MANAS Studies

DURATION: 200 Minutes

M.MARKS: 720

GENERAL INSTRUCTION

1.   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 the details given below:

   (a)   **Section A** shall consist of 35 (thirty-five) Questions in each subject (questions no. – 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 (questions no. – 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.**

2.   Each question carries **4 marks.** For **each correct response**, the candidate will get **4 marks.** For **each incorrect response, 1 mark will be deducted** from the total scores. **The maximum mark is 720.**

3.   Use a **Blue/Black ballpoint Pen** only for writing particulars on this page/marking responses on the Answer Sheet.

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

5.   On completion of the test, the candidate **must 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.

6.   The CODE for this Booklet is **T3**.

7.   The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. The use of white fluid for correction is **NOT** permissible on the Answer Sheet.

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

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

10.   Use of an Electronic/Manual Calculator is prohibited.

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

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

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

PHYSICS

SECTION – A

1. A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as $4\pi \times 10^{-7}$ SI units):
(1) 4.4 mT
(2) 44 T
(3) 44 mT
(4) 4.4 T

2. Math **List-I** with **List-II**.

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

Choose the **correct** answer from the options given below:
(1) A-III, B-II, C-I, D-IV
(2) A-IV, B-III, C-II, D-I
(3) A-II, B-III, C-IV, D-I
(4) C-II, B-I, C-III, D-IV

3. A thermodynamic system is taken through the *cycle abcda*. The work done by the gas along the path *bc* is:
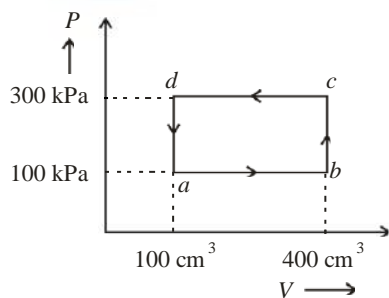
(1) $-90\ J^3$
(2) $-60\ J$
(3) zero
(4) $30\ J$

4. An unipolar light beam strikes a glass surface at Brewster's angle. Then
(1) both the reflected and refracted light will be completely polarised.
(2) the reflected light will be completely polarised but the refracted light will be partially polarised.
(3) the reflected light will be partially polarised.
(4) the refracted light will be completely polarised.

5. In an ideal transformer, the turns ratio is $\dfrac{N_p}{N_s} = \dfrac{1}{2}$.
The ratio $V_s : V_p$ is equal to (the symbols carry their usual meaning):
(1) 1 : 1
(2) 1 : 4
(3) 1 : 2
(4) 2 : 1

6. A logic circuit provides the output Y as per the following truth table:

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

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

7. In a vernier calipers, $(N + 1)$ divisions of vernier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is:
(1) $100\ N$
(2) $10\ (N + 1)$
(3) $\dfrac{1}{10N}$
(4) $\dfrac{1}{100(N + 1)}$

8. The maximum elongation of a steel wire of 1 m length if the elastic limit of steel and its Young's modulus, respectively, are 8×10^8 N m^{-2} and 2×10^{11} N m^{-2}, is:
(1) 40 mm
(2) 8 mm
(3) 4 mm
(4) 0.4 mm

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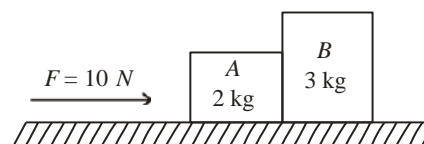

(1) 6 N
(2) 10 N
(3) zero
(4) 4 N

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

11. The graph which shows the variation of $\left(\dfrac{1}{\lambda^2}\right)$ and its kinetic energy, E is (where λ is de Broglie wavelength of a free particle):

(1)   (2)

(3)   (4)
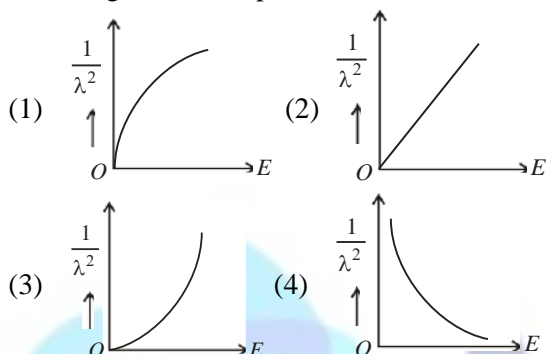
12. In the following circuit, the equivalent capacitance between terminal A and terminal B is:
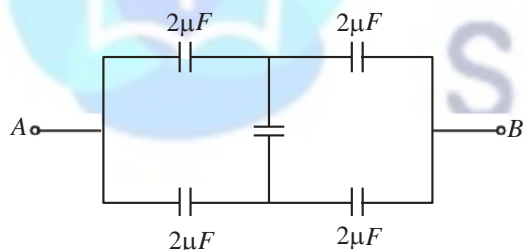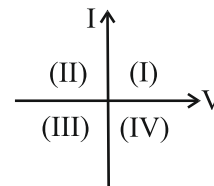

  (1) $0.5\ \mu F$
  (2) $4\ \mu F$
  (3) $2\ \mu F$
  (4) $1\ \mu F$

13.

Solenoid-1   Solenoid-2

In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions:
 (1) AB and CD
  (2) BA and DC
  (3) AB and DC
  (4) BA and CD

14. Consider the following statements A and B and identify the correct answer :

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

15. A light ray enters through a right angled prism at point P with the angle of incidence 30° as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is:
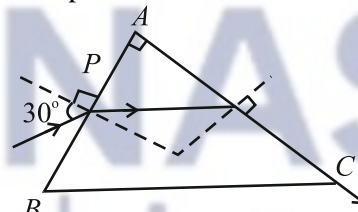
  (1) $\dfrac{\sqrt{3}}{4}$ (2) $\dfrac{\sqrt{3}}{2}$
  (3) $\dfrac{\sqrt{5}}{4}$ (4) $\dfrac{\sqrt{5}}{2}$

16. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.
Assertion A: The potential (V) at any axial point, at 2 m distance (r) from the centre of the dipole of dipole moment vector $\overrightarrow{P}$ of magnitude, $4\times10^{-6}\text{C m}$, is $\pm9\times10^3\ V$.

(Take $\dfrac{1}{4\pi\epsilon_0}=9\times10^9$ SI units)

Reason R: $V=\pm\dfrac{2P}{4\pi\epsilon_0\ r^2}$, where r is the distance of any axial point, situated at 2 m from the centre of the dipole.

In the light of the above statements, choose the *correct* answer from the options given below:
 (1) 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.

17. The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod, is 2400 g cm^2. The length of the 400 g rod is nearly:
(1) 20.7 cm
(2) 72.0 cm
(3) 8.5 cm
(4) 17.5 cm

18. The terminal voltage of the battery, whose emf is 10 V and internal resistance 1 Ω, when connected through an external resistance of 4 Ω as shown in the figure is :
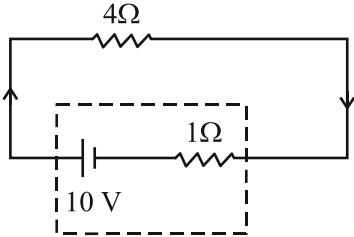
(1) 8 V
(2) 10 V
(3) 4 V
(4) 6 V

19. Match the **List-I** with **List-II**.

| List-I (Spectral Lines of Hydrogen for transitions from)		List-II (Wavelengths (nm))	
(A)	$n_2 = 3$ to $n_1 = 2$	I.	410.2
(B)	$n_2 = 4$ to $n_1 = 2$	II.	434.1
(C)	$n_2 = 5$ to $n_1 = 2$	III.	656.3
(D)	$n_2 = 6$ to $n_1 = 2$	IV.	486.1

Choose the correct answer from the options given below:
(1) A-IV, B-III, C-I, D-II
(2) A-I, B-II, C-III, D-IV
(3) A-II, B-I, C-IV, D-III
(4) A-III, B-IV, C-II, D-I

20. If c is the velocity of light in free space, the correct statements about photon among the following are :
A. The energy of a photon is $E = h\nu$.
B. The velocity of a photon is c.
C. The momentum of a photon, $p = \dfrac{h\nu}{c}$.
D. In a photon-electron collision, both total energy and total momentum are conserved.
E. Photon possesses positive charge.

Choose the correct answer from the options given below:
(1) A, C and D only
(2) A, B, D and E only
(3) A and B only
(4) A, B, C and D only

**21.** $^{290}_{82}X \xrightarrow{\alpha} Y \xrightarrow{e^+} Z \xrightarrow{\beta^-} P \xrightarrow{e^-} Q$
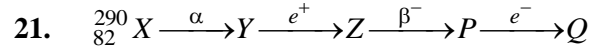
In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are:
(1) 288, 82
(2) 286, 81
(3) 280, 81
(4) 286, 80

22. At any instant of time t, the displacement of any particle is given by $2t-1$ (SI unit) under the influence of force of 5N. The value of instantaneous power is (in SI unit):
(1) 7
(2) 6
(3) 10
(4) 5

23. The output (Y) of the given logic gate is similar to the output of an/a :
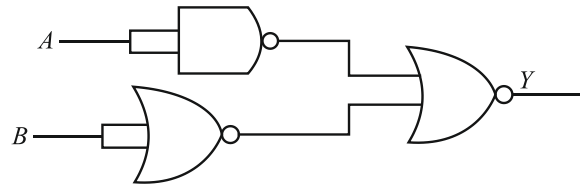
(1) OR gate
(2) AND gate
(3) NAND gate
(4) NOR gate

24. The mass of a planet is $\dfrac{1}{10}$ th that of the earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is :
(1) $4.9\,\text{ms}^{-2}$
(2) $3.92\,\text{ms}^{-2}$
(3) $19.6\,\text{ms}^{-2}$
(4) $9.8\,\text{ms}^{-2}$

25. Given below are two statements :

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

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

In the fight 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.

26. A wheel of a bullock cart is rolling on a level road as shows in the figure below. If its linerar speed is *v* in the direction shown, which one of the following options is correct (*P* and *Q* are any highest and lowest points on the wheel respectively)?
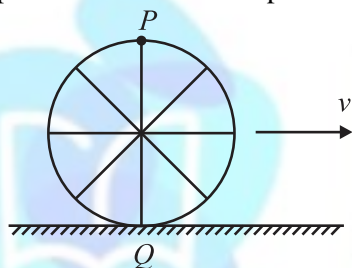
(1) Both the points *P* and *Q* move with equal speed.

(2) Point *P* has zero speed.

(3) Point *P* moves slower than point *Q*.

(4) Point *P* moves faster than point *Q*.

27. A particle moving with uniform speed in a circular path maintains;

(1) constant velocity but varying acceleration.

(2) varying velocity and varying acceleration.

(3) constant velocity.

(4) constant acceleration.

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

(1) 1.98 mN   (2) 99 N

(3) 19.8 mN   (4) 198 N

29. In a uniform magnetic field of 0.049 T, a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is 9.8×10^{-6} kg m^2. If the magnitude of magnetic moment of the needle is $x \times 10^{-5}$ Am^2, then the value of '*x*' is;
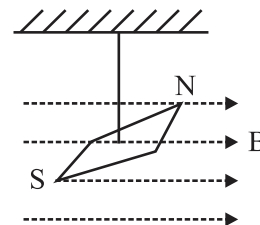
(1) $50 \, \pi^2$

(2) $1280 \, \pi^2$

(3) $5 \, \pi^2$

(4) $128 \, \pi^2$

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

(1) 4 : 1   (2) 1 : 4

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

31. If $x = 5 \sin\left(\pi t + \dfrac{\pi}{3}\right) m$ represents the motion of a particle execting simple harmonic motion, the amplitude and time period of motion, respectively, are;

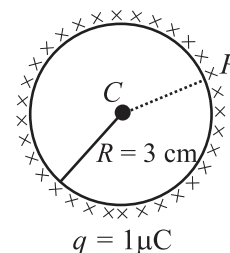(1) 5 cm, 1 s   (2) 5 m, 1 s

(3) 5 cm, 2 s   (4) 5 m, 2 s

32. The quantities which have the same dimensions as those of solid angle are;

(1) strain and arc

(2) angular speed and stress

(3) strain and angle

(4) stress and angle

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

$$\left(\text{Take} \, \frac{1}{4\pi \in_0} = 9 \times 10^9 \, \text{SI units} \right)$$

$q = 1\mu C$

(1) 0.5×10^5

(2) zero

(3) 3×10^5

(4) 1×10^5

34. A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2 ω white keeping the same radius, the tension in the string becomes;

(1) $\dfrac{T}{4}$

(2) $\sqrt{2}T$

(3) T

(4) $4T$

35. A wire of length 'l' and resistance 100 Ω is divided into 10 equal parts. The first 5 parts are connected in series while the next 5 parts are connected in parallel. The two combinations are again connected in series. The resistance of this final combination is;

(1) 55 Ω

(2) 60 Ω

(3) 26 Ω

(4) 52 Ω

SECTION-B

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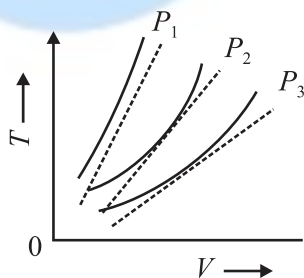
(1) $P_2 > P_1 > P_3$

(2) $P_1 > P_2 > P_3$

(3) $P_3 > P_2 > P_1$

(4) $P_1 > P_3 > P_2$

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

(1) displacement current of magnitude equal to I flows m a direction opposite to that of I.

(2) displacement current of magnitude greater than I flows but can be in any direction.

(3) there is no current.

(4) displacement current of magnitude equal to I flows in the same direction as I.

38. The property which is **not** of an electromagnetic wave travelling in free space is that;

(1) they travel with a speed equal to $\dfrac{1}{\sqrt{\mu_0 \in_0}}$

(2) they originate from charges moving with uniform speed.

(3) they are transverse in nature.

(4) they energy density in electric field is equal to energy density in magnetic field.

39. Choose the correct circuit which can achieve the bridge balance.

(1)

(2)

(3)

(4)
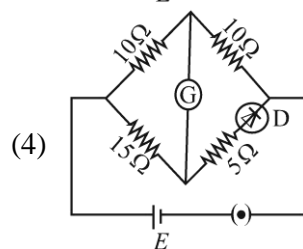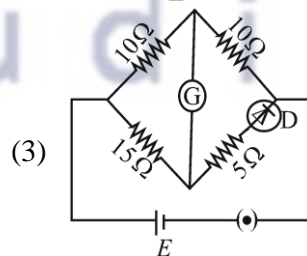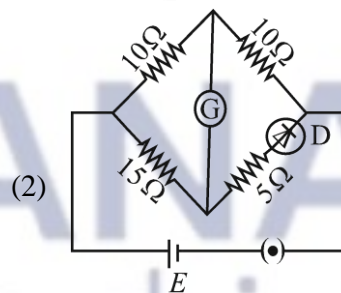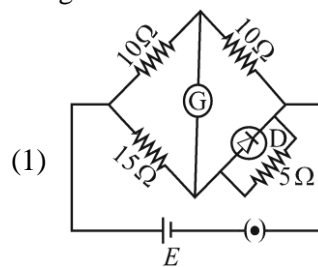
40. If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then

A. the charge stored in it, increase.

B. the energy stored in it, decreases.

C. its capacitance increases.

D. the ratio of charge to its potential remains the same.

E. the product of charge and voltage increases.

Choose the most appropriate answer from the options given below:

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

(3) A, B and E only (4) A, C and E only

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

(1) $\alpha\beta t$

(2) $\dfrac{\alpha\beta}{t}$

(3) $\dfrac{\beta t}{\alpha}$

(4) $\dfrac{\alpha t}{\beta}$

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

(1) 100×10^3 N

(2) 2×10^3 N

(3) 52×10^3 N

(4) 50×10^3 N??

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

(1) 17

(2) 32

(3) 34

(4) 28

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

(1) 2 M

(2) $\dfrac{M}{\sqrt{3}}$

(3) M

(4) $\dfrac{M}{2}$

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

210 V, 50 Hz
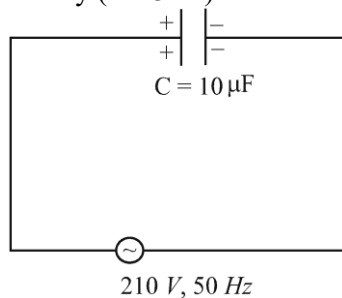
(1) 1.20 A

(2) 0.35 A

(3) 0.58 A

(4) 0.93 A

46. Two heaters A and B have power rating of 1 kW and 2kW, respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:

(1) 1 : 2

(2) 2 : 3

(3) 1 : 1

(4) 2 : 9

47. The velocity (v) –time (t) plot of the motion of a body is shown below:
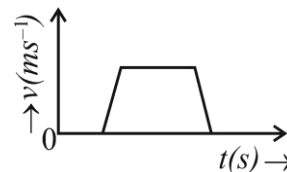
The acceleration (a) –time (t) graph that best suits this motion is:
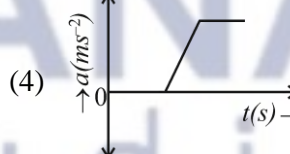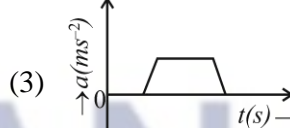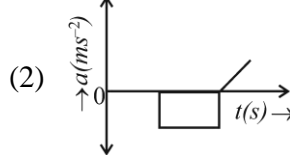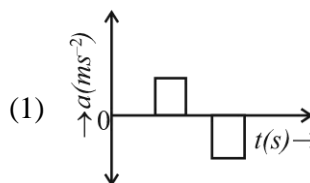
48. If the mass of the bob in s simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is $\dfrac{x}{2}$ times its original time period. Then the value of x is:

(1) $2\sqrt{3}$

(2) 4

(3) $\sqrt{3}$

(4) $\sqrt{2}$

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

(1) $\dfrac{GmM}{2R}$

(2) $\dfrac{GmM}{3R}$

(3) $\dfrac{5GmM}{6R}$

(4) $\dfrac{2GmM}{3R}$

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

Choose the correct statement(s) from the options given below:
  (1) A, C and D only
  (2) C only
  (3) B and D only
  (4) A and C only

CHEMISTRY

SECTION – A

51. Match List-I with List-II.

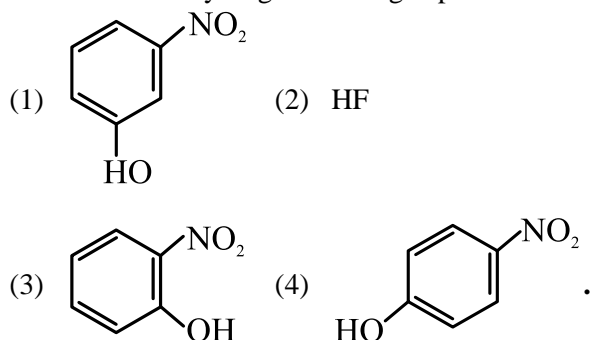| List-I (Conversion)		List-II (Number of Faraday required)
A.	1 mol of H_2O to O_2	I.	3F
B.	1 mol of MnO_4^- to Mn^{2+}	II.	2F
C.	1.5 mol of Ca from molten $CaCl_2$	III.	1F
D.	1 mol of FeO to Fe_2O_3	IV.	5F

Choose the correct answer from the options given below:
  (1) A-II, B-III, C-I, D-IV
  (2) A-III, B-IV, C-II, D-I
  (3) A-II, B-IV, C-I, D-III
  (4) A-III, B-IV, C-I, D-II

52. Which reaction is **NOT** a redox reaction?
  (1) $H_2 + Cl_2 \rightarrow 2\ HCl$
  (2) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2\ NaCl$
  (3) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
  (4) $2\ KClO_3 + I_2 \rightarrow 2\ KIO_3 + Cl_2$

53. Intramolecular hydrogen bonding is present in

  (1) [structure with NO_2 and HO groups on benzene ring]   (2) HF

  (3) [structure with NO_2 and OH groups on benzene ring]   (4) [structure with NO_2 and HO groups on benzene ring].

54. Fehling's solution 'A' is
  (1) alkaline solution of sodium potassium tartrate (Rochelle's salt)
  (2) aqueous sodium citrate
  (3) aqueous copper sulphate
  (4) alkaline copper sulphate

55. 1 gram of sodium hydroxide was treated with 25 mL of 0.75 M HCl solution, the mass of sodium hydroxide left unreacted is equal to
  (1) Zero mg
  (2) 200 mg
  (3) 750 mg
  (4) 250 mg

56. Match List-I with List-II.

List-I (Compound)		List-II (Shape/geometry)
A.	NH_3	I.	Trigonal Pyramidal
B.	BrF_5	II.	Square Planar
C.	XeF_4	III.	Octahedral
D.	SF_6	IV.	Square Pyramidal

Choose the correct answer from the options given below:
  (1) A-III, B-IV, C-I, D-II
  (2) A-II, B-III, C-IV, D-I
  (3) A-I, B-IV, C-II, D-III
  (4) A-II, B-IV, C-III, D-I

57. The $E°$ value for the Mn^{3+}/Mn^{2+} couple is more positive than that of Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+} due to change of
  (1) d^4 to d^5 configuration
  (2) d^3 to d^5 configuration
  (3) d^5 to d^4 configuration
  (4) d^5 to d^2 configuration

58. Match List-I with List-II.

List-I (Process)		List-II (Conditions)
A.	Isothermal process	I. No heat exchange
B.	Isochoric process	II. Carried out at constant temperature
C.	Isobaric process	III. Carried out at constant volume
D.	Adiabatic process	IV. Carried out at constant pressure

Choose the correct answer from the options given below:

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

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

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

60. A compound with a molecular formula of C_6H_{14} has two tertiary carbons. Its IUPAC name is:

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

61. 'Spin only' magnetic moment is same for which of the following ions?

A. Ti^{3+} B. Cr^{2+}
C. Mn^{2+} D. Fe^{2+}
E. Sc^{3+}

Choose the most appropriate answer from the options given below:

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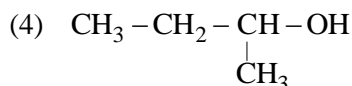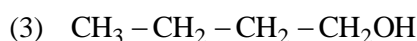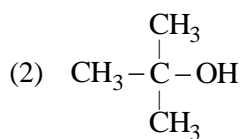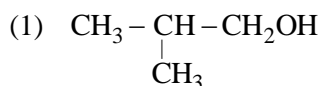(3) B and D only   (4) A and E only

62. Arrange the following elements in increasing order of electronegativity:

N, O, F, C, Si

Choose the correct answer from the options given below:

(1) $O < F < N < C < Si$
(2) $F < O < N < C < Si$
(3) $Si < C < N < O < F$
(4) $Si < C < O < N < F$

63. Which one of the following alcohols reacts instantaneously with Lucas reagent?

(1) $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2OH$

(2) $CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - OH$

(3) $CH_3 - CH_2 - CH_2 - CH_2OH$

(4) $CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{CH} - OH$

64. Given below are two statements:

Statement I: Both $\left[Co(NH_3)_6\right]^{3+}$ and $\left[CoF_6\right]^{3-}$ complexes are octahedral but differ in their magnetic behaviour.

Statement II: $\left[Co(NH_3)_6\right]^{3+}$ is diamagnetic whereas $\left[CoF_6\right]^{3-}$ is paramagnetic.

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

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

65. Given below are two statements:

Statement I : The boiling point of hydrides of Group 16 elements follow the order

$H_2O > H_2Te > H_2Se > H_2S$.
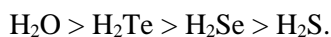
Statement II : On the basis of molecular mass, H_2O is expected to have lower boiling point than the other members of the group but due to the presence of extensive H-bonding in H_2O, it has higher boiling point.

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

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

66. Match List I with List II.

Lits I	List II
Quantum Number	**Information provided**
A. m_l	I. shape of orbital
B. m_s	II. size of orbital
C. l	III. orientation of orbital
D. n	IV. orientation of spin of electron

Choose the correct answer from the options given below:

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

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

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

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

67. Match List I with List II.

Lits I (Reaction) **List II (Reagents/ Condition)**
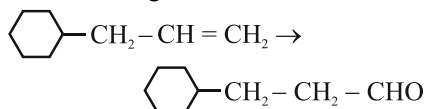
A. $\rightarrow$ 2 =O

I. Cl/ Anhyd.AlCl₃

B.

II. CrO₃

C.

III. KMnO₄/ KOH, Δ

D. CH₂CH₃ $\rightarrow$

IV. (i) O₃

COOK

(ii) Zn-H₂O

Choose the correct answer from the options given below:

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

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

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

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

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

—CH₂ – CH = CH₂ $\rightarrow$

—CH₂ – CH₂ – CHO

(1) (i) BH₃

   (ii) $H_2O_2 \big/ \overset{\ominus}{O}H$

   (iii) alk. KMnO₄

   (iv) $H_3O^{\oplus}$

(2) (i) H₂O/H⁺

   (ii) PCC

(3) (i) H₂O/H⁺

   (ii) CrO₃

(4) (i) BH₃

   (ii) $H_2O_2 \big/ \overset{\ominus}{O}H$

   (iii) PCC

69. The reagents with which glucose does **not** react to give the corresponding tests/products are

A. Tollen's reagent

B. Schiff's reagent

C. HCN

D. NH₂OH

E. NaHSO₃

Choose the correct options from the given below:

(1) B and E

(2) E and D

(3) B and C

(4) A and D

70. Match List I with List II.

	List-I (Molecule)		List-II (Number and types of bond/s between two carbon atoms)
A.	ethane	I.	one σ-bonds and two π-bonds
B.	ethene	II.	two π-bonds
C.	carbon molecule, C_2	III.	one σ-bond
D.	ethyne	IV.	one σ-bond and one π-bond

Choose the correct answer from the options given below:

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

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

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

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

71. Among Group 16 elements, which one does **NOT** show –2 oxidation state?

(1) Te

(2) Po

(3) O

(4) Se

72. For the reaction $2A \rightleftharpoons B + C$, $K_c = 4 \times 10^{-3}$. At a given time, the composition of reaction mixture is: $[A] = [B] = [C] = 2 \times 10^{-3}$ M.

Then, which of the following is correct?

(1) Reaction has a tendency to go in backward direction.

(2) Reaction has gone to completion in forward direction.

(3) Reaction is at equilibrium.

(4) Reaction has a tendency to go in forward direction.

73. Which plot of ln k vs $\dfrac{1}{T}$ is consistent with Arrhenius equation?
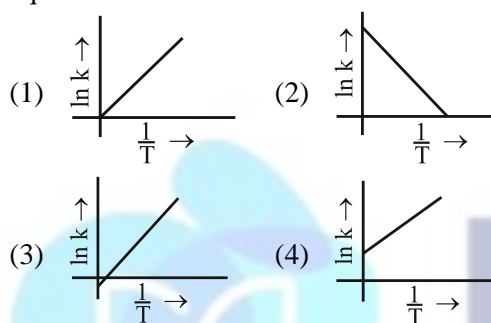
74. In which of the following equilibria, K_p and K_c are **NOT** equal?

(1) $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$

(2) $2\ BrCl_{(g)} \rightleftharpoons Br_{2(g)} + Cl_{2(g)}$

(3) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$

(4) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2\ HI_{(g)}$

75. Given below are two statements:

Statement I : The boiling point of three isomeric pentanes follows the order.

n-pentane > isopentane > neopentane

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

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

(1) 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.

76. The compound that will undergo S_N^1 reaction with the fastest rate is
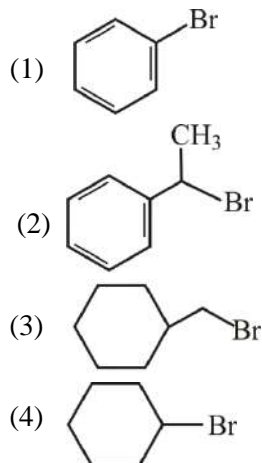
77. The energy of an electron in the ground state $(n = 1)$ for He^+ ion is $-x$ J, then that for an electron in $n = 2$ state for Be^{3+} ion in J is:

(1) $-4x$

(2) $-\dfrac{4}{9}x$

(3) $-x$

(4) $-\dfrac{x}{9}$

78. In which of the following processes entropy increases?

A. A liquid evaporates to vapour.

B. Temperature of a crystalline solid lowered from 130 K to 0 K.

C. $2\,NaHCO_{3(s)} \rightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$

D. $Cl_{2(g)} \rightarrow 2Cl_{(g)}$

Choose the correct answer from the options given below:

(1) A, C and D

(2) C and D

(3) A and C

(4) A, B and D

79. On heating some solid substance change from solid to vapour state without passing through liquid state. The technique used for the purification of such solid substances based on the above principle is known as:

(1) Distillation

(2) Chromatography

(3) Crystallization

(4) Sublimation

80. Match List-I with List-II

	List-I (Complex)		List-II (Type of isomerism)
A.	$[Co(NH_3)_5(NO_2)]Cl_2$	I.	Solvate isomerism
B.	$[Co(NH_3)_5(SO_4)]Br$	II.	Linkage isomerism
C.	$[Co(NH_3)_6][Cr(CN)_6]$	III.	Ionization isomerism
D.	$[Co(H_2O)_6]Cl_3$	IV.	Coordination isomerism

Choose the correct answer from the options given below:

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

81. Given below are two statements:

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

Statement II: Aniline cannot be prepared through Gabriel synthesis.

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

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

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

Li, Be, B, C, N

Choose the correct answer from options given below:

(1) Li < Be < C < B < N
(2) Li < Be < N < B < C
(3) Li < Be < B < C < N
(4) Li < B < Be < C < N

83. The highest number of helium atoms is in

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

84. The most stable carbocation among the following is:

(1)

(2)

(3)

(4)
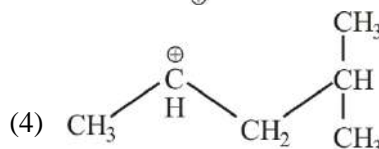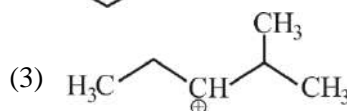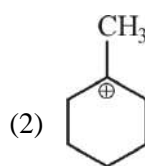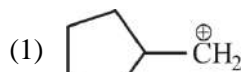
85. The Henry's law constant (K_H) values of three gases (A, B, C) in water are 145, 2×10^{-5} and 35 kbar, respectively. The solubility of these gases in water follow the order:

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

SECTION-B

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

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

(1) AB_2C_2 (2) ABC_4
(3) A_2BC_2 (4) ABC_3

87. The products A and B obtained in the following reactions, respectively, are

$3ROH + PCl_3 \rightarrow 3RCl + A$

$ROH + PCl_5 \rightarrow RCl + HCl + B$
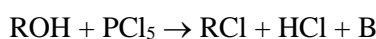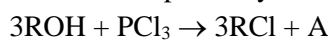
(1) H_3PO_4 and $POCl_3$
(2) H_3PO_3 and $POCl_3$
(3) $POCl_3$ and H_3PO_3
(4) $POCl_3$ and H_3PO_4

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

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

(1) 25.73ºC (2) 12.05ºC
(3) 37ºC (4) 310ºC

89. For the given reaction:

$\xrightarrow{KMnO_4/H^+}$ 'P' (major product)
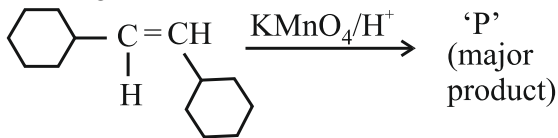
'P' is

(1)

(2)

(3)

(4)

90. Given below are two statements:

Statement I: $\left[Co(NH_3)_6\right]^{3+}$ is a homoleptic complex whereas $\left[Co(NH_3)_4Cl_2\right]^+$ is a heteroleptic complex.

Statement II: Complex $\left[Co(NH_3)_6\right]^{3+}$ has only one kind of ligands but $\left[Co(NH_3)_4Cl_2\right]^+$ has more than one kind of ligands.

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

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

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

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

92. Identify the **correct** answer.

(1) Dipole moment of NF_3 is greater than that of NH_3.
(2) Three canonical forms can be drawn for CO_3^{2-} ion.
(3) Three resonance structures can be drawn for ozone.
(4) BF_3 has non-zero dipole moment.

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

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

Choose the correct answer from the option given below:

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

94. Identify the major product C formed in the following reaction sequence:

$CH_3 - CH_2 - CH_2 - I \xrightarrow{NaCN} A$

$\xrightarrow[\text{Partial hydrolysis}]{OH^-} B \xrightarrow[Br_2]{NaOH} \underset{\text{(major)}}{C}$
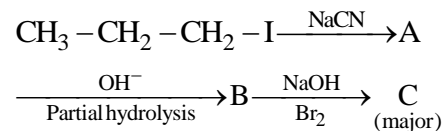
(1) butanamide
(2) α-bromobutanoic acid
(3) propylamine
(4) butylamine

95. The rate of a reaction quadruples when temperature changes from 27ºC to 57ºC. Calculate the energy of activation.

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

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

96. Consider the following reaction in a sealed vessel at equilibrium with concentrations of

$N_2 = 3.0 \times 10^{-3}$ M, $O_2 = 4.2 \times 10^{-3}$ M and NO = 2.8×10^{-3} M.

$2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$
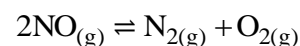
If 0.1 mol L^{-1} of $NO_{(g)}$ is taken in a closed vessel, what will be degree of dissociation (α) of $NO_{(g)}$ at equilibrium?

(1) 0.8889
(2) 0.717
(3) 0.00889
(4) 0.0889

97. The work done during reversible isothermal expansion of one mole of hydrogen gas at 25ºC from pressure of 20 atmosphere to 10 atmosphere is:

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

(1) 413.14 calories

(2) 100 calories

(3) 0 calorie

(4) – 413.14 calories

98. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is:

(Given: Molar mass of Cu : 63 g mol^{-1}, 1F = 96487 C)

(1) 31.5 g

(2) 0.0315 g

(3) 3.15 g

(4) 0.315 g

99. Major products A and B formed in the following reaction sequence, are
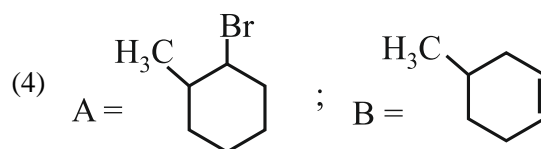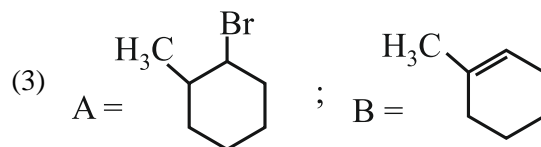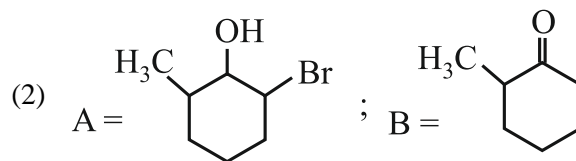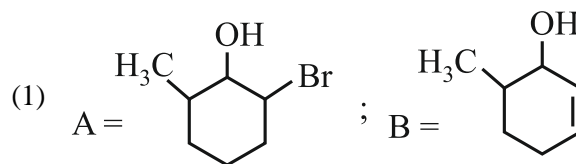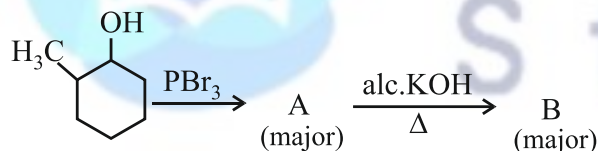
100. The pair of lanthanoid ions which are diamagnetic is

(1) Gd^{3+} and Eu^{3+}

(2) Pm^{3+} and Sm^{3+}

(3) Ce^{4+} and Yb^{2+}

(4) Ce^{3+} and Eu^{2+}

(1) A = ; B =

(2) A = ; B =

(3) A = ; B =

(4) A = ; B =

BOTANY

SECTION – A

101. Identify the set of correct statements:

A. The flowers of *Vallisneria* are colourful and produce nectar

B. The flowers of waterlily are not pollinated by water.

C. In most of water-pollinated species, the pollen grains are protected from wetting.

D. Pollen grains of some hydrophytes are long and ribbon like.

E. In some hydrophytes, the pollen grains are carried passively inside water.

Choose the correct answer from the options given below:

(1) A, C, D and E only

(2) B, C, D and E only

(3) C, D and E only

(4) A B, C and D only

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

(1) Semi-conservative method

(2) Sustainable development

(3) *in-situ* conservation

(4) Biodiversity conservation

103. Inhibition of Succinic dehydrogenase enzyme by malonate is a classical example of:

(1) Competitive inhibition

(2) Enzyme activation

(3) Cofactor inhibition

(4) Feedback inhibition

104. Identify the part of the seed from the given figure which is destined to form root when the seed germinates.
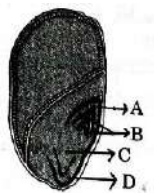
   (1) C   (2) D
   (3) A   (4) B

105. Bulliform cells are responsible for
   (1) Increased photosynthesis in monocots.
   (2) Providing large spaces for storage of sugars.
   (3) Inward curling of leaves in monocots.
   (4) Protecting the plant from salt stress.

106. Which of the following are required for the dark reaction of photosynthesis?
   A. Light
   B. Chlorophyll
   C. CO_2
   D. ATP
   E. NADPH
   Choose the correct answer from the options given below:
   (1) C, D and E only
   (2) D and E only
   (3) A, B and C only
   (4) B, C and D only

107. Formation of interfascicular cambium from fully developed parenchyma cells is an example for
   (1) Dedifferentiation
   (2) Maturation
   (3) Differentiation
   (4) Redifferentiation

108. Hind II always cuts DNA molecules at a particular point called recognition sequence and it consists of:
   (1) 4 bp   (2) 10 bp
   (3) 8 bp   (4) 6 bp

109. Tropical regions show greatest level of species richness because
   A. Tropical latitudes have remained relatively undisturbed for milions of years, hence more time was available for species diversification.
   B. Tropical environments are more seasonal.
   C. More solar energy is available in tropics.
   D. Constant environments promote niche specialization.
   E. Tropical environments are constant and predictable.

Choose the correct answer from the options given below:
   (1) A, B and E only
   (2) A, B and D only
   (3) A, C, D and E only
   (4) A and B only

110. Which one of the following is not a criterion for classification of fungi?
   (1) Mode of spore formation
   (2) Fruiting body
   (3) Morphology of mycelium
   (4) Mode of nutrition

111. How many molecules of ATP and NADPH are required for every molecule of CO_2 fixed in the Calvin cycle?
   (1) 3 molecules of ATP and 3 molecules of NADPH
   (2) 3 molecules of ATP and 2 molecules of NADPH
   (3) 2 molecules of ATP and 3 molecuifes of NADPH
   (4) 2 molecules of ATP and 2 molecules of NADPH

112. These are regarded as major causes of biodiversity loss:
   A. Over exploitation
   B. Co-extinction
   C. Mutation
   D. Habitat loss and fragmentation
   E. Migration
   Choose the correct option:
   (1) A, B and E only
   (2) A, B and D only
   (3) A, C and D only
   (4) A, B, C and D only

113. The capacity to generate a whole plant from any cell of the plant is called:
   (1) Differentiation
   (2) Somatic hybridization
   (3) Totipotency
   (4) Micropropagation

114. The equation of Verhulst-Pearl logistic growth is

$$\frac{dN}{dt} = rN\left[\frac{K-N}{K}\right].$$

From this equation, *K* indicates:

(1) Carrying capacity
(2) Population density
(3) Intrinsic rate of natural increase
(4) Biotic potential

115. Spindle fibers attach to kinetochores of chromosomes during

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

116. Identify the type of flowers based on the position of calyx, corolla and androecifum with respect to the ovary from the given figures (a) and (b)
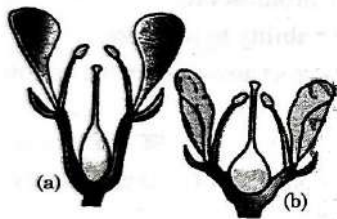
(1) (a) Perigynous; (b) Epigynous
(2) (a) Perigynous; (b) Perigynous
(3) (a) Epigynous; (b) Hypogynous
(4) (a) Hypogynous; (b) Epigynous

117. Match List I with List II

	List I		List II
A.	*Rhizopus*	I.	Mushroom
B.	*Ustilago*	II.	Smut fungus
C.	*Puccinia*	III.	Bread mould
D.	*Agaricus*	IV.	Rust fungus

Choose the correct answer from the options given below:

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

118. In a plant, black seed color (BB/Bb) is dominant over white seed color (bb). In order to find out the genotype of the black seed plant, with which of the following genotype will you cross it?

(1) Bb　　　　(2) BB/Bb
(3) BB　　　　(4) bb

119. A pink flowered Snapdragon plant was crossed with a red flowered Snapdragon plant. What type of phenotype/s is/are expected in the progeny?

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

120. Match List I with List II

	List I		List II
A.	Two or more alternative forms of a gene	I.	Back cross
B.	Cross of F_1 progeny with homozygous recessive parent	II.	Ploidy
C.	Cross of F_1 progeny with any of the parents	III.	Allele
D.	Number of chromosome sets in plant	IV.	Test cross

Choose the correct answer from the options given below:

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

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

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

122. Match List I with List II

	List I		List II
A.	*Clostridium butylicum*	I.	Ethanol
B.	*Saccharomyces cerevisiae*	II.	Streptokinase
C.	*Trichoderma polysporum*	III.	Butyric acid
D.	*Streptococcus sp.*	IV.	Cyclosporin-A

Choose the correct answer from the options given below:

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

123. In the given figure, which component has thin outer walls and highly thickened inner walls
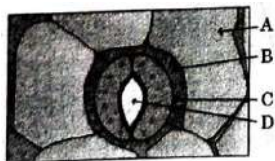
(1) A   (2) B
(3) C   (4) D

124. Which of the following is an example of actinomorphic flower?
(1) *Pisum*   (2) *Sesbania*
(3) *Datura*   (4) *Cassia*

125. A transcription unit in DNA is defined primarily by the three regions in DNA and these are with respect to upstream and down stream end;
(1) Inducer, Repressor, Structural gene
(2) Promotor, Structural gene, Terminator
(3) Repressor, Operator gene, Structural gene
(4) Structural gene, Transposons, Operator gene

126. What is the fate of piece of DNA carrying only gene of interest which is transferred into an alien organism?
A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organisms.
B. It may get generated into the genome of the recipient.
C. It may multiply and be inherited along with the host DNA.
D. The alien piece of DNA is not an integrated part of chromosome.
E. It shows ability to replicate.
Choose the correct answer from the options given below:
(1) B and C only
(2) A and E only
(3) A and B only
(4) D and E only

127. Auxin is used by gardeners to prepare weed free lawns. But no damage is caused to grass as auxin;
(1) does not affect mature monocotyledonous plants.
(2) can help in cell division in grasses, to produce growth.
(3) promotes apical dominance.
(4) promotes abscission of mature leaves only.

128. The cofactor of the enzyme carboxypeptidase is:
(1) Flavin   (2) Haem
(3) Zinc   (4) Niacin

129. The lactose present in the growth medium of bacteria is transported to the cell by the action of
(1) Permease
(2) Polymerase
(3) Beta-galactosidase
(4) Acetylase

130. Which one of the following can be explained on the basis of Mendel's Law of Dominance?
A. Out of one pair of factors one is dominant and the other is recessive.
B. Alleles do not show any expression and both the characters appear as such in F_2 generation.
C. Factors occur in pair in normal diploid plants.
D. The discrete unit controlling a particular character is called factor.
E. The expression of only one of the parental characters is found in a monohybrid cross.
Choose the correct answer from the options given below:
(1) B, C and D only   (2) A, B, C, D and E
(3) A, B and C only   (4) A, C, D and E only

131. Given below are two statements:
Statement I: Bt toxins are insect group specific and coded by a gene *cry* IAc.
Statement II: Bt toxin exists as inactive protoxin in B. *thuringienis*. However, after ingestion by the insect the inactive protoxin gets converted into active form due to acidic pH of the insect gut.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false.

132. Given below are two statements:
Statement I: Parenchyma is living but collenchyma is dead tissue.
Statement II: Gymnosperms lack xylem vessels but presence of xylem vessels is the characteristic of angiosperms.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false

133. Given below are two Statements:
Statement I : Chromomes become gradually visible under light microscope during leptotene stage.
Statement II: The begining of diplotene stage is recognized by dissolution of synaptonemal complex.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false

134. Match List-I with List-II.

	List-I		List-II
(A)	Nucleolus	(I)	Site of formation of glycolipid
(B)	Centriole	(II)	Organization like the cartwheel
(C)	Leucoplasts	(III)	Site for active ribosomal RNA synthesis
(D)	Golgi apparatus	(IV)	For storing nutrients

Choose the correct answer from the options given below
(1) A-III, B-IV, C-II, D-I
(2) A-I, B-II, C-III, D-IV
(3) A-III, B-II, C-IV, D-I
(4) A-II, B-III, C-I, D-IV

135. List of endangered spb&ies was released by-:
(1) Foam
(2) IUCN
(3) GEAC
(4) WWF

SECTION-B

136. The DNA present in chloroplast is:
(1) Linear, single stranded
(2) Circular, single stranded
(3) Linear, double stranded
(4) Circular, double stranded

137. Which of the following are fused in somatic hybridization involving two varieties of plants?
(1) Protoplsats   (2) Pollens
(3) Callus   (4) Somatic embryos

138. Identify the correct description about the given figure:

(1) Cleistogamous flowers showing autogamy.
(2) Compact inflorescence showing complete autogamy.
(3) Wind pollinated plant inflorescence showing flowers with well exposed stamens.
(4) Water pollinated flowers showing stamens with mucilaginous covering.

139. Spraying sugarcane crop with which of the following plant growth regulators, increases the length of stem, thus, increasing the yield?
(1) Cytokinin   (2) Abscisic acid
(3) Auxin   (4) Gibberellin

140. Match List-I with List-II.

	List-I		List-II
(A)	Frederick Griffith	(I)	Genetic code
(B)	Francois Jacob & Jacque Monod	(II)	Semi-conservative mode of DNA replication
(C)	Har Gobind Khorana	(III)	Transformation
(D)	Meselson & Stahl	(IV)	*Lac* operson

Choose the correct answer from the options given below
(1) A-II, B-III, C-IV, D-I
(2) A-IV, B-I, C-II, D-III
(3) A-III, B-II, C-I, D-IV
(4) A-III, B-IV, C-I, D-II

141. Match List-I with List-II.

	List-I		List-II
(A)	GLUT-4	(I)	Hormone
(B)	Insulin	(II)	Enzyme
(C)	Trypsin	(III)	Intercellular ground substances
(D)	Collagen	(IV)	Enables glucose transport into cell.

Choose the correct answer from the options given below
(1) A-II, B-III, C-IV, D-I
(2) A-III, B-IV, C-I, D-II
(3) A-IV, B-I, C-II, D-III
(4) A-I, B-II, C-III, D-IV

142. Given below are two statements:
Statement I : In C_3 Plants, some O_2 binds RuBisCO, hence CO_2 fixation is decreased.
Statement II: In C_4 plants, mesophyll cells show very little photorespiration while bundle sheath cells do not show photorespiration.
In the light of the above statements, choose the *correct* answer from the options given below:
(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false

143. Identify the step in tricarboxylic acid cycle, which does not involve oxidation of substrate.
(1) Succinyl-CoA → Succinic acid
(2) Isocitrate → α -ketoglutaric acid
(3) Malic acid → Oxaloacetic acid
(4) Succinic acid → Malic acid

144. Match List-I with List-II.

	List-I		List-II
(A)	Citric acid cycle	(I)	Cytoplasm
(B)	Glycolysis	(II)	Mitochondrial matrix
(C)	Electron transport system	(III)	Intermembrane space of mitochondria
(D)	Proton gradient	(IV)	Inner mitochondrial membrane

Choose the correct answer from the options given below.
(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-I, B-II, C-III, D-IV
(4) A-II, B-I, C-IV, D-III

145. Which of the following statement is correct regarding the process of replication in *E.coli* ?
(1) The DNA dependent DNA polymerase catalyses polymerization in 5'→3' as well as 3'→5' direction.
(2) The DNA dependent DNA polymerase catalyses polymerization in 5'→3' direction.
(3) The DNA dependent DNA polymerase catalyses polymerization in one direction, that is 3'→5'.
(4) The DNA dependent RNA polymerase catalyase polymerization in one direction, that is 5'→3'.

146. In an ecosystem if the Net Primary Productivity (NPP) of first trophic level is: $100x\left(kcal\,m^{-2}\right)yr^{-1}$ what would be the GPP (Gross Primary Productivity) of the third trophic level of the same ecosystem?
(1) $10x\left(kcal\,m^{-2}\right)yr^{-1}$
(2) $\dfrac{100x}{3x}\left(kcal\,m^{-2}\right)yr^{-1}$
(3) $\dfrac{x}{10}\left(kcal\,m^{-2}\right)yr^{-1}$
(4) $x\left(kcal\,m^{-2}\right)yr^{-1}$

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

	List-I		List-II
(A)	Rose	(I)	Twisted aestivation
(B)	Pea	(II)	Perigynous flower
(C)	Cotton	(III)	Drupe
(D)	Mango	(IV)	Marginal placentation

Choose the correct answer from the options given below
(1) A-IV, B-III, C-II, D-I
(2) A-II, B-III, C-IV, D-I
(3) A-II, B-IV, C-I, D-III
(4) A-I, B-II, C-III, D-IV

148. Match List-I with List-II.

	List-I		List-II
(A)	Robert May	(I)	Species area relationship
(B)	Alexander von Humboldt	(II)	Long term ecosystem experiment using out door plots
(C)	Paul Ehrlich	(III)	Global species diversity at about 7 million
(D)	David Tilman	(IV)	Rivet popper hypothesis

Choose the correct answer from the options given below

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

149. Match List-I with List-II.

	List-I (Types of stamen)		List-II (Example)
(A)	Monoadelphous	(I)	Citrus
(B)	Diadelphous	(II)	Pea
(C)	Polyadelphous	(III)	Lily
(D)	Epiphyllous	(IV)	China-rose

Choose the correct answer from the options given below

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

150. Read the following statements and choose the set of correct statements.

In the members of Phaeophyceae.

A. Asexual reproduction occurs usually by biflagellate zoospores.

B. Sexual reproduction is by oogamous method only.

C. Stored food is in the form of carbohydrates which is either mannitol or laminarin

D. The major pigments found are chlorophyll a, c and carotenoids and xanthophyll.

E. Vegetative cells have a cellulosic wall, usually covered on the outside by gelatinous coating of algin.

Choose the correct answer front the options given below:

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

ZOOLOGY

SECTION – A

151. Match List I with List II:

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

Choose the correct answer from the options given below:

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

152. Match List I with List II:

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

Choose the correct answer from the options given below:

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

153. Given below are two statements:
Statement I: The presence or absence of hymen is not a reliable indicator of virginity.
Statement II: The hymen is torn during the first coitus only.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false.

154. In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on:
(1) 8th and 9th segment
(2) 11th segment
(3) 5th segment
(4) 10th segment

155. Match List I with List II:

	List I		List II
A.	Pons	I.	Provides additional space for Neurons, regulates posture and balance.
B.	Hypothalamus	II.	Controls respiration and gastric secretions.
C.	Medulla	III.	Connects different regions of the brain.
D.	Cerebellum	IV.	Neuro secretory cells

Choose the correct answer from the options given below:
(1) A-I, B-III, C-II, D-IV
(2) A-II, B-I, C-III, D-IV
(3) A-II, B-III, C-I, D-IV
(4) A-III, B-IV, C-II, D-I

156. Which of the following is not a steroid hormone?
(1) Progesterone   (2) Glucagon
(3) Cortisol   (4) Testosterone

157. Which one is the correct product of DNA dependent RNA polymerase to the given template?
3' TACATGGCAAATATCCATTCA5'
(1) 5' AUGUACCGUUUAUAGGGAAGU3'
(2) 5' ATGTACCGTTTATAGGTAAGT3'
(3) 5' AUGUACCGUUUAUAGGUAAGU3'
(4) 5' AUGUAAAGUUUAUAGGUAAGU3'

158. Three type of muscles are given as a, b and c. Identify the correct matching pair along with their location in human body.
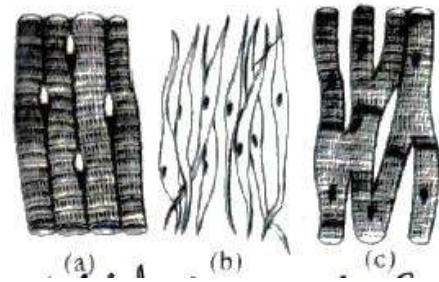
Name of muscle/location
(1) (a) Skeletal - Biceps
    (b) Involunatry - Intestine
    (c) Smooth - Heart.
(2) (a) Involunatry - Nose tip
    (b) Skeletal - Bone
    (c) Cardiac - Heart.
(3) (a) Smooth - Toes
    (b) Skeletal - Legs
    (c) Cardiac - Heart.
(4) (a) Skeletal - Triceps
    (b) Smooth - Stomach
    (c) Cardiac - Heart

159. Following are the stages of cell division:
A. Gap 2 phase
B. Cytokinesis
C. Synthesis phase
D. Karyokinesis
E. Gap 1 phase
Choose the correct sequence of stages from the options given below:
(1) B-D-E-A-C
(2) E-C-A-D-B
(3) C-E-D-A-B
(4) E-B-D-A-C

160. Which of the following are Autoimmune disorders?
A. Myasthenia gravis
B. Rheumatoid arthritis
C. Gout
D. Muscular dystrophy
E. Systemic Lupus Erythematosus (SLE)
Choose the most appropriate answer from the options given below:
(1) B, C & E only
(2) C, D & E only
(3) A, B & D only
(4) A, B & E only

161. Match List I with List II:

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

Choose the correct answer from the options given below:
(1) A-II, B-IV, C-I, D-III
(2) A-IV, B-I, C-III, D-II
(3) A-IV, B-II, C-III, D-I
(4) A-III, B-II, C-I, D-IV

162. The flippers of the Penguins and Dolphins are the example of the
(1) Convergent evolution
(2) Divergent evolution
(3) Adaptive radiation
(4) Natural selection

163. Match List I with List II:

	List I		List II
A.	Expiratory capacity	I.	Expiratory reserve volume + Tidal volume + Inspiratory reserve volume
B.	Functional residual capacity	II.	Tidal volume + Expiratory reserve volume
C.	Vital capacity	III.	Tidal volume + Inspiratory reserve volume
D.	Inspiratory capacity	IV.	Expiratory reserve volume + Residual volume

Choose the correct answer from the options given below:
(1) A-II, B-I, C-IV, D-III
(2) A-I, B-III, C-II, D-IV
(3) A-II, B-IV, C-I, D-III
(4) A-III, B-II, C-IV, D-I

164. Which one of the following factors will not affect the Hardy-Weinberg equilibrium?
(1) Gene migration
(2) Constant gene pool
(3) Genetic recombination
(4) Genetic drift

165. Given below are some stages of human evolution. Arrange them in correct sequence. (Past to Recent)
A. *Homo habilis*
B. *Homo sapiens*
C. *Homo neanderthalensis*
D. *Homo erectus*
Choose the correct sequence of human evolution from the options given below:
(1) C-B-D-A
(2) A-D-C-B
(3) D-A-C-B
(4) B-A-D-C

166. Following are the stages of pathway for conduction of an action potential through the heart:
A. AV bundle
B. Purkinje fibres
C. AV node
D. Bundle branches
E. SA node
Choose the correct sequence of pathway from the options given below:
(1) B-D-E-C-A
(2) E-A-D-B-C
(3) E-C-A-D-B
(4) A-E-C-B-D

167. Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?
(1) Low pCO_2 and High H^+ concentration
(2) Low pCO_2 and High temperature
(3) High pO_2 and High pCO_2
(4) High pO_2 and Lesser H^+ concentration

168. Match List I with List II:

	List I		List II
A.	α-1 antitrypsin	I.	Cotton bollworm
B.	Cry IAb	II.	ADA deficiency
C.	Cry IAc	III.	Emphysema
D.	Enzyme replacement therapy	IV.	Corn borer

Choose the correct answer from the options given below:
(1) A-III, B-IV, C-I, D-II
(2) A-II, B-IV, C-I, D-III
(3) A-II, B-I, C-IV, D-III
(4) A-III, B-I, C-II, D-IV

169. Given below are two statement: one is labelled as Assertion A and the other is labelled as Reason R:

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

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

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

(1) 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 but R is NOT the correct explanation of A.

170. The following diagram showing restriction sites in *E.coli* cloning vector pBR322. Find the role of *'X'* and *'Y'* genes:
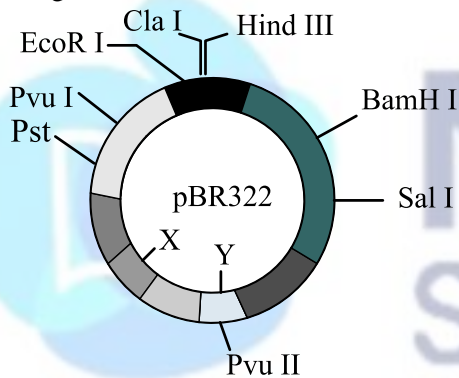
(1) The gene *'X'* is for protein involved in replication of Plasmid and *'Y'* for resistance to antibiotics.

(2) Gene *'X'* is responsible for recognition sites and *'Y'* is responsible for antibiotic resistance.

(3) The gene *'X'* is respoinsible for resistance to antibiotics and *'Y'* for protein involved in the replication of Plasmid.

(4) The gene *'X'* is responsible for controlling the copy number of the linked DNA and *'Y'* for protein involved in the replication of Plasmid.

171. Match List I with List II:

	List I		List II
A.	Cocaine	I.	Effective sedative in surgery
B.	Heroin	II.	*Cannabis sativa*
C.	Morphine	III.	*Erythroxylum*
D.	Marijuana	IV.	*Papaver somniferum*

Choose the correct answer from the options given below:

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

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

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

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

172. Consider the following statements:

A. Annelids are true coelomates

B. Poriferans are pseudocoelomates

C. Aschelminthes are acoelomates

D. Platyhelminthes are pseudocoelomates

Choose the correct answer from the options given below:

(1) C only   (2) D only

(3) B only   (4) A only

173. Given below are two statements:

Statements I: In the nephron the descending limb of loop of Henle is impermeable to water and permeable to electrolytes.

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

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

(1) Statement I is true but Statement II is false.

(2) Statement I is false but Statement II is true.

(3) Both Statement I and Statement II are true.

(4) Both Statement I and Statement II are false.

174. Match List I with List II:

	List I		List II
A.	Fibrous joints	I.	Adjacent vertebrae, limited movement
B.	Cartilaginous joints	II.	Humerus and pectoral girdle, rotational movement
C.	Hinge	III.	Skull, don't allow any movement
D.	Ball and socket joints	IV.	Knee, help in locomotion

Choose the correct answer from the options given below:

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

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

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

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

175. Which of the following is not a natural/traditional contraceptive method?
- (1) Lactational amenorrhea
- (2) Vaults
- (3) Coitus interruptus
- (4) Periodic abstinence

176. Match List I with List II:

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

Choose the correct answer form the options given below:
- (1) A-II, B-IV, C-I, D-III
- (2) A-IV, B-III, C-II, D-I
- (3) A-IV, B-II, C-III, D-I
- (4) A-II, B-I, C-IV, D-III

177. Match List I with List II:

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

Choose the correct answer form the options given below:
- (1) A-II, B-IV, C-I, D-III
- (2) A-II, B-I, C-IV, D-III
- (3) A-IV, B-III, C-II, D-I
- (4) A-IV, B-II, C-III, D-II

178. Which of the following statements is incorrect?
- (1) Bio-reactors are used to produce small scale bacterial cultures.
- (2) Bio-reactors have an agitator system, an oxygen delivery system and foam control system.
- (3) A bio-reactor provides optimal growth conditions for achieving the desired product.
- (4) Most commonly used bio-reactors are of stirring type.

179. Match List I with List II:

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

Choose the **correct** answer form the options given below:
- (1) A-II, B-IV, C-I, D-III
- (2) A-IV, B-III, C-II, D-I
- (3) A-IV, B-II, C-III, D-I
- (4) A-I, B-II, C-IV, D-III

180. Match List I with List II:

	List-I		List-II
A.	Common cold	I.	*Plasmodium*
B.	Haemozoin	II.	Typhoid
C.	Widal test	III.	Rhinoviruses
D.	Allergy	IV.	Dust mites

Choose the **correct** answer form the options given below:
- (1) A-III, B-I, C-II, D-IV
- (2) A-IV, B-II, C-III, D-I
- (3) A-II, B-IV, C-III, D-I
- (4) A-I, B-III, C-II, D-IV

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

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

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

In the light of the above statements, choose the most appropriate answer from the options given below:
- (1) 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.

182. Match List I with List II:

	List-I		List-II
A.	*Pterophyllum*	I.	Hag fish
B.	*Myxine*	II.	Saw fish
C.	*Pristis*	III.	Angel fish
D.	*Exocoetus*	IV.	Flying fish

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

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

183. The "Ti plasmid" of *Agrobacterium tumefaciens* stands for

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

184. Which of the following is not a component of Fallopian tube?

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

185. Match List I with List II:

	List-I		List-II
A.	Down's syndrome	I.	11th chromosome
B.	α - Thalassemia	II.	'X' chromosome
C.	β-Thalassemia	III.	21st chromosome
D.	Klinefelter's	IV.	16th chromosome

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

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

SECTION-B

186. The following are the statements about non-chordates:

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

Choose the most appropriate answer from the options given below:

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

187. Match List I with List II:

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

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

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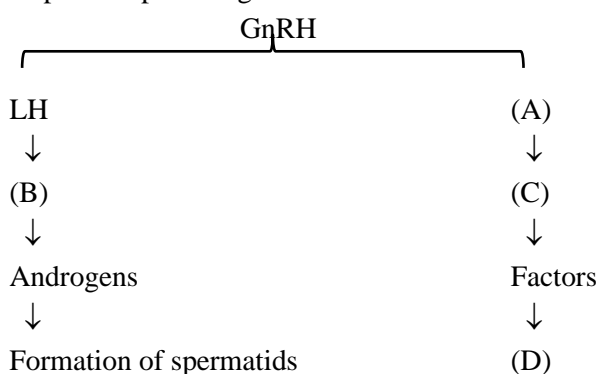(4) A-III, B-I, C-II, D-IV

188. Given below are two statements:

Statement I: The cerebral hemispheres are connected by nerve tract known as corpus callosum.
Statement II: The brain stem consists of the medulla oblongata, pons and cerebrum.

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

(1) 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.

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

```
                    GnRH
          ┌──────────────────────┐
LH                              (A)
↓                               ↓
(B)                             (C)
↓                               ↓
Androgens                       Factors
↓                               ↓
Formation of spermatids         (D)
```

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

[Type here]

190. Match List I with List II:

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

Choose the **correct** answer form the options given below:
(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-I, D-II
(3) A-II, B-IV, C-I, D-III
(4) A-III, B-II, C-IV, D-I

191. Match List I with List II:

	List-I		List-II
A.	Exophthalmic goiter	I.	Excess secretion of cortisol, moon face & hyperglycemia
B.	Acromegaly	II.	Hypo-secretion of thyroid hormone and stunted growth.
C.	Cushing's syndrome	III.	Hyper secretion of thyroid hormone & protruding eye balls.
D.	Cretinism	IV.	Excessive secretion of growth hormone.

Choose the **correct** answer form the options given below:
(1) A-III, B-IV, C-II, D-I
(2) A-III, B-IV, C-I, D-II
(3) A-I, B-III, C-II, D-IV
(4) A-IV, B-II, C-I, D-III

192. Match List I with List II:

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

Choose the **correct** answer form the options given below:
(1) A-III, B-IV, C-I, D-II
(2) A-II, B-I, C-IV, D-III
(3) A-II, B-I, C-III, D-IV
(4) A-IV, B-III, C-I, D-II

193. Given below are two statements:
Statement I: Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.
Statement II: Both bone marrow and thymus provide micro environments for the development and maturation of T-lymphocytes.
In the light of the above statements, choose the most approriate 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.

194. Match List I with List II:

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

Choose the **correct** answer form the options given below:
(1) A-IV, B-III, C-II, D-I
(2) A-III, B-II, C-IV, D-I
(3) A-IV, B-II, C-III, D-I
(4) A-I, B-II, C-III, D-IV

195. Choose the **correct** statement given below regarding juxta medullary nephron.
(1) Loop of Henle of juxtamedullary nephron runs deep into medulla.
(2) Juxtamedullary nephrons outnumber the cortical nephtons.
(3) Juxtamedullary nephrons are located in the columns of Bertini.
(4) Renal corpuscle of juxtamedullary nephron lies in the outer portion of he renal medulla.

196. Match List I with List II:

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

Choose the **correct** answer form the options given below:
(1) A-II, B-III, C-I, D-IV
(2) A-IV, B-II, C-I, D-III
(3) A-I, B-III, C-IV, D-II
(4) A-III, B-II, C-IV, D-I

197. As per ABO blood grouping system, the blood group of fathers is B^+, mother is A^+ and child is O^+. Their respective genotype can be
A. $I^B i / I^A i / ii$
B. $I^B I^B / I^A I^A / ii$
C. $I^A I^B / i I^A / I^B i$
D. $I^A i / I^B i / I^A i$
E. $i I^B / i I^A / I^A I^B$
Choose the most appropriate answer from the options given below:
(1) C & B only   (2) D & E only
(3) A only   (4) B only

198. Given below are two statements:
Statement I: Gause's competitive exclusive principle states that two closely related species competing for different resources cannot exist indefinitely.
Statement II: According to Gause's principle, during competition, the inferior will be eliminated. This may be true if resources are limiting.

In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement I is true but Statement II is false.
(2) Statement I is false but statement II is true.
(3) Both statement I and Statement II are true.
(4) Both statement I and Statement II are false.

199. Regarding catalytic cycle of an enzyme action, selecte the **correct** sequential steps:
A. Substrate enzyme complex formation.
B. Free enzyme ready to bind with another substrate.
C. Release fo products.
D. Chemical bonds of the substrate broken.
E. Substrate bindig to active site.
Choose the correct answer from the options given below:
(1) B, A, C, D, E
(2) E, D, C, B, A
(3) E, A, D, C, B
(4) A, E, B, D, C

200. Given below are two statements:
Statement I: Mitochondria and chloroplasts are both double membrane bound organelles.
Statement II: Inner membrane of mitochondria is relatively less permeable, as compared to chloroplast.
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.

■■■

NEET (UG)-2024

PHYSICS		CHEMISTRY		BOTANY		ZOOOLOGY	
1.	(1)	51.	(3)	101.	(2)	151.	(4)
2.	(3)	52.	(2)	102.	(4)	152.	(2)
3.	(3)	53.	(3)	103.	(1)	153.	(1)
4.	(2)	54.	(3)	104.	(1)	154.	(4)
5.	(4)	55.	(4)	105.	(3)	155.	(4)
6.	(1)	56.	(3)	106.	(1)	156.	(2)
7.	(4)	57.	(3)	107.	(1)	157.	(3)
8.	(3)	58.	(2)	108.	(4)	158.	(4)
9.	(1)	59.	(2)	109.	(3)	159.	(2)
10.	(1)	60.	(1)	110.	(4)	160.	(4)
11.	(2)	61.	(3)	111.	(2)	161.	(1)
12.	(3)	62.	(3)	112.	(2)	162.	(2)
13.	(3)	63.	(2)	113.	(3)	163.	(3)
14.	(3)	64.	(3)	114.	(1)	164.	(2)
15.	(4)	65.	(3)	115.	(4)	165.	(2)
16.	(1)	66.	(4)	116.	(2)	166.	(3)
17.	(3)	67.	(1)	117.	(3)	167.	(4)
18.	(1)	68.	(4)	118.	(4)	168.	(1)
19.	(4)	69.	(1)	119.	(4)	169.	(2)
20.	(4)	70.	(1)	120.	(1)	170.	(4)
21.	(2)	71.	(2)	121.	(4)	171.	(2)
22.	(3)	72.	(1)	122.	(1)	172.	(4)
23.	(2)	73.	(2)	123.	(3)	173.	(4)
24.	(2)	74.	(3)	124.	(3)	174.	(2)
25.	(1)	75.	(3)	125.	(2)	175.	(2)
26.	(4)	76.	(2)	126.	(1)	176.	(4)
27.	(2)	77.	(3)	127.	(1)	177.	(2)
28.	(3)	78.	(1)	128.	(3)	178.	(1)
29.	(2)	79.	(4)	129.	(1)	179.	(1)
30.	(4)	80.	(3)	130.	(4)	180.	(1)
31.	(4)	81.	(3)	131.	(1)	181.	(3)
32.	(3)	82.	(4)	132.	(2)	182.	(4)
33.	(2)	83.	(3)	133.	(3)	183.	(1)
34.	(4)	84.	(2)	134.	(3)	184.	(3)
35.	(4)	85.	(4)	135.	(2)	185.	(1)
36.	(2)	86.	(4)	136.	(4)	186.	(1)
37.	(4)	87.	(2)	137.	(1)	187.	(2)
38.	(2)	88.	(3)	138.	(3)	188.	(1)
39.	(3)	89.	(4)	139.	(4)	189.	(3)
40.	(4)	90.	(3)	140.	(4)	190.	(2)
41.	(4)	91.	(2)	141.	(3)	191.	(2)
42.	(4)	92.	(2)	142.	(1)	192.	(1)
43.	(4)	93.	(3)	143.	(1)	193.	(3)
44.	(4)	94.	(3)	144.	(4)	194.	(3)
45.	(4)	95.	(3)	145.	(2)	195.	(1)
46.	(4)	96.	(2)	146.	(1)	196.	(4)
47.	(1)	97.	(4)	147.	(3)	197.	(3)
48.	(4)	98.	(4)	148.	(4)	198.	(2)
49.	(3)	99.	(3)	149.	(3)	199.	(3)
50.	(4)	100.	(3)	150.	(1)	200.	(1)

PHYSICS

1. **(1)**

Magnetic field $B = \dfrac{\mu_0 NI}{2r}$

$= \dfrac{4\pi \times 10^{-7} \times 100 \times 7}{2 \times 100 \times 10^{-2}} = 0.0044$ T

$= 4.4$ mT

2. **(3)**

Material	Magnetic susceptibility (χ)
Diamagnetic	-10^{-5} to 10^{-9}
Paramagnetic	10^{-5} to 10^{-3}
Ferromagnetic	$\gg 1$
Non–magnetic	0

3. **(3)**

As volume is constant along path bc, hence the work done, $W = \int P\,dV = 0$

4. **(2)**

At brewster angle, only the reflected light is completely polarised, but the refracted light is partially polarised.

5. **(4)**

$\dfrac{N_P}{N_S} = \dfrac{1}{2}$ (given)

We know that transformation ratio (r) is

$r = \dfrac{N_S}{N_P} = \dfrac{V_S}{V_P}$

$\therefore \dfrac{V_S}{V_P} = \dfrac{2}{1}$

$V_S : V_P = 2 : 1$

6. **(1)**

Output for given options.

(1) $\overline{B}$	(2) B	(3) $A.B + \overline{A}$	(4) $A.\overline{B} + \overline{A}$
1	0	1	1
0	1	1	1
1	0	0	1
0	1	1	0

So option (1) is correct.

7. **(4)**

($N + 1$) vernier scale division (VSD) = (N) main scale division

$1\,\text{VSD} = \left(\dfrac{N}{N+1}\right)\text{MSD}$

L.C = Least count = 1 MSD – 1 VSD

$= \left(1 - \dfrac{N}{N+1}\right)\text{MSD}$

$= \left(\dfrac{1}{N+1}\right)\text{MSD}$

$= \left(\dfrac{1}{N+1}\right) \times \dfrac{0.1}{10}$ cm

$= \dfrac{1}{100(N+1)}$ cm

8. **(3)**

$(\text{Stress})_{max} = \text{Young's modulus} \times (\text{Strain})_{max}$

$\dfrac{8 \times 10^8}{2 \times 10^{11}} = (\Delta\ell)_{max}$

$4 \times 10^{-3} = (\Delta\ell)_{max}$

$(\Delta\ell)_{max} = 4$ mm

9. **(1)**

In connected motion,

Common acceleration $a = \dfrac{F_{net}}{M_{total}}$

$a = \dfrac{10}{5} = 2$ m/s^2

Now, from FBD of 2 kg block & 3 kg block

$F = 10$ N $\rightarrow$ 2 $\leftarrow F_{AB}$ $F_{BA} \rightarrow$ 3 $\rightarrow a$
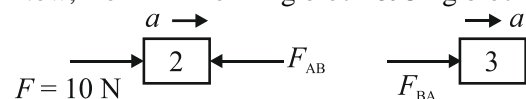
Force exerted by block A on block B,

$F_{BA} = (3)a$

$F_{BA} = 3 \times 2 = 6$ N

10. **(1)**

When we use white light in place of monochromatic light, the central fringe appears white, while the other fringes display different colours. This is because the central fringe for all colours is formed at central point, so it appears white after mixing up. As fringes of other colours fall at different positions, we see fringes of all colours on either side of the central bright fringe.

11. (2)
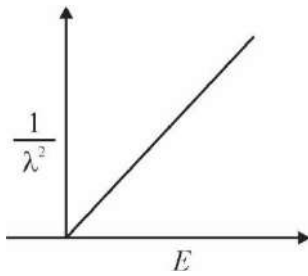
$$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$$
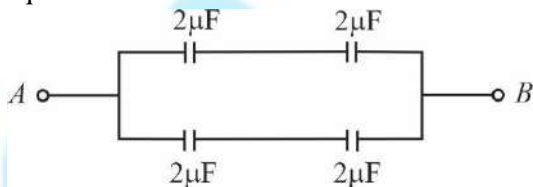
$$\lambda = \frac{h}{\sqrt{2mE}}$$

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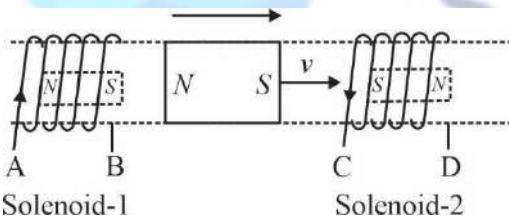
$$E \propto \frac{1}{\lambda^2}$$

12. (3)

Balanced Wheatstone bridge
Equivalent circuit

13. (3)

Lenz Law

14. (3)

The $I - V$ characteristics of solar cell is drawn in the fourth quadrant of the coordinate axes. This is because a solar cell does not draw current but supplies the same to the load.

In reverse bias condition, the positive terminal is connected to the n-type and the negative terminal is connected to the p-type. Hence, majority charge carriers are swept into terminals and minority charge carriers are repelled by the terminals. Thus, a very small drift current flows through the diode due to minority charge carriers of both n-side and p-side.

15. (4)
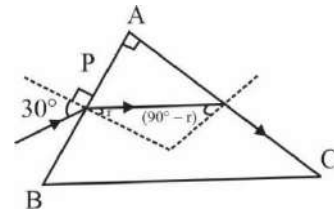
For surface AB

$1 \sin 30° = \mu \sin r$ ……… (1)

For surface AC

$\mu \sin (90° - r) = 1$ ……… (2)

$\Rightarrow \quad \mu \cos r = 1$

$\Rightarrow \quad \cos r = \frac{1}{\mu}$

From (1) and (2)

$\Rightarrow \quad \frac{1}{2} = \mu \sqrt{1 - \frac{1}{\mu^2}}$

$\Rightarrow \quad \frac{1}{4} = \mu^2 \left(1 - \frac{1}{\mu^2} \right)$

$\Rightarrow \quad \frac{1}{4} = \mu^2 - 1$

$\Rightarrow \quad \mu^2 = 1 + \frac{1}{4}$

$\Rightarrow \quad \mu = \frac{\sqrt{5}}{2}$

16. (1)

Formula of potential is given by $V = \frac{Kp\cos\theta}{r^2}$

For axial point $\theta = 0°$ or $180°$

$$V = \pm \frac{Kp}{r^2} = \pm \frac{1}{4\pi\varepsilon_0} \times \frac{p}{r^2}$$

$$= \pm \frac{9 \times 10^9 \times 4 \times 10^{-6}}{4}$$

$$= \pm 9 \times 10^3$$

17. (3)
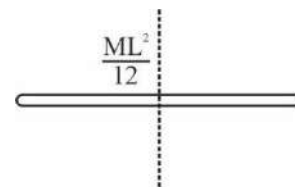
$$\frac{ML^2}{12} = 2400$$
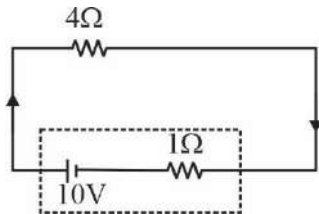
$\Rightarrow \quad \frac{400L^2}{12} = 2400$

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

$\Rightarrow \quad L^2 = 72$

$\Rightarrow \quad L = \sqrt{72}$

$\Rightarrow \quad L = 8.5 \, \text{cm}$

[3]

18. **(1)**

$10 = 5i$

$i = 2$ A

Terminal voltage $= 10 - 1(2)$

$= 8$ V

19. **(4)**

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

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

For H, $Z = 1$ So,

$$\lambda = 91.2\left(\frac{n_1^2 n_2^2}{n_2^2 - n_1^2}\right)\text{nm}$$

For A $\lambda = 656.3$

For B $\lambda = 486.1$

For C $\lambda = 434.1$

For D $\lambda = 410.2$

20. **(4)**

Energy $E = hv$

Velocity $= C = v\lambda$

$$\lambda = \frac{c}{v}$$

$$P = \frac{h}{\lambda} = \frac{h}{\dfrac{c}{v}} = \frac{hv}{c}$$

$F_{ext} = 0$, So momentum conserved energy conserved.

21. **(2)**

$$^{290}_{82}X \xrightarrow{\alpha} {}^{286}_{80}Y \xrightarrow{e^+} {}^{286}_{79}Z \xrightarrow{\beta^-} {}^{286}_{80}P \xrightarrow{e-} {}^{286}_{81}Q$$
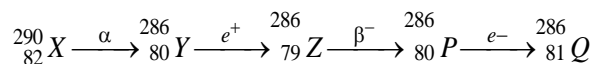
For α emission, mass number decreases by 4 and atomic number decreases by 2.

For e^+, atomic number decreases by 1 and mass number remains unchanged.

For β^-, mass number is unchanged and atomic number increases by 1.

22. **(3)**

$s = 2t - 1$

$$v = \frac{ds}{dt} = \frac{d}{dt}(2t - 1) = 2 \text{ (SI unit)}$$

Instantaneous power, $P = \vec{F}.\vec{v}$

$\qquad\qquad\qquad\qquad = 5 \times 2 = 10$ (SI unit)

23. **(2)**
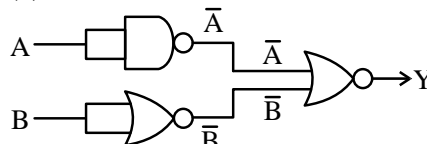
$Y = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}}.\overline{\overline{B}}$ (AND gate)

24. **(2)**

$$g = \frac{GM}{R^2} = 9.8 \text{ m/s}^2 \quad \ldots\ldots\ldots\text{(i)}$$

Now for Planet,

$$M' = \frac{M}{10}, D' = \frac{D}{2} \qquad \text{[D is diameter fo earth]}$$

$$\therefore \quad R' = \frac{R}{2}$$

Now, $\quad g' = \dfrac{GM'}{(R')^2} = \dfrac{GM \times 4}{10 \times R^2} = \dfrac{4}{10} \times \dfrac{GM}{R^2}$

Substitute value of $\dfrac{GM}{R^2}$ from equation (i)

$g' = 0.4 \times 9.8 \text{ m/s}^2 = 3.92 \text{ m/s}^2$

25. **(1)**

Statement I is correct and II is incorrect.

Atoms are electrically neutral as they have equal number of positive and negative charges. Also, atoms of most elements are stable and they emit characteristics spectrum of their own.

26. **(4)**

In case of rolling, the velocity of the point of contact with the surface is zero.

Also, the velocity of the point at the highest point of the rolling body is twice the velocity of COM of the body.

So, point P moves faster than point Q.

27. **(2)**

A particle moving with uniform speed in a circular path has varying velocity as the direction of motion changes continuously. The magnitude of velocity remains constant. As the direction of centripetal acceleration is changing, the particle has varying acceleration.

28. **(3)**

For circular disc,

$F_{excess} = 2\pi r T$

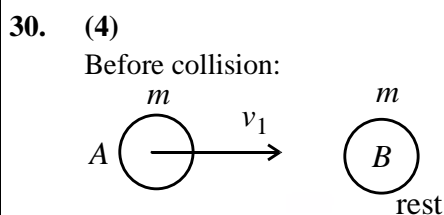where r is radius of disc and T is surface tension.

Substituting the given values,

$F_{excess} = 2\pi \times 4.5 \times 10^{-2} \times 0.07$

$\qquad\quad = 2 \times \dfrac{22}{7} \times 4.5 \times 10^{-2} \times 7 \times 10^{-2}$

$\qquad\quad = 198 \times 10^{-4} \text{ N} = 19.8 \text{ mN}$

29. (2)

$B = 0.049 \text{ T} = 4.9 \times 10^{-2} \text{ T}$

$T = \dfrac{5}{20} = \dfrac{1}{4} s, I = 9.8 \times 10^{-6} \text{ kgm}^2$

$T = 2\pi\sqrt{\dfrac{I}{mB}} \qquad \Rightarrow \quad T^2 = \dfrac{4\pi^2 I}{mB}$

$m = \dfrac{4\pi^2 I}{T^2 B}$

$= \dfrac{4\pi^2 \times 9.8 \times 10^{-6}}{\left(\dfrac{1}{4}\right)^2 \times 4.9 \times 10^{-2}} = 1280\pi^2 \times 10^{-5} \text{ Am}^2$

$\therefore \quad x = 1280\,\pi^2$

30. (4)

Before collision:

After collision:

Now, from conservations of momentum,
Momentum before collision = Momentum after collision.

$mv_1 + (0) = 2m\, v_2$

$mv_1 = 2mv_2$

$\dfrac{v_1}{v_2} = \dfrac{2}{1}$

$\therefore \quad v_1 : v_2 = 2 : 1$

31. (4)

$x = 5\sin\left(\pi t + \dfrac{\pi}{3}\right) m$

$A = 5m$

$\omega = \pi = \dfrac{2\pi}{T}$

$T = 2s$

32. (3)

Strain and angle are also dimensionless
Solid angle is dimensionless.

33. (2)

For spherical shell

$V_{centre} = V_{surface}$

Difference in potential is zero.

34. (4)

$T = m\omega^2 r$

$T \propto \omega^2$

T becomes 4 times

35. (4)

Resistance of each part = 10Ω
First five parts equivalent = 50Ω
Next five parts equivalent = 2Ω
Again for series combination $R_{eq} = 52\Omega$

36. (2)

According to Charle's law $V \propto T$
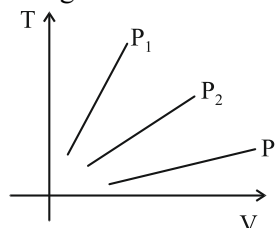
$P_1 > P_2 > P_3$

37. (4)

As capacitor is being charged the displacement current is

$I = \varepsilon_0 \dfrac{d(\phi)_E}{dt}$

$I = \varepsilon_0 \dfrac{d}{dt}(EA)$

$I = \varepsilon_0 \dfrac{d}{dt}\left(\dfrac{V}{d}A\right)$

$I = \dfrac{\varepsilon_0 A}{d} \dfrac{d}{dt}\left(\dfrac{Q}{C}\right)$

$I = \dfrac{dQ}{dt} = I_{conduction}$

38. (2)

EM waves do not originate from charges moving with uniform speed.

39. (3)

In option 3 if the diode is considered non ideal with resistance 10Ω then the bridge can be balanced.

40. (4)

Keeping the battery connected
V remains same

$C = \dfrac{\varepsilon_0 A}{d}$ d is reduced

$\therefore$ C increases
From
$Q = CV$
As C↑ Q↑ $\qquad \Rightarrow$ A is correct

$E = \dfrac{1}{2}CV^2$ As C↑ E increases $\Rightarrow$ B is incorrect

Capacitance increases $\Rightarrow$ C is correct
Product of charge and voltage increases
$\qquad \Rightarrow$ E is correct.

[5]

41. **(4)**

$F = \alpha t^2 + \beta t$

$[MLT^{-2}] = \alpha\,[T^2]$

$\alpha = [MLT^{-4}]$

$[MLT^{-2}] = \beta\,[T]$

$\beta = [MLT^{-3}]$

$$\frac{\alpha t}{\beta} = \frac{\left[MLT^{-4}\right][T]}{\left[MLT^{-3}\right]} = [M^0L^0T^0]$$

42. **(4)**

Thermal stress = thermal strain $\times$ Y

$$\frac{F}{A} = (\alpha\,\Delta T)\,Y$$

$$\frac{F}{10^{-3}} = \left(10^{-5}\right) \times 100 \times 0.5 \times 10^{11}$$
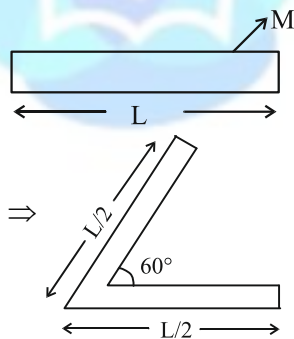
$F = 50 \times 10^3\ N$

43. **(4)**

$f_0 = 140$ cm, $f_e = 5$ cm

For normal adjustment

$$M = \left|\frac{-f_0}{f_e}\right| = \left|\frac{-140}{5}\right| = 28$$

44. **(4)**

$M = mL$

Magnetic pole strength remains the same

$$M_{new} = mL_{eff} = \frac{mL}{2} = \frac{M}{2}$$

45. **(4)**

$V_{rms} = 210$ volt,

$V_0 = 210\sqrt{2}$ volt

$V_0 = I_0 X_C$

$$V_0 = I_0 \times \frac{1}{\omega C}$$

$$210\sqrt{2} = I_0 \times \frac{1}{2\pi \times 50 \times 10 \times 10^{-6}}$$

$I_0 = 210\sqrt{2} \times 2\pi \times 500 \times 10^{-6}$

$I_0 = 0.932A$

46. **(4)**

$P_1 = 1kW$, $P_2 = 2kW$

<u>For parallel combination</u>

$P_{Parallel} = P_1 + P_2 = 1 + 2 = 3kW$

<u>For series combination</u>

$$\frac{1}{P_{series}} = \frac{1}{P_1} + \frac{1}{P_2} = 1 + \frac{1}{2}$$

$$P_{series} = \frac{2}{3}\,kW$$

$$\frac{P_{parallel}}{P_{series}} = \frac{3}{2} \times 3 = \frac{9}{2}$$

$$\frac{P_{series}}{P_{parallel}} = \frac{2}{9}$$

47. **(1)**
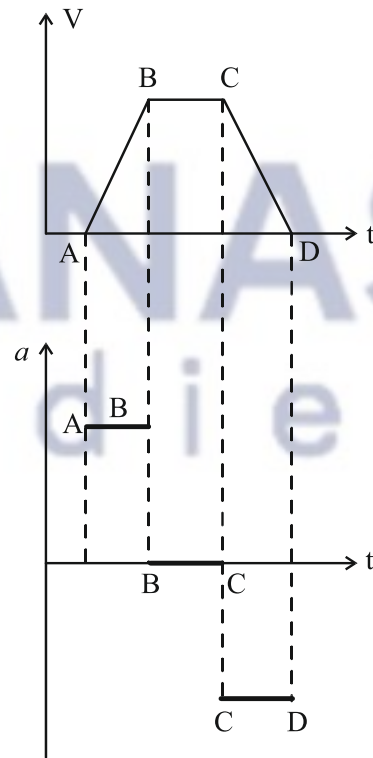
a = slope of $v - t$ graph

A to B $\rightarrow$ slope is positive and constant

$\Rightarrow$ so acceleration is positive & constant

B to C $\rightarrow$ slope is zero $\Rightarrow$ acceleration is zero.

C to D $\rightarrow$ slope is negative and constant

$\Rightarrow$ so acceleration is negative & constant

[6]

48. **(4)**

$m' = 3m$

$l' = \dfrac{1}{2} l$

$T = 2\pi \sqrt{\dfrac{l}{g}}$

$T' = 2\pi \sqrt{\dfrac{l'}{g}} = 2\pi \sqrt{\dfrac{l}{2g}}$

$T' = \left(\dfrac{1}{\sqrt{2}}\right) 2\pi \sqrt{\dfrac{l}{g}} = \dfrac{1}{\sqrt{2}} T$

$T' = \dfrac{x}{2} T$

$\dfrac{1}{\sqrt{2}} T = \dfrac{x}{2} T$

$x = \dfrac{2}{\sqrt{2}} = \sqrt{2}$

49. **(3)**

$(T.E)_{initial}$ = PE of satellite

$= \dfrac{-GMm}{R}$

$(T.E)_{final}$ = P.E of satellite + K.E of satellite

$= \dfrac{-GMm}{3R} + \dfrac{1}{2} m \left(\sqrt{\dfrac{GM}{3R}}\right)^2$

$= \dfrac{-GMm}{6R}$

Minimum energy required

$= \dfrac{-GMm}{6R} + \dfrac{GMm}{R}$

$= \dfrac{-GMm + 6GMm}{6R} = \dfrac{5GMm}{6R}$

50. **(4)**

- If sheet is magnetic, then force is required to hold the sheet because magnetic pole exert force on sheet
- As sheet is conducting, eddy current formed which oppose the way by which it is produced, so forced is required.
- As sheet is non conducting & non polar, so no magnetization occur in sheet hence no force is required.
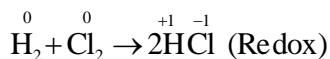
[7]

CHEMISTRY
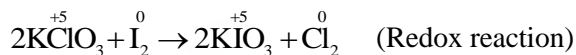
51. (3)

A) $H_2O \rightarrow \frac{1}{2}O_2 + 2e^- + 2H^+$ (2F)

B) $MnO_4^- + 5e^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O$ (5F)

C) Molten $CaCl_2 \rightarrow Ca^{2+} + 2e^-$ for 1.5 mole Ca^{2+} (3F)

D) $Fe^{2+} \rightarrow Fe^{3+} + e^-$ (1F)

52. (2)

Change in oxidation state of elements means redox reaction:

$\overset{0}{H_2} + \overset{0}{Cl_2} \rightarrow 2\overset{+1\ -1}{HCl}$ (Redox)

$\overset{+2\ -1}{BaCl_2} + \overset{+1\ -2}{Na_2SO_4} \rightarrow \overset{+2\ -2}{BaSO_4} + 2\overset{+1\ -1}{NaCl}$
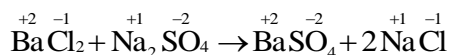
(No change in oxidation state hence not redox reaction)

$\overset{0}{Zn} + \overset{+2}{CuSO_4} \rightarrow \overset{+2}{ZnSO_4} + \overset{0}{Cu}$ (Redox reaction)

$2K\overset{+5}{Cl}O_3 + \overset{0}{I_2} \rightarrow 2K\overset{+5}{I}O_3 + \overset{0}{Cl_2}$ (Redox reaction)
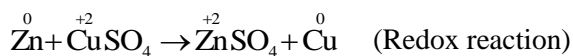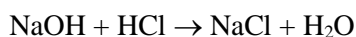
53. (3)
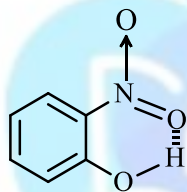
Intramolecular hydrogen bonding is observed in ortho nitrophenol.

54. (3)

Fehling's solution 'A' is aqueous copper sulphate.

55. (4)

$NaOH + HCl \rightarrow NaCl + H_2O$

Mass of NaOH = 1 g

Moles of NaOH = $\frac{1}{40}$ moles

     = 0.025 moles

= 25 millimoles

Millimoles of HCl = MV = 25×0.75

= 18.75 millimoles
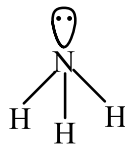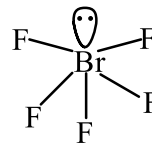
Millimoles of NaOH unreacted

= 25 – 18.75

= 6.25 millimoles

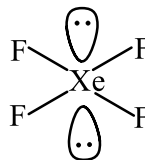Mass = $40 \times 6.25 = 250$ mg
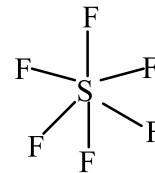
56. (3)

Trigonal Pyramidal   Square Pyramidal

Square Planner   Octahedral

57. (3)

Much larger third ionisation energy of Mn (where the required change is d^5 to d^4) is mainly responsible for this. This also explains why the +3 state of Mn is of little importance.
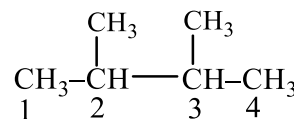
58. (2)

(A) Isothermal process → at constant temperature

(B) Isochoric process → at constant volume

(C) Isobaric process → at constant pressure

(D) Adiabatic process → No heat exchange

59. (2)

- Activation energy of any chemical reaction can be calculated if one knows the value of rate constant at two different temperatures by given formula:

- $\log \dfrac{k_1}{k_2} = \dfrac{E_a}{2.303R}\left[\dfrac{1}{T_2} - \dfrac{1}{T_1}\right]$

60. (1)

IUPAC name: 2,3-dimethyl butane

61. (3)

- Spin only magnetic moment
  $$= \sqrt{n(n+2)}$$
- n = number of unpaired electrons

A	Tc^{3+}	d^1	1.73
B	Cr^{2+}	d^4	4.90
C	Mn^{2+}	d^5	5.92
D	Fe^{2+}	d^6	4.90
E	Sc^{3+}	d^0	0

$B = Cr^{2+} = 4.90 \qquad D = Fe^{2+} = 4.90$

62. (3)

$$\left.\begin{array}{l} F = 4.0 \\ O = 3.5 \\ N = 3.0 \\ C = 2.5 \\ Si = 1.8 \end{array}\right\} \text{electronegativity}$$

Hence order will be:
$Si < C < N < O < F$

63. (2)

- $3°$ alcohols react with Lucas reagent instantaneously.
- $2°$ alcohols react with Lucas reagent after 5 minute.
- $1°$ alcohols do not react with Lucas reagent at ordinary temperature.

64. (3)

- Both $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ are octahedral complex because coordination number are six.
- Electronic configuration of Co^{3+} in $[Co(NH_3)_6]^{3+}$ is Co^{3+} : $[Ar]3d^6 4s^0 4p^0$
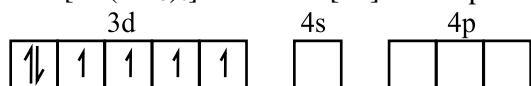
As NH_3 is a strong ligand, so pairing takes place
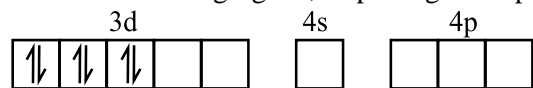
$n = 0$

d^2sp^3 hybridisation

No unpaired electron, so it is diamagnetic in nature
Electronic configuration of Co^{3+} in $[CoF_6]^{3-}$ is
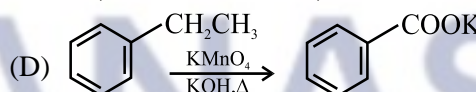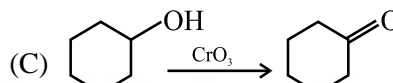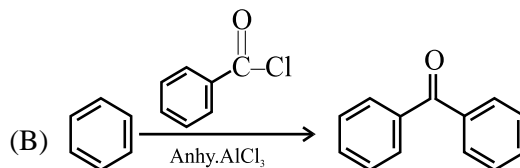Co^{3+} : $[Ar]3d^6 4s^0 4p^0$
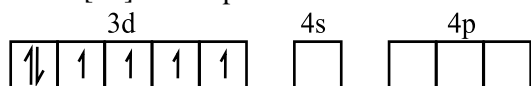
$n = 4$

sp^3 hybridisation

As F^- is a weak ligand no pairing takes place
So, it is paramagnetic in nature.

65. (3)

- The boiling point of hydrides of group 16 are in the order $H_2O > H_2Te > H_2Se > H_2S$.
- It is due to the presence of extensive H-bonding in H_2O.

66. (4)

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

67. (1)

68. (4)
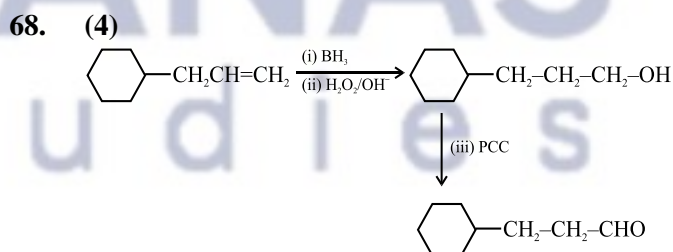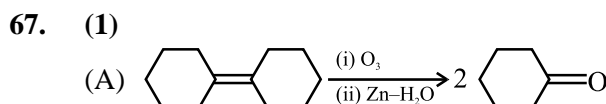
69. (1)

Glucose does not react with Schiff's reagent and $NaHSO_3$.

70. (1)

- (A) One σ bond
- (B) $H_2C=CH_2 \rightarrow$ One σ-bond and one π-bond
- (C) $C_2 \rightarrow$ Two π-bonds
- (D) $HC\equiv CH \rightarrow$ One σ-bond and two π-bonds
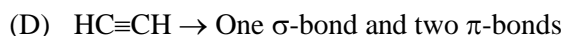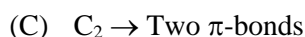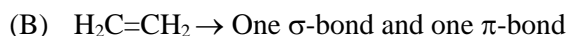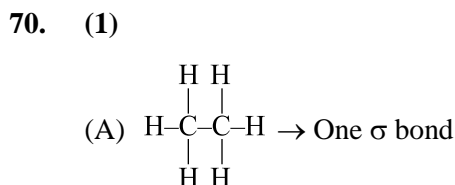
71. (2)

Po does not show -2 oxidation state because on going down the group, electropositive nature increases.

72. (1)

$2A \rightleftharpoons B + C$
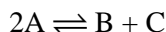
$$K_C = \frac{[B][C]}{[A]^2} = \frac{\left[2\times10^{-3}\right]\left[2\times10^{-3}\right]}{\left[2\times10^{-3}\right]^2}$$

$Q_C = 1$

$Q_C > K_C$

Reaction has a tendency to go in backward direction.

73. (2)

- Arrhenius equation is;

$$\ln k = -\frac{E_a}{R} \times \frac{1}{T} + \log A$$

- Graph between $\ln k$ vs $\frac{1}{T}$ with intercept $= \log A$

  and slope $= -\dfrac{E_a}{R}$

74 . (3)

(1) $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$

$$K_C = \frac{[CO_2][H_2]}{[CO][H_2O]}$$
$\Delta n_g = 2 - 2 = 0$

$K_p = K_C (RT)^{\Delta n_g}$

$K_p = K_C (RT)^0$

$K_p = K_C$

(2) $2BrCl(g) \rightleftharpoons Br_2(g) + Cl_2(g)$
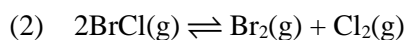
$\Delta n_g = 2 - 2 = 0$

$$K_C = \frac{[Br_2][Cl_2]}{[BrCl]^2}$$
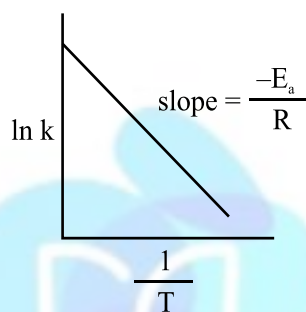
$K_p = K_C (RT)^{\Delta n_g}$

$K_p = K_C (RT)^0$

$K_p = K_C$

(3) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
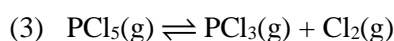
$\Delta n_g = 2 - 1 = 1$

$$K_C = \frac{[PCl_3][Cl_2]}{[PCl_5]}$$

$K_p = K_C (RT)^{\Delta n_g}$

$K_p = K_C (RT)^1$

Here, $K_p \neq K_C$

(4) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
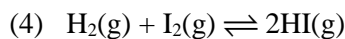
$\Delta n_g = 2 - 2 = 0$

$$K_C = \frac{[HI]^2}{[H_2][I_2]}$$

$K_p = K_C (RT)^{\Delta n_g}$

$K_p = K_C (RT)^0$

Here, $K_p = K_C$

75. (3)

- Boiling point decreases with increase in branching as the intermolecular forces decreases

- Boiling point: $\underset{\text{(n-pentane)}}{CH_3 - CH_2 - CH_2 - CH_2 - CH_3} >$
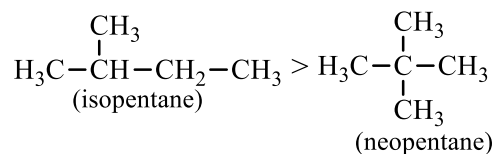
76. (2)

- S_N1 reaction are fastest in those compound, where the intermediate carbocation is resonance stablised.

- is resonance stablised carbocation among given options. So, rate of S_N1 reaction will be fastest in
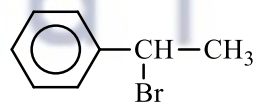
77. (3)

- For He^+ ion; Energy $= -x$ J, $Z = 2$, $n = 1$

$$\text{Energy} = \frac{-2.18\times10^{-18}Z^2}{n^2} J$$

$$-x = \frac{-2.18\times10^{-18}\times(2)^2}{(1)^2} J$$

$x = 2.18 \times 10^{-18} \times 4$ J

- For Be^{3+} ion; $Z = 4$, $n = 2$

$$(E_2)_{Be^{3+}} = \frac{-2.18\times10^{-18}Z^2}{n^2} J$$

$$= \frac{-2.18\times10^{-18}\times(4)^2}{(2)^2} J$$

$= -2.18 \times 10^{-18} \times 4$ J

$= -x$ J

78. **(1)**

(A) When liquid evaporates to vapour, entropy increases due to increase in randomness.

(B) When temperature of crystalline solid lowered from 130 K to 0 K, the random collisions will decrease, resulting in decrease in entropy.

(C) In the given reaction,

$2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$

Solid is converting to gas, due to which randomness increases and hence, entropy increase.

(D) In the given conversion, $Cl_2(g) \rightarrow 2Cl(g)$ number of gaseous atom increases, due to which entropy increases.

Hence, Entropy will increase in case of A, C, D.

79. **(4)**

On heating, solid substances change from solid to vapour state without passing through liquid state. This purification technique is known as sublimation and is used to separate sublimable compound from non-sublimable impurities.

80. **(3)**

(A) $[Co(NH_3)_5(NO_2)]Cl_2$ shows linkage isomerism. Its linkage Isomer is $[Co(NH_3)_5(ONO)]Cl_2$

(B) $[Co(NH_3)_5(SO_4)]Br$ shows ionization isomerism. Its ionization isomer is $[Co(NH_3)_5(Br)]SO_4$

(C) $[Co(NH_3)_6][Cr(CN)_6]$ shows coordination isomerism. Its coordination isomer is $[Cr(NH_3)_6][Co(CN)_6]$

(D) $[Co(H_2O)_6]Cl_3$ shows solvate isomerism. Its one of the solvate isomer is $[Co(H_2O)_5Cl]Cl_2.H_2O$

So correct option is:

$A \rightarrow II, B \rightarrow III, C \rightarrow IV, D \rightarrow I$

81. **(3)**

• Aniline does not undergo Friedel-craft reaction due to salt formation with anhy. aluminium chloride (the lewis acid) which is used as a catalyst.

• Gabriel synthesis is used for the preparation of aliphatic primary amines only. Aromatic primary amines cannot be prepared by this method because aryl halide do not undergo nucleophilic substitution with the anion formed by phthalimide.

82. **(4)**

• In a period, generally on moving left to right ionization enthalpy increases. But due to more stable configuration of $Be(2s^2)$, its ionization enthalpy is more as compared to $B(2p^1)$, less stable configuration.

• So, correct order of first IE : $Li < B < Be < C < N$

83. **(3)**

• Atoms in 4 g of Helium $= \dfrac{4}{4} \times N_A = N_A$

• Atoms in 2.271098 L of Helium at $STP = \dfrac{2.271098}{22.4} \times N_A = 0.101\ N_A$

• Atoms in 4 mol of Helium $= 4 \times N_A = 4N_A$

• Atoms in 4u of Helium $= \dfrac{4}{4} = 1$

Hence, highest number of atoms are present in 4 mol of Helium.

84. **(2)**
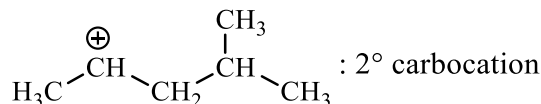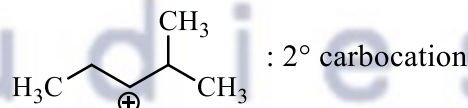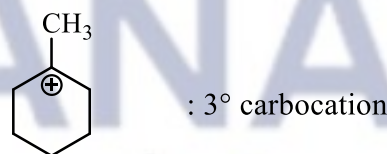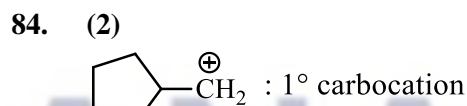
• Stability order of carbocation : $3° > 2° > 1°$.

• Hence, most stable carbocation is present in option (2).

85. **(4)**

Lesser the value of K_H, more will be the solubility of gas in water.

So, solubility order:

$B(K_H = 2 \times 10^{-5}) > C(K_H = 35) > A(K_H = 145)$

86. (4)

Element	Percentage composition	Atomic mass	Atomic ratio of atoms	Simplest ratio of atoms
A	32%	64	$\dfrac{32}{64}=0.5$	$\dfrac{0.5}{0.5}=1$
B	20%	40	$\dfrac{20}{40}=0.5$	$\dfrac{0.5}{0.5}=1$
C	48%	32	$\dfrac{48}{32}=1.5$	$\dfrac{1.5}{0.5}=3$

Hence, empirical formula is ABC_3.

87. (2)
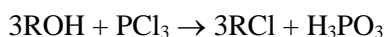
$3ROH + PCl_3 \rightarrow 3RCl + H_3PO_3$
$\qquad\qquad\qquad\qquad\qquad (A)$
$ROH + PCl_5 \rightarrow RCl + HCl + POCl_3$
$\qquad\qquad\qquad\qquad\qquad (B)$

Hence, A : H_3PO_3 and B : $POCl_3$

88. (3)

$\pi = CRT$

$\therefore$ slope $= RT = 25.73$ L bar mol^{-1}

$\therefore T = \dfrac{25.73}{0.083}$

$\quad = 310K$

$\quad = 37°C$

89. (4)
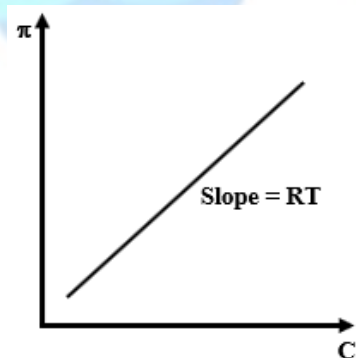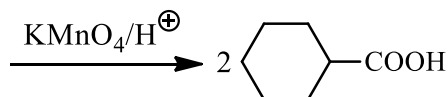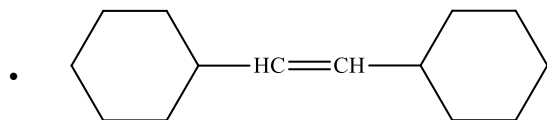
- $\overset{\diagup}{\underset{\diagdown}{C}} = \overset{\diagup}{\underset{\diagdown}{C}}$ Will be completely oxidized in presence of acidified KMnO$_4$ into carboxylic acid.

90. (3)

- Homoleptic complex is one which contains only one kind of ligands. Heteroleptic complex is one which contains two or more kinds of ligand.
- $[Co(NH_3)_6]^{3+}$ has only one kind of ligands but $[Co(NH_3)_4Cl_2]^+$ has more than one kind of ligands.

91. (2)

Fe^{2+} ion undergoes hydrolysis, therefore, while preparing aqueous solution of ferrous sulphate in water, 2-3 ml of dilute sulphuric acid is added to prevent the hydrolysis of Mohr's salt.

92. (2)

- Dipole Moment:

$(\mu = 4.9 \times 10^{-30}$ C m$)$ $(\mu = 0.8 \times 10^{-30}$ C m$)$
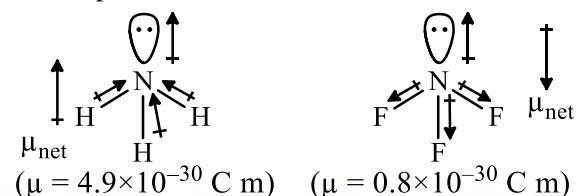
- CO_3^{2-} has three canonical forms.
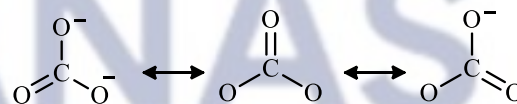
- Two resonating structures can be drawn for ozone.
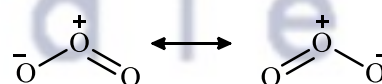
- BF$_3$ has trigonal planar structures. Its net dipole moment is Zero.

$\mu = $ Zero
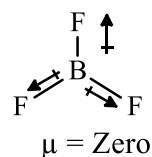
93. (3)

Below given the ions and the group they belong as per qualitative analysis.

Cation	Group
Cu^{2+}	2
Al^{3+}	3
Co^{2+}	4
Ba^{2+}	5
Mg^{2+}	6

94. **(3)**

$$CH_3 - CH_2 - CH_2 - I \xrightarrow{\text{NaCN}} CH_3CH_2CH_2 - CN$$
(A)

$\downarrow$ $\overset{OH^\ominus}{\underset{\text{Partial hydrolysis}}{}}$

$$CH_3CH_2CH_2 - NH_2 \xleftarrow[\text{Br}_2]{\text{NaOH}} CH_3CH_2CH_2 - \overset{\overset{O}{\|}}{C} - NH_2$$
(C)
propylamine   (B)

95. **(3)**

$$\log\left(\frac{K_{330}}{K_{300}}\right) = \frac{Ea}{2.303R} \times \left[\frac{330 - 300}{300 \times 330}\right]$$

Given: $\dfrac{K_{330}}{K_{300}} = 4$

$$\therefore \log 4 = \frac{Ea}{2.303R} \times \frac{30}{300 \times 330}$$

$$\therefore Ea = \frac{0.602 \times 2.303 \times 8.314 \times 300 \times 330}{30}\, J/mol$$

$$= 38037.7\, J/mol$$

$$= 38.0377\, kJ/mol$$

$$\simeq 38.04\, kJ/mol$$

96. **(2)**

$$2NO(g) \rightleftharpoons N_2(g) + O_2(g)$$

At $t = 0$ 0.1 M   —   —

At time = t $(0.1 - 0.1\alpha)M$ $\left(\dfrac{0.1\alpha}{2}\right)M$ $\left(\dfrac{0.1\alpha}{2}\right)M$

$$\therefore K_c = \frac{3 \times 10^{-3} \times 4.2 \times 10^{-3}}{(2.8 \times 10^{-3})^2} = \frac{\dfrac{0.1\alpha}{2} \times \dfrac{0.1\alpha}{2}}{(0.1 - 0.1\alpha)^2}$$

$$1.6 = \frac{\left(\dfrac{0.1\alpha}{2}\right)^2}{(0.1 - 0.1\alpha)^2}$$

$$1.27 = \frac{\left(\dfrac{0.1\alpha}{2}\right)}{0.1 - 0.1\alpha}$$

$\alpha = 0.717$

97. **(4)**

$$W = -2.303nRT \log\left(\frac{P_1}{P_2}\right)$$

$$= -2.303 \times 1 \times 2 \times 298 \times \log\left(\frac{20}{10}\right)$$

$$= -2.303 \times 2 \times 298 \times 0.301$$

$$= -413.14\, Calories$$

98. **(4)**

$$W = Z \times i \times t$$

$$= \frac{63}{96487 \times 2} \times 9.6487 \times 100$$

$$= 0.315g$$

99. **(3)**

100. **(3)**

$\underset{(Z=64)}{Gd^{3+}} : [Xe]4f^7$ (7 unpaired e^-)

$\therefore \underset{(Z=63)}{Eu^{3+}} : [Xe]4f^6$ (6 unpaired e^-)

$\therefore \underset{(Z=61)}{Pm^{3+}} : [Xe]4f^4$ (4 unpaired e^-)

$\therefore \underset{(Z=62)}{Sm^{3+}} : [Xe]4f^5$ (5 unpaired e^-)

$\therefore \underset{(Z=58)}{Ce^{4+}} : [Xe]4f^0$ (No unpaired e^-)

$\therefore \underset{(Z=70)}{Yb^{2+}} : [Xe]4f^{14}$ (No unpaired e^-)

$\therefore \underset{(Z=58)}{Ce^{3+}} : [Xe]4f^1$ (1 unpaired e^-)

$\therefore \underset{(Z=63)}{Eu^{2+}} : [Xe]4f^7$ (7 unpaired e^-)

Species having no unpaired e^- [Ce^{4+} and Yb^{2+}] are diamagnetic in nature.

101. **(2)**

Both wind and water pollinated flowers are not very colourful and do not produce nectar.

In most of the water-pollinated species, pollen grains are protected from wetting by a mucilaginous covering.

Some examples of water pollinated plants are *Vallisneria* and *Hydrilla* which grow in fresh water and several marine sea-grasses such as *Zostera*.

Not all aquatic plants use water for pollination. In a majority of aquatic plants such as water hyacinth and water lily, the flowers emerge above the level of water and are pollinated by insects or wind as in most of the land Plants.

In another group of water pollinated plants such as seagrasses, female flowers remain submerged in water and the pollen grains are released inside the water. Pollen grains in many such species are long, ribbon like and they are carried passively inside the water; some of them reach the stigma and achieve pollination.

102. **(4)**

Ex situ Conservation– In this approach, 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 and wildlife safari parks serve this purpose.

103. **(1)**

Inhibition of succinic dehydrogenase by malonate is an example of competitive inhibition. Malonate resembles the substrate succinate and competes with the substrate for the substrate-binding site of the enzyme. Consequently, the substrate cannot bind and as a result, the enzyme action declines.

104. **(1)**

The primary root, or radicle is the first organ to appear when a seed germinates.
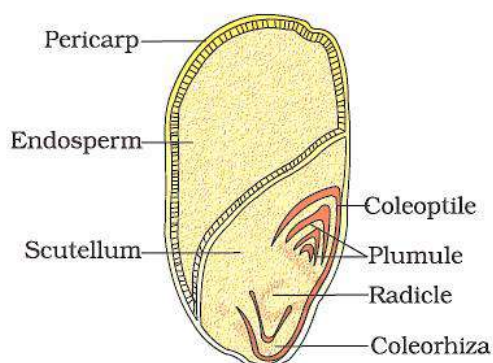
105. **(3)**

In grasses, certain adaxial epidermal cells along the veins modify themselves into large, empty, colourless cells. These are called bulliform cells. When the bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimise water loss.

106. **(1)**

For the dark reaction or Calvin cycle, CO_2 is required for the carboxylation step and ATP and NADH is required for the reduction and regeneration step.

107. **(1)**

Plants show an interesting phenomenon, the living differentiated cells, that by now have lost the capacity to divide can regain the capacity of division under certain conditions. This phenomenon is termed as dedifferentiation. For example, formation of meristems – interfascicular cambium and cork cambium from fully differentiated parenchyma cells.

108. **(4)**

Recognition sequence of *Hind II* is of 6 base pairs and it generates blunt ends.

109. **(3)**

Speciation is generally a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification.

Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity.

There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

110. **(4)**

The morphology of the mycelium, mode of spore formation and fruiting bodies form the basis for the division of the kingdom fungi into various classes.

111. (2)

For every CO_2 molecule entering the Calvin cycle, 3 molecules of ATP and 2 of NADPH are required.

The Calvin cycle can be described under three stages: carboxylation, reduction and regeneration. Reduction step involve utilisation of 2 molecules of ATP for phosphorylation and two of NADPH for reduction per CO_2 molecule fixed. The regeneration steps require one ATP for phosphorylation to form RuBP.

112. (2)

Causes of biodiversity losses: The accelerated rates of species extinctions that the world is facing now are largely due to human activities. There are four major causes (' The Evil Quartet ' is the sobriquet used to describe them).

1. Habitat loss and fragmentation:
2. Over-exploitation:
3. Alien species invasions:
4. Co-extinctions:

113. (3)

The capacity to generate a whole plant from any cell of plant is called as totipotency.

114. (1)

A population growing in a habitat with limited resources show initially a lag phase, followed by phases of acceleration and deceleration and finally an asymptote, when the population density reaches the carrying capacity. A plot of N in relation to time (t) results in a sigmoid curve. This type of population growth is called Verhulst-Pearl Logistic Growth and is described by the following equation:

$$dN / dt = rN\left(\frac{K-N}{K}\right)$$

Where N = Population density at time t

r = Intrinsic rate of natural increase

K = Carrying capacity

115. (4)

The key features of metaphase are:

I. Spindle fibres attach to kinetochores of chromosomes.

II. Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles.

116. (2)

If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous. The ovary here is said to be half inferior, e.g., plum, rose, peach.
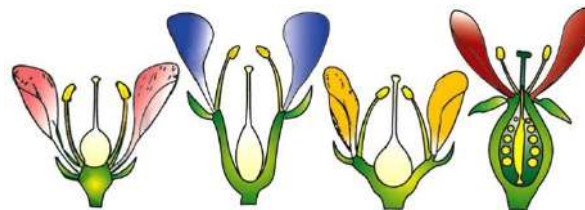
(a)   (b)   (c)   (d)

Position of floral parts on thalamus :(a) Hypogynous (b) and (c) Perigynous (d) Epigynous

117. (3)

Some common members of basidiomycetes are *Agaricus* (mushroom) , *Ustilago* (smut) and *Puccinia* (rust fungus).

Rhizopus is also known as the bread mould. It belongs to Phycomycetes.

118. (4)

In a typical test cross an organism (pea plants here) showing a dominant phenotype (and whose genotype is to be determined) is crossed with the recessive parent instead of self-crossing.

119. (4)

Pink flowered snapdragon plant (Rr) $\times$ Red flowered snapdragon plant (RR)

50% flowers are red in colour and 50% flowers are pink in colour.

120. (1)

Two or more alternative forms of a gene- Allele

Cross of F_1 progeny with homozygous recessive parent- Test cross

Cross of F1 progeny with any of the parents- Back cross

Number of chromosome sets in plant- Ploidy

121. (4)

Lecithin or phosphatidyl choline is an example of phospholipid.

122. (1)

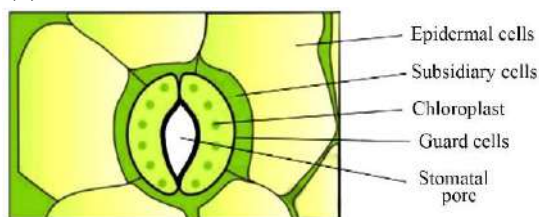*Clostridium butylicum* - Butyric acid
Saccharomyces cerevisiae- Ethanol
Trichoderma polysporum- . Cyclosporin-A-
Streptococcus sp.- Streptokinase

123. (3)

The outer walls of guard cells (away from the stomatal pore) are thin and the inner walls (towards the stomatal pore) are highly thickened.

124. (3)

When a flower can be divided into two equal radial halves in any radial plane passing through the centre, it is said to be actinomorphic, e.g., mustard, datura, chilli.

125. (2)

A transcription unit in DNA is defined primarily by the three regions in the DNA:
(i)   A Promoter
(ii) The Structural gene
(iii) A Terminator

126. (1)

When a piece of DNA carrying gene of interest is transferred into an alien organism – it may get integrated itself into the genome of the recipient and may multiply and be inherited along with the host DNA.

127. (1)

Auxins are widely used as herbicides. 2, 4-D, widely used to kill dicotyledonous weeds, does not affect mature monocotyledonous plants.

128. (3)

Metal ions are the common cofactors. Cofactor for enzyme carboxypeptidase is zinc.

129. (1)

In the absence of a preferred carbon source such as glucose, if lactose is provided in the growth medium of the bacteria, the lactose is transported into the cells through the action of permease.

130. (4)

Alleles show expressions in the F_2 generation.

131. (1)

Bt toxins are insect-group specific. The toxin is coded by a gene *cry*IAc named *cry*.
The *Bt* toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystals.

132. (2)

Parenchyma and collenchyma are living tissue. Gymnosperms lack vessels in their xylem but in flowering plants, tracheids and vessels are the main water transporting elements.

133. (3)

During leptotene stage the chromosomes become gradually visible under the light microscope.
The beginning of diplotene is recognised by the dissolution of the synaptonemal complex and the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at the sites of crossovers.

134. (3)

A. Nucleolus - site for active ribosomal RNA synthesis.
B. Centriole - organisation like cartwheel
C. Leucoplasts - for storing nutrients
D. Golgi apparatus- site for formation of glycolipid

135. (2)

The IUCN Red List (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.
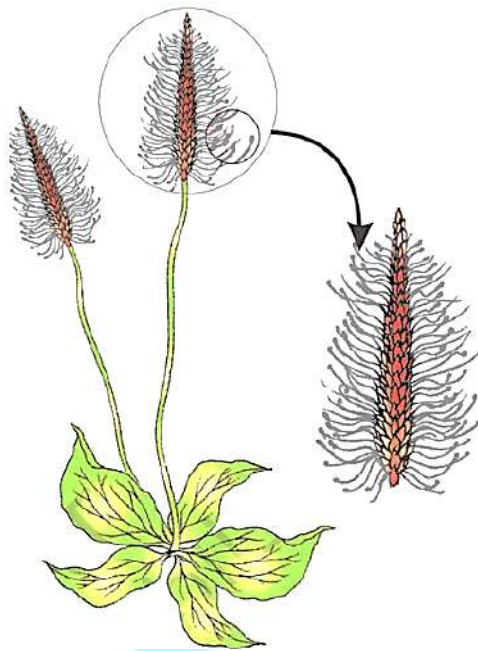
136. (4)

Chloroplast contains small, double- stranded circular DNA molecules and ribosomes.

137. (1)

In somatic hybridisation, protoplasts are fused involving two varieties of plants.

138. (3)

The given diagram shows a wind-pollinated plant showing compact inflorescence and well exposed stamens.

139. (4)

Sugarcane stores carbohydrate as sugar in their stems. Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield by as much as 20 tonnes per acre.

140. (4)

| Frederick Griffith	Transformation
Francois Jacob and Jacque Monod	*Lac* operon
Har Gobind Khorana	Genetic code
Meselson and Stahl	Semi-conservative mode of DNA replication

141. (3)

GLUT-4 enables glucose transport into cells.

Insulin is a hormone secreted by pancreas.

Trypsin is an example of enzyme.

Collagen is the most abundant protein in animal world, which is an intercellular ground substances.

142. (1)

In C_3 plants some O_2 does bind to RuBisCO, and hence CO_2 fixation is decreased. In C_4 plants photorespiration does not occur.

143. (1)
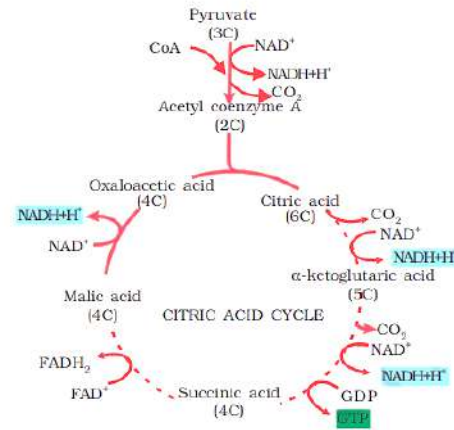
144. (4)

Citric acid cycle	Mitochondrial matrix
Glycolysis	Cytoplasm
Electron transport system	Inner mitochondrial membrane
Proton gradient	Intermembrane space of mitochondria

145. (2)

The DNA-dependent DNA polymerase in *E.Coli* catalyse polymerisation only in one direction, that is $5' \rightarrow 3'$.

146. (1)

The NPP of the first trophic level is the GPP of the second trophic level and the NPP of the 2nd trophic level is GPP is 3rd trophic level.

According to the 10% law 90 per cent is the respiratory loss (R) at each trophic level.

NPP = GPP – R

At the first trophic level NPP is 100x which is GPP of second trophic level.

At second trophic level NPP is 10% of GPP = 10x

Since the GPP of the 3rd trophic level is the same as the NPP of the second trophic level, it is equal to 10x.

147. (3)

Rose	Perigynous flower
Pea	Marginal placentation
Cotton	Twisted aestivation
Mango	Drupe

148. (4)

Robert May	Global species diversity at about 7 million
Alexander von Humboldt	Species-Area relationship
Paul Ehrlich	Rivet popper hypothesis
David Tilman	Long term ecosystem experiment using outdoor plots

[17]

149. (3)

Monoadelphous	China rose
Diadelphous	Pea
Polyadelphous	Citrus
Epiphyllous	Lily

150. (1)

Sexual reproduction can be isogamous, anisogamous or oogamous in phaeophyceae.

151. (4)

List-I	List-II
Typhoid	Bacteria
Leishmaniasis	Protozoa
Ringworm	Fungus
Filariasis	Nematode

152. (2)

List-I	List-II
Non-medicated IUD	Lippes loop
Copper releasing IUD	Multiload 375
Hormone releasing IUD	LNG-20
Implants	Progestogens

153. (1)

The presence or absence of hymen is not a reliable indicator of virginity or sexual experience.

However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horseback riding, cycling, etc. In some women the hymen persists even after coitus.

154. (4)

A pair of jointed filamentous structures called anal cerci are present in the 10th abdominal segment in both sexes of cockroaches.

155. (4)

List-I	List-II
Pons	Connects different regions of the brain
Hypothalamus	Neurosecretory cells
Medulla	Controls respiration and gastric secretions
Cerebellum	Provides additional space for neurons, regulates posture and balance

156. (2)

Glucagon is a peptide hormone secreted by the alpha cells of Islets of Langerhans of pancreas.

Remaining are steroidal hormones.

157. (3)

The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.

The process of transcription is catalyzed by the enzyme DNA dependent RNA polymerase in only one direction, that is, $5' \rightarrow 3'$, the strand of DNA that has the polarity $3' \rightarrow 5'$ acts as a template, and is also referred to as template strand.

The given template strand of DNA is:

3'-TACATGGCAAATATCCATTCA 5'

So, the transcribed strand of RNA will be:

5'AUGUACCGUUUAUAGGUAAGU 3'

158. (4)

Skeletal muscles: Triceps

Smooth muscles: Stomach

Cardiac muscles: Heart

159. (2)

The correct sequence of stages of cell division is:

Gap-1 phase $\rightarrow$ Synthesis phase $\rightarrow$ Gap-2 phase $\rightarrow$ Karyokinesis $\rightarrow$ Cytokinesis

160. (4)

Myasthenia gravis, Rheumatoid arthritis and Systemic Lupus Erythematosus are autoimmune disorders.

Gout is a skeletal disorder affecting joints and Muscular dystrophy is genetic disorder affecting muscles.

161. (1)

List-I	List-II
Lipase	Ester bond
Nuclease	Phosphodiester bond
Protease	Peptide bond
Amylase	Glycosidic bond

162. (1)

The flippers of Penguins and Dolphins are analogous organs and thus are examples of convergent evolution.

Other examples of analogy are the eye of the octopus and of mammals.

163. (3)

List-I	List-II
Expiratory capacity	Tidal Volume + Expiratory Reserve Volume
Functional residual capacity	Expiratory Reserve Volume + Residual Volume
Vital capacity	Tidal Volume + Expiratory Reserve Volume + Inspiratory Reserve Volume
Inspiratory capacity	Tidal Volume + Inspiratory Reserve Volume

164. (2)

Gene pool (total number of genes and alleles in a population) will remain constant if a population is following Hardy-Weinberg equilibrium. The factors affecting Hardy-Weinberg equilibrium are: genetic drift, mutation, gene migration or gene flow, genetic recombination and natural selection.

165. (2)

Homo habilis (A) → *Homo erectus* (D) → *Homo neanderthalensis* (C) → *Homo sapiens* (B).

166. (3)

Correct sequence is –
SA node (E) → AV node (C) → AV bundle (A) → Bundle branches (D) → Purkinje fibres (B).

167. (4)

Factors which are favourable for formation of oxyhaemoglobin in the alveoli – High pO_2, high pH, low pCO_2, lower temperature, lesser H^+ concentration.

168. (1)

List-I	List-II
α-1-antitrypsin	protein is used to treat emphysema.
cryIAb	controls corn borer
cryIAc	cotton bollworms.
Enzyme replacement therapy	treat ADA deficiency.

169. (2)

FSH acts upon ovarian follicles in females and sertoli cells in males.

170. (4)

X – *ori* and Y – *rop*
Ori responsible for controlling copy number of the linked DNA.
Rop codes for the proteins involved in the replication of the plasmid.

171. (2)

List-I	List-II
Cocaine	Obtained from coca plant (*Erythroxylum coca*)
Heroine	*Papaver sominiferum*
Morphine	Effective and sedative pain killer
Marijuana	Flower tops, leaves and the resin of *Cannabis sativa*

172. (4)

Annelids – True coelomates
Poriferans to Platyhelminthes – Acoelomates
Aschelminthes – Pseudocoelomates

173. (4)

Descending limb of Henle's loop - Permeable to water and impermeable to electrolytes.
Proximal convoluted tubule - Lined by simple cuboidal brush border epithelium.

174. (2)

List-I	List-II
Fibrous joints	Seen in flat skull bones and do not allow any movement.
Cartilaginous joints	Present between adjacent vertebrae and allow limited movements.
Hinge joints	Present in knees and help in locomotion.
Ball and socket joints	Present between humerus and pectoral girdle and allow rotational movement.

175. (2)

Vaults – Barrier method.

176. (4)

Pleurobrachia is the example of phylum ctenophora.
Radula is a file like rasping organ found in phylum mollusca.
Stomochord is found in phylum hemichordata similar to notochord of chordata.
Air - bladder maintains buoyancy in Osteichthyes.

177. (2)

A. Axoneme - Cilia and flagella
B. Cartwheel pattern - Centriole
C. Crista - Mitochondria
D. Satellite - Chromosome

178. (1)

Bio-reactors are used to produce large scale bacterial culture.

179. **(1)**

nesis	...letion of terminalisation of chiasmata
...tene	...urance of recombination nodules
...ene	...tonemal complex formation
...tene	...nosomes look like thin threads

180. **(1)**

Common cold is caused by rhinoviruses.

Haemozoin is toxic substance released from ruptured RBCs.

Widal test is used for diagnosis of typhoid.

Allergy is exaggerated response of immune system caused by allergens (Dust mites etc).

181. **(3)**

Breast feeding during initial periods of infants growth is recommended by doctors for bringing a healthy baby because colostrum contains several antibodies absolutely essential for develop resistance for new born.

182. **(4)**

Scientific name of Angel fish is *Pterophyllum*.

Myxine is also known as hagfish.

Scientific name of saw fish is *Pristis*.

Scientific name of flying fish is *Exocetus*.

183. **(1)**

The 'Ti plasmid' of *Agrobacterium tumefaciens* stands for Tumor inducing plasmid.

184. **(3)**

Uterine fundus is a part of uterus. Infundibulum, ampulla and isthmus are the parts of fallopian tube.

185. **(1)**

Down's syndrome - 21st chromosomes

α-thalassemia - 16th chromosomes

β-thalassemia - 11th chromosomes

Klinefelter's syndrome - 'X' chromosome

186. **(1)**

Notochord is absent in non-chordate instead it is a characterstic of chordate. In non-chordate heart is dorsal (if present) but in chordate it is ventral. Post anal tail is found in chordate.

187. **(2)**

Mesozoic Era - Birds and reptiles

Proterozoic Era - Lower invertebrates

Coenozoic Era - Mammals

Paleozoic Era - Fish and amphibians

188. **(1)**

The cerebral hemispheres are connected by a tract of nerve fibres called corpus callosum.

Three major regions make up the brain stem; mid brain, pons and medulla oblongata. Cerebrum is the part of forebrain.

189. **(3)**

A - FSH

B - Leydig cell

C - Sertoli cells

D - Spermiogenesis

The increased levels of GnRH acts at the anterior pituitary gland and stimulates secretion of two gonadotropins – luteinising hormone (LH) and follicle stimulating hormone (FSH). LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. Androgens, in turn, stimulate the process of spermatogenesis. FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis.

190. **(2)**

A. RNA Polymerase III - SnRNAs, tRNA

B. Termination of transcription - Rho factor

C. Splicing of exons - snRNPs

D. TATA box - Promoter

191. **(2)**

Exopthalmic goitre is a form of hyperthyroidism, characterised by enlargement of the thyroid gland, protrusion of the eyeballs, increased basal metabolic rate, and weight loss, also called Graves' disease.

Acromegaly is the excessive secretion of growth hormone.

Cushing's syndrome is caused by excessive secretion of cortisol. Cretinism is the hyposecretion of thyroid hormone during pregnancy which leads to stunted growth (cretinism), mental retardation, low intelligence quotient, abnormal skin, deaf-mutism, etc.

192. **(1)**

Goblet cells of alimentary canal is an example of unicellular glandular epithelium. Compound epithelium is present in the dry surface of the skin, the moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and of pancreatic ducts.

Salivary gland is an example of multicellular glandular epithelium.

Pancreas is a type of endocrine glandular epithelium. It secretes insulin and glucagon hormone.

193. (3)

The bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced. Both bone-marrow and thymus provide micro-environments for the development and maturation of T-lymphocytes.

194. (3)

The structure used for storing food in cockroaches is Crop.

A ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut, which secrete digestive juice.

At the junction of midgut and hindgut is present another ring of 100-150 yellow coloured thin filamentous Malpighian tubules.

Gizzard helps in grinding the food particles in cockroach.

195. (1)

In juxtamedullary nephron, the loop of Henle is very long and runs deep into the medulla.

Cortical nephron is present in majority w.r.t juxtamedullary nephron.

196. (4)

In ECG, The P-wave represents the electrical excitation (or depolarisation) of the atria, which leads to the contraction of both the atria.

The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction.

The T-wave represents the return of the ventricles from excited to normal state (repolarisation). The end of the T-wave marks the end of systole. T-P gap represents joint diastole of heart, in which heart muscles are electrically silent.

197. (3)

If a child has blood group O$^+$ (ii) so according to that both the parents should have at least one recessive allele (i). So the correct answer is father ($I^B i$) and the mother is ($I^A i$).

198. (2)

Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the **same** resources cannot co-exist indefinitely and the competitively inferior one will be eliminated eventually.

199. (3)

The correct sequential steps in the enzyme action is as follows:

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

200. (1)

Like mitochondria, the chloroplasts are also double membrane bound. Of the two, the inner chloroplast membrane is relatively less permeable.