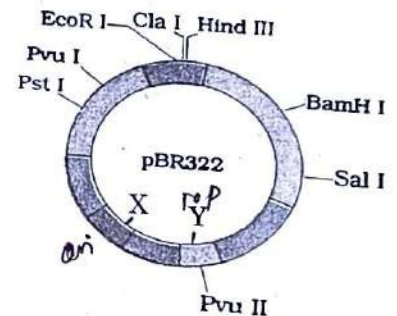
178 Match List I with List II :

| List I          | List II                                     |
|-----------------|---------------------------------------------|
| A. Pons         | I. Provides space for regulates and balance |
| B. Hypothalamus | II. Controls respiration gastric secretion  |
| C. Medulla      | III. Connects regions of brain              |
| D. Cerebellum   | IV. Neuro secretory cells                   |

Choose the correct answer from the options given below :

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

179 The following diagram showing restriction sites in *E. coli* cloning vector pBR322. Find 'X' and 'Y' genes :



- (1) The gene 'X' is responsible for conferring resistance to ampicillin and 'Y' is responsible for conferring resistance to tetracycline. ✓
- (2) The gene 'X' is for protein involved in the replication of Plasmid and 'Y' for protein involved in the replication of Plasmid. ✗
- (3) Gene 'X' is responsible for conferring resistance to ampicillin and 'Y' is responsible for conferring resistance to tetracycline. ✗
- (4) The gene 'X' is responsible for conferring resistance to ampicillin and 'Y' for protein involved in the replication of Plasmid. ✗

- A.  $m_l$  shape of orbital  
B.  $m_s$  size of orbital  
C.  $l$  orientation of orbital  
D.  $n$  orientation of spin of electron

Choose the correct answer from the options given below:

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

63 The Henry's law constant ( $K_H$ ) values of three gases (A, B, C) in water are  $145$ ,  $2 \times 10^{-5}$  and  $35$  kbar, respectively. The solubility of these gases in water follow the order:

- (1) ~~A > C > B~~  
(2) ~~B > C > A~~  
(3) ~~A > B > C~~  
(4) ~~B > A > C~~

64 In which of the following processes entropy increases?

- A. A liquid evaporates to vapour. ✓  
B. Temperature of a crystalline solid lowered from  $130\text{ K}$  to  $0\text{ K}$ . ✗  
C.  $2\text{ NaHCO}_3(s) \rightarrow \text{Na}_2\text{CO}_3(s) + \text{CO}_2(g) + \text{H}_2\text{O}(g)$  ✓  
D.  $\text{Cl}_2(g) \rightarrow 2\text{ Cl}(g)$  ✓  
Choose the correct answer from the options given below:  
(1) A, B and D ✓  
(2) A, C and D ✓  
(3) C and D ✓  
(4) A and C

65 Given below are two statements:

**Statement I:** Aniline does not undergo Friedel-Crafts alkylation reaction. ✓

**Statement II:** Aniline cannot be prepared through Gabriel synthesis. ✓

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

- (1) Both Statement I and Statement II are false.  
(2) Statement I is correct but Statement II is false.  
(3) Statement I is incorrect but Statement II is true.  
(4) Both Statement I and Statement II are true. ✓

R3\_English I

10

- (2) ~~tartrate (Rochelle's salt)~~  
(3) ~~aqueous sodium citrate~~  
(4) ~~aqueous copper sulphate~~

67

Activation energy of any chemical reaction can be calculated if one knows the value of

- (1) probability of collision.  
(2) orientation of reactant molecules during collision.  
(3) rate constant at two different temperatures.  
(4) ~~Rate constant at standard temperature.~~ ✓

68

Arrange the following elements in increasing order of first ionization enthalpy:

$\text{Li}, \text{Be}, \text{B}, \text{C}, \text{N}$   
 $2s^1, 2s^2, 2p^1, 2p^2, 2p^3$

Choose the correct answer from the options given below:

- (1)  ~~$\text{Li} < \text{B} < \text{Be} < \text{C} < \text{N}$~~   
(2)  ~~$\text{Li} < \text{Be} < \text{C} < \text{B} < \text{N}$~~   
(3)  ~~$\text{Li} < \text{Be} < \text{N} < \text{B} < \text{C}$~~   
(4)  ~~$\text{Li} < \text{Be} < \text{B} < \text{C} < \text{N}$~~

69

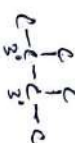
1 gram of sodium hydroxide was treated with 25 mL of  $0.75\text{ M HCl}$  solution, the mass of sodium hydroxide left unreacted is equal to

- (1) ~~250 mg~~ (2) ~~Zero mg~~  
(3) ~~200 mg~~ (4) ~~750 mg~~

70

A compound with a molecular formula of  $\text{C}_6\text{H}_{14}$  has two tertiary carbons. Its IUPAC name is:

- (1) 2-methylpentane  
(2) ~~2,3-dimethylbutane~~  
(3) 2,2-dimethylbutane  
(4) n-hexane



I Contd..

155 Match List I with List II :

- | List I                    | List II                          |
|---------------------------|----------------------------------|
| A. Down's syndrome        | I. 11 <sup>th</sup> chromosome   |
| B. $\alpha$ -Thalassemia  | II. 'X' chromosome               |
| C. $\beta$ -Thalassemia   | III. 21 <sup>st</sup> chromosome |
| D. Klinefelter's syndrome | IV. 16 <sup>th</sup> chromosome  |

Choose the correct answer from the options given below :

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

156 Match List I with List II :

- | List I                   | List II          |
|--------------------------|------------------|
| A. Non-medicated IUD     | I. Multiload 375 |
| B. Copper releasing IUD  | II. Progestogens |
| C. Hormone releasing IUD | III. Lippes loop |
| D. Implants              | IV. LNG-20       |

Choose the correct answer from the options given below :

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

157 Match List I with List II :

- | List I           | List II           |
|------------------|-------------------|
| A. Pleurobrachia | I. Mollusca       |
| B. Radula        | II. Ctenophora    |
| C. Stomochord    | III. Osteichthyes |
| D. Air bladder   | IV. Hemichordata  |

Choose the correct answer from the options given below :

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

158 Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?

- (1) High  $pO_2$  and Lesser  $H^+$  concentration  
 (2) Low  $pCO_2$  and High  $H^+$  concentration  
 (3) Low  $pCO_2$  and High temperature  
 (4) High  $pO_2$  and High  $pCO_2$

159 Match List I with List II :

- | List I       | List II                          |
|--------------|----------------------------------|
| A. Cocaine   | I. Effective sedative in surgery |
| B. Heroin    | II. <i>Cannabis sativa</i>       |
| C. Morphine  | III. <i>Erythroxylum</i>         |
| D. Marijuana | IV. <i>Papaver somniferum</i>    |

Choose the correct answer from the options given below :

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

160 Match List I with List II :

- | List I<br>(Sub Phases of Prophase I) | List II<br>(Specific characters)               |
|--------------------------------------|------------------------------------------------|
| A. Diakinesis                        | I. Synaptonemal complex formation              |
| B. Pachytene                         | II. Completion of terminalisation of chiasmata |
| C. Zygotene                          | III. Chromosomes look like thin threads        |
| D. Leptotene                         | IV. Appearance of recombination nodules        |

Choose the correct answer from the options given below :

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

- 71 Given below are two statements:

**Statement I :** The boiling point of three isomeric pentanes follows the order  $n\text{-pentane} > \text{isopentane} > \text{neopentane}$

**Statement II :** When branching increases, the molecule attains a shape of sphere. This results in smaller surface area for contact, due to which the intermolecular forces between the spherical molecules are weak, thereby lowering the boiling point.

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

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

- 72 In which of the following equilibria,  $K_p$  and  $K_c$  are NOT equal?

- (1)  $\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2 \text{HI}_{(g)}$   
 (2)  $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightleftharpoons \text{CO}_{2(g)} + \text{H}_{2(g)}$   
 (3)  $2 \text{BrCl}_{(g)} \rightleftharpoons \text{Br}_{2(g)} + \text{Cl}_{2(g)}$   
 (4)  $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$

- 73 The reagents with which glucose does not react to give the corresponding tests/products are

- A. Tollen's reagent  
 B. Schiff's reagent  
 C. HCN  
 D.  $\text{NH}_2\text{OH}$   
 E.  $\text{NaHSO}_3$

Choose the correct options from the given below:

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

- 74 Match List I with List II.

| List I<br>(Compound) | List II<br>(Shape/geometry) |
|----------------------|-----------------------------|
| A. $\text{NH}_3$     | I. Trigonal Pyramidal       |
| B. $\text{BrF}_5$    | II. Square Planar           |
| C. $\text{XeF}_4$    | III. Octahedral             |
| D. $\text{SF}_6$     | IV. Square Pyramidal        |

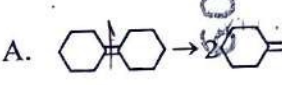
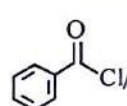
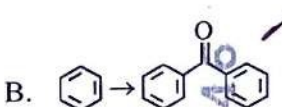
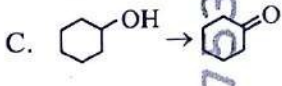
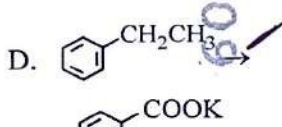
Choose the correct answer from the options given below:

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

- 75 Among Group 16 elements, which one does NOT show -2 oxidation state?

- (1) Se  
 (2) Te  
 (3) Po  
 (4) O

- 76 Match List I with List II.

| List I (Reaction)                                                                       | List II (Reagents/Conditions)                                                                                      |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| A.  | I. <br>Anhyd. $\text{AlCl}_3$ |
| B.  | II. $\text{CrO}_3$                                                                                                 |
| C.  | III. $\text{KMnO}_4$ /<br>$\text{KOH}$ , $\Delta$                                                                  |
| D.  | IV. (i) $\text{O}_3$<br>(ii) $\text{Zn-H}_2\text{O}$                                                               |

Choose the correct answer from the options given below:

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

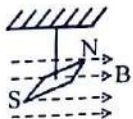
- 33 A logic circuit provides the output  $Y$  as per the following truth table :

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

The expression for the output  $Y$  is :

- (1)  $A \cdot B + \bar{A}$  (2)  $\bar{A} \cdot B$   
 (3)  $B$  (4)  $A \cdot B + \bar{A} \cdot \bar{B}$

- 34 In a uniform magnetic field of  $0.049 \text{ T}$ , a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is  $9.8 \times 10^{-6} \text{ kg m}^2$ . If the magnitude of magnetic moment of the needle is  $x \times 10^{-5} \text{ Am}^2$ , then the value of 'x' is :



- (1)  $128 \pi^2$  (2)  $50 \pi^2$   
 (3)  $1280 \pi^2$  (4)  $5 \pi^2$

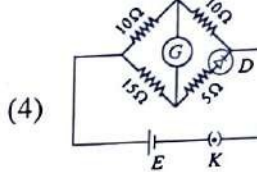
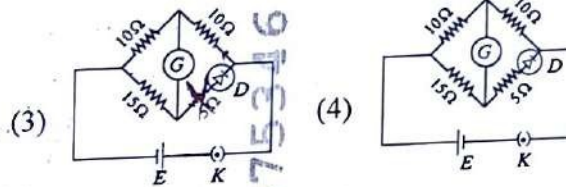
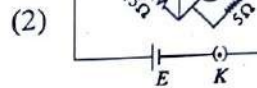
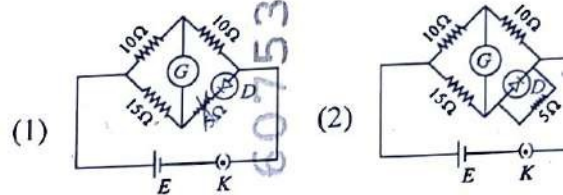
- 35 A bob is whirled in a horizontal plane by means of a string with an initial speed of  $\omega \text{ rpm}$ . The tension in the string is  $T$ . If speed becomes  $2\omega$  while keeping the same radius, the tension in the string becomes :

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

- 36 A metallic bar of Young's modulus  $0.5 \times 10^{11} \text{ N m}^{-2}$  and coefficient of linear expansion  $10^{-5} \text{ } ^\circ\text{C}^{-1}$ , length  $1 \text{ m}$  and area of cross-section  $10^{-3} \text{ m}^2$  is heated from  $0^\circ\text{C}$  to  $100^\circ\text{C}$  without expansion or bending. The compressive force developed in it is:

- (1)  $50 \times 10^3 \text{ N}$  (2)  $100 \times 10^3 \text{ N}$   
 (3)  $2 \times 10^3 \text{ N}$  (4)  $5 \times 10^3 \text{ N}$

- 37 Choose the correct circuit which can achieve a bridge balance.



- 38 A small telescope has an objective of focal length  $140 \text{ cm}$  and an eye piece of focal length  $5.0 \text{ cm}$ . The magnifying power of telescope for viewing a distant object is:

- (1) 28 (2) 17  
 (3) 32 (4) 34

- 39 An iron bar of length  $L$  has magnetic moment  $M$ . It is bent at the middle of its length such that two arms make an angle  $60^\circ$  with each other. The magnetic moment of this new magnet is:

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

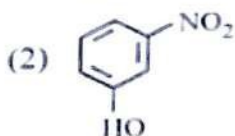
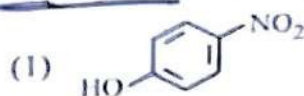
- 77 Arrange the following elements in increasing order of electronegativity:

N, O, F, C, Si

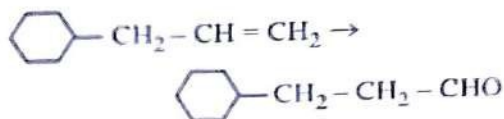
Choose the correct answer from the options given below:

- (1)  $\text{Si} < \text{C} < \text{O} < \text{N} < \text{F}$   
 (2)  $\text{O} < \text{F} < \text{N} < \text{C} < \text{Si}$   
 (3)  $\text{F} < \text{O} < \text{N} < \text{C} < \text{Si}$   
 (4)  $\text{Si} < \text{C} < \text{N} < \text{O} < \text{F}$

- 78 Intramolecular hydrogen bonding is present in



- 79 Identify the correct reagents that would bring about the following transformation.



- (1) (i)  $\text{BH}_3$   
 (ii)  $\text{H}_2\text{O}_2 / \text{OH}^-$   
 (iii) PCC  
 (2) (i)  $\text{BH}_3$   
 (ii)  $\text{H}_2\text{O}_2 / \text{OH}^-$   
 (iii) alk.  $\text{KMnO}_4$   
 (iv)  $\text{H}_3\text{O}^+$

- (3) (i)  $\text{H}_2\text{O} / \text{H}^+$   
 (ii) PCC  
 (4) (i)  $\text{H}_2\text{O} / \text{H}^+$   
 (ii)  $\text{CrO}_3$

- 80 Match List I with List II.

**List I**

(Conversion)

- A. 1 mol of  $\text{H}_2\text{O}^2$  to  $\text{O}_2^0$   
 B. 1 mol of  $\text{MnO}_4^-$  to  $\text{Mn}^{2+}$   
 C. 1.5 mol of Ca from molten  $\text{CaCl}_2$   
 D. 1 mol of  $\text{FeO}$  to  $\text{Fe}_2\text{O}_3$

(Numerical Faradaic)

I.

II.

III.

IV.

Choose the correct answer from the below:

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

- 81 Given below are two statements:

**Statement I :** The boiling point Group 16 elements follow the order  $\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$ .

**Statement II :** On the basis of  $\text{H}_2\text{O}$  is expected to have lower boiling point than the other members of the group in the absence of extensive H-bonding.

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

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

- 82 Given below are two statements:

**Statement I :** Both  $[\text{Co}(\text{NH}_3)_6]^{3+}$  and  $[\text{Co}(\text{F}_6)]^{3-}$  complexes are octahedral but have different magnetic behaviour.

**Statement II :**  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is diamagnetic whereas  $[\text{CoF}_6]^{3-}$  is paramagnetic.

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

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

$$ML^2T^{-2} = F \quad B = ML^2T^{-3}$$

$$\propto (ML^2T^{-4})$$

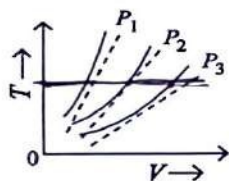
- 47 A force defined by  $F = \alpha t^2 + \beta t$  acts on a particle at a given time  $t$ . The factor which is dimensionless, if  $\alpha$  and  $\beta$  are constants, is:

- (1)  $\alpha/\beta$  (2)  $\alpha\beta$   
(3)  $\alpha\beta/t$  (4)  $\beta/\alpha$

- 48 If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then  
A. the charge stored in it, increases. ✓  
B. the energy stored in it, decreases. ✗  
C. its capacitance increases. ✓  
D. the ratio of charge to its potential remains the same. ✗  
E. the product of charge and voltage increases. ✓  
Choose the most appropriate answer from the options given below:

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

- 49 The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume) at three pressures  $P_1$ ,  $P_2$  and  $P_3$  compared with those of Charles's law represented as dotted lines.



Then the correct relation is:

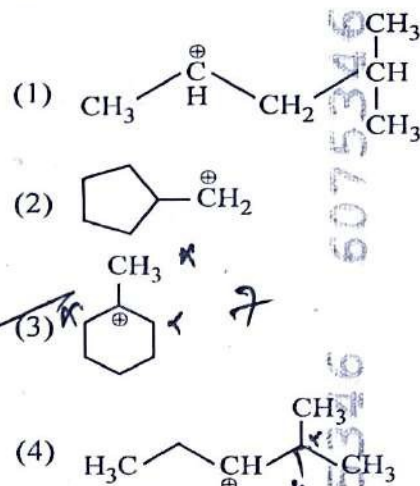
- (1)  $P_1 > P_3 > P_2$  (2)  $P_2 > P_1 > P_3$   
(3)  $P_1 > P_2 > P_3$  (4)  $P_3 > P_2 > P_1$

- 50 The minimum energy required to launch a satellite of mass  $m$  from the surface of earth of mass  $M$  and radius  $R$  in a circular orbit at an altitude of  $2R$  from the surface of the earth is:

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

## Chemistry : Section-A (Q. No

- 51 The most stable carbocation among is:



- 52 For the reaction  $2A \rightleftharpoons B + C$ , K given time, the composition of

is :  $[A] = [B] = [C] = 2 \times 10^{-3} M$

Then, which of the following is

- (1) Reaction has a tendency direction.  
(2) Reaction has a tendency to direction. ✓  
(3) Reaction has gone to comp direction.  
(4) Reaction is at equilibrium

- 53 'Spin only' magnetic moment of the following ions?

- A.  $Ti^{3+}$   $n=1$  B.  $Cr^{2+}$   
C.  $Mn^{2+}$   $n=5$  D.  $Fe^{2+}$   
E.  $Sc^{3+}$   $n=0$

Choose the most appropriate options given below:

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

- 54 The energy of an electron in ( $n=1$ ) for  $He^+$  ion is  $-x$  J, then the energy of an electron in  $n=2$  state for  $Be^{3+}$  ion in J

- (1)  $-\frac{x}{9}$  (2)  $-4x$   
(3)  $-\frac{4}{9}x$  (4)  $-x$

$$\frac{GMm}{2} \left( \frac{1}{r_1} - \frac{1}{r_2} \right)$$

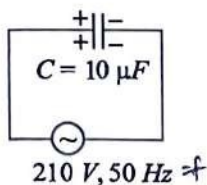
$$\left( \frac{1}{R} - \frac{1}{3R} \right)$$

$$\frac{3-1}{3} \times \frac{GMm}{2R}$$

So Ti  $d^2$  V  $d^3$  Cr  $d^4$  Mn  $d^5$  Fe  $d^6$  Co  $d^7$  Ni  $d^8$  Cu  $d^9$  Zn  $d^{10}$

$$I_{rms} = \frac{I_0}{\sqrt{2}}$$

- 40 A  $10 \mu F$  capacitor is connected to a  $210 V, 50 Hz$  source as shown in figure. The peak current in the circuit is nearly ( $\pi = 3.14$ ):



$$I_{rms} = \frac{210}{X_C}$$

$$= \frac{210 \times 2\pi f C}{1}$$

$$I_0 = 210 \times 2 \times 3.14 \times 50 \times 10 \times 10^{-6}$$

$$= 210 \times 2 \times 3.14 \times 5 \times 10^{-3} \times 1.4$$

$$= 42 \times 3.14 \times 5 \times 10^{-3} \times 1.4$$

$$= 210 \times 3.14 \times 1.4$$

$$= 210 \times 22 \times 10^{-2} \times 1.4$$

$$= 66 \times 1.4$$

- (1)  $0.93 A$   
(3)  $0.35 A$   
(2)  $1.20 A$   
(4)  $0.58 A$
- 41 Two heaters A and B have power rating of  $1 kW$  and  $2 kW$ , respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:

- (1)  $2 : 9$   
(3)  $2 : 3$   
(2)  $1 : 2$   
(4)  $1 : 1$

- 42 If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time

period of oscillation is  $\frac{x}{2}$  times its original time period. Then the value of  $x$  is:

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

- 43 The property which is not of an electromagnetic wave travelling in free space is that :

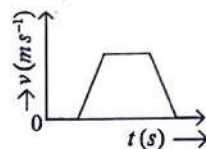
- (1) the energy density in electric field is equal to energy density in magnetic field. ✓  
(2) they travel with a speed equal to  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$ . ✓  
(3) they originate from charges moving with uniform speed.  
(4) they are transverse in nature. ✓

- 44 A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to :
- A. hold the sheet there if it is magnetic.  
B. hold the sheet there if it is non-magnetic.  
C. move the sheet away from the pole with uniform velocity if it is conducting.  
D. move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.

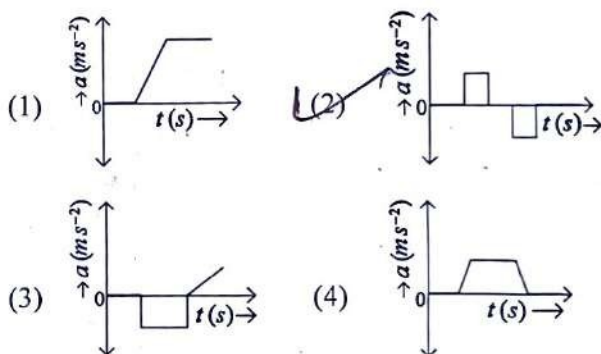
Choose the correct statement(s) from the options given below:

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

- 45 The velocity ( $v$ ) – time ( $t$ ) plot of the motion of a body is shown below :



The acceleration ( $a$ ) – time ( $t$ ) graph that best suits this motion is :



- 46 A parallel plate capacitor is charged by connecting it to a battery through a resistor. If  $I$  is the current in the circuit, then in the gap between the plates :

- (1) displacement current of magnitude equal to  $I$  flows in the same direction as  $I$ . ✓  
(2) displacement current of magnitude equal to  $I$  flows in a direction opposite to that of  $I$ .  
(3) displacement current of magnitude greater than  $I$  flows but can be in any direction.  
(4) there is no current.

- 33 A logic circuit provides the output  $Y$  as per the following truth table :

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

The expression for the output  $Y$  is :

- (1)  $A\bar{B} + \bar{A}B$  (2)  $\bar{A}\bar{B}$   
 (3)  $B$  (4)  $A\bar{B} + \bar{A}B$

- 34 In a uniform magnetic field of  $0.049$  T, a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is  $9.8 \times 10^{-6}$  kg m<sup>2</sup>. If the magnitude of magnetic moment of the needle is  $x \times 10^{-5}$  Am<sup>2</sup>; then the value of 'x' is :

- (1)  $128\pi^2$  (2)  $50\pi^2$   
 (3)  $1280\pi^2$  (4)  $5\pi^2$

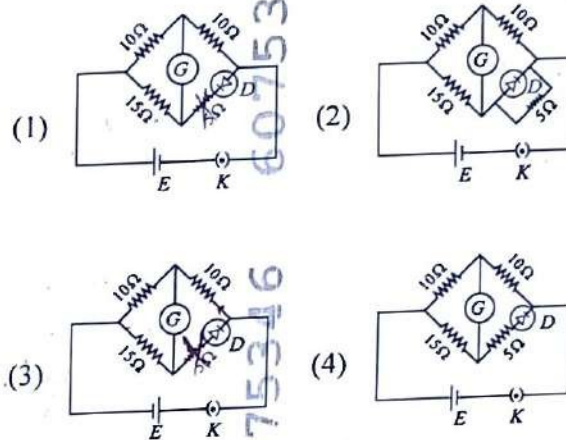
- 35 A bob is whirled in a horizontal plane by means of a string with an initial speed of  $\omega$  rpm. The tension in the string is  $T$ . If speed becomes  $2\omega$  while keeping the same radius, the tension in the string becomes :

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

- 36 A metallic bar of Young's modulus  $0.5 \times 10^{11}$  N m<sup>-2</sup> and coefficient of linear thermal expansion  $10^{-5}$  °C<sup>-1</sup>, length  $1$  m and area of cross-section  $10^{-3}$  m<sup>2</sup> is heated from  $0^\circ\text{C}$  to  $100^\circ\text{C}$  without expansion or bending. The compressive force developed in it is:

- (1)  $50 \times 10^3$  N (2)  $100 \times 10^3$  N  
 (3)  $2 \times 10^3$  N (4)  $5 \times 10^3$  N

- 37 Choose the correct circuit which can achieve bridge balance.



- 38 A small telescope has an objective of focal length  $140$  cm and an eye piece of focal length  $5.0$  cm. The magnifying power of telescope for viewing a distant object is:

- (1) 28 (2) 17  
 (3) 32 (4) 34

- 39 An iron bar of length  $L$  has magnetic moment  $M$ . It is bent at the middle of its length such that the two arms make an angle  $60^\circ$  with each other. The magnetic moment of this new magnet is:

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

$\begin{matrix} 2 & 3 & 8 & 4 \\ \text{C} & \text{N} & \text{O} & \text{F} \\ 9 & 15 & 16 & 17 \end{matrix}$

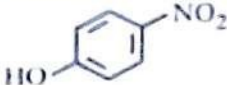
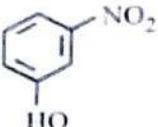
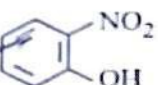
77 Arrange the following elements in increasing order of electronegativity:

N, O, F, C, Si

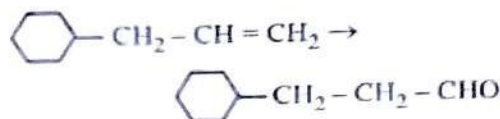
Choose the correct answer from the options given below:

- (1)  $\text{Si} < \text{C} < \text{O} < \text{N} < \text{F}$   
 (2)  $\text{O} < \text{F} < \text{N} < \text{C} < \text{Si}$   
 (3)  $\text{F} < \text{O} < \text{N} < \text{C} < \text{Si}$   
 (4)  $\text{Si} < \text{C} < \text{N} < \text{O} < \text{F}$

78 Intramolecular hydrogen bonding is present in

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

79 Identify the correct reagents that would bring about the following transformation.



- (1) (i)  $\text{BH}_3$   
 (ii)  $\text{H}_2\text{O}_2 / \text{OH}^-$   
 (iii) PCC  
 (2) (i)  $\text{BH}_3$   
 (ii)  $\text{H}_2\text{O}_2 / \text{OH}^-$   
 (iii) alk.  $\text{KMnO}_4$   
 (iv)  $\text{H}_3\text{O}^+$   
 (3) (i)  $\text{H}_2\text{O} / \text{H}^+$   
 (ii) PCC  
 (4) (i)  $\text{H}_2\text{O} / \text{H}^+$   
 (ii)  $\text{CrO}_3$

80 Match List I with List II.

**List I**

(Conversion)

(Nur)

Fara

- A. 1 mol of  $\text{H}_2\text{O}^{2-}$  to  $\text{O}_2^0$  I.  
 B. 1 mol of  $\text{MnO}_4^-$  to  $\text{Mn}^{2+}$  II.  
 C. 1.5 mol of Ca from molten  $\text{CaCl}_2$  III.  
 D. 1 mol of  $\text{FeO}^{+2}$  to  $\text{Fe}_2\text{O}_3^{+3}$  IV.

Choose the correct answer from the below:

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

81 Given below are two statements:

**Statement I :** The boiling point Group 16 elements follow the order  $\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$ . ✓

**Statement II :** On the basis of m  $\text{H}_2\text{O}$  is expected to have lower boiling point than the other members of the group, presence of extensive H-bonding higher boiling point. ✓

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

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

82 Given below are two statements :

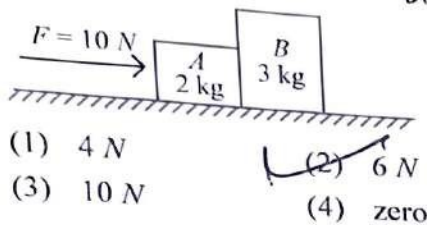
**Statement I :** Both  $[\text{Co}(\text{NH}_3)_6]^{3+}$  and  $[\text{CoF}_6]^{3-}$  complexes are octahedral but differ in magnetic behaviour. ✓

**Statement II :**  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is diamagnetic whereas  $[\text{CoF}_6]^{3-}$  is paramagnetic.

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

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

- 25 A horizontal force  $10\text{ N}$  is applied to a block  $A$  as shown in figure. The mass of blocks  $A$  and  $B$  are  $2\text{ kg}$  and  $3\text{ kg}$ , respectively. The blocks slide over a frictionless surface. The force exerted by block  $A$  on block  $B$  is :



$$a = \frac{F}{5} = 2\text{ m/s}^2$$

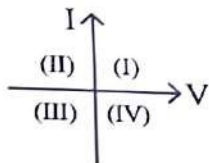
- 26 The quantities which have the same dimensions as those of solid angle are :

- (1) stress and angle  $\times$   
(2) strain and arc  
(3) angular speed and stress  $\frac{F}{A} \times$   
(4) strain and angle

- 27 The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is  $2400\text{ g cm}^2$ . The length of the  $400\text{ g}$  rod is nearly :

- (1)  $17.5\text{ cm}$   
(2)  $20.7\text{ cm}$   
(3)  $72.0\text{ cm} \times$   
(4)  $8.5\text{ cm}$
- $\frac{ML^2}{12} = 2400$   
 $\frac{400 \times L^2}{12} = 2400$   
 $L^2 = \frac{24 \times 12}{400} = \frac{72}{100}$   
 $L = \sqrt{0.72} = 0.8485\text{ m} = 84.85\text{ cm}$

- 28 Consider the following statements A and B and identify the correct answer :



- A. For a solar-cell, the I-V characteristics lies in the IV quadrant of the given graph.  
B. In a reverse biased pn junction diode, the current measured in  $(\mu\text{A})$ , is due to majority charge carriers.  $\times$
- (1) A is incorrect but B is correct.  
(2) Both A and B are correct.  
(3) Both A and B are incorrect.  
(4) A is correct but B is incorrect.

- 29 A wire of length ' $l$ ' and resistance  $10\Omega$  divided into 10 equal parts. The first 5 parts connected in series while the next 5 parts connected in parallel. The two combinations again connected in series. The resistance of final combination is:

- (1)  $52\Omega$   
(2)  $55\Omega$   
(3)  $60\Omega$   
(4)  $26\Omega$

- 30 If  $x = 5 \sin\left(\pi t + \frac{\pi}{3}\right)\text{ m}$  represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively are :

- (1)  $5\text{ m}, 2\text{ s}$   
(2)  $5\text{ cm}, 1\text{ s}$   
(3)  $5\text{ m}, 1\text{ s}$   
(4)  $5\text{ cm}, 2\text{ s}$

- 31 If  $c$  is the velocity of light in free space, the statements about photon among the following are :

- A. The energy of a photon is  $E = hv$ .  
B. The velocity of a photon is  $c$ .  
C. The momentum of a photon,  $p = \frac{hv}{c}$ .  
D. In a photon-electron collision, both energy and total momentum are conserved.  
E. Photon possesses positive charge.

Choose the correct answer from the options below :

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

- 32 Match List I with List II.

List I  
(Spectral Lines of Hydrogen for transitions from)

- A.  $n_2 = 3$  to  $n_1 = 2$   
B.  $n_2 = 4$  to  $n_1 = 2$   
C.  $n_2 = 5$  to  $n_1 = 2$   
D.  $n_2 = 6$  to  $n_1 = 2$

List II  
(Wavelengths in  $\text{\AA}$ )

$$\frac{1}{\lambda} = RZ^2 \left( \frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

$$= R \left( \frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

- I.  $410.2$   
II.  $434.1$   
III.  $656.3$   
IV.  $486.1$

Choose the correct answer from the options below :

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