

**W6**

SHRVAN

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## Questions & Answers

Time : 3 hrs. 20 Min.

M.M. : 720

*for*

## NEET (UG)-2022

### Important Instructions :

1. The test is of **3.20 hours** duration and the Test Booklet contains **200** multiple choice questions (Four options with a single correct answer). There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15. (**Candidates are advised to read all 15 questions in each subject of Section-B** before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.**)
2. Each question carries **4 marks**. For each correct response, the candidate will get **4 marks**. For every wrong response **1 mark** shall be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue / Black Ball point Pen only** for writing particulars on this page / marking responses on Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must handover the Answer Sheet to the Invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is **W6**.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
8. Each candidate must show on-demand his/her Admission Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.

## PHYSICS

### SECTION-A

1. An energy of 484 J is spent in increasing the speed of a flywheel from 60 rpm to 360 rpm. The moment of inertia of the flywheel is :
- (1) 0.07 kg-m<sup>2</sup>
  - (2) 0.7 kg-m<sup>2</sup>
  - (3) 3.22 kg-m<sup>2</sup>
  - (4) 30.8 kg-m<sup>2</sup>

**Answer (2)**

2. Let  $R_1$  be the radius of the second stationary orbit and  $R_2$  be the radius of the fourth stationary orbit of an electron in Bohr's model. The ratio  $\frac{R_1}{R_2}$  is :
- (1) 4
  - (2) 0.25
  - (3) 0.5
  - (4) 2

**Answer (2)**

3. During a cloudy day, a primary and a secondary rainbow may be created, then the :
- (1) secondary rainbow is due to single internal reflection and is formed above the primary one.
  - (2) primary rainbow is due to double internal reflection and is formed above the secondary one.
  - (3) primary rainbow is due to double internal reflection and is formed below the secondary one.
  - (4) secondary rainbow is due to double internal reflection and is formed above the primary one.

**Answer (4)**

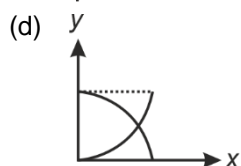
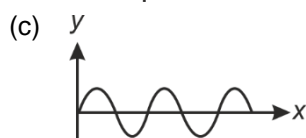
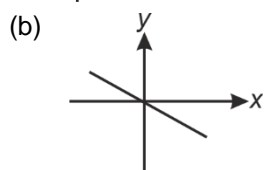
4. The reciprocal of resistance is :
- (1) conductance
  - (2) reactance
  - (3) mobility
  - (4) conductivity

**Answer (1)**

5. Two copper vessels  $A$  and  $B$  have the same base area but of different shapes.  $A$  takes twice the volume of water as that  $B$  requires to fill upto a particular common height. Then the correct statement among the following is:
- (1) Vessel  $B$  weighs twice that of  $A$ .
  - (2) Pressure on the base area of vessels  $A$  and  $B$  is same.
  - (3) Pressure on the base area of vessels  $A$  and  $B$  is not same.
  - (4) Both vessels  $A$  and  $B$  weigh the same.

**Answer (2)**

6. Match List-I with List-II

**List-I**  
**(x-y graphs)**

**List-II**  
**(Situations)**

- (i) Total mechanical energy is conserved
- (ii) Bob of a pendulum is oscillating under negligible air friction
- (iii) Restoring force of a spring
- (iv) Bob of a pendulum is oscillating along with air friction

Choose the **correct** answer from the options given below

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

**Answer (3)**

7. The distance covered by a body of mass 5 g having linear momentum 0.3 kg m/s in 5 s is

- (1) 0.3 m (2) 300 m
- (3) 30 m (4) 3 m

**Answer (2)**8. The distance between the two plates of a parallel plate capacitor is doubled and the area of each plate is halved. If  $C$  is its initial capacitance, its final capacitance is equal to

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

**Answer (1)**9. A closely packed coil having 1000 turns has an average radius of 62.8 cm. If current carried by the wire of the coil is 1 A, the value of magnetic field produced at the centre of the coil will be (permeability of free space =  $4\pi \times 10^{-7}$  H/m) nearly

- (1)  $10^{-3}$  T
- (2)  $10^{-1}$  T
- (3)  $10^{-2}$  T
- (4)  $10^2$  T

**Answer (1)**

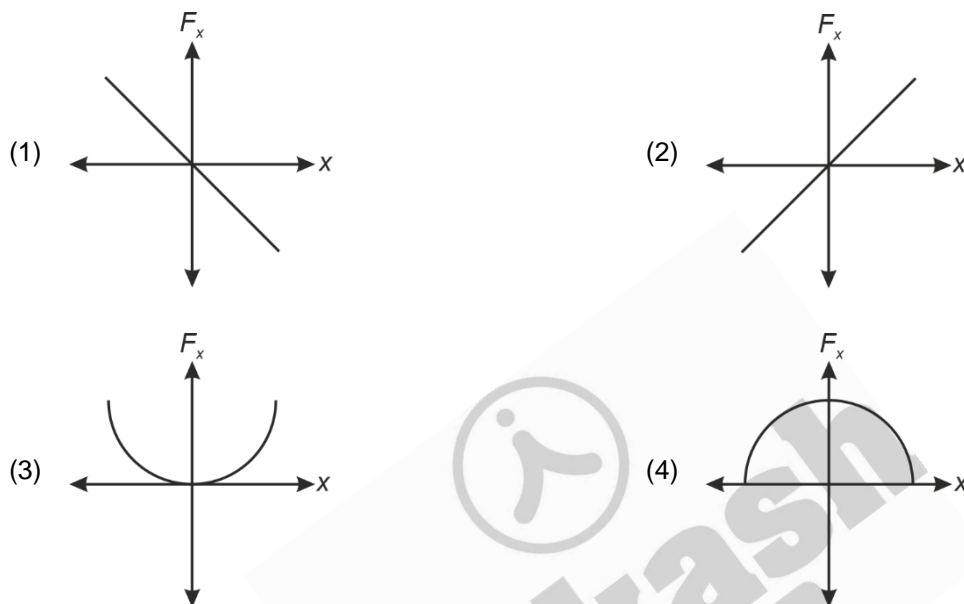
10. The magnetic field of a plane electromagnetic wave is given by

$\vec{B} = 3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{j}$ , then the associated electric field will be :

- (1)  $9 \cos(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{k}$  V/m      (2)  $3 \times 10^{-8} \cos(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{i}$  V/m  
(3)  $3 \times 10^{-8} \sin(1.6 \times 10^3 x + 48 \times 10^{10} t) \hat{i}$  V/m      (4)  $9 \sin(1.6 \times 10^3 x - 48 \times 10^{10} t) \hat{k}$  V/m

**Answer (1)**

11. The restoring force of a spring with a block attached to the free end of the spring is represented by



**Answer (1)**

12. Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A):** When a fire cracker (rocket) explodes in mid air, its fragments fly in such a way that they continue moving in the same path, which the fire cracker would have followed, had it not exploded.

**Reason (R):** Explosion of cracker (rocket) occurs due to internal force only and no external force acts for this explosion.

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

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

**Answer (1)**

13. A cricket ball is thrown by a player at a speed of 20 m/s in a direction  $30^\circ$  above the horizontal. The maximum height attained by the ball during its motion is

( $g = 10 \text{ m/s}^2$ )

- (1) 25 m      (2) 5 m  
(3) 10 m      (4) 20 m

**Answer (2)**

14. Given below are two statements

**Statement I:** In an ac circuit, the current through a capacitor leads the voltage across it.

**Statement II:** In a.c. circuit containing pure capacitance only, the phase difference between the current and the voltage is  $\pi$ .

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

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

**Answer (4)**

15. A cell of emf 4 V and internal resistance  $0.5 \Omega$  is connected to a  $7.5 \Omega$  external resistance. The terminal potential difference of the cell is

- (1) 0.375 V
- (2) 3.75 V
- (3) 4.25 V
- (4) 4 V

**Answer (2)**

16. An ideal gas follows a process described by the equation  $PV^2 = C$  from the initial  $(P_1, V_1, T_1)$  to final  $(P_2, V_2, T_2)$  thermodynamic states, where  $C$  is a constant. Then

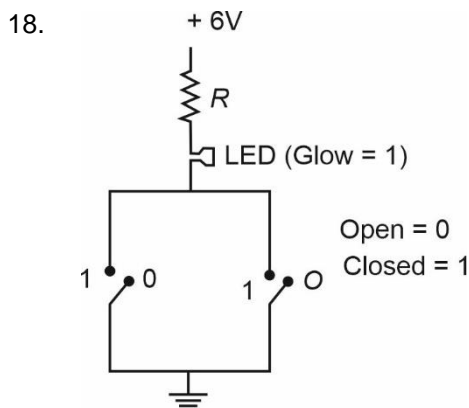
- (1) If  $P_1 > P_2$  then  $V_1 > V_2$
- (2) If  $P_1 > P_2$  then  $T_1 < T_2$
- (3) If  $V_2 > V_1$  then  $T_2 > T_1$
- (4) If  $V_2 > V_1$  then  $T_2 < T_1$

**Answer (4)**

17. The shape of the magnetic field lines due to an infinite long, straight current carrying conductor is

- (1) a plane
- (2) a straight line
- (3) circular
- (4) elliptical

**Answer (3)**



Identify the equivalent logic gate represented by the given circuit

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

**Answer (2)**

19. The light rays having photons of energy 4.2 eV are falling on a metal surface having a work function of 2.2 eV. The stopping potential of the surface is
- (1) 6.4 V (2) 2 eV  
(3) 2 V (4) 1.1 V

**Answer (3)**

20. Identify the function which represents a non-periodic motion.
- (1)  $\sin(\omega t + \pi/4)$  (2)  $e^{-\omega t}$   
(3)  $\sin \omega t$  (4)  $\sin \omega t + \cos \omega t$

**Answer (2)**

21. An inductor of inductance 2 mH is connected to a 220 V, 50 Hz a.c. source. Let the inductive reactance in the circuit is  $X_1$ . If a 220 V dc source replace the ac source in the circuit, then the inductive reactance in the circuit is  $X_2$ .  $X_1$  and  $X_2$  respectively are :
- (1) 0.628  $\Omega$ , infinity (2) 6.28  $\Omega$ , zero  
(3) 6.28  $\Omega$ , infinity (4) 0.628  $\Omega$ , zero

**Answer (4)**

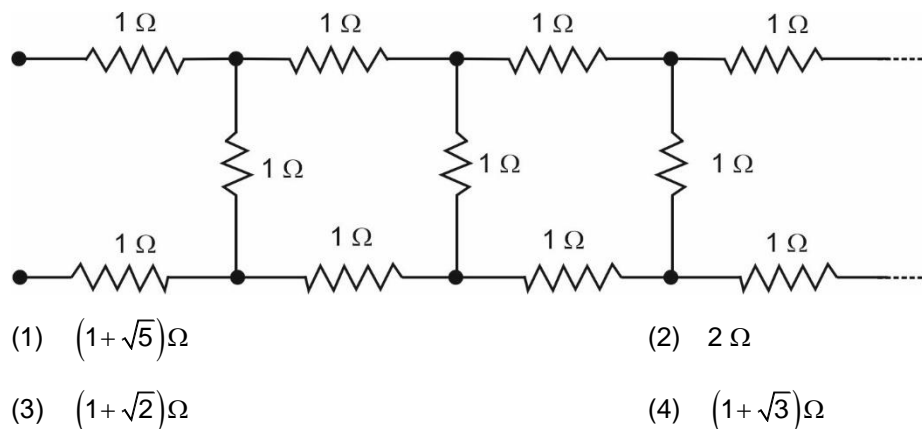
22. The ratio of the magnitude of the magnetic field and electric field intensity of a plane electromagnetic wave in free space of permeability  $\mu_0$  and permittivity  $\epsilon_0$  is (Given that  $c$  - velocity) of light in free space)
- (1)  $\frac{\sqrt{\mu_0 \epsilon_0}}{c}$  (2)  $c$   
(3)  $\frac{1}{c}$  (4)  $\frac{c}{\sqrt{\mu_0 \epsilon_0}}$

**Answer (3)**

23. The threshold frequency of a photoelectric metal is  $\nu_0$ . If light of frequency  $4\nu_0$  is incident on this metal, then the maximum kinetic energy of emitted electrons will be :
- (1)  $4 h\nu_0$  (2)  $h\nu_0$   
(3)  $2 h\nu_0$  (4)  $3 h\nu_0$

**Answer (4)**

24. The equivalent resistance of the infinite network given below is :



**Answer (4)**

25. If the screen is moved away from the plane of the slits in a Young's double slit experiment, then the :
- (1) linear separation of the fringes decreases      (2) angular separation of the fringes increases  
(3) angular separation of the fringes decreases      (4) linear separation of the fringes increase

**Answer (4)**

26. If  $\vec{F} = 2\hat{i} + \hat{j} - \hat{k}$  and  $\vec{r} = 3\hat{i} + 2\hat{j} - 2\hat{k}$ , then the scalar and vector products of  $\vec{F}$  and  $\vec{r}$  have the magnitudes respectively as
- (1) 10, 2      (2)  $5, \sqrt{3}$   
(3)  $4, \sqrt{5}$       (4)  $10, \sqrt{2}$

**Answer (4)**

27. Given below are two statements

**Statement I :**

The law of radioactive decay states that the number of nuclei undergoing the decay per unit time is inversely proportional to the total number of nuclei in the sample.

**Statement II :**

The half of a radionuclide is the sum of the life time of all nuclei, divided by the initial concentration of the nuclei at time  $t = 0$ .

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

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

**Answer (3)**

28. The physical quantity that has the same dimensional formula as pressure is
- (1) Coefficient of viscosity      (2) Force  
(3) Momentum      (4) Young's modulus of elasticity

**Answer (4)**

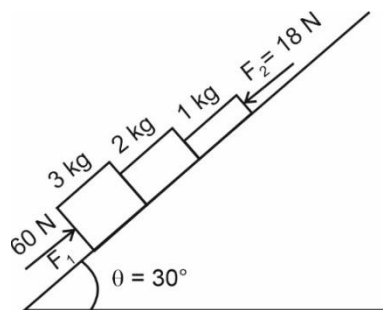
29. The effective capacitances of two capacitors are  $3 \mu\text{F}$  and  $16 \mu\text{F}$ , when they are connected in series and parallel respectively. The capacitance of two capacitors are :
- (1)  $1.2 \mu\text{F}$ ,  $1.8 \mu\text{F}$       (2)  $10 \mu\text{F}$ ,  $6 \mu\text{F}$   
(3)  $8 \mu\text{F}$ ,  $8 \mu\text{F}$       (4)  $12 \mu\text{F}$ ,  $4 \mu\text{F}$

**Answer (4)**

30. After passing through a polariser a linearly polarised light of intensity  $I$  is incident on an analyser making an angle of  $30^\circ$  with that of the polariser. The intensity of light emitted from the analyser will be
- (1)  $\frac{2I}{3}$       (2)  $\frac{I}{2}$   
(3)  $\frac{I}{3}$       (4)  $\frac{3I}{4}$

**Answer (4)**

31. In the diagram shown, the normal reaction force between 2 kg and 1 kg is (Consider the surface, to be smooth):  
Given  $g = 10 \text{ ms}^{-2}$



- (1) 10 N  
(2) 25 N  
(3) 39 N  
(4) 6 N

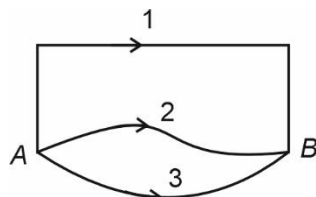
**Answer (2)**

32. The incorrect statement about the property of a Zener diode is:

- (1) p and n regions of zener diode are heavily doped  
(2) Zener voltage remains constant at breakdown  
(3) It is designed to operate under reverse bias  
(4) Depletion region formed is very wide

**Answer (4)**

33. A gravitational field is present in a region and a mass is shifted from A to B through different paths as shown. If  $W_1$ ,  $W_2$  and  $W_3$  represent the work done by the gravitational force along the respective paths, then:



- (1)  $W_1 < W_2 < W_3$   
(2)  $W_1 = W_2 = W_3$   
(3)  $W_1 > W_2 > W_3$   
(4)  $W_1 > W_3 > W_2$

**Answer (2)**

34. A standard filament lamp consumes 100 W when connected to 200 V ac mains supply. The peak current through the bulb will be:

- (1) 2 A  
(2) 0.707 A  
(3) 1 A  
(4) 1.414 A

**Answer (2)**

35. The terminal velocity of a copper ball of radius 5 mm falling through a tank of oil at room temperature is 10 cm s<sup>-1</sup>. If the viscosity of oil at room temperature is 0.9 kg m<sup>-1</sup> s<sup>-1</sup>, the viscous drag force is:
- (1)  $4.23 \times 10^{-6}$  N
  - (2)  $8.48 \times 10^{-3}$  N
  - (3)  $8.48 \times 10^{-5}$  N
  - (4)  $4.23 \times 10^{-3}$  N

**Answer (2)**

## SECTION-B

36. In a gravitational field, the gravitational potential is given by,  $V = -\frac{K}{x}$  (J/Kg). The gravitational field intensity at point (2, 0, 3) m is
- (1)  $+\frac{K}{4}$
  - (2)  $+\frac{K}{2}$
  - (3)  $-\frac{K}{2}$
  - (4)  $-\frac{K}{4}$

**Answer (4)**

37. The percentage error in the measurement of  $g$  is : (Given that  $g = \frac{4\pi^2 L}{T^2}$ ,  $L = (10 \pm 0.1)$  cm,  $T = (100 \pm 1)$  s)
- (1) 7%
  - (2) 2%
  - (3) 5%
  - (4) 3%

**Answer (4)**

38. Two very long, straight, parallel conductors  $A$  and  $B$  carry current of 5 A and 10 A respectively and are at a distance of 10 cm from each other. The direction of current in two conductors is same. The force acting per unit length between two conductors is : ( $\mu_0 = 4\pi \times 10^{-7}$  SI unit)
- (1)  $1 \times 10^{-4}$  Nm<sup>-1</sup> and is repulsive
  - (2)  $2 \times 10^{-4}$  Nm<sup>-1</sup> and is attractive
  - (3)  $2 \times 10^{-4}$  Nm<sup>-1</sup> and is repulsive
  - (4)  $1 \times 10^{-4}$  Nm<sup>-1</sup> and is attractive

**Answer (4)**

39. The magnetic field on the axis of a circular loop of radius 100 cm carrying current  $I = \sqrt{2}$  A, at point 1 m away from the centre of the loop is given by :
- (1)  $6.28 \times 10^{-4}$  T
  - (2)  $3.14 \times 10^{-7}$  T
  - (3)  $6.28 \times 10^{-7}$  T
  - (4)  $3.14 \times 10^{-4}$  T

**Answer (2)**

40. At any instant, two elements  $X_1$  and  $X_2$  have same number of radioactive atoms. If the decay constant of  $X_1$  and  $X_2$  are  $10\lambda$  and  $\lambda$  respectively, then the time when the ratio of their atoms becomes  $\frac{1}{e}$  respectively will be :

- (1)  $\frac{1}{5\lambda}$  (2)  $\frac{1}{11\lambda}$   
(3)  $\frac{1}{9\lambda}$  (4)  $\frac{1}{6\lambda}$

**Answer (3)**

41. Two rods one made of copper and other made of steel of same length and same cross sectional area are joined together. The thermal conductivity of copper and steel are  $385 \text{ J s}^{-1} \text{ K}^{-1} \text{ m}^{-1}$  and  $50 \text{ J s}^{-1} \text{ K}^{-1} \text{ m}^{-1}$  respectively. The free ends of copper and steel are held at  $100^\circ\text{C}$  and  $0^\circ\text{C}$  respectively. The temperature at the junction is, nearly :

- (1)  $88.5^\circ\text{C}$  (2)  $12^\circ\text{C}$   
(3)  $50^\circ\text{C}$  (4)  $73^\circ\text{C}$

**Answer (1)**

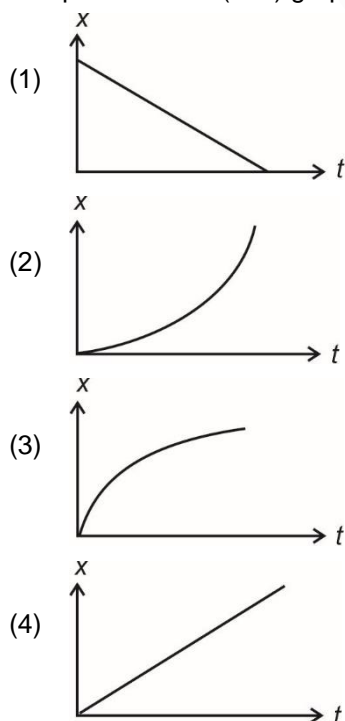
42. The ratio of Coulomb's electrostatic force to the gravitational force between an electron and a proton separated by some distance is  $2.4 \times 10^{39}$ . The ratio of the proportionality constant,  $K = \frac{1}{4\pi\epsilon_0}$  to the Gravitational constant

$G$  is nearly (Given that the charge of the proton and electron each =  $1.6 \times 10^{-19} \text{ C}$ , the mass of the electron =  $9.11 \times 10^{-31} \text{ kg}$ , the mass of the proton =  $1.67 \times 10^{-27} \text{ kg}$ ) :

- (1) 10 (2)  $10^{20}$   
(3)  $10^{30}$  (4)  $10^{40}$

**Answer (2)**

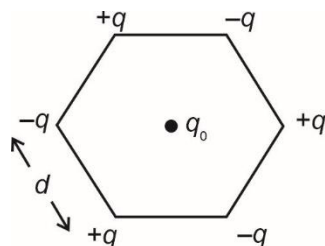
43. The position-time ( $x - t$ ) graph for positive acceleration is



**Answer (2)**

44. Six charges  $+q, -q, +q, -q, +q$ , and  $-q$  are fixed at the corners of a hexagon of side  $d$  as shown in the figure. The work done in bringing a charge  $q_0$  to the centre of the hexagon from infinity is

( $\epsilon_0$  – permittivity of free space)



- (1)  $\frac{-q^2}{4\pi\epsilon_0 d} \left( 6 - \frac{1}{\sqrt{2}} \right)$
- (2) Zero
- (3)  $\frac{-q^2}{4\pi\epsilon_0 d}$
- (4)  $\frac{-q^2}{4\pi\epsilon_0 d} \left( 3 - \frac{1}{\sqrt{2}} \right)$

**Answer (2)**

45. An astronomical refracting telescope is being used by an observer to observe planets in normal adjustment. The focal lengths of the objective and eye piece used in the construction of the telescope are 20 m and 2 cm respectively. Consider the following statements about the telescope :
- (a) The distance between the objective and eye piece is 20.02 m
- (b) The magnification of the telescope is  $(-)$  1000
- (c) The image of the planet is erect and diminished
- (d) The aperture of eye piece is smaller than that of objective

The correct statements are :

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

**Answer (1)**

46. The magnetic flux linked to a circular coil of radius  $R$  is

$$\phi = 2t^3 + 4t^2 + 2t + 5 \text{ Wb}$$

The magnitude of induced emf in the coil at  $t = 5$  s is

- (1) 192 V
- (2) 108 V
- (3) 197 V
- (4) 150 V

**Answer (1)**

47. Three vessels of equal capacity have gases at the same temperature and pressure. The first vessel contains helium (monoatomic), the second contains fluorine (diatomic) and the third contains sulfur hexafluoride (polyatomic). The correct statement, among the following is :
- (1) The root mean square speed of sulfur hexafluoride is the largest
  - (2) All vessels contain unequal number of respective molecules
  - (3) The root mean square speed of molecules is same in all three cases
  - (4) The root mean square speed of helium is the largest

**Answer (4)**

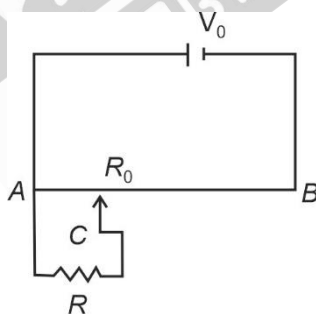
48. An organ pipe filled with a gas at  $27^\circ\text{C}$  resonates at 400 Hz in its fundamental mode. If it is filled with the same gas at  $90^\circ\text{C}$ , the resonance frequency at the same mode will be
- (1) 512 Hz
  - (2) 420 Hz
  - (3) 440 Hz
  - (4) 484 Hz

**Answer (3)**

49. The collector current in a common base amplifier using n-p-n transistor is 24 mA. If 80% of the electrons released by the emitter is accepted by the collector, then the base current is numerically :
- (1) 3 mA and entering the base
  - (2) 6 mA and leaving the base
  - (3) 3 mA and leaving the base
  - (4) 6 mA and entering the base

**Answer (4)**

50. The sliding contact C is at one fourth of the length of the potentiometer wire (AB) from A as shown in the circuit diagram. If the resistance of the wire AB is  $R_0$ , then the potential drop (V) across the resistor R is



- (1)  $\frac{2V_0R}{2R_0 + 3R}$
- (2)  $\frac{4V_0R}{3R_0 + 16R}$
- (3)  $\frac{4V_0R}{3R_0 + R}$
- (4)  $\frac{2V_0R}{4R_0 + R}$

**Answer (2)**

# CHEMISTRY

## SECTION-A

51. Match **List - I** with **List - II** :

<b>List - I</b> (quantum number)	<b>List - II</b> (orbital)
(a) $n = 2, l = 1$	(i) 3s
(b) $n = 3, l = 2$	(ii) 3s
(c) $n = 3, l = 0$	(iii) 2p
(d) $n = 2, l = 0$	(iv) 3d

Choose the **correct answer** from the options given below :

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

**Answer (1)**

52. The density of the solution is  $2.15 \text{ g mL}^{-1}$ , then mass of 2.5 mL solution in **correct** significant figures is :

- |             |                                     |
|-------------|-------------------------------------|
| (1) 53.75 g | (2) $5375 \times 10^{-3} \text{ g}$ |
| (3) 5.4 g   | (4) 5.38 g                          |

**Answer (3)**

53. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A)** : Chlorine is an electron withdrawing group but it is ortho, para directing in electrophilic aromatic substitution.

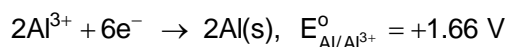
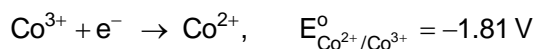
**Reason (R)** : Inductive effect of chlorine destabilises the intermediate carbocation formed during the electrophilic substitution, however due to the more pronounced resonance effect, the halogen stabilises the carbocation at ortho and para positions.

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

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

**Answer (4)**

54. Two half cell reactions are given below.



The standard EMF of a cell with feasible redox reaction will be :

- |             |             |
|-------------|-------------|
| (1) -3.47 V | (2) +7.09 V |
| (3) +0.15 V | (4) +3.47 V |

**Answer (4)**

55. Match **List - I** with **List - II** :

**List - I**

**(Compounds)**

- (a) Borax
- (b) Kernite
- (c) Orthoboric acid
- (d) Borax bead

**List - II**

**(Molecular formula)**

- (i)  $\text{NaBO}_2$
- (ii)  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$
- (iii)  $\text{H}_3\text{BO}_3$
- (iv)  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

Choose the **correct answer** from the options given below :

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

**Answer (2)**

56. The correct order of first ionization enthalpy for the given four elements is :

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

**Answer (4)**

57. Match List-I with List-II :

**List-I**

**(Defects)**

- (a) Frenkel defect
- (b) Schottky defect
- (c) Vacancy defect
- (d) Interstitial defect

**List-II**

**(Shown by)**

- (i) Non-ionic solids and density of the solid decreases
- (ii) Non-ionic solids and density of the solid increases
- (iii) Ionic solids and density of the solid decreases
- (iv) Ionic solids and density of the solid remains constant

Chose the **correct answer** from the options given below :

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

**Answer (1)**

58. Predict the order of reactivity of the following four isomers towards  $\text{S}_{\text{N}}2$  reaction.

- (I)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
- (II)  $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3$
- (III)  $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$
- (IV)  $(\text{CH}_3)_3\text{CCl}$

- (1) (IV) > (II) > (III) > (I)
- (2) (IV) > (III) > (II) > (I)
- (3) (I) > (II) > (III) > (IV)
- (4) (I) > (III) > (II) > (IV)

**Answer (4)**

59. Match List-I with List-II :

List-I (Molecules)	List-II (Shape)
(a) $\text{NH}_3$	(i) Square pyramidal
(b) $\text{ClF}_3$	(ii) Trigonal bipyramidal
(c) $\text{PCl}_5$	(iii) Trigonal pyramidal
(d) $\text{BrF}_5$	(iv) T-shape

Chose 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) – (iii), (b) – (iv), (c) – (ii), (d) – (i)
- (4) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)

**Answer (3)**

60. Which of the following reactions is a part of the large scale industrial preparation of nitric acid?

- (1)  $\text{Cu}(\text{NO}_3)_2 + 2\text{NO}_2 + 2\text{H}_2\text{O} \xrightarrow[500 \text{ K, 9 bar}]{\text{Pt}} 4\text{HNO}_3 + \text{Cu}$
- (2)  $\text{NaNO}_3 + \text{H}_2\text{SO}_4 \xrightarrow[500 \text{ K, 9 bar}]{\text{Pt}} \text{NaHSO}_4 + \text{HNO}_3$
- (3)  $4\text{NH}_3 + 5\text{O}_2 \text{ (from air)} \xrightarrow[500 \text{ K, 9 bar}]{\text{Pt}} 4\text{NO} + 6\text{H}_2\text{O}$
- (4)  $4\text{HPO}_3 + 2\text{N}_2\text{O}_5 \xrightarrow[500 \text{ K, 9 bar}]{\text{Pt}} 4\text{HNO}_3 + \text{P}_4\text{O}_{10}$

**Answer (3)**

61. Match List-I with List-II:

List-I	List-II
(a) Sodium laurylsulphate	(i) Toilet soap
(b) Cetyltrimethyl ammonium chloride	(ii) Non-ionic detergent
(c) Sodium stearate	(iii) Anionic detergent
(d) Polyethyleneglycol stearate	(iv) Cationic detergent

Choose the **correct answer** from the options given below:

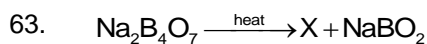
- (1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (2) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (3) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)
- (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

**Answer (4)**

62. Which among the following is a thermoplastic polymer?

- (1) Melamine polymer
- (2) Bakelite
- (3) Polythene
- (4) Urea-formaldehyde resin

**Answer (3)**



in the above reaction the product "X" is:

- (1)  $\text{NaB}_3\text{O}_5$  (2)  $\text{H}_3\text{BO}_3$   
(3)  $\text{B}_2\text{O}_3$  (4)  $\text{Na}_2\text{B}_2\text{O}_5$

**Answer (3)**

64. One mole of an ideal gas at 300 K is expanded isothermally from 1 L to 10 L volume.  $\Delta U$  for this process is:

(Use  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )

- (1) 0 J (2) 1260 J  
(3) 2520 J (4) 5040 J

**Answer (1)**

65. Match List-I with List-II:

**List-I**

**(Complexes)**

- (a)  $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$   
and  $[\text{Co}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$   
(b)  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$   
and  $[\text{Cr}(\text{CN})_6][\text{Co}(\text{NH}_3)_6]$   
(c)  $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$   
and  $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$   
(d)  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  and  
 $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$

**List-II**

**(Types)**

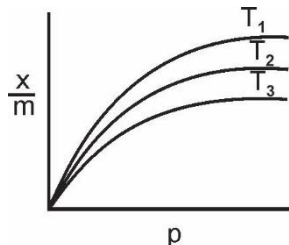
- (i) ionisation isomerism  
(ii) coordination isomerism  
(iii) linkage isomerism  
(iv) solvate isomerism

Choose the **correct answer** from the options given below:

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

**Answer (4)**

66. Shown below are adsorption isotherms for a gas 'X' at temperatures  $T_1$ ,  $T_2$  and  $T_3$ :



$p$  and  $\frac{x}{m}$  represent pressure and extent of adsorption, respectively. The correct order of temperatures for the given adsorption is:

- (1)  $T_1 = T_2 > T_3$  (2)  $T_1 > T_2 > T_3$   
(3)  $T_3 > T_2 > T_1$  (4)  $T_1 = T_2 = T_3$

**Answer (3)**

67. 0.01 M acetic acid solution is 1% ionised, then pH of this acetic acid solution is :

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

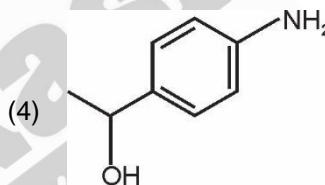
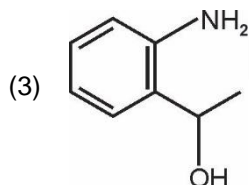
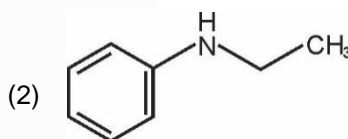
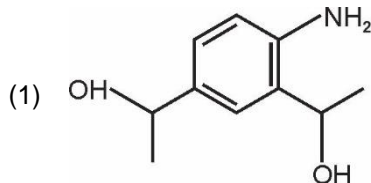
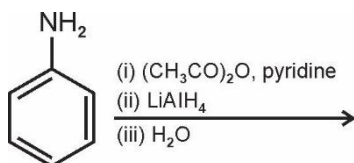
**Answer (4)**

68. The half life of a first order reaction is 2000 years. If the concentration after 8000 years is 0.02 M, then the initial concentration was :

- (1) 0.04 M (2) 0.16 M  
(3) 0.32 M (4) 0.08 M

**Answer (3)**

69. The product formed from the following reaction sequence is :



**Answer (2)**

70. The decreasing order of boiling points of the following alkanes is :

- (a) heptane  
(b) butane  
(c) 2-methylbutane  
(d) 2-methylpropane  
(e) hexane

Choose the correct answer from the options given below :

- (1) (a) > (e) > (c) > (b) > (d) (2) (a) > (c) > (e) > (d) > (b)  
(3) (c) > (d) > (a) > (e) > (b) (4) (a) > (e) > (b) > (c) > (d)

**Answer (1)**

71. The element used for welding metals with high melting points is

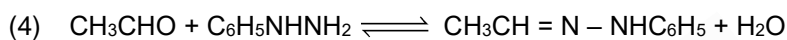
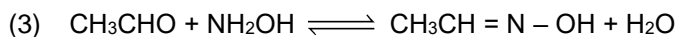
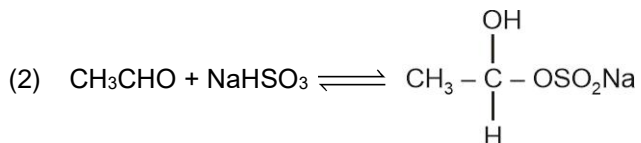
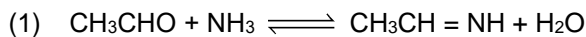
- (1) He (2) Cl<sub>2</sub>  
(3) H<sub>2</sub> (4) Ne

**Answer (3)**

72. Decrease in size from left to right in actinoid series is greater and gradual than that in lanthanoid series due to
- |   |  |
|---|--|
| (1) 5f orbitals have greater shielding effect | (2) 4f orbitals are penultimate            |
| (3) 4f orbitals have greater shielding effect | (4) 5f orbitals have poor shielding effect |

**Answer (4)**

73. Which of the following reactions is not an example for nucleophilic addition-elimination reaction?



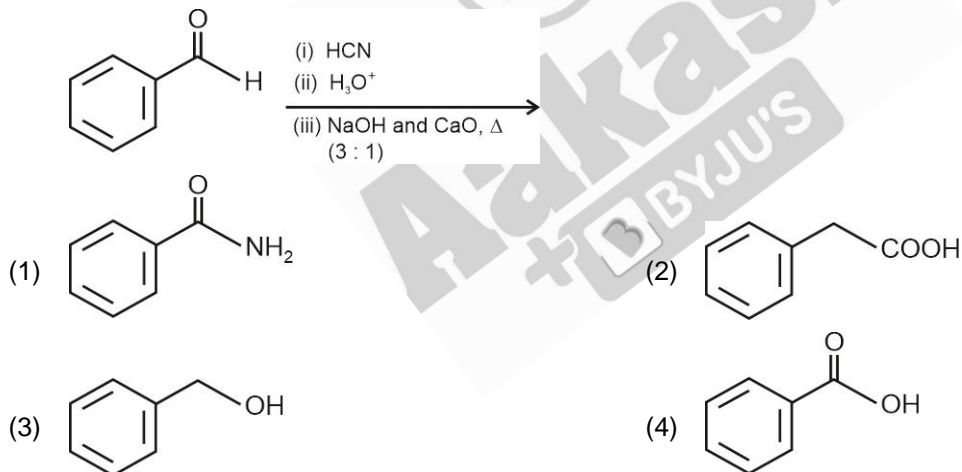
**Answer (2)**

74.  $\text{CaCl}_2$  and  $\text{Ca}(\text{OCl})_2$  are components of

- (1) Lime water                      (2) Gypsum  
(3) Portland cement            (4) Bleaching power

**Answer (4)**

75. The product formed from the following reaction sequence is



**Answer (3)**

76. Fluorine is a stronger oxidising agent than chlorine because:

- (a) F-F bond has a low enthalpy of dissociation.
- (b) Fluoride ion ( $\text{F}^-$ ) has high hydration enthalpy.
- (c) Electron gain enthalpy of fluorine is less negative than chlorine.
- (d) Fluorine has a very small size.

Choose the **most appropriate** answer from the options given:

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

### Answer (2)

77.  $K_H$  value for some gases at the same temperature 'T' are given:

Gas	$K_H/k$ bar
Ar	40.3
CO <sub>2</sub>	1.67
HCHO	$1.83 \times 10^{-5}$
CH <sub>4</sub>	0.413

where  $K_H$  is Henry's Law constant in water. The order of their solubility in water is:

- (1) HCHO < CH<sub>4</sub> < CO<sub>2</sub> < Ar                      (2) Ar < CO<sub>2</sub> < CH<sub>4</sub> < HCHO  
 (3) Ar < CH<sub>4</sub> < CO<sub>2</sub> < HCHO                      (4) HCHO < CO<sub>2</sub> < CH<sub>4</sub> < Ar

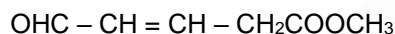
**Answer (2)**

78. Which of the following reactions is a decomposition redox reaction?

- (1)  $P_4(s) + 3OH^-(aq) + 3H_2O(l) \rightarrow PH_3(g) + 3H_2PO_2^-(aq)$   
 (2)  $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$   
 (3)  $N_2(g) + O_2(g) \rightarrow 2NO(g)$   
 (4)  $Cl_2(g) + 2OH^-(aq) \rightarrow ClO^-(aq) + Cl^-(aq) + H_2O(l)$

**Answer (2)**

79. What is the hybridization shown by C<sub>1</sub> and C<sub>2</sub> carbons, respectively in the given compound?



- (1)  $sp^3$  and  $sp^3$     (2)  $sp^2$  and  $sp^3$   
 (3)  $sp^2$  and  $sp^2$     (4)  $sp^3$  and  $sp^2$

**Answer (2)**

80. Match the reagents (**List - I**) with the product (**List - II**) obtained from phenol.

**List - I**

- (a) (i) NaOH (ii) CO<sub>2</sub> (iii) H<sup>+</sup>  
 (b) (i) Aqueous NaOH + CHCl<sub>3</sub> (ii) H<sup>+</sup>  
 (c) Zn dust,  $\Delta$   
 (d) Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, H<sub>2</sub>SO<sub>4</sub>

**List - II**

- (i) Benzoquinone  
 (ii) Benzene  
 (iii) Salicyl aldehyde  
 (iv) Salicylic acid

Choose the correct answer from the options given below:

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

**Answer (4)**

81. The correct order of bond angles in the following compounds/species is :

- (1) CO<sub>2</sub> < NH<sub>3</sub> < H<sub>2</sub>O < NH<sub>4</sub><sup>+</sup>                      (2) H<sub>2</sub>O < NH<sub>3</sub> < NH<sub>4</sub><sup>+</sup> < CO<sub>2</sub>  
 (3) H<sub>2</sub>O < NH<sub>4</sub><sup>+</sup> < NH<sub>3</sub> < CO<sub>2</sub>                      (4) H<sub>2</sub>O < NH<sub>4</sub><sup>+</sup> = NH<sub>3</sub> < CO<sub>2</sub>

**Answer (2)**

82. Match **List-I** with **List-II** :

<b>List-I</b> <b>(Reaction)</b>	<b>List-II</b> <b>(Product formed)</b>
(a) Gabriel synthesis	(i) Benzaldehyde
(b) Kolbe synthesis	(ii) Ethers
(c) Williamson synthesis	(iii) Primary amines
(d) Etard reaction	(iv) Salicylic acid

Choose the **correct answer** from the options given below:

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

**Answer (1)**

83. If first ionization enthalpies of elements X and Y are  $419 \text{ kJ mol}^{-1}$  and  $590 \text{ kJ mol}^{-1}$ , respectively and second ionization enthalpies of X and Y are  $3069 \text{ kJ mol}^{-1}$  and  $1145 \text{ kJ mol}^{-1}$ , respectively. Then **correct** statement is :

- (1) Both X and Y are alkaline earth metals
- (2) X is an alkali metal and Y is an alkaline earth metal
- (3) X is an alkaline earth metal and Y is an alkali metal
- (4) Both X and Y are alkali metals

**Answer (2)**

84. The **incorrect** statement about denaturation of proteins is :

- (1) Uncoiling of the helical structure takes place
- (2) It results due to change of temperature and/or pH
- (3) It results in loss of biological activity of proteins
- (4) A protein is formed from amino acids linked by peptide bonds

**Answer (4)**

85. Four gas cylinders containing He,  $\text{N}_2$ ,  $\text{CO}_2$  and  $\text{NH}_3$  gases separately are gradually cooled from a temperature of 500 K. Which gas will liquify first?

(Given  $T_c$  in K – He : 5.3,  $\text{N}_2$  : 126,  $\text{CO}_2$  : 304.1 and  $\text{NH}_3$  : 405.5)

- |                   |                   |
|-------------------|-------------------|
| (1) $\text{NH}_3$ | (2) He            |
| (3) $\text{N}_2$  | (4) $\text{CO}_2$ |

**Answer (1)**

## SECTION-B

86. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A):** The metal carbon bond in metal carbonyls possesses both  $\sigma$  and  $\pi$  character.

**Reason (R):** The ligand to metal bond is a  $\pi$  bond and metal to ligand bond is a  $\sigma$  bond.

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

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

**Answer (4)**

87. Match **List - I** with **List - II** :

**List - I**

- (a) Biochemical oxygen demand
- (b) Photochemical smog
- (c) Classical smog
- (d) Ozone layer depletion

**List - II**

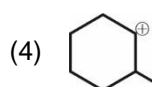
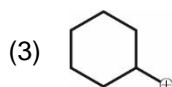
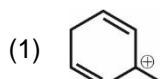
- (i) oxidising mixture
- (ii) polar stratospheric cloud
- (iii) organic matter in water
- (iv) reducing mixture

Choose the **correct answer** from the options given below:

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

**Answer (4)**

88. Which of the following is the most stable carbocation?



**Answer (1)**

89. Given below are two statements :

**Statement I :**  $\text{Cr}^{2+}$  is oxidising and  $\text{Mn}^{3+}$  is reducing in nature.

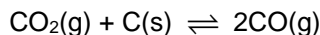
**Statement II :**  $\text{Sc}^{3+}$  compounds are repelled by the applied magnetic field.

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

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

**Answer (1)**

90.  $K_p$  for the following reaction is 3.0 at 1000 K.



What will be the value of  $K_c$  for the reaction at the same temperature?

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

- (1) 3.6 (2) 0.36  
(3)  $3.6 \times 10^{-2}$  (4)  $3.6 \times 10^{-3}$

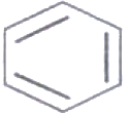
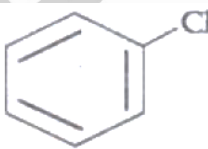
**Answer (3)**

91. A vessel contains 3.2 g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is: (Given-molar volume at STP is 22.4 L)

- (1) 67.2 (2) 6.72  
(3) 2.24 (4) 22.4

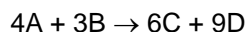
**Answer (2)**

92. Which one of the following reaction sequence is **incorrect** method to prepare phenol?

- (1) , oleum, NaOH,  $\text{H}_3\text{O}^+$  (2) Aniline,  $\text{NaNO}_2 + \text{HCl}$ ,  $\text{H}_2\text{O}$ , heating  
(3) Cumene,  $\text{O}_2$ ,  $\text{H}_3\text{O}^+$  (4) , NaOH, STP condition

**Answer (4)**

93. For a chemical reaction

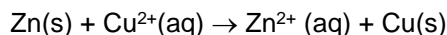


Rate of formation of C is  $6 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$  and rate of disappearance of A is  $4 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ . The rate of reaction and amount of B consumed in interval of 10 seconds, respectively will be:

- (1)  $10 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$  and  $30 \times 10^{-2} \text{ mol L}^{-1}$  (2)  $1 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$  and  $30 \times 10^{-2} \text{ mol L}^{-1}$   
(3)  $10 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$  and  $10 \times 10^{-2} \text{ mol L}^{-1}$  (4)  $1 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$  and  $10 \times 10^{-2} \text{ mol L}^{-1}$

**Answer (2)**

94. Standard electrode potential for the cell with cell reaction

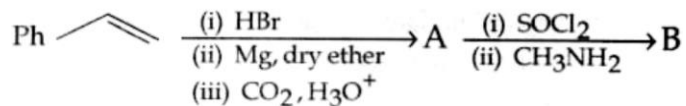


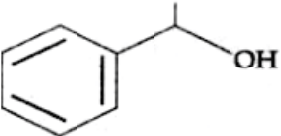
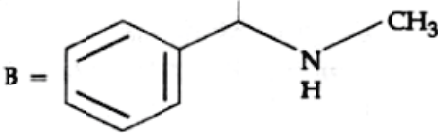
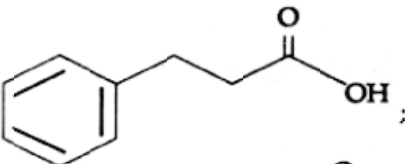
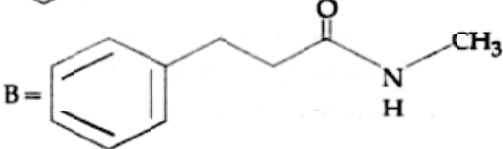
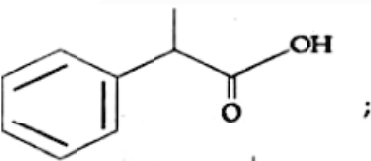
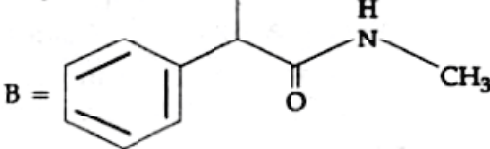
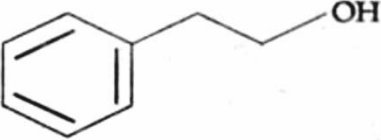
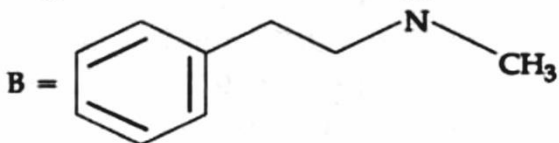
is 1.1 V. Calculate the standard Gibbs energy change for the cell reaction. (Given  $F = 96487 \text{ C mol}^{-1}$ )

- (1)  $-200.27 \text{ J mol}^{-1}$  (2)  $-200.27 \text{ kJ mol}^{-1}$   
(3)  $-212.27 \text{ kJ mol}^{-1}$  (4)  $-212.27 \text{ J mol}^{-1}$

**Answer (3)**

95. The products A and B in the following reaction sequence are:



- (1) A =  ;  
 B = 
- (2) A =  ;  
 B = 
- (3) A =  ;  
 B = 
- (4) A =  ;  
 B = 

**Answer (3)**

96. Which one of the following is not a calcination reaction?

- (1)  $\text{CaCO}_3 + 2\text{HCl} \xrightarrow{\Delta} \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$       (2)  $\text{ZnCO}_3 \xrightarrow{\Delta} \text{ZnO} + \text{CO}_2$   
 (3)  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O} \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + x\text{H}_2\text{O}$       (4)  $\text{CaCO}_3 \cdot \text{MgCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{MgO} + 2\text{CO}_2$

**Answer (1)**

97. The incorrect method for the synthesis of alkenes is

- |   |   |
|---|---|
| (1) Treating vicinal dihalides with Zn metal          | (2) Treating of alkynes with Na in liquid $\text{NH}_3$ |
| (3) Heating alkyl halides with alcoholic KOH solution | (4) Treating alkyl halides in aqueous KOH solution      |

**Answer (4)**

98. When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of  $1.68 \times 10^5 \text{ J mol}^{-1}$ . What is the minimum energy needed to remove an electron from the metal?

( $h = 6.626 \times 10^{-34} \text{ Js}$ ,  $c = 3 \times 10^8 \text{ ms}^{-1}$ ,  $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$ )

- |   |   |
|---|---|
| (1) $2.31 \times 10^5 \text{ J mol}^{-1}$ | (2) $2.31 \times 10^6 \text{ J mol}^{-1}$     |
| (3) $3.84 \times 10^4 \text{ J mol}^{-1}$ | (4) $3.84 \times 10^{-19} \text{ J mol}^{-1}$ |

**Answer (1)**

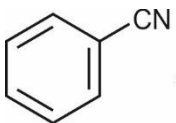
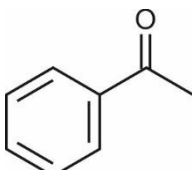
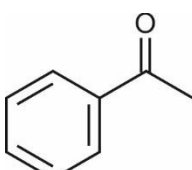
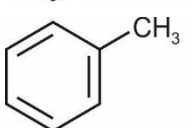
99. What fraction of Fe exists as Fe(III) in  $\text{Fe}_{0.96}\text{O}$ ?

(Consider  $\text{Fe}_{0.96}\text{O}$  to be made up of Fe(II) and Fe(III) only)

- (1)  $\frac{1}{20}$   
 (2)  $\frac{1}{12}$   
 (3) 0.08  
 (4)  $\frac{1}{16}$

**Answer (2)**

100. The incorrect method to synthesize benzaldehyde is

- (1) ,  $\text{CH}_3\text{MgBr}$ , followed by  $\text{H}_3\text{O}^+$
- (2) ,  $\text{H}_2$ , Pd-BaSO<sub>4</sub>
- (3) , DIBAL-H, followed by  $\text{H}_2\text{O}$
- (4) ,  $\text{CrO}_2\text{Cl}_2$ , followed by  $\text{H}_3\text{O}^+$  in  $\text{CS}_2$

**Answer (1)**

**BOTANY****SECTION-A**

101. Given below are two statements :

**Statement I** : Sickle cell anaemia and Haemophilia are autosomal dominant traits.

**Statement II** : Sickle cell anaemia and Haemophilia are disorders of the blood.

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

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

**Answer (1)**

102. Which stage of meiosis can last for months or years in the oocytes of some vertebrates?

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

**Answer (4)**

103. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A)**: When a particular restriction enzyme cuts strand of DNA, overhanging stretches or sticky ends are formed.

**Reason (R)**: Some restriction enzymes cut the strand of DNA a little away from the centre of palindromic site.

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

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

**Answer (2)**

104. Give the **correct** descending order of organisms with reference to their estimated number found in Amazon forest.

- (a) Plants
- (b) Invertebrates
- (c) Fishes
- (d) Mammals
- (e) Birds

Choose the **correct** answer from the options given below :

- (1) (b) > (a) > (c) > (e) > (d)
- (2) (a) > (b) > (e) > (d) > (c)
- (3) (a) > (c) > (d) > (b) > (e)
- (4) (b) > (a) > (e) > (d) > (c)

**Answer (1)**

105. In *lac* operon, *z* gene codes for

- |                    |                            |
|--------------------|----------------------------|
| (1) Transacetylase | (2) $\beta$ -galactosidase |
| (3) Permease       | (4) Repressor              |

**Answer (2)**

106. The 5-C compound formed during TCA cycle is

- |                         |                                 |
|-------------------------|---------------------------------|
| (1) Fumaric acid        | (2) $\alpha$ -ketoglutaric acid |
| (3) Oxalo succinic acid | (4) Succinic acid               |

**Answer (2)**

107. In meiosis, crossing over and exchange of genetic material between homologous chromosomes are catalyzed by the enzyme

- |                 |                   |
|-----------------|-------------------|
| (1) Polymerase  | (2) Phosphorylase |
| (3) Recombinase | (4) Transferase   |

**Answer (3)**

108. All successions irrespective of the habitat proceed to which type of climax community?

- |             |                 |
|-------------|-----------------|
| (1) Edaphic | (2) Xeric       |
| (3) Mesic   | (4) Hydrophytic |

**Answer (3)**

109. When a carrier protein facilitates the movement of two molecules across the membrane in same direction, it is called

- |               |              |
|---------------|--------------|
| (1) Symport   | (2) Uniport  |
| (3) Transport | (4) Antiport |

**Answer (1)**

110. When one  $\text{CO}_2$  molecule is fixed as one molecule of triose phosphate, which of the following photochemically made, high energy chemical intermediates are used in the reduction phase?

- (1) 2 ATP + 2 NADPH
- (2) 1 ATP + 1 NADPH
- (3) 1 ATP + 2 NADPH
- (4) 2 ATP + 1 NADPH

**Answer (1)**

111. The ability of plants to follow different pathways in response to environment leading to formation of different kinds of structures is called

- (1) Differentiation
- (2) Redifferentiation
- (3) Development
- (4) Plasticity

**Answer (4)**

112. Match List-I with List-II

List-I	List-II
(a) <i>Chlamydomonas</i>	(i) Moss
(b) <i>Cycas</i>	(ii) Pteridophyte
(c) <i>Selaginella</i>	(iii) Alga
(d) <i>Sphagnum</i>	(iv) Gymnosperm

Choose the **correct** answer from the options given below

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

**Answer (3)**

113. Interfascicular cambium is present between

- (1) Secondary xylem and secondary phloem
- (2) Primary xylem and primary phloem
- (3) Pericycle and endodermis
- (4) Two vascular bundles

**Answer (4)**

114. Which of the following growth regulators is an adenine derivative?

- (1) Absciscic acid
- (2) Auxin
- (3) Cytokinin
- (4) Ethylene

**Answer (3)**

115. The chromosomal theory of inheritance was proposed by

- (1) Robert Brown
- (2) Thomas Morgan
- (3) Sutton and Boveri
- (4) Gregor Mendel

**Answer (3)**

116. Which of the following statement is **not** correct?

- (1) The rhizome is thick, prostrate and branched
- (2) Rhizome is a condensed form of stem
- (3) The apical bud in rhizome always remains above the ground
- (4) The rhizome is aerial with no distinct nodes and internodes

**Answer (4)**

117. The Phenomenon by which the undividing parenchyma cells start to divide mitotically during plant tissue culture is called as

- (1) Secondary growth
- (2) Differentiation
- (3) Dedifferentiation
- (4) Redifferentiation

**Answer (3)**

118. Match **List-I** with **List-II**

<b>List-I</b>	<b>List-II</b>
(a) Adenine	(i) Pigment
(b) Anthocyanin	(ii) Polysaccharide
(c) Chitin	(iii) Alkaloid
(d) Codeine	(iv) Purine

Choose the **correct answer** from the options given below

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

**Answer (2)**

119. The residual persistent part which forms the perisperm in the seeds of beet is

- |                |              |
|----------------|--------------|
| (1) Integument | (2) Calyx    |
| (3) Endosperm  | (4) Nucellus |

**Answer (4)**

120. The World Summit on sustainable development held in 2002 in Johannesburg, South Africa pledged for

- (1) Collection and preservation of seeds of different genetic strains of commercially important plants.
- (2) A significant reduction in the current rate of biodiversity loss.
- (3) Declaration of more biodiversity hotspots.
- (4) Increase in agricultural production.

**Answer (2)**

121. The type of tissue commonly found in the fruit wall of nuts is :

- |                 |                  |
|-----------------|------------------|
| (1) Sclereid    | (2) Parenchyma   |
| (3) Collenchyma | (4) Sclerenchyma |

**Answer (1)**

122. The pioneer species in a hydrarch succession are

- |                             |                               |
|-----------------------------|-------------------------------|
| (1) Filamentous algae       | (2) Free-floating angiosperms |
| (3) Submerged rooted plants | (4) Phytoplanktons            |

**Answer (4)**

123. Which of the following protects nitrogenase inside the root nodule of a leguminous plant?

- (1) Glutamate dehydrogenase
- (2) Catalase
- (3) *leg* haemoglobin
- (4) Transaminase

**Answer (3)**

124. Given below are two statements

**Statement I:**

DNA polymerases catalyse polymerisation only in one direction, that is  $5' \rightarrow 3'$ .

**Statement II:**

During replication of DNA, on one strand the replication is continuous while on other strand it is discontinuous.

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

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

**Answer (2)**

125. The species that come to appear in bare area are called

- (1) Species of seral community
- (2) Pioneer species
- (3) Invasive species
- (4) Competitive species

**Answer (2)**

126. Initiation of lateral roots and vascular cambium during secondary growth takes place in cells of

- (1) Pericycle
- (2) Epiblema
- (3) Cortex
- (4) Endodermis

**Answer (1)**

127. Match **List - I** with **List - II**.

	List - I		List - II
(a)	In <i>lac</i> operon <i>i</i> gene codes for	(i)	transacetylase
(b)	In <i>lac</i> operon <i>z</i> gene codes for	(ii)	permease
(c)	In <i>lac</i> operon <i>y</i> gene codes for	(iii)	$\beta$ -galactosidase
(d)	In <i>lac</i> operon <i>a</i> gene codes for	(iv)	Repressor

Choose the **correct answer** from the options given below

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

**Answer (3)**

128. To ensure that only the desired pollens fall on the stigma in artificial hybridization process
- the female flower buds of plant producing unisexual flowers need not be bagged.
  - there is no need to emasculate unisexual flowers of selected female parent
  - emasculated flowers are to be bagged immediately after cross pollination
  - emasculated flowers are to be bagged after removal of anthers
  - bisexual flowers, showing protogyny are never selected for cross

Choose the **correct answer** from the options given belows

- (a), (d) and (e) only
- (a), (b) and (c) only
- (b), (c) and (d) only
- (b), (c) and (e) only

**Answer (3)**

129. The ascent of xylem sap in plants is mainly accomplished by the
- root pressure
  - size of the stomatal aperture
  - distribution of stomata on the upper and lower epidermis
  - cohesion and adhesion between water molecules

**Answer (4)**

130. Match **List - I** with **List - II**.

	List - I		List - II
(a)	Imbricate	(i)	<i>Calotropis</i>
(b)	Valvate	(ii)	<i>Cassia</i>
(c)	Vexillary	(iii)	Cotton
(d)	Twisted	(iv)	Bean

Choose the **correct answer** from the options given below

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

**Answer (3)**

131. The number of time(s) decarboxylation of isocitrate occurs during single TCA cycle is

- Four
- One
- Two
- Three

**Answer (3)**

132. Match List-I with List-II

	List-I		List-II
(a)	Porins	(i)	Pink coloured nodules
(b)	leg haemoglobin	(ii)	Lumen of thylakoid
(c)	H <sup>+</sup> accumulation	(iii)	Amphibolic pathway
(d)	Respiration	(iv)	Huge pores in outer membrane of mitochondria

Choose the **correct** answer from the options given below.

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

**Answer (3)**

133. Separation of DNA fragments is done by a technique known as

- (1) Gel electrophoresis
- (2) Polymerase Chain Reaction
- (3) Recombinant technology
- (4) Southern blotting

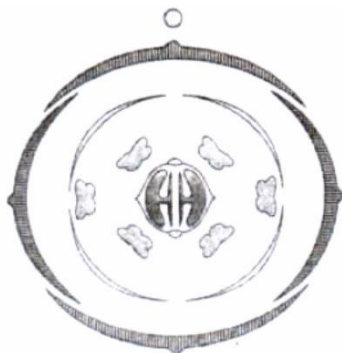
**Answer (1)**

134. In general the egg apparatus of embryo sac in angiosperm consists of

- (1) One egg cell, two synergids, two antipodal cells, two Polar nuclei
- (2) One egg cell, two synergids, three antipodal cells, two Polar nuclei
- (3) One egg cell, two synergids, two antipodal cells, three Polar nuclei
- (4) One egg cell, three synergids, two antipodal cells, two Polar nuclei

**Answer (2)**

135. The Floral Diagram represents which one of the following families?



- (1) Liliaceae                      (2) Fabaceae
- (3) Brassicaceae                      (4) Solanaceae

**Answer (3)**

**SECTION-B**

136. Primary proteins are also called as polypeptides because:

- (1) They can assume many conformations
- (2) They are linear chains
- (3) They are polymers of peptide monomers
- (4) Successive amino acids are joined by peptide bonds

**Answer (4)**

137. Match List-I with List-II:

	List-I		List-II
(a)	Bacteriophage $\phi \times 174$	(i)	48502 base pairs
(b)	Bacteriophage lambda	(ii)	5386 nucleotides
(c)	<i>Escherichia coli</i>	(iii)	$3.3 \times 10^9$ base pairs
(d)	Haploid content of human DNA	(iv)	$4.6 \times 10^6$ base pairs

Choose the **correct** answer from the options given below:

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

**Answer (4)**

138. Which type of substance would face difficulty to pass through the cell membrane?

- (1) Substance soluble in lipids
- (2) Substance with hydrophobic moiety
- (3) Substance with hydrophilic moiety
- (4) All substance irrespective of hydrophobic and hydrophilic moiety

**Answer (3)**

139. What is the expected percentage of  $F_2$  progeny with yellow and inflated pod in dihybrid cross experiment involving pea plants with green coloured, inflated pod and yellow coloured constricted pod?

- (1) 9%
- (2) 100%
- (3) 56.25%
- (4) 18.75%

**Answer (4)**

140. Match List-I with List-II:

	List-I		List-II
(a)	Carbon dissolved in oceans	(i)	55 billion tons
(b)	Annual fixation of carbon through photosynthesis	(ii)	71%
(c)	PAR captured by plants	(iii)	$4 \times 10^3$ kg
(d)	Productivity of oceans	(iv)	2 to 10%

Choose the **correct** answer from the options given below:

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

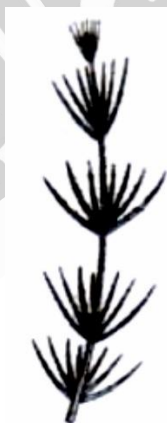
**Answer (4)**

141. If a female individual is with small round head, furrowed tongue, partially open mouth and broad palm with characteristic palm crease. Also the physical, psychomotor and mental development is retarded. The karyotype analysis of such an individual will show :

- (1) Trisomy of chromosome 21  
 (2) 47 chromosomes with XXY sex chromosomes  
 (3) 45 chromosomes with XO sex chromosomes  
 (4) 47 chromosomes with XYY sex chromosomes

**Answer (1)**

142. Read the following statements and identify the characters related to the alga shown in the diagram :



- (a) It is a member of Chlorophyceae  
 (b) Food is stored in the form of starch  
 (c) It is monoecious plant showing oogonium and antheridium  
 (d) Food is stored in the form of laminarin or mannitol  
 (e) It shows dominance of pigments Chlorophyll a, c and Fucoxanthin

Choose the **correct answer** from the options given below :

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

**Answer (3)**

143. Match the **List-I** with **List-II** :

<b>List-I</b>	<b>List-II</b>
(a) Sacred groves	(i) Alien species
(b) Zoological park	(ii) Release of large quantity of oxygen
(c) Nile perch	(iii) <i>Ex-situ</i> conservation
(d) Amazon forest	(iv) Khasi Hills in Meghalaya

Choose the **correct answer** from the options given below :

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

**Answer (2)**

144. The enzyme (a) is needed for isolating genetic material from plant cells and enzyme (b) for isolating genetic material from fungus. Choose the **correct** pair of options from the following :

- (1) (a) Cellulase (b) Lipase
- (2) (a) Cellulase (b) Protease
- (3) (a) Cellulase (b) Chitinase
- (4) (a) Chitinase (b) Lipase

**Answer (3)**

145. Identify the **correct** sequence of events during Prophase I of meiosis:

- (a) Synapsis of homologous chromosomes
- (b) Chromosomes become gradually visible under microscope
- (c) Crossing over between non-sister chromatids of homologous chromosomes
- (d) Terminalisation of chiasmata
- (e) Dissolution of synaptonemal complex

Choose the **correct answer** from the options given below:

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

**Answer (4)**

146. Which of the following pair represents free living nitrogen fixing aerobic bacteria?

- (1) *Pseudomonas* and *Thiobacillus*
- (2) *Rhizobium* and *Frankia*
- (3) *Azotobacter* and *Beijernickia*
- (4) *Anabaena* and *Rhodospirillum*

**Answer (3)**

147. Frugivorous birds are found in large numbers in tropical forests mainly because of :

- (1) Temperature conducive for their breeding
- (2) Lack of niche specialisation
- (3) Higher annual rainfall
- (4) Availability of fruits throughout the year

**Answer (4)**

148. Identify the **correct** statements regarding chemiosmotic hypothesis:

- (a) Splitting of the water molecule takes place on the inner side of the membrane.
- (b) Protons accumulate within the lumen of the thylakoids.
- (c) Primary acceptor of electron transfers the electrons to an electron carrier.
- (d) NADP reductase enzyme is located on the stroma side of the membrane.
- (e) Protons increase in number in stroma.

Choose the **correct answer** from the options given below:

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

**Answer (3)**

149. Match **List-I** with **List-II**:

	List-I		List-II
(a)	Gene gun	(i)	Replacement of a faulty gene by a normal healthy gene
(b)	Gene therapy	(ii)	Used for transfer of gene
(c)	Gene cloning	(iii)	Total DNA in the cells of an organism
(d)	Genome	(iv)	To obtain identical copies of a particular DNA molecule

Choose the correct answer from the options given below:

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

**Answer (2)**

150. Which of the following can be expected if scientists succeed in introducing apomictic gene into hybrid varieties of crops?

- (1) There will be segregation of the desired characters only in the progeny
- (2) Polyembryony will be seen and each seed will produce many plantlets
- (3) Seeds of hybrid plants will show longer dormancy
- (4) Farmers can keep on using the seeds produced by the hybrids to raise new crop year after year

**Answer (4)**

## ZOOLOGY

### SECTION-A

151. Which of the following animals has three chambered heart?

- |                        |                      |
|------------------------|----------------------|
| (1) <i>Pteropus</i>    | (2) <i>Scoliodon</i> |
| (3) <i>Hippocampus</i> | (4) <i>Chelone</i>   |

**Answer (4)**

152. Which of the following types of epithelium is present in the bronchioles and Fallopian tubes?

- |                                    |                                |
|------------------------------------|--------------------------------|
| (1) Stratified squamous epithelium | (2) Simple squamous epithelium |
| (3) Simple columnar epithelium     | (4) Ciliated epithelium        |

**Answer (4)**

153. Which of the following is **not** an Intra Uterine Device?

- |                   |                  |
|-------------------|------------------|
| (1) Progestasert  | (2) Progestogens |
| (3) Multiload 375 | (4) Lippes loop  |

**Answer (2)**

154. Match **List-I** with **List-II**

- | <b>List-I</b>            | <b>List-II</b> |
|--------------------------|----------------|
| (a) <i>Chlamydomonas</i> | (i) Conidia    |
| (b) <i>Penicillium</i>   | (ii) Zoospores |
| (c) <i>Hydra</i>         | (iii) Gemmules |
| (d) Sponge               | (iv) Buds      |

Choose the **correct answer** from the options given below

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

**Answer (3)**

155. Which of the following reasons is mainly responsible for graft rejection in transplantation of organs?

- (1) Cell-mediated response
- (2) Inability of recipient to differentiate between 'self' and 'non-self' tissues/cells
- (3) Humoral immune response only
- (4) Auto-immune response

**Answer (1)**

156. Bivalent or Tetrad formation is a characteristic feature observed during

- |                                  |   |
|----------------------------------|---|
| (1) Chiasmata in zygotene stage  | (2) Synaptonemal complex in zygotene stage  |
| (3) Chiasmata in Diplotene stage | (4) Synaptonemal complex in Pachytene stage |

**Answer (2)**

157. Give below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A):** FSH which interacts with membrane bound receptors does not enter the target cell.

**Reason (R):** Binding of FSH to its receptors generates second messenger (cyclic AMP) for its biochemical and physiological responses.

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

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

**Answer (3)**

158. Choose the correct statement about a muscular tissue

- (1) Smooth muscles are multinucleated and involuntary.
- (2) Skeletal muscle fibres are uninucleated and found in parallel bundles.
- (3) Intercalated discs allow the cardiac muscle cells to contract as a unit.
- (4) The walls of blood vessels are made up of columnar epithelium.

**Answer (3)**

159. Identify the region of human brain which has pneumotaxic centre that alters respiratory rate by reducing the duration of inspiration.

- |              |              |
|--------------|--------------|
| (1) Cerebrum | (2) Medulla  |
| (3) Pons     | (4) Thalamus |

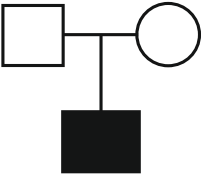



**Answer (3)**

160. The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis is called

- |                            |                              |
|----------------------------|------------------------------|
| (1) Net primary production | (2) Secondary production     |
| (3) Primary production     | (4) Gross primary production |

**Answer (4)**

161. Select the **incorrect** match regarding the symbols used in Pedigree analysis:

- |   |  |
|---|--|
| (1)  | – Parent with male child affected with disease |
| (2)  | – Sex unspecified                              |
| (3)  | – Affected individual                          |
| (4)  | – Consanguineous mating                        |

**Answer (4)**

162. If the pH in lysosomes is increased to alkaline, what will be the outcome?

- (1) Lysosomal enzymes will be more active
- (2) Hydrolytic enzymes will function more efficiently
- (3) Hydrolytic enzymes will become inactive
- (4) Lysosomal enzymes will be released into the cytoplasm

**Answer (3)**

163. According to the sliding filament theory:
- (1) The actin filaments slide away from A-band resulting in shortening of sarcomere.
  - (2) Actin and myosin filaments slide over each other to increase the length of the sarcomere.
  - (3) Length of A-band does not change
  - (4) I-band increases in length.

**Answer (3)**

164. Pathogenic bacteria gain resistance to antibiotics due to changes in their:
- (1) Nucleoid
  - (2) Cosmids
  - (3) Plasmids
  - (4) Nucleus

**Answer (3)**

165. Panspermia, an idea that is still a favourite for some astronomers, means:
- (1) Transfer of spores as unit of life from other planets to Earth
  - (2) Creation of life from dead and decaying matter
  - (3) Creation of life from chemicals
  - (4) Origin of sperm in human testes

**Answer (1)**

166. Why CNG is considered better fuel than diesel?

- (a) It can not be adulterated.
- (b) It takes less time to fill the fuel tank
- (c) It burns more efficiently.
- (d) It is cheaper.
- (e) It is less inflammable.

Choose the **most appropriate** answer from the options given below :

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

**Answer (3)**

167. Which of the following statements are correct with respect to vital capacity?

- (a) It includes ERV, TV and IRV
- (b) Total volume of air a person can inspire after a normal expiration.
- (c) The maximum volume of air a person can breathe in after forced expiration.
- (d) It includes ERV, RV and IRV.
- (e) The maximum volume of air a person can breath out after a forced inspiration.

Choose the **most appropriate** answer from the options given below :

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

**Answer (4)**

168. How many secondary spermatocytes are required to form 400 million spermatozoa?

- (1) 400 million
- (2) 50 million
- (3) 100 million
- (4) 200 million

**Answer (4)**

169. Mad cow disease in cattle and Cr Jacob disease in humans are due to infection by \_\_\_\_\_.

- (1) Prion (2) Bacterium  
(3) Virus (4) Viroid

**Answer (1)**

170. Arrange the components of mammary gland. (from proximal to distal).

- (a) Mammary duct  
(b) Lactiferous duct  
(c) Alveoli  
(d) Mammary ampulla  
(e) Mammary tubules

Choose the **most appropriate** answer from the options given below :

- (1) (e) → (c) → (d) → (b) → (a) (2) (c) → (a) → (d) → (e) → (b)  
(3) (b) → (c) → (e) → (d) → (a) (4) (c) → (e) → (a) → (d) → (b)

**Answer (4)**

171. Western Ghats have a large number of plants and animal species that are not found anywhere else. Which of the following term is used to notify such species?

- (1) Vulnerable species (2) Threatened species  
(3) Keystone species (4) Endemic species

**Answer (4)**

172. Match **List-I** with **List-II** regarding the organs of Cockroach:

- | <b>List-I</b>          | <b>List-II</b>                     |
|------------------------|------------------------------------|
| (a) Crop               | (i) Grinding the food particles    |
| (b) Proventriculus     | (ii) Secretion of digestive juice  |
| (c) Hepatic caecae     | (iii) Removal of nitrogenous waste |
| (d) Malpighian tubules | (iv) Storage of food               |

Choose the **correct answer** from the options given below :

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

**Answer (2)**

173. Two butterfly species are competing for the same nectar of a flower in a garden. To survive and coexist together, they may avoid competition in the same garden by :

- (1) Predating on each other (2) Feeding at the same time  
(3) Choosing different foraging patterns (4) Increasing time spent on attacking each other

**Answer (3)**

174. Role of enamel is to

- (1) Give basic shape to the teeth (2) Connect crown of tooth with its root  
(3) Masticate the food (4) Form bolus

**Answer (3)**

175. Choose the **incorrect** enzymatic reaction:

- (1) Dipeptides  $\xrightarrow{\text{Dipeptidases}}$  Amino acids (2) Maltose  $\xrightarrow{\text{Maltase}}$  Glucose + Fructose  
(3) Sucrose  $\xrightarrow{\text{Sucrase}}$  Glucose + Fructose (4) Lactose  $\xrightarrow{\text{Lactase}}$  Glucose + Galactose

**Answer (2)**

176. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A):** During pregnancy the level of thyroxine is increased in the maternal blood.

**Reason (R):** Pregnancy is characterised by metabolic changes in the mother.

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

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

**Answer (2)**

177. Choose the **correct** statements:

- (a) Bones support and protect softer tissues and organs
- (b) Weight bearing function is served by limb bones
- (c) Ligament is the site of production of blood cells.
- (d) Adipose tissue is specialised to store fats.
- (e) Tendons attach one bone to another.

Choose the most appropriate answer from the options given below:

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

**Answer (2)**

178. If DNA contained sulfur instead of phosphorus and proteins contained phosphorus instead of sulfur, what would have been the outcome of Hershey and Chase experiment?

- (1) Radioactive phosphorus in bacterial cells
- (2) No radioactive sulfur in bacterial cells
- (3) Both radioactive sulfur and phosphorus in bacterial cells
- (4) Radioactive sulfur in bacterial cells

**Answer (4)**

179. Select the **incorrect** statements with respect to Cyclostomes:

- (a) They lack scales and paired fins.
- (b) They have circular mouth with jaws.
- (c) They bear 6-15 pairs of gills.
- (d) They migrate to deep sea for spawning.

Choose the most appropriate answer from the options given below:

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

**Answer (4)**

180. A unique vascular connection between the digestive tract and liver is called\_\_\_\_\_.

- (1) Hepato-cystic system
- (2) Hepato-pancreatic system
- (3) Hepatic portal system
- (4) Renal portal system

**Answer (3)**

181. Milk of transgenic 'Cow Rosie' was nutritionally more balanced product for human babies than natural cow milk because it contained:
- (1) Human enzyme Adenosine Deaminase (ADA)    (2) Human protein  $\alpha$ -1-antitrypsin  
(3) Human alpha-lactalbumin    (4) Human insulin-like growth factor

**Answer (3)**

182. Gout is a type of disorder which leads to:
- (1) Weakening of bones due to low calcium level  
(2) Inflammation of joints due to accumulation of uric acid crystals  
(3) Weakening of bones due to decreased bone mass  
(4) Inflammation of joints due to cartilage degeneration

**Answer (2)**

183. Which of the following methods is not commonly used for introducing foreign DNA into the plant cell?
- (1) Bacteriophages    (2) Agrobacterium mediated transformation  
(3) Gene gun    (4) 'Disarmed pathogen' vectors

**Answer (1)**

184. Given below are two statements:

**Statement I** : Amino acids have a property of ionizable nature of  $-\text{NH}_2$  and  $-\text{COOH}$  groups, hence have different structures at different pH.

**Statement-II** : Amino acids can exist as Zwitterionic form at acidic and basic pH.

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

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

**Answer (4)**

185. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A)** : *Spirulina* is a microbe that can be used for reducing environmental pollution.

**Reason (R)** : *Spirulina* is a rich source of protein, carbohydrates, fats, minerals and vitamins.

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

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

**Answer (3)**

## SECTION-B

186. With respect to metaphase, which of the following statements is incorrect?
- (1) Chromosomes lie at the equator of the cell  
(2) Complete disintegration of nuclear envelope takes place  
(3) Chromosomes are highly condensed  
(4) Metaphase chromosomes are made up of four sister chromatids held together by centromere

**Answer (4)**

187. Against the codon 5' UAC 3', what would be the sequence of anticodon on tRNA?

- (1) 5' GUA 3'
- (2) 5' AUG 3'
- (3) 5' ATG 3'
- (4) 5' GTA 3'

**Answer (1)**

188. Arrange the following formed elements in the decreasing order of their abundance in blood in humans:

- |                  |                 |
|------------------|-----------------|
| (a) Platelets    | (b) Neutrophils |
| (c) Erythrocytes | (d) Eosinophils |
| (e) Monocytes    |                 |

Choose the **most appropriate** answer from the options given below:

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

**Answer (2)**

189. Which of the following are true about the taxonomical aid 'key'?

- (a) Keys are based on the similarities and dissimilarities.
- (b) Key is analytical in nature.
- (c) Keys are based on the contrasting characters in pair called couplet.
- (d) Same key can be used for all taxonomic categories.
- (e) Each statement in the key is called Lead.

Choose the most appropriate answer from the options given below:

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

**Answer (4)**

190. A normal girl, whose mother is haemophilic marries a male with no ancestral history of haemophilia. What will be the possible phenotypes of the offspring?

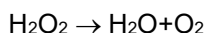
- (a) Haemophilic son and haemophilic daughter.
- (b) Haemophilic son and carrier daughter.
- (c) Normal daughter and normal son.
- (d) Normal son and haemophilic daughter.

Choose the **most appropriate** answer from the options given below:

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

**Answer (3)**

191. In the enzyme which catalyses the breakdown of:



the prosthetic group is:

- |            |                                       |
|------------|---------------------------------------|
| (1) Niacin | (2) Nicotinamide adenine dinucleotide |
| (3) Haem   | (4) Zinc                              |

**Answer (3)**

192. Select the **incorrect** statement with respect to inbreeding of animals.
- (1) It exposes harmful recessive genes that are eliminated by selection.
  - (2) It is used for evolving pure lines in cattle.
  - (3) It helps in accumulation of superior genes and elimination of less desirable genes.
  - (4) It decreases homozygosity.

**Answer (4)**

193. IUDs are small objects made up of plastic or copper that are inserted in the uterine cavity. Which of the following statements are correct about IUDs ?
- (a) IUDs decrease phagocytosis of sperm within the uterus.
  - (b) The released copper ions suppress the sperm motility.
  - (c) IUDs do not make the cervix hostile to the sperm.
  - (d) IUDs suppress the fertilization capacity of sperm.
  - (e) The IUDs require surgical intervention for their insertion in the uterine cavity.

Choose the **most appropriate** answer from the options given below:

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

**Answer (4)**

194. Select the correct statement regarding mutation theory of evolution.
- (1) Large differences due to mutations arise gradually in a population
  - (2) This theory was proposed by Alfred Wallace
  - (3) Variations are small directional changes
  - (4) Single step large mutation is a cause of speciation

**Answer (4)**

195. Excretion in cockroach is performed by all, EXCEPT:

- (1) Hepatic caeca
- (2) Urecose glands
- (3) Malpighian tubules
- (4) Fat body

**Answer (1)**

196. Select the **correct** statements.

- (a) Angiotensin II activates the cortex of adrenal gland to release aldosterone.
- (b) Aldosterone leads to increase in blood pressure.
- (c) ANF acts as a check on renin-angiotensin mechanism.
- (d) ADH causes vasodilation.
- (e) Vasopressin is released from adenohypophysis.

Choose the **most appropriate** answer from the options given below :

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

**Answer (1)**

197. If A and C make 30% and 20% of DNA, respectively, what will be the percentage composition of T and G?
- (1) T : 20%, G : 20%
  - (2) T : 20%, G : 30%
  - (3) T : 30%, G : 20%
  - (4) T : 30%, G : 30%

**Answer (3)**

198. Refer to the following statements for agarose-gel electrophoresis:
- (a) Agarose is a natural polymer obtained from sea-weed.
  - (b) The separation of DNA molecules in agarose-gel electrophoresis depends on the size of DNA.
  - (c) The DNA migrates from negatively-charged electrode to the positively-charged electrode
  - (d) The DNA migrates from positively-charged electrode to the negatively-charged electrode.

Choose the **most appropriate** answer from the options given below :

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

**Answer (3)**

199. Match **List-I** with **List - II** :

<b>List - I</b>	<b>List - II</b>
(a) Multipolar neuron	(i) Somatic neural system
(b) Bipolar neuron	(ii) Cerebral cortex
(c) Myelinated nerve fibre	(iii) Retina of Eye
(d) Unmyelinated nerve fibre	(iv) Spinal nerves

Choose the **correct answer** from the options given below :

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

**Answer (1)**

200. Match **List-I** with **List - II** :

<b>List - I</b>	<b>List - II</b>
(a) Cellular barrier	(i) Interferons
(b) Cytokine barrier	(ii) Mucus
(c) Physical barrier	(iii) Neutrophils
(d) Physiological barrier	(iv) HCl in gastric juice

Choose the **correct answer** from the options given below :

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

**Answer (1)**

