Test Booklet Code

S3

Infinity Learn by **Sri Chaitanya** Educational Institutions

Time : **3 hrs**.   Q. Paper, Answers & Solutions   Max. Marks : **720**

for **NEET (UG) – 2022**

Important Instructions :

1 The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with blue/ black ball point pen only.

2 The test is of **3 hours 20 minutes** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology). 50 questions** in each subject are divided into **two Sections (A and B)** as per details given below:

(a) **Section A** shall consist of 35 (Thirty-five) Questions in each subject (Question Nos - 1 to 35, 51 to 85 , 101 to 135 and 151 to 185). All questions are compulsory.
(b) **Section B** shall consist of 15 (Fifteen) questions in each subject (Question Nos –36 to 50,86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten) questions** out of **15 (Fifteen)** in each subject.

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.**

3 Each question carries **4 marks.** For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. **The maximum marks are 720**.

4 Use **Blue/Black Ball Point Pen** only for writing particulars on this page/ marking responses on Answer Sheet.

5 Rough work is to be done in the space provided for this purpose in the Test Booklet only.

6 On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy)** to the Invigilator before leaving the room/hall. **The candidates are allowed to take away this Test Booklet with them.**

7 **The CODE for this Booklet is S3**. Make sure that the CODE printed on the Original Copy of the Answer Sheet **is the same as that on this Test Booklet.** In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.

8 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.

9 Use of white fluid for correction is **NOT** permissible on the Answer Sheet.

10 Each candidate must show on-demand his/her Admit Card to the Invigilator.

11 No candidate, without special permission of the centre Superintendent or Invigilator, would leave his/her seat.

12 The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice. Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**

13 Use of Electronic/Manual Calculator is prohibited.

14 The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination.

15 **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**

16 The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

17 Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.

PHYSICS

SECTION - A

1. Two resistors of resistance, $100\,\Omega$ and $200\,\Omega$ are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in $100\,\Omega$ to that in $200\,\Omega$ in a given time is :
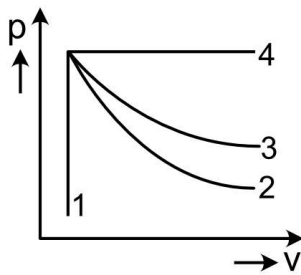
   (1) $1:4$

   (2) $4:1$

   (3) $1:2$

   (4) $2:1$

Ans. (4)

Sol. $P = \dfrac{V^2}{R}$

$\dfrac{P_{100}}{P_{200}} = \dfrac{R_{200}}{R_{100}} = 2:1$

2. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is :

   (1) 3

   (2) 4

   (3) 1

   (4) 2

Ans. (4)

Sol. The curve 2 represents adiabatic process.

3. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second:

   (1) $1:3:5:7$

   (2) $1:1:1:1$

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

   (4) $1:4:9:16$

Ans. (1)

Sol. Distance travelled in n^{th} second = $\dfrac{g}{2}(2n-1)$

$S_1 : S_2 : S_3 : S_4 = 1:3:5:7$

4. **Statement I** : Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

   Statement II : Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.

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

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

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

   (3) Both Statement I and Statement II are correct

   (4) Both Statement I and Statement II are incorrect

Ans. (1)

Sol. Statement I is correct, Statement II is wrong because Idl is a vector source while in case of coulomb law, charge is a scalar source.

5. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is

   (1) 20 N/kg

   (2) 180 N/kg

   (3) 0.05 N/kg

   (4) 50 N/kg

Ans. (4)

Sol. $E = \dfrac{F}{m} = \dfrac{3}{60 \times 10^{-3}} = \dfrac{3000}{60} = 50\ N/kg$

6. The peak voltage of the ac source is equal to

   (1) $\sqrt{2}$ times the rms value of the ac source

   (2) $1/\sqrt{2}$ times the rms value of the ac source

   (3) the value of voltage supplied to the circuit

   (4) the rms value of the ac source

Ans. (1)

Sol. $V_0 = \sqrt{2}\ V_{rms}$

7. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is:

(1) 36×10^5 J

(2) 1×10^5 J

(3) 36×10^7 J

(4) 36×10^4 J

Ans. (3)

Sol. Energy radiated = $100 \times 10^3 \times 3600 = 36 \times 10^7$

8. A copper wire of length 10 m and radius $\left(10^{-2} / \sqrt{\pi}\right)$m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is:

(1) 10^{-5} A / m^2

(2) 10^5 A / m^2

(3) 10^4 A / m^2

(4) 10^6 A / m^2

Ans. (2)

Sol. $J = \dfrac{El}{RA} = 10^5$ A / m^2

9. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be:

(1) 60 Hz

(2) 120 Hz

(3) zero

(4) 30 Hz

Ans. (1)

Sol. In Half wave rectifier output frequency = input frequency.

10. If a soap bubble expands, the pressure inside the bubble:

(1) remains the same

(2) is equal to the atmosphere pressure

(3) decreases

(4) increases

Ans. (3)

Sol. $P \propto \dfrac{1}{r}$ $r \uparrow$ $P \downarrow$

11. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is:

(1) 4 : 1

(2) $1 : \sqrt{2}$

(3) 2 : 1

(4) $\sqrt{2} : 1$

Ans. (4)

Sol. $\dfrac{MR^2}{2} = I$ (about its axis through the centre)

$K_1 = \dfrac{R}{\sqrt{2}}$

$\dfrac{MR^2}{4} = I'$ (about its diameter)

$K_2 = \dfrac{R}{2}$

$\dfrac{K_1}{K_2} = \sqrt{\dfrac{2}{1}}$

12. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is:

(1) $1 : \sqrt{2}$

(2) $1 : 2$

(3) $1 : 1$

(4) $\sqrt{2} : 1$

Ans. (1)

Sol. $v = \sqrt{\dfrac{T}{\mu}}$

So when tension is doubled, v becomes $\sqrt{2}$ times.

Hence, ratio = $1 : \sqrt{2}$

13. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with nelgigible mass. The distance of the center of mass of the system from the 10 kg mass is :

(1) 10 m

(2) 5 m

(3) $\dfrac{10}{3}$ m

(4) $\dfrac{20}{3}$ m

Ans. (4)

Sol. $x = \dfrac{2}{3} \times 10 = \dfrac{20}{3}$ m

14. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is:

(1)

(2)

(3)

(4)
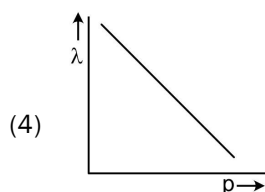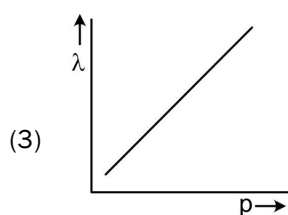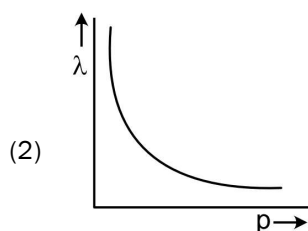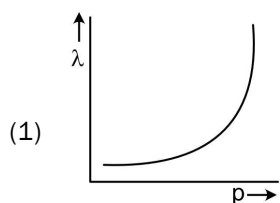
Ans. (2)

Sol. $\lambda = \dfrac{h}{p}$ $\lambda \propto \dfrac{1}{p}$

15. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is:

(1) 12.56×10^{-4} T

(2) 6.28×10^{-4} T

(3) 6.28×10^{-2} T

(4) 12.56×10^{-2} T

Ans. (4)

Sol. $B = \mu_0 ni = 4\pi \times 10^{-7} \times \dfrac{100}{10^{-3}} \times 1 = 12.56 \times 10^{-2}$ T

16. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60^0. The angle between the refracted and reflected rays would be:

(1) 90^0

(2) 120^0

(3) 30^0

(4) 60^0

Ans. (1)

Sol. Brewster's law $\tan 60^0 = \sqrt{3}$

17. A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2 : 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed υ, the speed of the third (lighter) fragments is

(1) $2\sqrt{2}\,\upsilon$

(2) $3\sqrt{2}\,\upsilon$

(3) υ

(4) $\sqrt{2}\,\upsilon$

Ans. (1)

Sol. $\sqrt{\left(\dfrac{2m}{5}v\right)^2 + \left(\dfrac{2m}{5}v\right)^2} = \dfrac{m}{5}v'$

$\sqrt{2}\dfrac{2}{5}v = \dfrac{v'}{5}$

$v' = 2\sqrt{2}\,v$

18. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is:

(1) 9

(2) 12

(3) 6

(4) 8

Ans. (2)

Sol. $600 \times 8 = 400 \times n$, where n is the number of fringes when wavelength = 400 nm.

n = 12

19. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1}. The fractional force opposing the motion is 3000 N. The minimum power delivered by the motor tot the lift in watts is : (g = 10 ms^{-2})

(1) 34500

(2) 23500

(3) 23000

(4) 20000

Ans. (1)

Sol. $P = (mg + f)v$

$= (2000 \times 10 + 3000)1.5$

23000×1.5

= 34500 N.
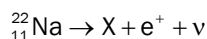
20. Plane angle and solid angle have :

(1) No units and no dimensions

(2) Both units and dimensions

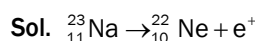(3) Units but no dimensions

(4) Dimensions but no units

Ans. (3)

Sol. Plane angle and solid angle have units but no dimensions.

21. In the given nuclear reaction, the element X is:

$^{22}_{11}\text{Na} \rightarrow X + e^+ + \nu$

(1) $^{22}_{10}\text{Ne}$

(2) $^{22}_{12}\text{Mg}$

(3) $^{23}_{11}\text{Na}$

(4) $^{23}_{10}\text{Ne}$

Ans. (1)

Sol. $^{23}_{11}\text{Na} \rightarrow ^{22}_{10}\text{Ne} + e^+$

22. When light propagates through a material medium of relative permittivity $\in_r$ and relative permeability μ_r, the velocity of light, υ is given by : (c - velocity of light in vacuum)

(1) $\upsilon = \sqrt{\dfrac{\in_r}{\mu_r}}$

(2) $\upsilon = \dfrac{c}{\sqrt{\in_r \mu_r}}$

(3) $\upsilon = c$

(4) $\upsilon = \sqrt{\dfrac{\mu_r}{\in_r}}$

Ans. (2)

Sol. $v = \dfrac{c}{\sqrt{\mu_r \in_r}}$

23. As the temperature increases, the electrical resistance:

(1) increases for conductors but decreases for semiconductors

(2) decreases for conductors but increases for semiconductors

(3) increases for both conductors and semiconductors

(4) decreases for both conductors and semiconductors

Ans. (1)

Sol. In case of conductor, resistance increases while it decreases in case of semiconductor.

24. The dimensions $\left[MLT^{-2}A^{-2} \right]$ belong to the :

(1) magnetic permeability

(2) electric permittivity

(3) magnetic flux

(4) self inductance

Ans. (1)

Sol. $[L] = \left[M^1 L^2 T^{-2} A^{-2} \right]$

$[\mu] = \left[M^1 L^1 T^{-2} A^{-2} \right]$

$[\varepsilon] = \left[M^{-1} L^{-3} T^4 A^2 \right]$

$[\phi] = \left[M^1 L^2 T^{-2} A^{-1} \right]$

25. The angle between the electric lines of force and the equipotential surface is

   (1) 90º

   (2) 180º

   (3) 0º

   (4) 45º

Ans. (1)

Sol. $\vec{E}$ is always perpendicular to equipotential surfaces.

26. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is:
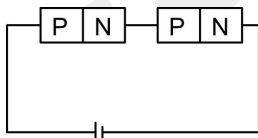
   (1) 4 : 9

   (2) 9 : 4

   (3) 1 : 4

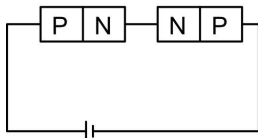   (4) 4 : 1

Ans. (2)

Sol. $E \propto \dfrac{1}{n^2}$

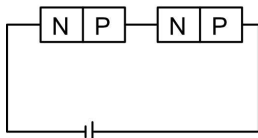   Hence, $\dfrac{T_1}{T_2} = \dfrac{9}{4}$

27.

   (a)

   (b)

   (c)

   In the given circuits (a), (b) and (c), the potential drop across

   (1) Circuit (c) only

   (2) Both circuits (a) and (c)

   (3) Circuit (a) only

   (4) Circuit (b) only

Ans. (2)

Sol. In the circuit (a) and (c) the potential drop across the two p-n junctions are equal, since both are in forward bias.

28. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is :

   (1) +5 D

   (2) infinity

   (3) +2 D

   (4) +20 D

Ans. (1)

Sol. $\dfrac{1}{f} = (\mu - 1)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

   $\Rightarrow \dfrac{1}{f} = 0.5 \times \left(\dfrac{2}{20}\right)$

   $\Rightarrow f = 20\ cm$

   $\Rightarrow P = +5\ D$

29. When two monochromatic lights of frequency, ν and $\dfrac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\dfrac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is:

   (1) $\dfrac{2}{3}\nu$

   (2) $\dfrac{3}{2}\nu$

   (3) 2ν

   (4) 3ν

Ans. (2)

30. A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (υ) as a function of time (t) is:
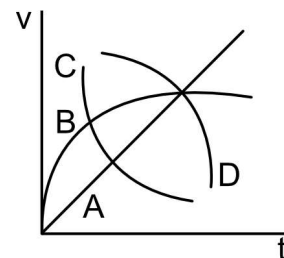
   (1) C

   (2) D

   (3) A

   (4) B

Ans. (4)

Sol. Speed of the ball increases and becomes constant after a while.

31. The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is:

(1) 12π

(2) 104π

(3) 2π

(4) 4π

Ans. (4)

Sol. $\alpha = \left(\dfrac{3120 - 1200}{16} \right) \times \dfrac{2\pi}{60}$

$\dfrac{1920}{16} \times \dfrac{2\pi}{60} = 4\pi$

32. A square loop of side 1 m and reistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux throug the loop is:

(1) 1 weber

(2) zero weber

(3) 2 weber

(4) 0.5 weber

Ans. (4)

Sol. $\phi = B.A = 0.5$ Wb

33. The displacement-time graphs of two moving particles make angles of 30º and 45º with the x-axis as shown in the figure. The ratio of their respective velocity is :
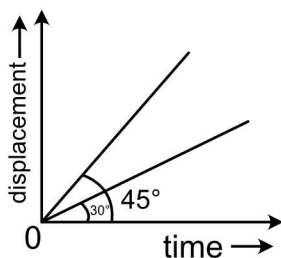
(1) 1:2

(2) $1 : \sqrt{3}$

(3) $\sqrt{3} : 1$

(4) 1:1

Ans. (2)

Sol. $\dfrac{V_1}{V_2} = \dfrac{\tan 30º}{\tan 45º} = \dfrac{1}{\sqrt{3}}$

34. Match List-I with List-II:

	List – I (Electromagneitc waves)		List – II (Wavelength)
a)	AM radio waves	i)	10^{-10} m
b)	Microwaves	ii)	10^2 m
c)	Infrared radiations	iii)	10^{-2} m
d)	X-rays	iv)	10^{-4} m

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

Ans. (2)

Sol. Option (2)

35. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be:

(1) equal on both the spheres

(2) dependent on the material property of the sphere

(3) more on bigger sphere

(4) more on smaller sphere

Ans. (4)

Sol. $V_{smaller} = kq \left(\dfrac{1}{R_1} + \dfrac{1}{R_2} \right)$

$V_{bigger} = \dfrac{2\,kq}{R_1}$

SECTION - B

36. A capacitor of capacitance C=900 pF is charged fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance C=900 pF as shown in figure (b). The electrostatic energy stored by the system (b) is:

(a) (b)
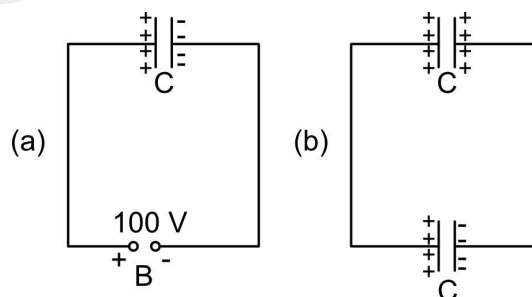
(1) 2.25×10^{-6} J

(2) 1.5×10^{-6} J

(3) 4.5×10^{-6} J

(4) 3.25×10^{-6} J

Ans. (1)

Sol. $U = \dfrac{\left(9 \times 10^{-10} \times 10^2 \right)^2}{2 \times 18 \times 10^{-10}} = 2.25 \times 10^{-6}$ J

37. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is :

    (1) 5.6×10^{-3} m³

    (2) 5.6 m³

    (3) 5.6×10^{6} m³

    (4) 5.6×10^{3} m³

Ans. (2)

Sol. Each mole will ouccupy 22.4 x 10^{-3} m³

No. of moles $= \dfrac{4500}{18}$

Volume $= 22.4 \times 10^{-3} \times \dfrac{4500}{18} = 5.6$ m³

38. Match List-I with List-II

	List – I		List – II
a)	Gravitational constant (G)	i)	$\left[L^2 T^{-2}\right]$
b)	Gravitational potential energy	ii)	$\left[M^{-1} L^3 T^{-2}\right]$
c)	Gravitational potential	iii)	$\left[LT^{-2}\right]$
d)	Gravitational intensity	iv)	$\left[ML^2 T^{-2}\right]$

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

Ans. (4)

Sol. Option (4)

39. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q:

40. The area of a rectangular field (in m²) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is :

    (1) 1382.5

    (2) 14×10^2

    (3) 138×10^1

    (4) 1382
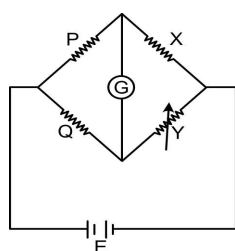
(1) should be very large and unequal

(2) do not play any significant role

(3) should be approximately equal to 2X

(4) should be approximately equal and are small

Ans. (4)

Sol. Option (4)

Ans. (2)

Sol. Area = 55.3 x 25 = 1382 = 14×10^2 m²

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

    Assertion (A) : The stretching of a spring is determined by the shear modulus of the material of the spring.

    Reason (R) : A coil spring of copper has more tensile strength than a steel spring of same dimensions. In the light of the above statements, choose the most appropriate answer from the options given below :

    (1) (A) is true but (R) is false

    (2) (A) is false but (R) is true

    (3) Both (A) and (R) are true and (R) is the correct explanation of (A)

    (4) Both (A) and (R) are true and (R) is not the correct explanation of (A)

Ans. (1)

Sol. Option (1)

42. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is:

    (1) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with 1/r dependence for the outside region.

    (2) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region

    (3) uniform and remains constant for both the regions.

    (4) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.

Ans. (1)

Sol. $B \propto r \left(r \leq R\right)$

$B \propto \dfrac{1}{r} \left(r \geq R\right)$

43. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is :

(1) 10

(2) 8

(3) 11

(4) 9

Ans. (3)

Sol. $(n+1)T_1 = nT_2$

$\dfrac{n+1}{n} = \dfrac{T_2}{T_1} = \sqrt{\dfrac{l_2}{l_1}} = \sqrt{\dfrac{121}{100}} = \dfrac{11}{10}$

$n = 10$

smaller oxillate 10 + 1 = 11

44. Two point charges –q and +q are placed at a distance of L, as shown in the figure.

The magnitude of electric field intensity at a distance R (R>>L) varies as :

(1) $\dfrac{1}{R^4}$

(2) $\dfrac{1}{R^6}$

(3) $\dfrac{1}{R^2}$

(4) $\dfrac{1}{R^3}$

Ans. (4)

Sol. For dipole $E \propto \dfrac{1}{r^3}$

45. A series LCR circuit with inductance 10 H, capacitance 10 μF , resistance 50 Ω is connected to an ac source of voltage, V=200 sin (100 t) volt. If the resonant frequency of the LCR circuit is υ_0 and the frequency of the ac source is υ, then:

(1) $\upsilon_0 = \dfrac{50}{\pi}$Hz, $\upsilon = 50$ Hz

(2) $\upsilon = 100$ Hz; $\upsilon_0 = \dfrac{100}{\pi}$Hz

(3) $\upsilon_0 = \upsilon = 50$ Hz

(4) $\upsilon_0 = \upsilon = \dfrac{50}{\pi}$Hz

Ans. (4)

Sol. V = 200 sin (100 t)

$\upsilon = \dfrac{50}{\pi}$

$\upsilon = \dfrac{1}{2\pi} \times \dfrac{1}{\sqrt{LC}} = \dfrac{1}{2\pi}\dfrac{1}{\sqrt{10 \times 10^{-5}}} = \dfrac{100}{2\pi}$

46. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei repsectively is :

(1) 5:4

(2) 25:16

(3) 1:1

(4) 4:5

Ans. (1)

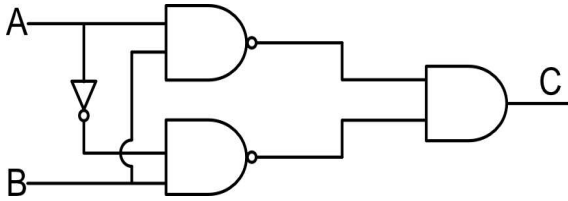Sol. $\dfrac{r_1}{r_2} = \left(\dfrac{125}{64}\right)^{1/3} = \dfrac{5}{4}$

47. A ball is projected with a velocity, 10 ms⁻¹, at an angle of 60⁰ with the vertical direction. Its speed at the highest point of its trajectory will be:

(1) $5\,ms^{-1}$

(2) $10\,ms^{-1}$

(3) Zero

(4) $5\sqrt{3}$ ms¹

Ans. (4)

Sol. $u\cos\theta = 10\cos 30^0 = 5\sqrt{3}$ m / s

48.

The truth table for the given logic circuit is :

(1)

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

(3)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(4)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

Ans. (1)

Sol. $\left(\overline{AB}\right)\left(\overline{\overline{A}.B}\right)$

$\left(\overline{A}+\overline{B}\right)\left(A+\overline{B}\right)$

$A\overline{B}+\overline{A}\,\overline{B}+\overline{B}$

$\overline{B}\left(A+1\right)+\overline{A}\,\overline{B}$

$\overline{B}+\overline{A}\,\overline{B}=\overline{B}$

49. Two transparent media A and B are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is:

(1) $\tan^{-1}\left(0.500\right)$

(2) $\tan^{-1}\left(0.750\right)$

(3) $\sin^{-1}\left(0.500\right)$

(4) $\sin^{-1}\left(0.750\right)$

Ans. (4)

Sol. $\sin\theta_c = \dfrac{\mu_1}{\mu_2} = \dfrac{1.5}{2} = 0.75$

$\theta_c = \sin^{-1}\left(0.75\right)$

50. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2×10^{-5} T and electrical resistance of the coil is 12.56 Ω, then the maximum induced current in the coil will be:
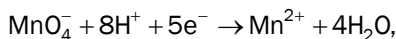
(1) 1 A

(2) 2 A

(3) 0.25 A

(4) 1.5 A

Ans. (1)

Sol. $I_{max} = \dfrac{nAB\omega}{R} = \dfrac{1000 \times \pi \times 10^2 \times 2 \times 10^{-5} \times 2}{12.56} = 1$ A
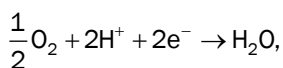
CHEMISTRY

SECTION - A

51. Given below are half cell reactions:

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O,$$

$$E^o_{Mn^{2+}/MnO_4^-} = -1.510\,V$$

$$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O,$$

$$E^o_{O_2/H_2O} = +1.223V$$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid?

(1) Yes, because $E^o_{cell} = +2.733\,V$

(2) No, because $E^o_{cell} = -2.733\,V$

(3) Yes, because $E^o_{cell} = +0.287\,V$

(4) No, because $E^o_{cell} = -0.287\,V$

Ans. (3)

Sol: $E_{Cell} = E^o_{cathode} - E^o_{Anode}$

$$= E^o_{MnO_4^-/Mn^{+2}} - E^o_{O_2/H_2O}$$

$$= 1.51 - 1.223 = 0.287.$$

52. Identify the incorrect statement from the following

(1) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.

(2) Lithium is the strongest reducing agent among the alkali metals.

(3) Alkali metals react with water to form their hydroxides.

(4) The oxidation number of K in KO_2 is +4.

Ans. (4)

Sol: Alkali metals always show only +1 oxidation state.

53. Identify the incorrect statement from the following.

(1) In an atom, all the five 3d orbitals are equal in energy in free state.

(2) The shapes of d_{xy}, d_{yz}, and d_{zx} orbitals are similar to each other; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.

(3) All the five 5d orbitals are different in size when compared to the respective 4d orbitals.

(4) All the five 4d orbitals have shapes similar to the respective 3d orbitals.

Ans. (2)

Sol: The shape of d_{xy}, d_{yz}, d_{zx} = dumbell

$d_{x^2-y^2}$ = dumbell

d_{z^2} = dumbell shape with a doughnut – s h a p e d electroncloud in the center.

54. Gadolinium has a low value of third ionisation enthalpy because of

(1) high electronegativity

(2) high basic character

(3) small size

(4) high exchange enthalpy

Ans. (1)

Sol: $4f^7 \rightarrow$ subshell high exchange enthalpy.

55. The IUPAC name of an element with atomic number 119 is

(1) unununnium

(2) ununoctium

(3) ununennium

(4) unnilennium

Ans. (3)

Sol: 1 = un

9 = enn

∴ The IUPAC name ununennium.

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

List – I (Hydridies)		List – II (Nature)	
a)	MgH_2	i)	Electron precise
b)	GeH_4	ii)	Electron deficient
c)	B_2H_6	iii)	Electron rich
d)	HF	iv)	Ionic

Choose the correct answer from the options given below:

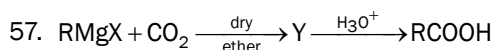|	(a)	(b)	(c)	(d)
(1)	i	ii	iv	iii
(2)	ii	iii	iv	i
(3)	iv	i	ii	iii
(4)	iii	i	ii	iv

Ans. (3)

Sol: MgH_2 is Ionic hydride

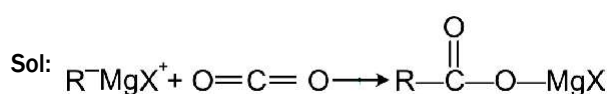GeH_4 has exact 8 electrons in Octect

B_2H_6 is electron Deficient

HF is electron Rich hydride.

57. $RMgX + CO_2 \xrightarrow[\text{ether}]{\text{dry}} Y \xrightarrow{H_3O^+} RCOOH$

What is Y in the above reaction?

(1) $RCOO^-X^+$

(2) $(RCOO)_2 Mg$

(3) $RCOO^-Mg^+X$

(4) $R_3CO^-Mg^+X$

Ans. (3)

Sol:

$$R^-MgX^+ + O=C=O \longrightarrow R-\overset{\overset{\displaystyle O}{\|}}{C}-O-MgX$$

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

List – I (Drug Class)		List – II (Drug molecule)	
a)	Antacids	i)	Salvarsan
b)	Antihistamines	ii)	Morphine
c)	Analgesics	iii)	Cimetidine
d)	Antimicrobial	iv)	Seldane

Choose the correct answer from the options given below:

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

Ans. (4)

Sol:

Seldine	–	Antihistamine
Cimetidine	–	Antacids
Morphine	–	Analgesics
Salvarsan	–	Antimicrobial

59. Which of the following statement is not correct about diborane?

(1) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.

(2) Both the Boron atoms are sp² hybridised

(3) There are two 3-centre-2-electron bonds

(4) The four terminal B-H bonds are two centre two electron bonds

Ans. (2)

Sol: Boron atom is sp³ Hybridized.

60. The incorrect statement regarding enzymes is:

(1) Enzymes are polysaccharides.

(2) Enzymes are very specific for a particular reaction and substrate.

(3) Enzymes are biocatalysts.

(4) Like chemical catalysts enzymes reduce the activation energy of bio processes.

Ans. (1)

Sol: Enzymes are poly-peptides, made up of poly Amino acids.

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

Assertion (A) : In a particular point defect, an ionic sold is electrically netural, even if few of its cations are missing from its unit cells.

Reason (R) : In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to itnerstitial site, maintaining overall electrical neutrality.
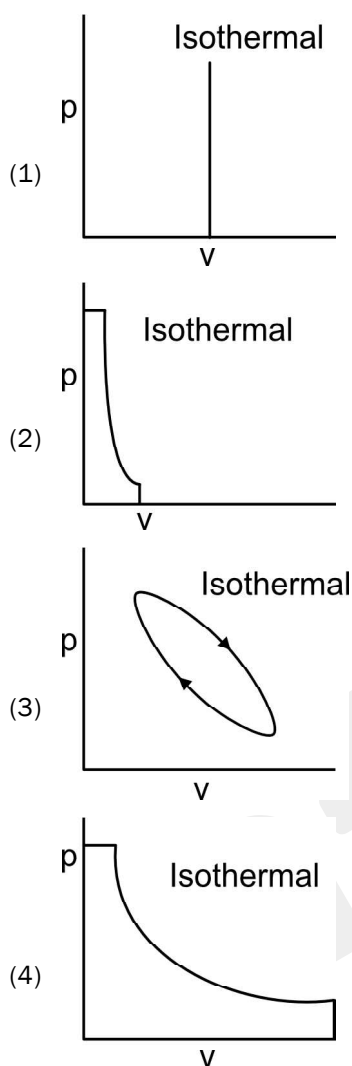
In the light of the above statemetns, choose the most **appropriate** answer from the options given below:

(1) **(A)** is correct but **(R)** is not correct

(2) **(A)** is not correct but **(R)** is correct

(3) Both **(A)** and **(R)** are correct but **(R)** is the correct explanation of **(A)**

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

Ans. (3)

Sol: In Point defect the overall crystal maintains electrical neutrality.

62. Which of the following p - V curve represents maixmum work done?

(1) Isothermal

(2) Isothermal

(3) Isothermal

(4) Isothermal

Ans. (4)

Sol: $W = P\Delta V$

63. Given below are two statements:

Statement I : Primary aliphatic amines react with HNO_2 to give unstable diazonium salts.

Statement II : Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.

In the light of the above statements, choose the most appropriate answer from the options given below:
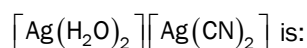
(1) **Statement I** is correct but **Statement II** is incorrect

(2) **Statement I** is incorrect but **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

Ans. (1)

Sol: $R-\overset{\oplus}{N}\equiv N\ Cl$, unstable

$Ar-\overset{\oplus}{N}\equiv N\ Cl$, unstable at 27°C but stable at 0°C.

64. The IUPAC name of the complex -

$\left[Ag(H_2O)_2\right]\left[Ag(CN)_2\right]$ is:
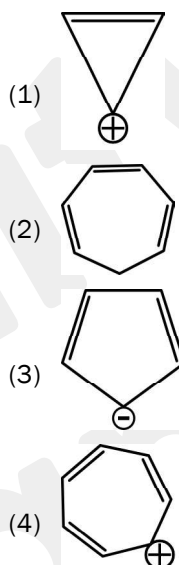
(1) dicyanidosilver (I) diaquaargentate (I)

(2) diaquasilver (I) dicyanidoargentate (I)

(3) dicyanidosilver (II) diaquaargentate (II)

(4) diaquasilver (II) dicyanidoargenatate (II)

Ans. (2)

Sol: Ag in first complex as silver (+ve oxidation state)

Ag in second complex as Argentate (−ve oxdiation state).

65. Which compound amongst the following is not an aromatic compound?

(1)

(2)

(3)

(4)

Ans. (2)

Sol: It is non planar as sp^3 Carbon is present.

66. Given below are two statements:

Statement I : In the coagulation of a negative sol, the flocculating power of the three given ions is in the order- $Al^{3+} > Ba^{2+} > Na^+$

Statement II : In the cogulation of a postiive sol, the flocculating power of the three given salts is in the order-. $NaCl > Na_2SO_4 > Na_3PO_4$

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

(1) **Statement I** is correct but **Statement II** is incorrect

(2) **Statement I** is incorrect but **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

Ans. (1)

Sol: Greater the positive charge, greater will be floculation power.

Floculation power $\propto$ charge.

While coagulating positive sols, negative charge must be high.

67. Match List-I with List-II.

	List – I		List – II
a)	Li	i)	absorbent for carbon dioxide
b)	Na	ii)	electrochemcial cells
c)	KOH	iii)	coolant in fast breeder reactors
d)	Cs	iv)	photoelectric cell

Choose the correct answer from the options given below:

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

Ans. (2)

Sol: Li used in electochemical cells

Na used as coolant in fast breeeder reactors

KOH absorbs CO_2 to form K_2CO_3.

Cs used in photo electric cell due to low I.E.

68. Given below are two statements: One is labelled as Asssertion (A) and the other is labelled as Reason (R).

Assertion (A) : ICl is more reactive than I_2.

Reason (R) : I-Cl bond is weaker than I-I bond.

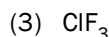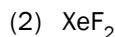In the light of the above statements, choose the most appropriate answer from the options given below:

(1) (A) is correct but (R) is not correct.

(2) (A) is not correct but (R) is correct.

(3) Both (A) and (R) are correct but (R) is the correct explanation of (A).

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
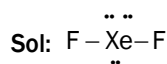
Ans. (3)

Sol: Interhalogens are more reactive than halogens expect F_2 because the bond energy in interhalogen compound is weak.

69. Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions?

(1) SF_4

(2) XeF_2

(3) ClF_3

(4) IF_5

Ans. (2)

Sol: $F-\overset{\cdot\cdot}{\underset{\cdot\cdot}{Xe}}-F$

70 Given below are two statements:

Statement I : The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II : o-nitrophenol, m-nitrophenol and p-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

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

(1) **Statement I** is correct but **Statement II** is incorrect

(2) **Statement I** is incorrect but **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

Ans. (1)

Sol: Acidic strength $\propto EWG$

EWG = Electron Withdrawing Group.

71. Which one is not correct mathematical equation for Dalton's Law of partial pressure? Here p = total pressure of gaseous mixture

(1) $p_i = X_ip$, where p_i = partial pressure of ith gas

X_i = mole fraction of ith gas in gaseous mixture

(2) $p_i = X_iP_i^0$, where X_i = mole fraction of ith gas in gaseous mixture

P_i^0 = pressure of ith gas in pure state

(3) $p = p_1 + p_2 + p_3$

(4) $p = n_1\dfrac{RT}{V} + n_2\dfrac{RT}{V} + n_3\dfrac{RT}{V}$
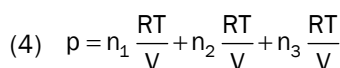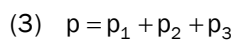
Ans. (2)

Sol: Represents Raoult's law.

72. Given below are two statements:

    Statement I : The boiling points of the following hydrides of group 16 elements increases in the order $H_2O < H_2S < H_2Se < H_2Te$.

    Statement II : The boiling points of these hydrides increase with increase in molar mass.

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

    (1) **Statement I** is correct but **Statement II** is incorrect

    (2) **Statement I** is incorrect but **Statement II** is correct

    (3) Both **Statement I** and **Statement II** are correct

    (4) Both **Statement I** and **Statement II** are incorrect

Ans. (4)

Sol: $H_2S < H_2Se < H_2Te < H_2O$

From H_2S to H_2Te B.P increases with its Molecular weight, but in H_2O, highest B.P is due to H−bond.

73. In one molal solution that contains 0.5 mole of a solute, there is

    (1) 100 mL of solvent

    (2) 1000 g of solvent

    (3) 500 mL of solvent

    (4) 500 g of solvent

Ans. (4)

Sol: $m = \dfrac{\text{moles of solute}}{\text{mass of solvent}\,(\text{kg})}$
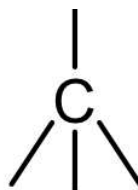
$1 = \dfrac{0.5}{a}$

∴ mass of solvent (a) = 0.5 kg = 500 g.
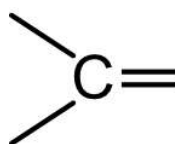
74. Choose the correct statement :

    (1) Diamond is sp^3 hybridised and graphite is sp^2 hybridized.

    (2) Both diamond and graphite are used as dry lubricants.

    (3) Diamond and graphite have two dimensional network.

    (4) Diamond is covalent and graphite is ionic.

Ans. (1)

Sol:

Diamond has sp^3 carbon and tetrahedral shape.

Graphite has sp2 carbon with Hexagonal rings (due to delocalised electron).

75. What mass of 95% pure $CaCO_3$ will be required to nenutralise 50 mL of 0.5 M HCl solution according to the following reaction?

    $CaCO_{3(s)} + 2HCl(aq) \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$

    [Calculate up to second place of decimal point]

    (1) 3.65 g

    (2) 9.50 g

    (3) 1.25 g

    (4) 1.32 g

Ans. (4)

Sol:

$\underset{\underset{1\,mole}{}}{CaCO_3} + \underset{\underset{2mole}{}}{2HCl} \rightarrow CaCl_2 + H_2O + CO_2$

$\underset{?}{} \quad \underset{\dfrac{0.5}{20}}{}$
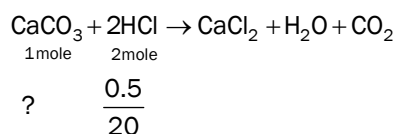
No. of moles of $CaCO_3 = \dfrac{1}{80}$

Wt. of 100% $CaCO_3 = \dfrac{1}{80} \times 100 = 1.25$

Wt. of 95% $CaCO_3$ = 1.3157 .

$\approx 1.32\,g$

76. Which of the following sequence of reactions is suitable to synthesize chlorobenzene?

(1) , HCl

(2) , HCl, Heating

(3) Benzene, Cl_2, anhydrous $FeCl_3$

(4) Phenol, $NaNO_2$, HCl, CuCl

Ans. (3)

Sol:

77. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is

[Given pK_a of CH_3COOH = 4.57]
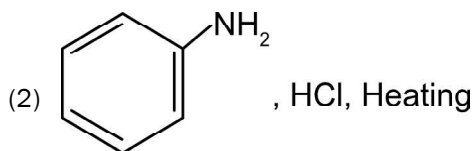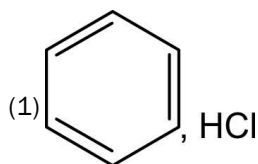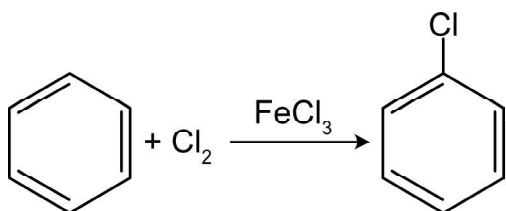
(1) 4.57

(2) 2.57

(3) 5.57

(4) 3.57

Ans. (3)

Sol: $P^H = P^{Ka} + \log_{10} \dfrac{[acid]}{[salt]}$

$P^H = 4.57 + \log_{10}\left(\dfrac{50 \times 0.1}{0.01 \times 50}\right)$

$P^H = 4.57 + 1 = 5.57$

78. Which amongst the following is **incorrect** statement?

(1) H_2^+ ion has one electron.

(2) O_2^+ ion is diamagnetic

(3) The bond orders of O_2^+, O_2, O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.

(4) C_2 molecule has four electrons in its two degenerate π molecular orbitals

Ans. (2)

Sol: (1) $C_2 = (\sigma 1s^2)(\sigma*1s^2)(\sigma 2s^2)(\sigma*2s^2)(\pi 2p_x^2 = \pi 2p_y^2)$

C_2 molecule has 4 electrons in its two degenerate π molecular orbitals.

(2) $H_2^+ = \sigma 1s^1$ H_2^+ ion has 1 electron.

(3) O_2^+ $(\sigma 1s^2)(\sigma*1s^2)(\sigma 2s^2)(\sigma*2s^2)(\sigma 2p_z^2)$

$(\pi 2p_x^2 = \pi 2p_y^2)(\pi*2p_x^1 = \pi*2p_y^0)$

O_2^+ is a paramagnetic

(4) $O_2^+ = (\sigma 1s^2)(\sigma*1s^2)(\sigma 2s^2)(\sigma*2s^2)(\sigma 2p_z^2)$

$(\pi 2p_x^2 = \pi 2p_y^2)(\pi*2p_x^1 = \pi*2p_y^0)$

Bond order = $\dfrac{10-5}{2} = \dfrac{5}{2} = 2.5$

$O_2 = (\sigma 1s^2)(\sigma*1s^2)(\sigma 2s^2)(\sigma*2s^2)(\sigma 2p_z^2)$

$(\pi 2p_x^2 = \pi 2p_y^2)(\pi*2p_x^1 = \pi*2p_y^1)$

Bond order = $\dfrac{10-6}{2} = \dfrac{4}{2} = 2$

$O_2^- = (\sigma 1s^2)(\sigma*1s^2)(\sigma 2s^2)(\sigma*2s^2)(\sigma 2p_z^2)$

$(\pi 2p_x^2 = \pi 2p_y^2)(\pi*2p_x^2 = \pi*2p_y^1)$

Bond order = $\dfrac{10-7}{2} = \dfrac{3}{2} = 1.5$

$O_2^{2-} = (\sigma 1s^2)(\sigma*1s^2)(\sigma 2s^2)(\sigma*2s^2)(\sigma 2p_z^2)$

$(\pi 2p_x^2 = \pi 2p_y^2)(\pi*2p_x^2 = \pi*2p_y^2)$

Bond order = $\dfrac{10-8}{2} = 1$

79. Which statement regarding polymer is **not correct**?

(1) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.

(2) Thermosetting polymers are reusable.

(3) Elastomers have polymer chains held together by weak intermolecular forces.

(4) Fibers possess high tensile strength

Ans. (2)

Sol: Thermosetting polymers are not reusable, as they have permanent chemical change.
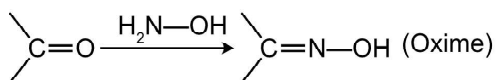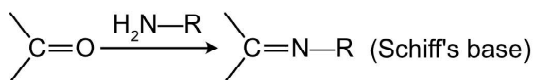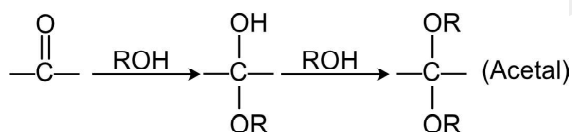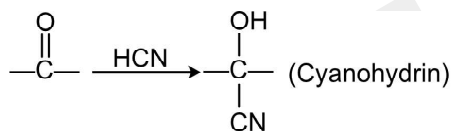
80.

List – I (Products formed)	List – II (Reaction of carbonyl compound with)
a) Cyanohydrin	i) NH_2OH
b) Acetal	ii) RNH_2
c) Schiff's base	iii) alcohol
d) Oxime	iv) HCN

Choose the correct answer from the options given below :

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

Ans. (2)

Sol:

81. Given below are two statements:

Statement I :

The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions.

Statement II :

The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding

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

(1) Statement I is correct but statement II is incorrect

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

(3) Both Statement I and Statement II are correct

(4) Both statement I and Statement II are incorrect

Ans. (3)

Sol: Carbonyl compounds of comparable molar mass donot show hydrogen bonding, hence boiling point is lesser than alcohols.

82. The given graph is a representation of kinetics of a reaction
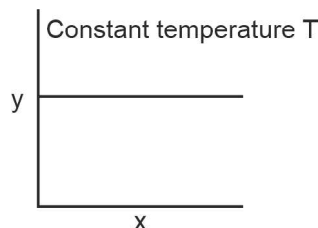
The y and x axes for zero and first order reactions, respectively are

(1) zero order (y = rate and x = concentration), first order (y = $t_{1/2}$ and x = concentration)

(2) zero order (y = rate and x = concentration), first order (y = rate and x = $t_{1/2}$)

(3) zero order (y = concentration and x = time), first order (y = $t_{1/2}$ and x = concentration)

(4) zero order (y = concentration and x = time), first order (y = rate constnat and x = concentration)

Ans. (1)

Sol: For a zero order reaction rate is independent of concentration of reactant.

For a first order reaction $t_{1/2}$ is independent of initial concentration of reactant.

83. The **incorrect** statement regarding chirality is:

(1) Enantiomers are superimposable mirror images on each other.

(2) A racemic mixture shows zero optical rotation.

(3) S_N1 reaction yields 1 : 1 mixture of both enantiomers.

(4) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

Ans. (1)

Sol: Enatiomers are non-superimposable mirror images
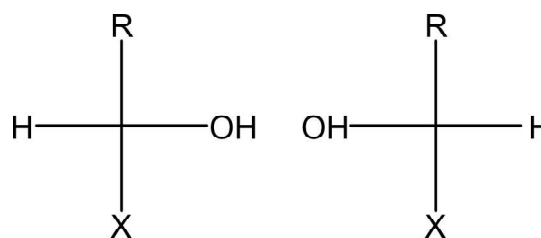
84. The Kjeldhal's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?

(1)

NH₂

(2)

N=N

(3)

NO₂

(4)

N
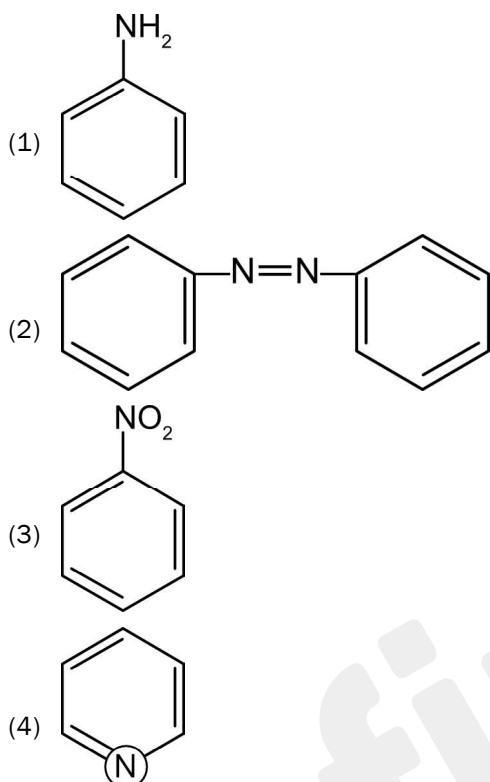
Ans. (1)

Sol: Kjeldhal method is not applicable to compounds containing nitrogen in nitro and azo groups and nitrogen present in the ring (e.g. pyridine) as nitrogen of these compounds does not change to ammonium sulphate under these conditions.

85. At 298K, the standard electrode potentials of $Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe$ and Ag^+/Ag are 0.34 V, -0.76 V, -0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential predict

Which of the followhing reaction can not occur?

(1) $FeSO_4(aq)+Zn(s)\rightarrow ZnSO_4(aq)+Fe(s)$

(2) $2CuSO_4(aq)+2Ag(s)\rightarrow 2Cu(s)+Ag_2SO_4(aq)$

(3) $CuSO_4(aq)+Zn(s)\rightarrow ZnSO_4(aq)+Cu(s)$

(4) $CuSO_4(aq)+Fe(s)\rightarrow FeSO_4(aq)+Cu(s)$

Ans. (2)

Sol: 'Ag' has high S.R.P, So it oxidises by 'Cu' but not reduced.

SECTION - B

86. Match List-I with List-II

	List – I (Ores)		List – II (Composition)
a)	Haematite	i)	Fe_3O_4
b)	Magnetite	ii)	$ZnCO_3$
c)	Calamine	iii)	Fe_2O_3
d)	Kaolinite	iv)	$[Al_2(OH)_4Si_2O_5]$

Choose the correct answer from the options given below

	(a)	(b)	(c)	(d)

(1)	iii	i	iv	ii
(2)	i	iii	ii	iv
(3)	i	ii	iii	iv
(4)	iii	i	ii	iv

Ans. (4)

Sol:

Haematite	–	Fe_2O_3
Magnetite	–	Fe_3O_4
Calamine	–	$ZnCO_3$
Kaolinite	–	$[Al_2(OH)_4Si_2O_5]$

87. Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?

(1)

(2)

(3)

(4)

Ans. (4)

Sol:

$$CH_3-\overset{O}{\overset{||}{C}}-CH_3 \quad , \quad CH_3-CH_2-CH_2-\overset{O}{\overset{||}{C}}-CH_2$$
$$I \qquad\qquad\qquad\qquad II$$

$$I + II \implies CH_3-\overset{O}{\overset{||}{C}}-CH=C-CH_3$$

$$II + I \implies CH_3-CH_2-CH_2-CH_2-C=CH-\overset{O}{\overset{||}{C}}-CH_3$$

$$I + I \implies CH_3-CH=CH-\overset{O}{\overset{||}{C}}-CH_3$$

$$II + II \implies CH_3-CH_2-C=C-\overset{O}{\overset{||}{C}}-CH_3$$
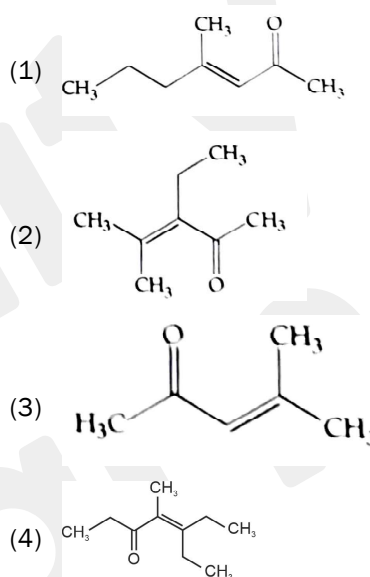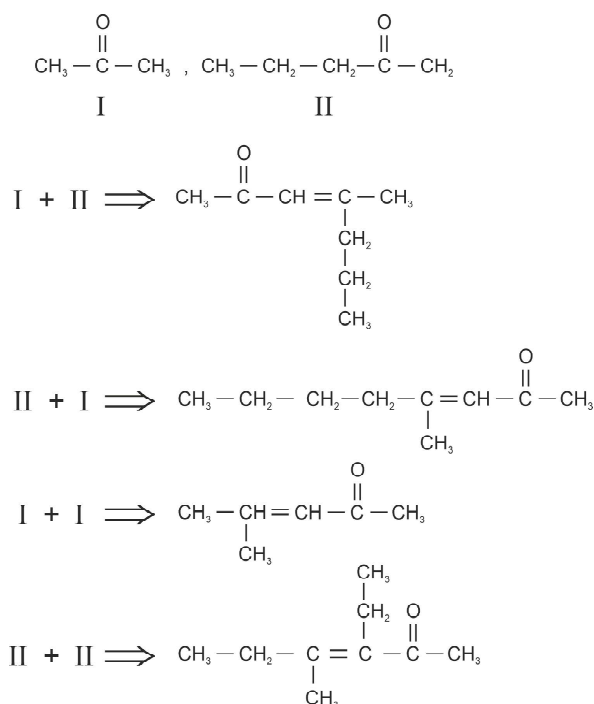
88. Given below are two statements

    Statement I:

    In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. HCl + $ZnCl_2$, known as Lucas reagent.

    Statement II :

   Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas reagent.

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

    (1) Statement I is correct but statement II is incorrect

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

    (3) Both Statements I and Statement II are correct

    (4) Both statement I and Statement II are incorrect

Ans. (1)

Sol: Tertiary alcohols can form stable carbocation and react fast and give white turbidity with Lucas reagent. Primary alcohols do not react with Lucas reagent.

89. If radius of second Bohr orbit of the He^+ ion is 105.8 pm, what is the radius of third Bohr orbit of Li^{2+} ion?

    (1) 1.587 pm

    (2) 158.7A°

    (3) 158.7 pm

    (4) 15.87 pm

Ans. (3)

Sol: $r = \dfrac{r_H \times n^2}{Z}$ pm.

90. A 10.0 L flask contains 64 g of oxygen at 27^0 C. (Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is

    (Given R = 0.0831 L bar K^{-1} mol^{-1})

    (1) 49.8

    (2) 4.9

    (3) 2.5

    (4) 498.6

Ans. (2)

Sol: PV = nRT

$P \times 10 = \dfrac{64}{32} \times 0.0831 \times 300$

P = 4.986 atm

91. Find the emf of the cell in which the following reaction takes place at 298 K

    Ni(s) + 2 Ag^+ (0.001 M) $\rightarrow$ Ni^{2+} (0.001 M) + 2 Ag(s)
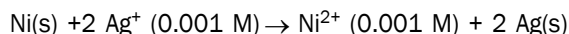
    (Given that $E^0_{cell} = 10.5$ V, $\dfrac{2.303\ RT}{F} = 0.059$ at 298 K)

    (1) 0.9615 V

    (2) 1.05 V

    (3) 1.0385 V

    (4) 1.385 V

Ans. (1)

Sol: 1 is correct answer if $E^0_{cell} = 1.05$V (from the given data there no answer).

$E = 1.05 - \dfrac{0.0591}{2} \log \dfrac{10^{-3}}{(10^{-3})^2}$

= 0.9615 V.

92. The correct IUPAC name of the following compound is:
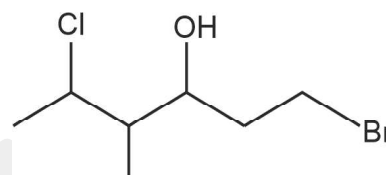
    (1) 1-bromo-4-methyl-5-chlorohexan-3-ol

    (2) 6-bromo-4-methyl-2-chlorohexan-4-ol

    (3) 1-bromo-5-chloro-4-methylhexan-3-ol

    (4) 6-bromo-2-chloro-4-methylhexan-4-ol

Ans. (3)

Sol:
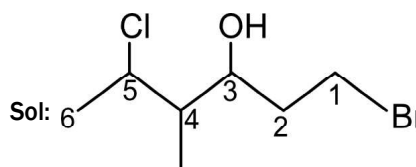
93. In the neutral or faintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

    (1) +7 to +3

    (2) +6 to +5

    (3) +7 to +4

    (4) +6 to +4

Ans. (3)

Sol: In faintly alkaline medium $KMnO_4$ will be reduced to MnO_2, therefore change in oxidation state will be +7 to +4.

94. $3O_2(g) \rightleftharpoons 2O_3(g)$ for the above reaction at 298 K, K_c is found to be 3.0 x 10⁻⁵⁹. If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is

(1) 2.4 x 10³¹

(2) 1.2 x 10²¹

(3) 4.38 x 10⁻³²

(4) 1.9 x 10⁻⁶³

Ans. (3)

Sol: $K_c = \dfrac{[O_3]^2}{[O_2]^3}$

$[O_3] = \sqrt{K_c[O_2]^3} = 4.38 \times 10^{-32}$.

95. Copper crystallises in fcc unit cell with cell edge length of 3.608 x 10⁻⁸ cm. The density of copper is 8.92 g cm⁻³. Calculate the atomic mass of copper.

(1) 60 u

(2) 65 u

(3) 63.1 u

(4) 31.55 u

Ans. (3)

Sol: $d = \dfrac{A \times Z}{N_0 \times a^3}$

$A = \dfrac{\left(3.608 \times 10^{-8}\right)^3 \times 6.02 \times 10^{23} \times 8.92}{4}$

A = 63.1u.

96. The pollution due to oxides of sulphur gets enhanced due to the presence of :

(a) particulate matter

(b) ozone

(c) hydrocarbons

(d) hydrogen peroxide

Choose the most appropriate answer from the options given below

(1) (b), (c), (d) only

(2) (a), (c), (d) only

(3) (a), (d) only

(4) (a), (b), (d) only

Ans. (4)

Sol: $SO_2 + O_3 \rightarrow SO_3 + O_2$

$SO_2 + H_2O_2 \rightarrow H_2SO_4$
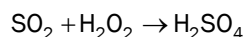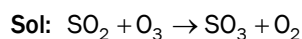
Particulate matter.

97. The product formed from the following reaction sequence is

(i) LiAlH₄,H₂O
(ii) NaNO₂ + HCl
(iii) H₂O

(1)

(2)

(3)

(4)
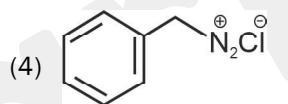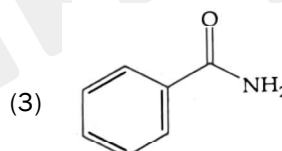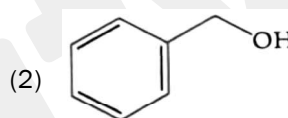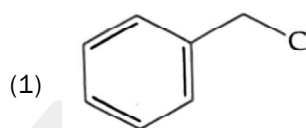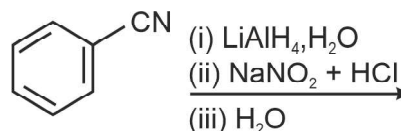
Ans. (2)

Sol:
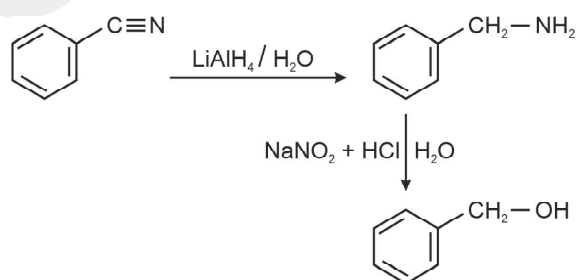
98. Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is :

(1) 2-Methylbut-1-ene

(2) Pent-2-ene

(3) 3-Methylbut-1-ene

(4) 2-Methylbut-1-ene

Ans. (3)

Sol:

$H_2C = CH - \underset{\underset{CH_3}{|}}{CH} - CH_3$
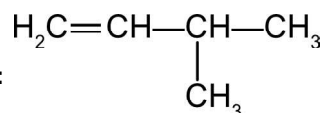
99. For a first order reaction $A \rightarrow$ Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constnat for the reaction in min^{-1} is

(1) 0.4606

(2) 0.2303

(3) 1.3818

(4) 0.9212

Ans. (4)

Sol: $K = \dfrac{2.303}{t} \log \dfrac{a}{a-x}$

$K = \dfrac{2.303}{5} \log \dfrac{0.1}{0.001} = 0.9212$.

100. The order of energy absorbed which is responsible for the color of complexes.

(A) $[Ni(H_2O)_2(en)_2]^{2+}$

(B) $[Ni(H_2O)_4(en)]^{2+}$ and

(C) $[Ni(en)_3]^{2+}$

is

(1) (C) > (A) > (B)

(2) (B) > (A) > (C)

(3) (A) > (B) > (C)

(4) (C) > (B) > (A)

Ans. (1)

Sol: $E_{absorbed} = C > A > B$

$[Ni(en)_3]^{2+} > [Ni(H_2O)_2(en)_2]^{2+} > [Ni(H_2O)_4(en)]^{2+}$
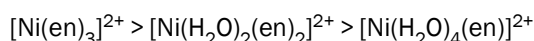
Number of bidentate ligands are decreases, then its crystal field stabilisation energy decreases. Hence $E_{absorbed}$ also decreases.

BOTANY

SECTION - A

101. In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :

(a) secretion of secondary metabolities and their deposition in the lumen of vessels.

(b) deposition of organic compounds like tannins and resins in the central layers of stem.

(c) deposition of suberin and aromatic substances in the outer layer of stem.

(d) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.

(e) presence of parenchyma cells, functionally active xylem elements and essential oils.

Choose the correct answer from the options given below:

(1) (d) and (e) Only

(2) (b) and (d) Only

(3) (a) and (b) Only

(4) (c) and (d) Only

Ans. (3)

Sol . In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to secretion of secondary metabolites and their deposition in lumen of vessels and the deposition of organic compounds like tannins and resins in central layers of stem.

102. Read the following statements and choose the set of correct statements :

(a) Euchromatin is loosely packed chromatin

(b) Heterochromatin is transcriptionally active

(c) Histone octomer is wrapped by negatively charged DNA in nucleosome

(d) Histones are rich in lysine and arginine

(e) A typical nucleosome contains 400 bp of DNA helix

Choose the correct answer from the options given below:

(1) (b), (e) Only

(2) (a),(c),(e) only

(3) (b), (d), (e) Only

(4) (a),(c),(d) Only

Ans. (4)

Sol . Heterochromatin is transcriptionally inactive.

A typical nucleosome contains 200 of DNA helix.

103. Which one of the following statement is not **true** regarding gel electrophoresis technique?

(1) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

(2) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

(3) The process of extraction of separated DNA strands from gel is called elution.

(4) The separated DNA fragments are stained by using ethidium bromide.

Ans. (1)

Sol. The presence of chromogenic substrate gives white coloured DNA bands on the gel.

104. Exoskeleton of arthropods is composed of:

(1) Chitin

(2) Glucosamine

(3) Cutin

(4) Cellulose

Ans. (1)

Sol. In arthropods, exoskeleton is composed of chitin, which is present in the form of plates called sclerites. These sclerites are joined by soft, flexible arthrodial membrane.

105. Match List - I with List - II.

	List - I		List - II
(a)	Manganese	(i)	Activates the enzyme catalase
(b)	Magnesium	(ii)	Required for pollen germination
(c)	Boron	(iii)	Activates enzymes of respiration
(d)	Iron	(iv)	Functions in splitting of water during photosynthesis

Choose the correct answer from the options given below:

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

Ans. (4)

Sol. Manganese: Splitting of water to liberate oxygen during photosynthesis.

Magnesium: Activates the enzymes of respiration

Boron: Pollen germination.

Iron : Activates catalase enzyme

106. DNA polymorphism forms the basis of :

(1) Both genetic mapping and DNA finger printing

(2) Translation

(3) Genetic mapping

(4) DNA finger printing

Ans. (1)

Sol. DNA polymorphism forms the basis of genetic mapping and DNA finger printing.

107. The gaseous plant growth regulator is used in plants to

(1) help overcome apical dominance

(2) kill dicotyledonous weeds in the fields

(3) speed up the malting process

(4) promote root growth and root hair formation to increase the absorption surface

Ans. (4)

Sol. Gaseous plant growth regulator is ethylene which promotes root growth and root hair formation to increase the absorption surface.

108. Given below are two statements:

Statement I : The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.

Statement II : Mesophyll cells of C_4 plants lack RuBisCo enzyme.

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

(1) Statement I is correct but statement II is incorrect

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

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (3)

Sol. The primary CO_2 acceptor in C_4 plant is PEP and is found in the mesophyll cells. Mesophyll cells of C_4 plants lack RuBiSCO enzyme.

109. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for:

(1) Biodiversity loss

(2) Natality

(3) Population explosion

(4) Competition

Ans. (1)

Sol. Habitat loss and fragmentation, over-exploitation, invasion of alien species and, co-extinctions are the four major causes of biodiversity loss (evil quartet).

110. Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants:

(1) Ethylene

(2) Cytokinin

(3) ABA

(4) Gibberellin

Ans. (1)

Sol. Increase in yield of cucumber is due to ethylene.

111. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes:

(1) Sites at which crossing over occurs

(2) Terminalization

(3) Synaptonemal complex

(4) Bivalent

Ans. (1)

Sol. The appearance of recombination nodules is the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes during meiosis-I.

112. Which of the following is not a method of ex situ conservation ?

(1) Micropropagation

(2) Cryopreservation

(3) In vitro fertilization

(4) National Parks

Ans. (4)

Sol. In *ex situ* conservation, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. Zoological parks, botanical gardens, *in vitro fertilisation*, micropropagation and cryopreservation serve this purpose.

National parks are an example of *in situ* conservation. *In situ* conservation is the process of protecting organisms in their natural habitat. Biosphere reserves, national parks, sanctuaries and sacred groves are a part of *in-situ* conservation.

113. Which one of the following produces nitrogen fixing nodules on the roots of *Alnus*?

(1) *Rhodospirillum*

(2) *Beijernickia*

(3) *Rhizobium*

(4) *Frankia*

Ans. (4)

Sol. The microbe, *Frankia*, produces nitrogen-fixing nodules on the roots of nonleguminous plants e.g., *Alnus*.

114. Which one of the following statements cannot be connected to Predation?

(1) Both the interacting species are negatively impacted

(2) It is necessitated by nature to maintain the ecological balance

(3) It helps in maintaining species diversity in a community

(4) It might lead to extinction of a species

Ans. (1)

Sol. In predation, only one species (predator) benefits while the other (prey) is harmed. Both interacting species are negatively impacted in case of competition.

115. The device which can remove particulate matter present in the exhaust from a thermal power plant is :

(1) Electrostatic Precipitator

(2) Catalytic Convertor

(3) STP

(4) Incinerator

Ans. (1)

Sol. Electrostatic precipitator is a widely used filter for removing particulate matter from the exhaust of thermal power plants.

116. Identify the incorrect statement related to Pollination :

(1) Flowers produce foul odours to attract flies and beetles to get pollinated

(2) Moths and butterflies are the most dominant pollinating agents among insects

(3) Pollination by water is quite rare in flowering plants

(4) Pollination by wind is more common amongst abiotic pollination

Ans. (2)

Sol . Bees are the most dominant pollinating agents among insects.

117. Which one of the following plants does not show plasticity ?

(1) Buttercup

(2) Maize

(3) Cotton

(4) Coriander

Ans. (2)

Sol . Maize do not show plasticity.

118. What amount of energy is released from glucose during lactic acid fermentation

(1) About 10%

(2) Less than 7%

(3) Approximately 15%

(4) More than 18%

Ans. (2)

Sol . Less than 7% of energy is released from glucose during lactic acid fermentation.

119. "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which.

(1) for both water and food transportation

(2) osmosis is observed

(3) water is transported

(4) food is transported

Ans. (4)

Sol . "Girdling experiment" was performed by plant physiologist to identify the plant tissue through which food is transported.

120. Which one of the following plants shows vexillary aestivation and diadelphous stamens?

(1) *Allium cepa*

(2) *Solanum nigrum*

(3) *Colchicum autummale*

(4) *Pisum sativum*

Ans. (4)

Sol . Vexillary aestivation and diadelphous stamen is seen in Fabaceae members example *Pisum sativum* (Garden pea).

121. Read the following statements about the vascular bundles:

(a) In roots, xylem and phloem in a vascular bundle bundle are arranged in an alternate manner along the different radii.

(b) Conjoint closed vascular bundles do not possess cambium

(c) In open vascular bundles, cambium is present in between xylem and pholem

(d) The vascular bundles of dicotyledonous stem between xylem and phloem

(e) In monocotyledonous root, usually there are more than six xylem bundles present

Choose the correct answer from the options given below

(1) (a), (b), (c) and (d) Only

(2) (a), (c), (d) and (e) Only

(3) (a), (b) and (d) Only

(4) (b), (c), (d) and (e) Only

Ans. (0)

Sol . All statements are correct.

122. Which one of the following never occurs during mitotic cell division?

(1) Pairing of homologous chromosomes

(2) Coiling and condensation of the chromatids

(3) Spindle fibres attach to kinetochores of chromosomes

(4) Movement of centrioles towards opposite poles

Ans. (1)

Sol . Pairing of homologous chromosomes occurs during meiosis and not during mitosis.

123. Given below are two statements :

Statement-I : Cleistogamous flowers are invariably autogamous

Statement-II : Cleistogamy is disadvantageous as there is no chance for cross pollination

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (3)

Sol . Cleistogamous flowers are closed flowers and hence they are invariably autogamous. It is a disadvantageous as there is no chance for cross pollination.

124. Identify the correct set of statements:

(a) The leaflets are modified into pointed hard thorns in *Citrus* and *Bougainvillea*

(b) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin

(c) Stem is flattened and fleshy in *Opuntia* and modified to perform the function of leaves

(d) *Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration

(e) Subaerially growing stems in grasses and straw berry help in vegetative propagation

Choose the correct answer from the options given below :

(1) (b), (c), (d) and (e) Only

(2) (a), (b), (d) and (e) Only

(3) (b) and (c) Only

(4) (a) and (d) Only

Ans. (1)

Sol . The pointed, hard thorns in *Citrus* and *Bougainvillea* are modified axillary buds.

125. XO type of sex determination can be found in

(1) Grasshoppers

(2) Monkeys

(3) *Drosophila*

(4) Birds

Ans. (1)

Sol . XX-XO type of sex determination is seen in orthopteran insects (e.g., grasshoppers, cockroaches) and hemipteran insects (e.g., bugs).

126. Hydrocolloid carrageen is obtained from :

(1) Rhodophyceae only

(2) Phaeophyceae only

(3) Chlorophyceae and Phaeophyceae

(4) Phaeophyceae and Rhodophyceae

Ans. (1)

Sol . Hydrocolloid carrageen is obtained from Rhodophyceae members.

127. Which of the following is not observed during apoplastic pathway ?

(1) The movement is aided by cytoplasmic streaming

(2) Apoplast is continuous and does not provide any barrier to water movement.

(3) Movement of water occurs through intercellular spaces and wall of the cells.

(4) The movement does not involve crossing of cell membrane

Ans. (1)

Sol . Cytoplasmic streaming does not aid in apoplastic movement.

128. Given below are two statements : one is labelled as

Assertion (A) and the other is : labelled as reason(R).

Assertion (A) : Polymerase chain reaction is used in DNA amplification

Reason (R) : The ampicillin resistant gene is used as a selectable marker to check transformation

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

(1) (A) is correct but (R) is not correct

(2) (A) is not correct but (R) is correct

(3) Both (A) and (R) are correct and (R) is the correct explantaion of (A)

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Ans. (3)

Sol . Polymerase chain reaction is used in DNA amplification. The ampicillin resistant gene is used as a selectable marker to check transformation. Here both assertion and reason is correct but the reason is not correct explanation of the assertion.

129. Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis? It involves :

(1) Movement of protons across the membrane to the stroma

(2) Reduction of NADP to NADPH$_2$ on the stroma side of the membrane

(3) Breakdown of proton gradient

(4) Breakdown of electron gradient

Ans. (4)

Sol . Breakdown of electron gradient is not true regarding the release of energy during ATP synthesis through chemiosmosis.

130. The flowers are Zygomorphic in :

(a) Mustard

(b) Gulmohar

(c) *Cassia*

(d) *Datura*

(e) Chilly

Choose the correct answer from the options given below:

(1) (d), (e) Only

(2) (c), (d), (e) Only

(3) (a),(b),(c) only

(4) (b), (c) Only

Ans. (4)

Sol . When a flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic, e.g., pea, gulmohur, bean, *Cassia*.

131. Given below are two statements :

Statement I : Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance

Statement II : Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (3)

Sol . Mendel studied seven pairs of contrasting traits in pea plant and proposed the laws of inheritance. Seven characters examined by Mendel in his experiment on pea plants were seed shape, seed colour, flower colour, pod shape, pod colour, flower position and stem height.

132. What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ?

(1) Two

(2) Eight

(3) Four

(4) Six

Ans. (1)

Sol . Net gain of ATP when one molecule of glucose is partially oxidized to 2 molecules of pyruvic acid is two.

133. Given below are two statements :

Statement I : Decomposition is a process in which the detritus is degraded into simpler substances by microbes.

Statement II : Decomposition is faster if the detritus is rich in lignin and chitin In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (1)

Sol . Decomposition is a process in which detritus is degraded into simpler substances by microbes. In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars.

134. The process of translation of mRNA to proteins begins as soon as:

(1) Both the subunits join together to bind with mRNA

(2) The tRNA is activated and the larger subunit of ribosome encounters mRNA

(3) The small subunit of ribosome encounters mRNA

(4) The larger subunit of ribosome encounters mRNA

Ans. (3)

Sol. The process of translation of mRNA to protein synthesis begins as soon as the smaller sub-unit of ribosome encounters mRNA.

135. Which of the following is incorrectly matched?

(1) *Porphyra* - Floridian Starch

(2) *Volvox* - Starch

(3) *Ectocarpus* - Fucoxanthin

(4) *Ulothrix* - Mannitol

Ans. (4)

Sol. *Ulothrix* is a green algae and hence the reserve food material is starch.

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

Assertion (A): Mendel's law of Independent assortment does not hold good for the genes that are located closely on the same chromosome.

Reason (R) : Closely located genes assort independently. In the light of the above statements, choose the correct answer from the options given below:

(1) (A) is correct but (R) is not correct

(2) (A) is not correct but (R) is correct

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Ans. (1)

Sol. Mendel's Law of Independent assortment does not hold good for the genes that are located closely on the same chromosomes. Closely located genes cannot be assorted independently. Hence assertion is correct but the reason is incorrect.

137. Which part of the fruit, labelled in the given figure makes it a false fruit?
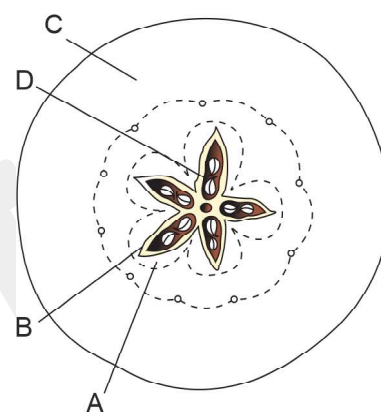
(1) C → Thalamus

(2) D → Seed

(3) A → Mesocarp

(4) B → Endocarp

Ans. (1)

Sol. As thalamus is involved in fruit formation. Therefore, it is a false fruit.

138. Which one of the following will accelerate phosphorus cycle?

(1) Weathering of rocks

(2) Rain fall and storms

(3) Burning of fossil fuels

(4) Volcanic activity

Ans. (1)

Sol. The natural reservoir of phosphorus is rock, which contains phosphorus in the form of phosphates. When rocks are **weathered**, these phosphates are dissolved in soil solution.

139. The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is false?

    (1) It is cheaper than diesel

    (2) It can not be adulterated like diesel

    (3) CNG burns more efficiently than diesel

    (4) The same diesel engine is used in CNG buses making the cost of conversion low

Ans. (4)

Sol . CNG buses use a different engine compared to diesel buses.

Under the direction of the Supreme Court the government switched the entire fleet of public transport buses from diesel to compressed natural gas (CNG) by the end of 2002 because:

· CNG burns most efficiently, unlike petrol or diesel, in the automobiles.

· CNG is very efficient and very little of is left unburnt.

· CNG is cheaper than petrol or diesel.

CNG cannot be siphoned off by thieves and adulterated like petrol or diesel.

140. What is the role of large bundle sheath cells found around the vascular bundles in C_4 plants?

    (1) To enable the plant to tolerate high temperature

    (2) To protect the vascular tissue from high light intensity

    (3) To provide the site for photorespiratory pathway

    (4) To increase the number of chloroplast for the operation of Calvin cycle

Ans. (4)

Sol . The bundle sheath cells may form several layers around the vascular bundles; they are characterized by having a large number of chloroplasts, thick walls impervious to gaseous exchange and no intercellular spaces.

141. Transposons can be used during which one of the following ?

    (1) Autoradiography

    (2) Gene sequencing

    (3) Polymerase Chain Reaction

    (4) Gene silencing

Ans. (4)

Sol . Transposons can be used during gene silencing.

142. Which of the following occurs due to the presence of autosome linked dominant trait?

    (1) Haemophilia

    (2) Thalessemia

    (3) Sickle cell anaemia

    (4) Myotonic dystrophy

Ans. (4)

Sol . Myotonic dystrophy is an autosomal dominant trait. Haemophilia is X-linked recessive disorder. Thalassemia and sickle-celled anaemia are autosomal recessive disorders.

143. Match List - I with List - II

	List-I		List-II
(a)	Metacentric chromosome	(i)	Centromere situated close to the end forming one extremely short and one very long arms
(b)	Acrocentric chromosome	(ii)	Centromere at the terminal end
(c)	Sub-metacentric	(iii)	Centromere in the middle forming two equal arms of chromosomes
(d)	Telocentric chromosome	(iv)	Centromere slightly away from the middle forming one shorter arm and one longer arm

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

Ans. (3)

Sol . The metacentric chromosome has middle centromere forming two equal arms of the chromosome. The sub-metacentric chromosome has centromere slightly away from the middle of the chromosome resulting into one shorter arm and one longer arm. In case of acrocentric chromosome the centromere is situated close to its end forming one extremely short and one very long arm, whereas the telocentric chromosome has a terminal centromere.

144. Read the following statements on lipids and find out correct set of statements :

   (a) Lecithin found in the plasma membrane is a glycolipid

   (b) Saturated fatty acids possess one or more c=c bonds

   (c) Gingely oil has lower melting point, hence remains as oil in winter

   (d) Lipids are generally insoluble in water but soluble in some organic solvents

   (e) When fatty acid is esterified with glycerol, monoglycerides are formed

   Choose the correct answer from the options given below:

   (1) (c), (d) and (e) only

   (2) (a), (b) and (d) only

   (3) (a), (b) and (c) only

   (4) (a), (d) and (e) only

Ans. (1)

Sol . Lecithin in plasma membrane is a phospholipid. Saturated fatty acids possess C——C bonds.

145. Addition of more solutes in a given solution will :

   (1) make its water potential zero

   (2) not affect the water potential at all

   (3) raise its water potential

   (4) lower its water potential

Ans. (4)

Sol . Addition of more solutes in a given solution will lower its water potential.

146. Match the plant with the kind of life cycle it exhibits:

	List-I		List-II
(a)	*Spirogyra*	(i)	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(b)	Fern	(ii)	Dominant haploid free-living gametophyte
(c)	*Funaria*	(iii)	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(d)	*Cycas*	(iv)	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Choose the correct answer from the options given below:

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

Ans. (4)

Sol . Spirogyra- Dominant haploid free living gametophyte.

   Fern- Dominant diploid sporophyte alternating with reduced gametophyte called prothallus.

   Funaria- Dominant haploid leafy gametophyte alternating with partially dependent, multicellular sporophyte.

   Cycas- Dominant diploid sporophyte, vascular plant with highly reduced male or female gametophyte.

147. While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (-) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (-) for another species involved in the interaction?

    (1) Commensalism

    (2) Competition

    (3) Predation

    (4) Amensalism

Ans. (3)

Sol . In predation and parasitism, only one species is benefitted (+) whereas other species is harmed (-).

	Species A	Species B
Mutualism	+	+
Competition	-	-
Predation	+	-
Parasitism	+	-
Commensalism	+	0
Amensalism	-	0

148. In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme?

    (1) 5' C T C A G T 3' ; 3' G A G T C A 5'

    (2) 5' G T A T T C 3' ; 3' C A T A A G 5'

    (3) 5' G A T A C T 3' ; 3' C T A T G A 5'

    (4) 5' G A A T T C 3' ; 3' C T T A A G 5'

Ans. (4)

Sol . Palindromic base sequence of DNA which can be cut easily by restriction enzyme is 5' GAATTC3'; 3'CTTAAG5'

149. If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as :

    (1) Expressed sequence tags

    (2) Bioinformatics

    (3) Sequence annotation

    (4) Gene mapping

Ans. (3)

Sol . In the human genome project, the blind approach of simply sequencing the whole set of genome that contained all the coding and non-coding sequence, and later assigning different regions in the sequence with functions is referred to as sequence annotation.

150. The anatomy of springwood shows some peculiar features. Identify the correct set of statements about springwood.

    (a) It is also called as the earlywood

    (b) In spring season cambium produces xylem elements with narrow vessels

    (c) It is lighter in colour

    (d) The springwood along with autumnwood shows alternate concentric rings forming annual rings

    (e) It has lower density

    Choose the correct answer from the options given below:

    (1) (a), (b) and (d) Only

    (2) (c), (d) and (e) Only

    (3) (a), (b), (d) and (e) Only

    (4) (a), (c), (d) and (e) Only

Ans. (4)

Sol . In spring season cambium produces xylem elements with broad vessels.

ZOOLOGY

SECTION - A

151. Which of the following statements are true for spermatogenesis but do not hold true for Oogenesis?

    (a) It results in the formation of haploid gametes

    (b) Differentiation of gamete occurs after the completion of meiosis

    (c) Meiosis occurs continuously in a mitotically dividing stem cell population

    (d) It is controlled by the Luteinising hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary

    (e) It is initiated at puberty

    Choose the most appropriate answer from the options given below:

    (1) (b), (d) and (e) only

    (2) (b), (c) and (e) only

    (3) (c) and (e) only

    (4) (b) and (c) only

Ans. (2)

Sol. (a) In both spermatogenesis and oogenesis, haploid gametes are formed.

(b) Differentiation of spermatids to spermatozoa (spermiogenesis) occurs only during spermatogenesis. The spermatozoon is morphologically much different from the spermatid. Oogenesis does not involve such morphological differentiation of the ovum.

(c) Meiosis is continuous during spermatogenesis. During oogenesis meiosis begins during embryonic stage and gets arrested at prophase-I. It resumes only after puberty. So, meiosis is discontinuous during oogenesis while it is continuous during spermatogenesis.

(d) Spermatogenesis is controlled by FSH and androgens (but not directly by LH). Oogenesis is also controlled by FSH only. LH stimulates ovulation but not oogenesis. Thus (d) does not hold good for both spermatogenesis and oogenesis.

(e) Spermatogenesis is initiated at puberty whereas oogenesis is initiated during embryonic stage itself.

152. Given below are two statements :

    Statement I : Fatty acids and glycerols cannot be absorbed into the blood.

    Statement II : Specialized lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.

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

    (1) Statement I is correct but Statement II is incorrect

    (2) Statement I is incorrect but Statement II is correct

    (3) Both Statement I and Statement II are correct

    (4) Both statement I and Statement II are incorrect

Ans. (3)

Sol. Fatty acids and glycerol being insoluble, cannot be absorbed into the blood. They are first incorporated into small droplets called micelles which move into the intestinal mucosa. They are re-formed into very small protein coated fat globules called the chylomicrons which are transported into the lymph vessels (lacteals) in the villi. These lymph vessels ultimately release the absorbed substances into the blood stream.

153. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called:

    (1) Bio-fortification

    (2) Bio-accumulation

    (3) Bio-magnification

    (4) Bio-remediation

Ans. (1)

Sol. Breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats – is the most practical means to improve public health is called bio-fortification.

154. In an *E.coli* strain *i* gene gets mutated and its product can not bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome?

    (1) z, y a genes will not be translated

    (2) RNA polymerase will bind the promoter region

    (3) Only z gene will get transcribed

    (4) z, y, a genes will be transcribed

Ans. (1)

Sol. In an *E.coli* strain I gene gets mutated and its product cannot bind the inducer molecule. If growth medium is provided with lactose then z, y, a genes will not be translated.

155. Which of the following is present between the adjacent bones of the vertebral column?

(1) Areolar tissue

(2) Smooth muscle

(3) Intercalated discs

(4) Cartilage

Ans. (4)

Sol. The adjacent vertebrae of the vertebral column are separated by intervertebral discs made up of fibrous cartilage.

156. Given below are two statements:

Statement I : Autoimmune disorder is a condition where body defense mechanism recognizes its own cells as foreign bodies.

Statement II : Rheumatoid arthritis is a condition where body does not attack self cells.

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (1)

Sol. Autoimmune disorder is a condition where body defense mechanism recognises its own cells as foreign bodies. Rheumatoid arthritis is an autoimmune disorder in which body attacks its own self cells.

157. At which stage of life the oogenesis process initiated?

(1) Birth

(2) Adult

(3) Puberty

(4) Embryonic development stage

Ans. (4)

Sol. Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each foetal ovary; no more oogonia are formed and added after birth. These cells start division and enter prophase-I of the meiotic division and get temporarily arrested at that stage, called primary oocytes.

158. Select the **incorrect** statement with reference to mitosis:

(1) Chromosomes decondense at telophase.

(2) Splitting of centromere occurs at anaphase.

(3) All the chromosomes lie at the equator at metaphase.

(4) Spindle fibres attach to centromere of chromosomes.

Ans. (4)

Sol. Small disc-shaped structures at the surface of the centromeres are called kinetochores. These structures serve as the sites of attachment of spindle fibres (formed by the spindle fibres) to the chromosomes that are moved into position at the centre of the cell.

159. *In-situ* conservation refers to :

(1) Conserve only endangered species

(2) Conserve only extinct species

(3) Protect and conserve the whole ecosystem

(4) Conserve only high risk species

Ans. (3)

Sol. *In situ* conservation is the process of protecting an animal species in its natural habitat. It protects and conserves the whole ecosystem. When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected. For example, we save the entire forest to save the tiger.

160. Which of the following functions is not performed by secretions from salivary glands?

(1) Lubrication of oral cavity

(2) Digestion of disaccharides

(3) Control bacterial population in mouth

(4) Digestion of complex carbohydrates

Ans. (2)

Sol. Digestion of disaccharides is brought about by disaccharidases present in the intestinal juice. Salivary amylase digests about 30% of starch (a polysaccharide) into maltose (a disaccharide).

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

Assertion (A): Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R) : Common cause of osteoporosis is increased levels of estrogen.

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

(1) (A) is correct but (R) is not correct

(2) (A) is not correct but (R) is correct

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Ans.(1)

Sol. Osteoporosis is an age-related disorder characterised by decreased bone mass and increased chances of fractures. Decreased levels of estrogen is a common cause.

162. Given below are two statements:

Statement I : The coagulum is formed of network of threads called thrombins.

Statement II : Spleen is the graveyard of erythrocytes.

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (2)

Sol. Coagulum is formed of network of threads called fibrins (not thrombins). Spleen is the graveyard of erythrocytes.

163. Given below are two statements :

Statement I : Mycoplasma can pass through less than 1 micron filter size.

Statement II : Mycoplasma are bacteria with cell wall

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (1)

Sol. Mycoplasma is an exception to kingdom monera as they do not have cell wall.

164. Tegmina in cocroach, arises from :

(1) Metathorax

(2) Prothorax and Mesothorax

(3) Prothorax

(4) Mesothorax

Ans. (4)

Sol. The cockroach has two pairs of wings. The forewings (tegmina) present on the mesothorax and the hindwings present on the metathorax. The prothorax lacks wings.

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

Assertion (A): All vertebrates are chordates but all chordates are not vertebrates.

Reason (R) : Notochord is replaced by vertebral column in the adult vertebrates.

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

(1) (A) is correct but (R) is not correct

(2) (A) is not correct but (R) is correct

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Ans. (3)

Sol. All vertebrates are chordates because they possess a notochord at least at some time during their life. All chordates are not vertebrates because protochordates have notochord but lack a vertebral column. Therefore, A and R are true and R is the correct explanation of A.

166. Nitrogenous waste is excreted in the form of pellet or paste by :

(1) *Hippocampus*

(2) *Pavo*

(3) *Ornithorhynchus*

(4) *Salamandra*

Ans. (2)

Sol. Reptiles, birds, land snails and insects are uricotelic animals and excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water. *Pavo* (peacock) is a bird.

167. A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose?

(1) $C_{12}H_{22}O_{11}$

(2) $C_{12}H_{24}O_{11}$

(3) $C_{12}H_{20}O_{10}$

(4) $C_{12}H_{24}O_{12}$

Ans. (1)

Sol. The formula for maltose is $C_{12}H_{22}O_{11}$.

168. Regarding Meiosis, which of the statements is incorrect?

(1) Pairing of homologous chromosomes and recombination occurs in Meisosis-I

(2) Four halpoid cells are formed at the end of Meiosis-II

(3) There are two stages in Meiosis, Meiosis-I and II

(4) DNA replication occurs in S phase of Meiosis-II

Ans. (4)

Sol. DNA replication do not occur in S phase of Meiosis-II

169. Under normal physiological conditions in human being every 100 ml of oxygenated blood can deliver _____ ml of O_2 to the tissues.

(1) 4 ml

(2) 10 ml

(3) 2 ml

(4) 5 ml

Ans. (4)

Sol. In human being, every 100 ml of oxygenated blood can deliver 5ml of O_2 to the tissues under normal physiological conditions.

170. Given below are two statements:

Statement I : The release of sperms into the seminiferous tubules is called spermiation.

Statement II : Spermiogenesis is the process of formation of sperms from spermatogonia.

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans.(1)

Sol. The release of sperms into the seminiferous tubules is called spermiation. Spermiogenesis is the process of the formation of spermatozoa from spermatids.

171. In the taxonomic categories which heirarchial arrangement in ascending order is **correct** in case of animals?

(1) Kingdom, Order, Class, Phylum, Family, Genus, Species

(2) Kingdom, Order, Phylum, Class, Family, Genus, Species

(3) Kingdom, Phylum, Class, Order, Family, Genus, Species

(4) Kingdom, Class, Phylum, Family, Order, Genus, Species

Ans. (3)

Sol. Correct hierarchical arrangement in ascending order of taxonomic categories in animal taxonomy is:
Kingdom → Phylum → Class → Order → Family → Genus → Species

172. Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin A :

(1) *Aspergillus niger*

(2) *Streptococcus cerevisiae*

(3) *Trichoderma polysporum*

(4) *Clostridium butyulicum*

Ans. (3)

Sol. Cyclosporin A that is used as an immunosuppressive agent in organ-transplant patients is produced by the fungus *Trichoderma polysporum*.

173. Lippe's loop is a type of contraceptive used as :

(1) Non-Medicted IUD

(2) Copper releasing IUD

(3) Cervical barrier

(4) Vault barrier

Ans. (1)

Sol. Lippe's loop is a non-medicated IUD, it increases phagocytosis of sperms within the uterus.

174. If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs?

(1) 3.3×10^6 bp

(2) 6.6×10^6 bp

(3) 3.3×10^9 bp

(4) 6.6×10^9 bp

Ans. (3)

Sol. If the length of DNA molecule is 1.1 metres, then the approximate number of base pairs would be 3.3×10^9 bp.

175. Detritivores breakdown detritus into smaller particles. This process is called :

(1) Humification

(2) Decomposition

(3) Catabolism

(4) Fragmentation

Ans. (4)

Sol. Detritivores like earthworm breakdown detritus into smaller particles. This process is called fragmentation. Catabolism is breakdown detritus into smaller particles by releasing of enzymes by bacteria and fungi. Humification is the formation of a dark-coloured amorphous substance called humus. Mineralisation is the degradation of humus into minerals by microbes.

176. Which of the following is **not** a connective tissue?

(1) Cartilage

(2) Neuroglia

(3) Blood

(4) Adipose tissue

Ans. (2)

Sol. Neuroglia are the supporting cells of the nervous tissue. They protect and support neurons. Neuroglia make up more than one-half the volume of neural tissue in our body. Adipose tissue is a loose connective tissue. Cartilage is a skeletal tissue (a type of connective tissue). Blood is a fluid connective tissue.

177. Which of the following is a **correct** match for disease and its symptoms?

(1) Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle

(2) Muscular dystrophy - An auto immune disorder causing progressive degeneration of skeletal muscle

(3) Arthritis - Inflamed joints

(4) Tetany-high Ca^{2+} level causing rapid spasms.

Ans. (3)

Sol. Arthritis is the inflammation in the joints. Tetany is due to **low** blood calcium levels. Myasthenia gravis is an **autoimmune** disorder. Muscular dystrophy is a **genetic** disorder.

178. Which of the following statements with respect to Endoplasmic Reticulum is **incorrect**?

(1) In prokaryotes only RER are present

(2) SER are the sites for lipid synthesis

(3) RER has ribosomes attached to ER

(4) SER is devoid of ribosomes

Ans. (1)

Sol. In prokaryotes membrane bound cell organelles are absent.

179. In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocyes because :

(1) Lymphocytes from patient's blood are grown in culture, outside the body.

(2) Genetically engineered lymphocytes are not immortal cells.

(3) Retroviral vector is introduced into these lymphocytes.

(4) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages.

Ans. (2)

Sol. In gene therapy of ADA deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because they are not immortal cells.

180. Natural selection where more individuals acquire specific character value other than the mean character value, leads to :

(1) Disruptive change

(2) Random change

(3) Stabilising change

(4) Directional change

Ans. (4)

Sol. In directional natural selection, more individuals acquire value other than the mean character value. It involves elimination of individuals at one extreme of the phenotypic distribution and the mean value gradually shifts in the other direction. For example the evolution of long-necked giraffes from short-necked ancestors involved directional selection.

181. Given below are two statements :

Statement I : Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.

Statement II : Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site.

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (3)

Sol. Each restriction endonuclease recognises a specific palindromic nucleotide sequences in the DNA. Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites, but between the same two bases on the opposite strands.

182. If '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is _____ individuals per *Drosophila* per week

(1) 1.0

(2) zero

(3) 0.1

(4) 10

Ans. (3)

Sol. Per capita death rate (d) = No. of deaths/ total population size.

d = 8/80 = 0.1

183. In which of the following animals, digestive tract has additional chambers like crop and gizzard?

(1) *Catla, Columba, Crocodilus*

(2) *Pavo, Psittacula, Corvus*

(3) *Corvus, Columba, Chameleon*

(4) *Bufo, Balaenoptera, Bangarus*

Ans. (2)

Sol. The digestive tract has two additional chambers, the crop and the gizzard, in birds (e.g., *Pavo, Psittacula, Corvus*).

184. Identify the asexual reproductive structure associated with *Penicillium* :

(1) Gemmules

(2) Buds

(3) Zoospores

(4) Conidia

Ans.(4)

Sol. Asexual reproductive structures associated with *Penicillium* are conidia.

185. Which of the following is **not** the function of conducting part of respiratory system?

(1) Temperature of inhaled air is brought to body temperature

(2) Provides surface for diffusion of O_2 and CO_2

(3) It clears inhaled air from foreign particles

(4) Inhaled air humidified

Ans. (2)

Sol. Exchange part is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air. The conducting part transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature.

186. Which of the following statements is **not** true?

(1) Homology indicates common ancestry

(2) Flippers of penguins and dolphins are a pair of homologous organs

(3) Analogous structures are a result of convergent evolution

(4) Sweet potato and potato is an example of analogy

Ans. (2)

Sol. Flippers of penguins and dolphins are a pair of **analogous** organs that evolved due to convergent evolution.

187. Which of the following are **not** the effects of Parathyroid hormone?

(a) Stimulates the process of bone resorption

(b) Decreases Ca^{2+} by level in blood

(c) Reabsorption of Ca^{2+} by rental tubules

(d) Decreases the absorption of Ca^{2+} from digested food

(e) Increases metabolism of carbohydrates

Choose the most appropriate answer from the options given below:

(1) (a) and (e) only

(2) (b) and (c) only

(3) (a) and (c) only

(4) (b), (d) and (e) only

Ans. (4)

Sol. Parathyroid hormone increases blood calcium level by stimulating bone resorption, promoting absorption of calcium from GI tract and promoting reabsorption of calcium from renal tubules. It **increases** Ca^{2+} level in the blood. It promotes the formation of calcitriol which **increases** the absorption of Ca^{2+} from digested food. It has no role in the regulation of metabolism of carbohydrates.

188. Select **incorrect** statement regarding synapses:

(1) Chemical synapses use neurotransmitters

(2) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.

(3) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

(4) Electrical current can flow directly from one neuron into the other across the electrical synapse.

Ans. (2)

Sol. Impulse transmission across an electrical synapse is always **faster** than across chemical synapse.

189. Match List - I with List - II with respect to methods of Contraception and their respective actions.

	List - I		List - II
(a)	Diaphragms	(i)	Inhibit ovulation and Implantation
(b)	Contraceptive Pills	(ii)	Increase phagocytosis of sperm within Uterus
(c)	Intra Uterine Devices	(iii)	Absence of Menstrual cycle and ovulation following parturition
(d)	Lactational Amenorrhea	(iv)	They cover the cervix blocking the entry of sperms

Choose the correct answer from the options given below:

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

Ans. (4)

Sol.

Diaphragms	–	They cover the cervix blocking the entry of sperms.
Contraceptive pills	–	Inhibit ovulation and implantation
Intra uterine devices	–	Increase phagocytosis of sperm within uterus
Lactational amenorrhea	–	Absence of Menstrual cycle and ovulation following parturition

190. Select the **incorrect** statement with respect to acquired immunity.

(1) Anamnestic response is due to memory of first encounter.

(2) Acquired immunity is non-specific type of defense present at the time of birth.

(3) Primary response is produced when our body encounters a pathogen for the first time.

(4) Anamnestic response is elicited on subsequent encounters with the same pathogen.

Ans. (2)

Sol. Non-specific type of defence present at the time of birth is termed **innate** immunity. Acquired immunity is gained by individual during their lifetime, when they interact with pathogen.

191. Statements related to human Insulin are given below : Which statement(s) is / are correct about genetically engineered Insulin?

(a) Pro-hormone insulin contain extra stretch of C-peptide

(b) A-peptide and B-peptide chains of insulin were produced separately in *E.coli*, extracted and combined by creating disulphide bond between them.

(c) Insulin used for treating Diabetes was extracted from Cattles and Pigs

(d) Pro-hromone Insuline needs to be processed for converting into a mature and functional hormone.

(e) Some patients develop allergic reactions to the foreign insulin.

Choose the most appropriate answer from the options given below:

(1) (c) and (d) only

(2) (c), (d) and (e) only

(3) (a), (b) and (d) only

(4) (b) only

Ans. (4)

Sol. Chains A and B are produced separately, extracted, and combined by creating disulphide bonds to form human insulin through genetic engineering. Insulin extracted from cattle and pigs is not genetically engineered. Genetically engineered insulin is produced by combining chain A and chain B, without the production of proinsulin. Patients do not develop allergic reaction to genetically engineered insulin.

192. Match List-I with List-II.

	List - I (Biological Molecules)		List – II (Biological functions)
(a)	Glycogen	(i)	Hormone
(b)	Globulin	(ii)	Biocatalyst
(c)	Steroids	(iii)	Antibody
(d)	Thrombin	(iv)	Storage product

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

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

Ans. (2)

Sol.

Glycogen	–	Storage product
Globulin	–	Antibody
Steroids	–	Hormone
Thrombin	–	Biocatalyst

193. Which of the following is **not** a desirable feature of a cloning vector?

    (1) Presence of single restriction enzyme site

    (2) Presence of two or more recognition sites

    (3) Presence of origin of replication

    (4) Presence of a marker gene

Ans. (2)

Sol. Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning

194. Ten *E.coli* cells with ^{15}N-dsDNA are incubated in medium containing ^{14}N nucleotide. After 60 minutes, how many *E.coli* cells will have DNA totally free from ^{15}N?

    (1) 60 cells

    (2) 80 cells

    (3) 20 cells

    (4) 40 cells

Ans. (1)

Sol. Initially we have ^{15}N^{15}N.

After 1st generation in medium containing N^{14} nucleotide we will get, 2 ^{15}N^{14}N DNA

After 2nd generation in medium containing N^{14} nucleotide we will get, 2 ^{15}N^{14}N DNA and 4 ^{14}N^{14}N DNA

After 3rd generation in medium containing N^{14} nucleotide we will get, 2 ^{15}N^{14}N DNA and 6 ^{14}N^{14}N DNA.

195. Which one of the following statements is **correct**?

    (1) Blood moves freely from atrium to the ventricle during joint diastole.

    (2) Increased ventricular pressure causes closing of the semilunar valves.

    (3) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction

    (4) The tricuspid and the biscuspid valves open due to the pressure exerted by the simultaneous contraction of the atria

Ans. (1)

Sol. During joint diastole stage AV valves open and passive filling of ventricle occurs. The tricuspid and the bicuspid valves open due to the fall in the **ventricular** pressure during the joint diastole itself (not during atrial systole). Increased ventricular pressure causes closing of the **atrioventricular** (bicuspid and tricuspid) valves. Atrial contraction is stimulated by the action potentials generated by the **SA** node.

196. The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosomes?

    (4) d, b, a, c

    (1) a, b, c, d

    (2) a, c, b, d

    (3) a, d, b, c

Ans. (2)

Sol. Recombination frequency is equal to the distance between the genes.

Distance between a & c is 5%, b & c is 15%, b & d is 9%, a &b is 20%, c & d is 24% and a & d is 29%. Then the sequence of these genes on a linear chromosome will be a, c, b, d.

197. Which of the following is correct statements?

    (1) Slime moulds are saprophytic organisms classified under Kingdom Monera.

    (2) Mycoplasma have DNA, Ribosome and cell wall

    (3) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.

    (4) Bacteria are exclusively heterotrophic organisms

Ans. (3)

Sol. Cyanobacteria are group of autotrophic organisms classified under kingdom monera.

198. Given below are two statements

Statement - I: In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles

Statement - II: Particulate matter (PM2.5) can not be removed by scrubber but can be removed by an electrostatic precipitator.

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

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Ans. (2)

Sol. The exhaust is passed through electrode wires in a catalytic converter but not in a scrubber. Particulate matter (PM 2.5) can be removed effectively by electrostatic precipitators but not scrubbers. Scrubbers remove gases like sulphur dioxide effectively.

199. If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour blindness?
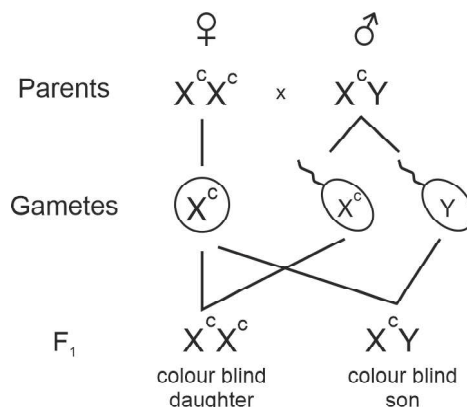
(4) 50%

(1) 75%

(2) 100%

(3) 25%

Ans. (2)

Sol. X^cX^c - X^cY – Parents genotype

X^cX^c - X^cX^c - X^cY - X^cY – F1 Generation

100% progeny will be colourblind

200. Match List - I with List - II

List - I		List - II
a) Bronchioles	i)	Dense Regular Connective Tissue
b) Goblet cell	ii)	Loose Connective Tissue
c) Tendons	iii)	Glandular Tissue
d) Adipose Tissue	iv)	Ciliated Epithelium

Choose the correct answer from the options given below:

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

Ans. (3)

Sol.
Bronchioles	–	Ciliated Epithelium
Goblet cell	–	Glandular tissue
Tendons	–	Dense regular connective tissue
Adipose tissue	–	Loose connective tissue