NEET-UG 2024 Question Paper

Time Allowed :200 Minutes	Maximum Marks :720	Total Questions :200

General Instructions

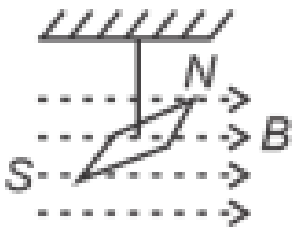
Read the following instructions very carefully and strictly follow them:

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 details given below:
(a) **Section-A** shall consist of 35 (Thirty-five) Questions in each subject (Question Nos-1 to 35, 51 to 85, 101 to 135 and 151 to 185). All Questions are compulsory.
(b) **Section-B** shall consist of 15 (Fifteen) questions in each subject (Question Nos- 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to attempt any 10 (Ten) questions out of 15 (Fifteen) in each subject.
2. Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.
3. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.
4. Use Blue / Black Ball Point Pen only for writing particulars on this page / marking responses on Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
6. The CODE for this Booklet is R4. Make sure that the CODE printed on the Original Copy of the Answer Sheet is the same as that on this Test Booklet.

Physics

Section A

1. In a uniform magnetic field of 0.049 T, a magnetic needle performs 20 complete oscillations in 5 seconds. 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) $128\pi^2$
(2) $50\pi^2$
(3) $1280\pi^2$
(4) $5\pi^2$

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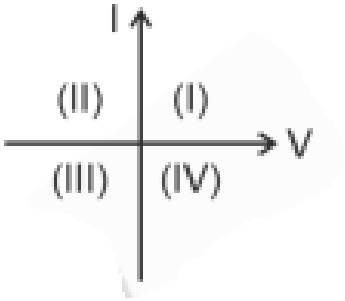
2. Consider the following statements A and B and identify the correct answer:



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

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3. If $5\sin\left(\frac{m\pi}{3}\right) = \pi + xt$**, the amplitude and time period of motion, respectively, are:**
(1) 5 m, 2 s
(2) 5 cm, 1 s
(3) 5 m, 1 s
(4) 5 cm, 2 s

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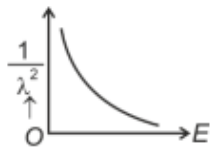
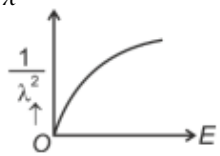
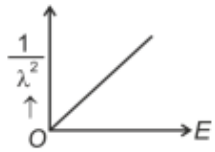
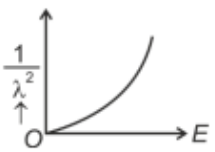
4. The graph which shows the variation of $\frac{1}{\lambda^2}$ **and kinetic energy (E) is:**

(1) 

(2) 

(3) 

(4) 

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5. The moment of inertia of a thin rod about an axis passing through its midpoint and perpendicular to the rod is 2400 **g cm**^{2}**. The length of the** 400 **g rod is nearly:**

(1) 17.5 cm
(2) 20.7 cm
(3) 72.0 cm
(4) 8.5 cm

---

6. 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) 0.4 mm
(2) 40 mm
(3) 8 mm
(4) 4 mm

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

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8. 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 N/m, then the excess force required to take it away from the surface is:
(1) 198 N
(2) 1.98 mN
(3) 99 N
(4) 19.8 mN

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9. 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) 52 Ω
(2) 55 Ω
(3) 60 Ω
(4) 26 Ω

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

(3) 6
(4) 10

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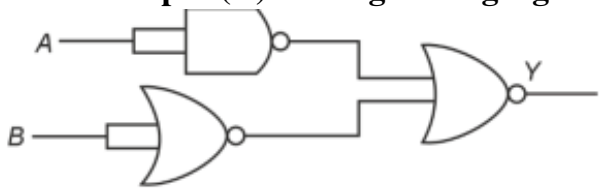
11. The output (Y) of the given logic gate is similar to the output of an/a:



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

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

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

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14. Match List I with List II:

List I (Spectral Lines of Hydrogen)	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

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

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

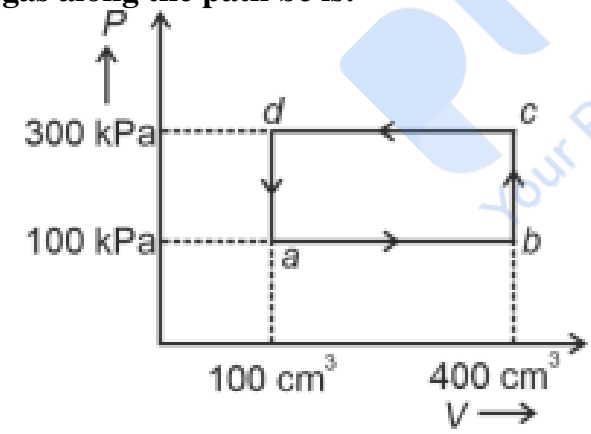
(1) 2 : 1
(2) 4 : 1
(3) 1 : 4
(4) 1 : 2

16. Match List-I with List-II:

List-I (Material)	List-II (Susceptibility (χ))
A. Diamagnetic	II. $0 > \chi \geq -1$
B. Ferromagnetic	III. $\chi >> 1$
C. Paramagnetic	IV. $0 < \chi < \epsilon$
D. Non-magnetic	I. $\chi = 0$

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

17. A thermodynamic system is taken through the cycle abcda. The work done by the gas along the path bc is:



(1) 30 J
(2) –90 J
(3) –60 J
(4) Zero

18. The quantities which have the same dimensions as those of solid angle are:

(1) Stress and angle
(2) Strain and arc

(3) Angular speed and stress
(4) Strain and angle

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19. The mass of a planet is $\frac{1}{10}$th that of Earth, and its diameter is half that of Earth. The acceleration due to gravity on that planet is:
(1) $9.8\ \text{m/s}^2$
(2) $4.9\ \text{m/s}^2$
(3) $3.92\ \text{m/s}^2$
(4) $19.6\ \text{m/s}^2$

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

---

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

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

The expression for the output Y is:
(1) $\overline{A} + B$
(2) $\overline{B}$
(3) B
(4) $A\overline{B} + \overline{A}B$

---

22. Given below are two statements: one is labelled as Assertion A and the other as Reason R:
Assertion (A): The potential V at any axial point, at 2 m distance from the centre of the dipole of dipole moment vector **P**, is $\pm 9 \times 10^3$ V.
Reason (R): $V = \pm\frac{1}{4\pi\epsilon_0} \cdot \frac{2P}{r^3}$, where $r = 2$ m.
In the light of the above statements, choose the correct answer:
(1) Both A and R are true, and R is NOT the correct explanation of A.
(2) A is true but R is false.
(3) A is false but R is true.

(4) Both A and R are true, and R is the correct explanation of A.

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23. In an ideal transformer, the turns ratio is $\frac{N_P}{N_S} = 1$. The ratio $V_S : V_P$ is equal to:
(1) 2 : 1
(2) 1 : 1
(3) 1 : 4
(4) 1 : 2

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

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25. 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 the speed becomes 2ω while keeping the same radius, the tension in the string becomes:
(1) 4T
(2) $\frac{T}{4}$
(3) 2T
(4) T

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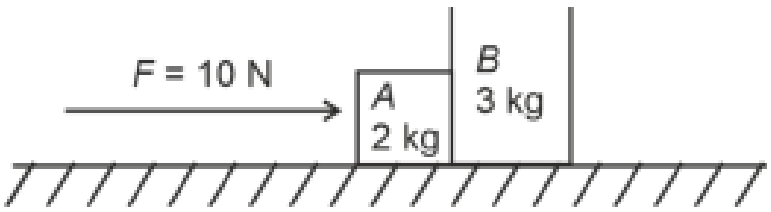
26. A horizontal force of 10 N is applied to a block A as shown in the figure. The masses of blocks A and B are 2 kg and 3 kg respectively. The blocks slide over a frictionless surface. The force exerted by block A on block B is:



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

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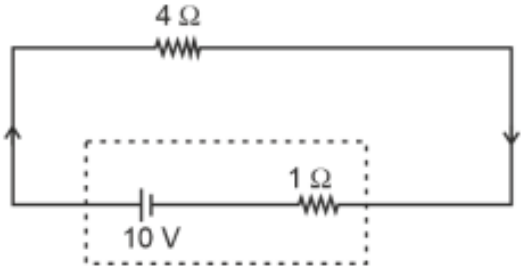
27. The terminal voltage of a battery with an emf of 10 V and internal resistance of 1 Ω,

when connected through an external resistance of 4 Ω, is:



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

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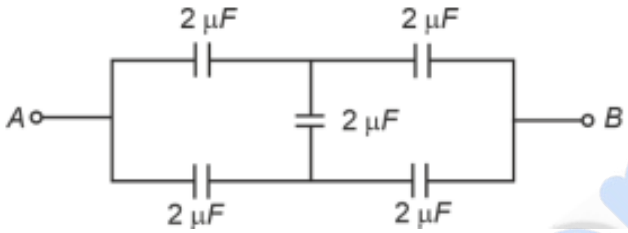
28. In the following circuit, the equivalent capacitance between terminals A and B is:

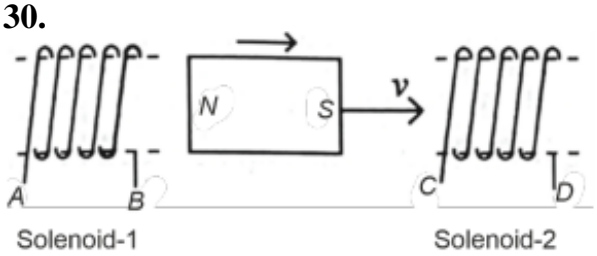


(1) 1 μF
(2) 0.5 μF
(3) 4 μF
(4) 2 μF

---

29. Given below are two statements: Statement I: Atoms are electrically neutral as they contain equal numbers of positive and negative charges. **Statement II:** Atoms of each element are stable and emit their characteristic spectrum.
Choose the most appropriate answer:
(1) Both Statement I and Statement II are incorrect
(2) Statement I is correct but Statement II is incorrect
(3) Statement I is incorrect but Statement II is correct
(4) Both Statement I and Statement II are correct

30.



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 solenoid-2, respectively, are through the directions:
(1) BA and CD
(2) AB and CD
(3) BA and DC
(4) AB and DC

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31. If c is the velocity of light in free space, the correct statements about photons 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 is $p = \frac{h\nu}{c}$.
- D. In a photon-electron collision, both total energy and total momentum are conserved.
- E. Photon possesses positive charge.

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

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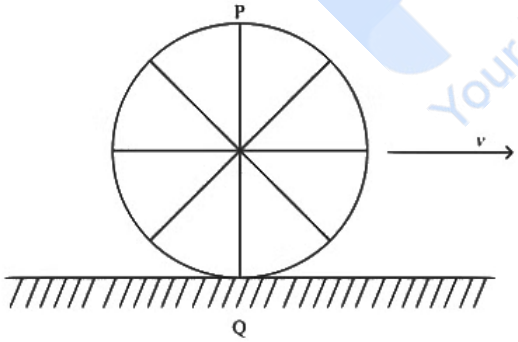
32. A wheel of a bullock cart is rolling on a level road as shown in the figure. If its linear speed is v, which of the following is correct (P and Q are the highest and lowest points on the wheel, respectively)?



(1) Point P moves faster than point Q.
(2) Both points P and Q move with equal speed.
(3) Point P has zero speed.
(4) Point P moves slower than point Q.

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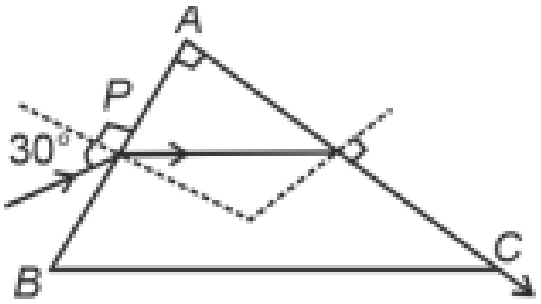
33. A light ray enters a right-angled prism at point P with an angle of incidence of 30°. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is:



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

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34. A particle moving with uniform speed in a circular path maintains:
(1) Constant acceleration
(2) Constant velocity but varying acceleration
(3) Varying velocity and varying acceleration
(4) Constant velocity

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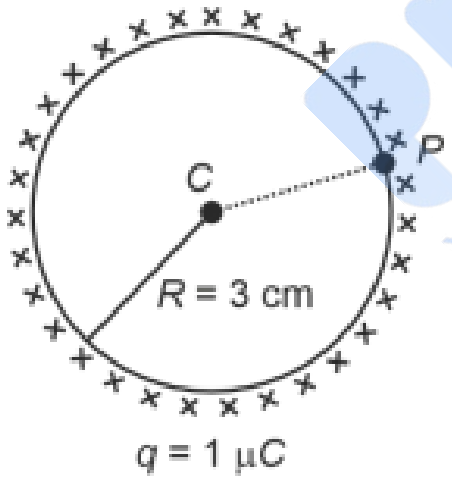
35. A thin spherical shell is charged by some source. The potential difference between two points C and P is:



(1) 1×10^5 V
(2) 0.5×10^5 V
(3) Zero
(4) 3×10^5 V

Section B

36. A parallel plate capacitor is charged by connecting it to a battery through a resistor. If I is the current in the circuit, then in the gap between the plates:
(1) Displacement current of magnitude equal to I flows in the same direction as I.
(2) Displacement current of magnitude equal to I flows in a direction opposite to that of I.
(3) Displacement current of magnitude greater than I flows but can be in any direction.
(4) There is no current.

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37. 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 0C to 100C without expansion or bending. The compressive force developed in it is:
(1) 50×10^3 N
(2) 100×10^3 N
(3) 2×10^3 N
(4) 5×10^3 N

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38. The property which is not of an electromagnetic wave traveling in free space is:
(1) The energy density in the electric field is equal to the energy density in the magnetic field.
(2) They travel with a speed equal to $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$.
(3) They originate from charges moving with uniform speed.
(4) They are transverse in nature.

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39. The minimum energy required to launch a satellite of mass m from the surface of Earth (mass M and radius R) in a circular orbit at an altitude of $2R$ from the surface of the Earth is:
(1) $\frac{2}{3}\frac{GMm}{R}$
(2) $\frac{2GMm}{R}$
(3) $\frac{3GMm}{R}$
(4) $\frac{5}{6}\frac{GMm}{R}$

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40. Two heaters A and B have power ratings of 1 kW and 2 kW, respectively. These are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:
(1) 2 : 9
(2) 1 : 2
(3) 2 : 3
(4) 1 : 1

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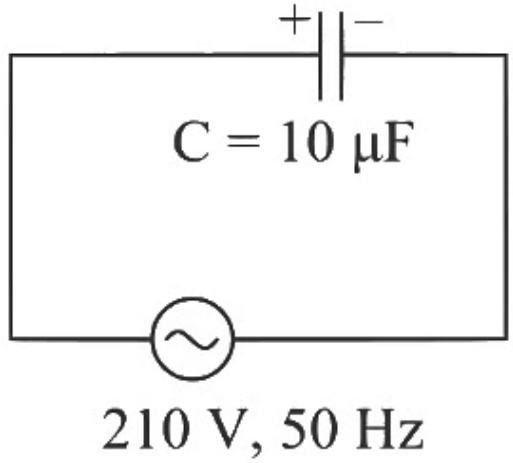
41. A 10 μF capacitor is connected to a 210 V, 50 Hz source as shown in the figure. The peak current in the circuit is nearly (π = 3.14):



(1) 0.93 A
(2) 1.20 A
(3) 0.35 A
(4) 0.58 A

---

42. If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is $\sqrt{x}$ times its original time period. Find the value of x:
(1) 2
(2) $2\sqrt{3}$
(3) 4
(4) 3

---

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

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

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

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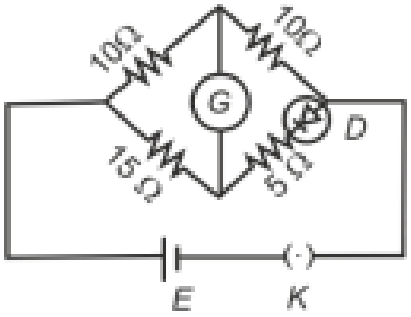
44. Choose the correct circuit which can achieve the bridge balance.

(1)



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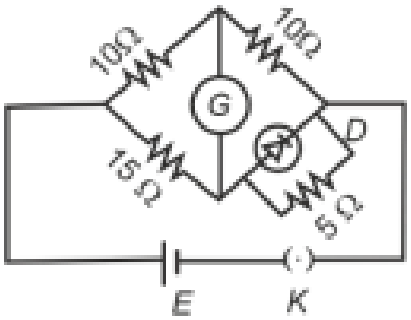

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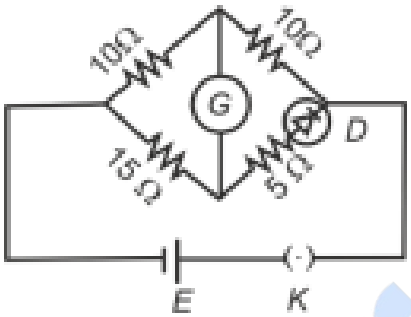

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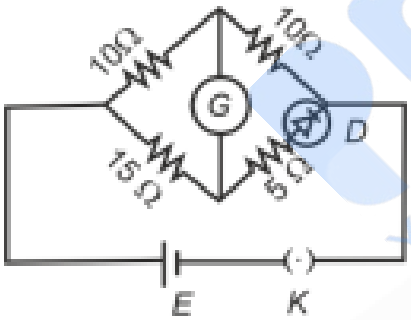

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45. If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then: A. The charge stored in it increases.
B. The energy stored in it decreases.
C. Its capacitance increases.
D. The ratio of charge to its potential remains the same.
E. The product of charge and voltage increases.

Choose the most appropriate answer:
(1) A, C, and E only
(2) B, D, and E only
(3) A, B, and C only

(4) A, B, and E only

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

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

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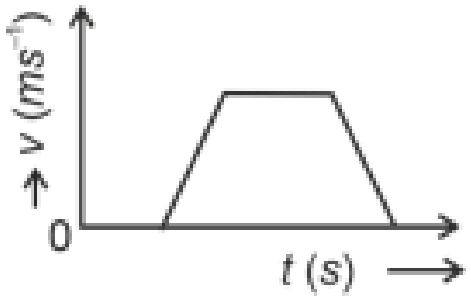
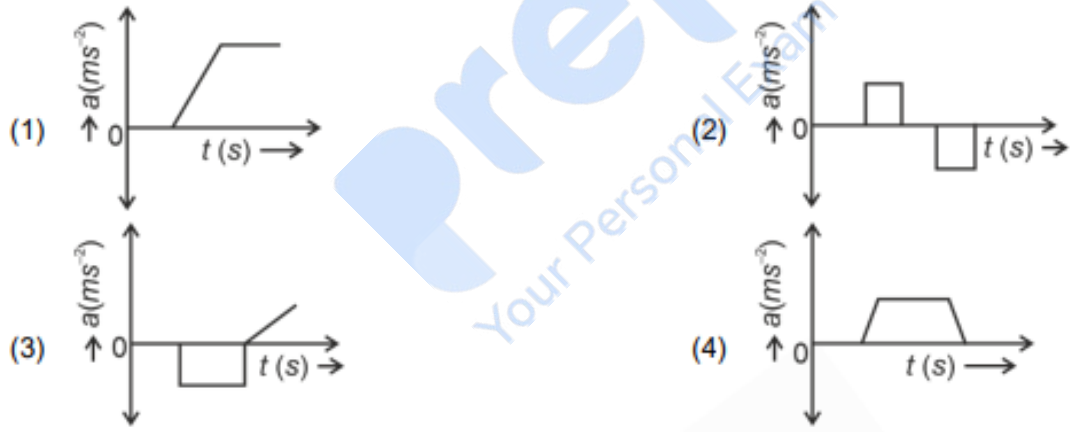
47. The velocity (v)–time (t) plot of a body's motion is shown below:



Which acceleration (a)–time (t) graph best suits the motion?



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

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

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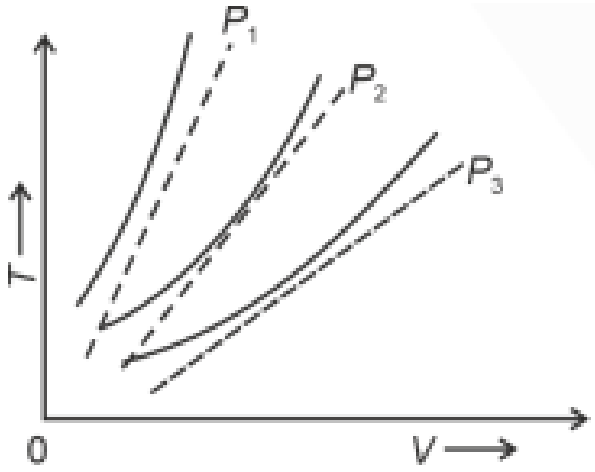
49. The following graph represents the T-V curves of an ideal gas at pressures P_1, P_2, and P_3. The correct relation is:



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

---

50. A force defined by $F = \alpha t^2 + \beta t$ acts on a particle at a given time t. Which factor is dimensionless if α and β are constants?
(1) $t\frac{\alpha}{\beta}$
(2) $\alpha\beta t$
(3) $\frac{t}{\alpha\beta}$
(4) $\frac{t\beta}{\alpha}$

Chemistry

Section A

51. Spin only magnetic moment is the same for which of the following ions?
(1) A and E only
(2) B and C only
(3) A and D only
(4) B and D only

---

52. Match List I with List II and choose the correct answer.
List I (Conversion) A. 1 mol of H_2O to O_2
B. 1 mol of MnO_4^- to Mn^{2+}
C. 1.5 mol of Ca from molten $CaCl_2$
D. 1 mol of FeO to Fe_2O_3

List II (Number of Faraday required) I. 3F
II. 1F
III. 5F
IV. 5F

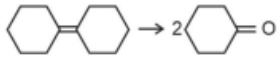
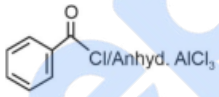
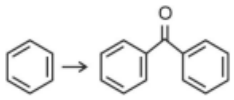
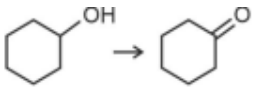
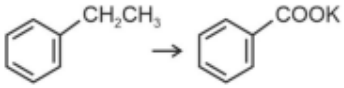
(1) A-III, B-IV, C-II, D-III
(2) A-II, B-III, C-I, D-IV
(3) A-III, B-IV, C-II, D-II
(4) A-II, B-II, C-I, D-III

---

53. Fehling's solution 'A' is:
(1) Alkaline copper sulphate
(2) Alkaline solution of sodium potassium tartrate (Rochelle's salt)
(3) Aqueous sodium citrate
(4) Aqueous copper sulphate

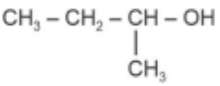
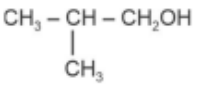
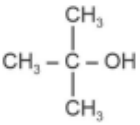
---

54. Match List I with List II and choose the correct answer.

List I (Reaction)	List II (Reagents/Condition)
A. 	I. 
B. 	II. CrO_3
C. 	III. $KMnO_4/KOH, \Delta$
D. 	IV. (i) O_3 (ii) $Zn\text{-}H_2O$

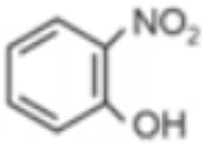
---

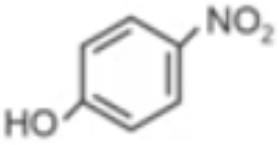
55. Which one of the following alcohols reacts instantaneously with Lucas reagent?

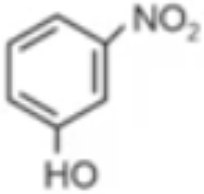
(1) 
(2) 
(3) 
(4) $CH_3 - CH_2 - CH_2 - CH_2OH$

---

56. Intramolecular hydrogen bonding is present in:

(1) 

(2) 

(3) 

(4) HF

---

57. Match List I with List II and choose the correct answer.

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

---

58. Given below are two statements:

Statement 1: The boiling point of these isomeric pentanes follows the order n-pentane > isopentane > neopentane

Statement 2: When branching increases, the molecule attains a shape of a sphere. This results in smaller surface area for contact, due to which the intermolecular forces between the spherical molecules are weak, thereby lowering the boiling point.

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

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

59. Which of the following processes increases entropy?
(1) A liquid evaporates to vapour
(2) Temperature of a crystalline solid lowered from 130 K to 0 K
(3) $ZnCl_2 + NaCO_3 \rightarrow CO_2 + H_2O$
(4) $Cl_2 \rightarrow 2Cl$

---

60. 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) 250 mg
(2) 200 mg
(3) Zero mg
(4) 750 mg

---

61. Match List I with List II and choose the correct answer.
List I (Molecule) A. Benzene
B. Ethene
C. Acetylene
D. Ethane

List II (Number and types of bonds between two carbon atoms) I. One π-bond and one σ-bond
II. Two π-bonds and one σ-bond
III. One σ-bond
IV. No π-bonds and three σ-bonds

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

---

62. Given below are two statements:
Statement 1: The boiling point of hydrides of Group 16 elements follows the order

$$H_2O > H_2Te > H_2Se > H_2S$$

Statement 2: On the basis of molecular mass, H_2O is expected to have a lower boiling point than the other members of the group, but due to the presence of extensive H-bonding in H_2O, it has a higher boiling point.
In the light of the above statements, choose the correct answer from the options given below:
(1) Both Statement 1 and Statement 2 are false
(2) Statement 1 is false but Statement 2 is true
(3) Statement 1 is true but Statement 2 is false

(4) Both Statement 1 and Statement 2 are true

---

63. Match List I with List II and choose the correct answer.

	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

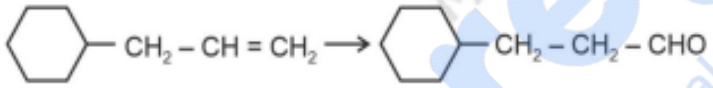
Choose the correct answer from the options given below: (1) A-II, B-III, C-IV, D-I
(2) A-II, B-I, C-IV, D-III
(3) A-I, B-II, C-III, D-IV
(4) A-III, B-II, C-I, D-IV

---

64. The highest number of helium atoms is in:
(1) 1 g of helium
(2) 4 g of helium
(3) 2.27108 g of helium at STP
(4) 4 mol of helium

---

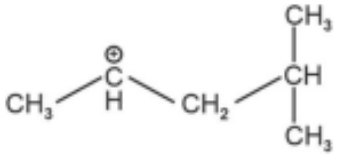
65. Identify the correct reagents that would bring about the following transformation.

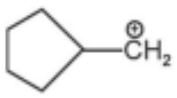


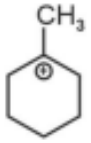
(1) PCC
(2) BH_3
(3) H_2O_2 / OH^-
(4) H_2 + Pd

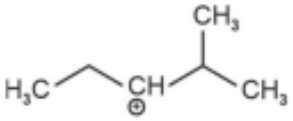
---

66. The most stable carbocation among the following is:

(1) 

(2) 

(3) 

(4) 

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67. Arrange the following elements in increasing order of electronegativity: N, O, F, C, Si.
(1) Si ¡ C ¡ O ¡ N ¡ F

(2) O ¡ F ¡ N ¡ C ¡ Si
(3) F ¡ O ¡ N ¡ C ¡ Si
(4) Si ¡ C ¡ N ¡ O ¡ F

---

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

(1) Linear with negative slope
(2) Linear with positive slope
(3) Parabolic increase
(4) Exponential decrease

---

69. Among Group 16 elements, which one does NOT show –2 oxidation state?
(1) Te
(2) Po
(3) Se
(4) O

---

70. Arrange the following elements in increasing order of first ionization enthalpy: Li, B, Be, C, N.
(1) Li ¡ B ¡ Be ¡ C ¡ N
(2) Li ¡ Be ¡ B ¡ C ¡ N
(3) Li ¡ C ¡ B ¡ N ¡ Be
(4) Be ¡ Li ¡ B ¡ C ¡ N

---

71. Given below are two statements:
Statement 1: Aniline does not undergo Friedel-Crafts alkylation reaction.
Statement 2: Aniline cannot be prepared through Gabriel synthesis.

In the light of the above statements, choose the correct answer from the options given below:
(1) Both Statement 1 and Statement 2 are false
(2) Statement 1 is correct but Statement 2 is false
(3) Statement 1 is incorrect but Statement 2 is true
(4) Both Statement 1 and Statement 2 are true

72. Given below are two statements:
Statement 1: Both $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ complexes are octahedral but differ in their magnetic behavior.
Statement 2: $[Co(NH_3)_6]^{3+}$ is diamagnetic whereas $[CoF_6]^{3-}$ is paramagnetic.

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

---

73. 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^5 to d^4 configuration
(2) d^4 to d^5 configuration
(3) d^3 to d^2 configuration
(4) d^6 to d^5 configuration

---

74. Match List I with List II and choose the correct answer.
List I (Quantum Number) A. *n*
B. *l*
C. *m*
D. *s*

List II (Information Provided) I. Shape of orbital
II. Size of orbital
III. Orientation of orbital
IV. Orientation of spin of electron

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

---

75. For the reaction 2A + B - C, $K_c = 4 \times 10^3$. At a given time, the composition of reaction mixture is: (A) = (B) = (C) = 2×10^{-3}.
Then, which of the following is correct?
(1) Reaction has a tendency to go in forward direction.
(2) Reaction has a tendency to go in backward direction.

(3) Reaction has gone to completion in forward direction.
(4) Reaction is at equilibrium.

---

76. Match List I with List II and choose the correct answer.

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

---

77. In which of the following equilibria, K_p and K_c are NOT equal?
(1) $H_2 + Cl_2$ - 2HCl
(2) $H_2 + I_2$ - 2HI
(3) $PCl_3 + Cl_2$ - PCl_5
(4) $N_2 + 3H_2$ - $2NH_3$

---

78. The reagent with which glucose does not react to give the corresponding test/products are:
(1) Tollen's reagent
(2) Fehling's solution
(3) NH_2OH
(4) $NaHSO_3$

---

79. Name some solid substances 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) Sublimation
(2) Chromatography
(3) Crystallization
(4) Distillation

---

80. Which reaction is NOT a redox reaction?
(1) $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$
(2) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$
(3) $Zn + HCl \rightarrow ZnCl_2 + H_2$

(4) $CuSO_4 + ZnSO_4 \rightarrow ZnO + Cu$

---

81. 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) B > C > A
(2) A > C > B
(3) A > B > C (4) B > A > C

---

82. Activation energy of any chemical reaction can be calculated if one knows the value of:
(1) Probability of collision
(2) Orientation of reactant molecules during collision
(3) Rate constant at two different temperatures
(4) Rate constant at standard temperature

---

83. The energy of an electron in the ground state (n = 1) for H^+ ion is -x J, then for an electron in n = 2 state for Be^{3+} ion in J is:
(1) -x
(2) -4x
(3) -x/4
(4) -x

---

84. The compound that will undergo S_N1 reaction with the fastest rate is:

---

85. A compound with a molecular formula of C_6H_{14} has two tertiary carbons. Its IUPAC name is:
(1) 2-methylpentane
(2) 2,3-dimethylbutane
(3) n-hexane
(4) 2-methylbutane

Section B

86. Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing group number from 0 to VI.
A. Ag^+ B. Ba^{2+} C. Cu^{2+} D. Ca^{2+}
Choose the correct answer from the options given below:

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

---

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) $POCl_3$ and HPO_3
(2) HPO_4 and PCl_3
(3) H_3PO_4 and $POCl_3$
(4) $POCl_3$ and HPO_4

---

88. During the preparation of Mohr's salt solution (Ferrous ammonium sulfate), which of the following acids is added to prevent hydrolysis of Fe^{2+} ion?
(1) Concentrated sulphuric acid
(2) Dilute nitric acid
(3) Dilute sulphuric acid
(4) Dilute hydrochloric acid

---

89. 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:
(1) 310°C
(2) 0°C
(3) 25.73°C
(4) 37°C

---

90. The work done during reversible isothermal expansion of one mole of hydrogen gas at 25°C from pressure of 20 atmosphere to 10 atmosphere is:
(Given R = 2.0 cal mol^{-1} K^{-1})
(1) 113.4 calories
(2) 403.14 calories
(3) 213.4 calories
(4) 140 calories

---

91. The pair of lanthanide ions which are diamagnetic is:

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

---

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

---

93. 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}, 1 F = 96487 C)
(1) 0.315 g
(2) 3.15 g
(3) 0.0315 g
(4) 31.5 g

---

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

$$CH_3 - CH_2 - CH_3 \xrightarrow{NBS,\ h\nu} A \xrightarrow{NaCN,\ DMSO} B \xrightarrow{H_3O^+} C \xrightarrow{SOCl_2} D \xrightarrow{NH_3} E$$

(1) Butylamine
(2) Butanamide
(3) - Bromobutanoic acid
(4) Propylamine

---

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

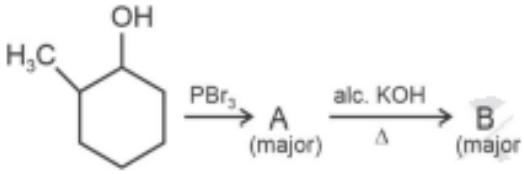
$$N_2 = 3.0 \times 10^{-3}\ \mathbf{M}, O_2 = 4.2 \times 10^{-3}\ \mathbf{M}, NO = 2.8 \times 10^{-3}\ \mathbf{M}$$

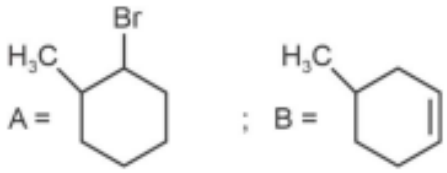
$$N_2O_4 \rightleftharpoons 2NO_2$$

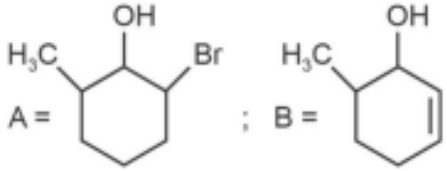
If 0.1 mol L^{-1} of NO_2 is taken in a closed vessel, what will be the degree of dissociation (α) of NO_2 at equilibrium?
(1) 0.4
(2) 0.6889
(3) 0.8899
(4) 0.0889

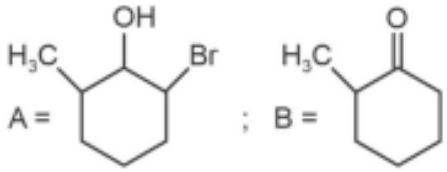
---

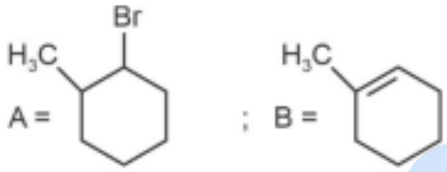
96. Major products A and B formed in the following reaction sequence, are:



(1) 

(2) 

(3) 

(4) 

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

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

(1) 38.0 kJ/mol

(2) 38.0 J/mol

(3) 380.4 kJ/mol

(4) 38.04 kJ/mol

---

98. Given below are two statements:

Statement 1: $[Co(NH_3)_6]^{3+}$ is a homoleptic complex whereas $[Co(NH_3)_4Cl_2]^{+}$ is a heteroleptic complex.

Statement 2: Complex $[Co(NH_3)_6]^{3+}$ has only one kind of ligand but $[Co(NH_3)_4Cl_2]^{+}$ has more than one kind of ligands.

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

(1) Both Statement 1 and Statement 2 are false

(2) Statement 1 is true but Statement 2 is false

(3) Statement 1 is false but Statement 2 is true

(4) Both Statement 1 and Statement 2 are true

99. For the given reaction:

$$C = CH - CHO \xrightarrow{MCPBA} P \text{ (major product)}$$

100. A compound X contains 32 percent of A, 20 percent of B and remaining percentage of C. Then, the empirical formula of X is:
(Given atomic masses of A = 64, B = 40, C = 32 u)
(1) ABC_2
(2) AB_2C
(3) A_2BC
(4) ABC

Botany

Section A

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

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

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

---

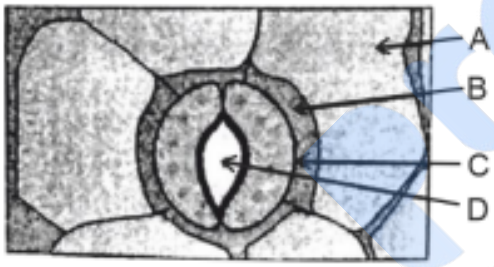
104. Which one of the following can be explained on the basis of Mendel's Law of Dominance?

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

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

---

105. In the given figure, which component has thin outer walls and highly thickened inner walls?



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

---

106. List of endangered species was released by

(1) WWF
(2) FOAM
(3) IUCN
(4) GEAC

---

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

---

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

---

109. Inhibition of Succinic dehydrogenase enzyme by malonate is a classical example of:
(1) Feedback inhibition
(2) Competitive inhibition
(3) Enzyme activation
(4) Cofactor inhibition

---

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

---

111. These are regarded as major causes of biodiversity loss:
A. Over-exploitation
B. Co-extinction
C. Mutation
D. Habitat loss and fragmentation
E. Migration

Choose the correct option:

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

---

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

---

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

---

114. Tropical regions show greatest level of species richness because:
A. Tropical latitudes have remained relatively undisturbed for millions 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 and B only
(2) A, B and E only
(3) A, B and D only
(4) A, C, D and E only

---

115. Spindle fibers attach to kinetochores of chromosomes during:
(1) Metaphase
(2) Anaphase
(3) Telophase

(4) Prophase

---

116. 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 F1 progeny with homozygous recessive parent	II. Ploidy
C. Cross of F1 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-II, B-I, C-III, D-IV
(2) A-III, B-IV, C-I, D-II
(3) A-IV, B-III, C-II, D-I
(4) A-I, B-II, C-III, D-IV

---

117. Lecithin, a small molecular weight organic compound found in living tissues, is an example of:
(1) Phospholipids
(2) Glycerides
(3) Carbohydrates
(4) Amino acids

---

118. The equation of Verhulst-Pearl logistic growth is:

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

From this equation, K indicates:
(1) Biotic potential
(2) Carrying capacity
(3) Population density
(4) Intrinsic rate of natural increase

---

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

---

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

---

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

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

---

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

---

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

---

124. The type of conservation in which the threatened species are taken out from their natural habitat and placed in special settings where they can be protected and given

special care is called:
(1) Biodiversity conservation
(2) Semi-conservative method
(3) Sustainable development
(4) In-situ conservation

---

125. A transcription unit in DNA is defined primarily by the three regions in DNA and these are with respect to upstream and downstream ends:
(1) Structural gene, Transposons, Operator gene
(2) Inducer, Repressor, Structural gene
(3) Promoter, Structural gene, Terminator
(4) Repressor, Operator gene, Structural gene

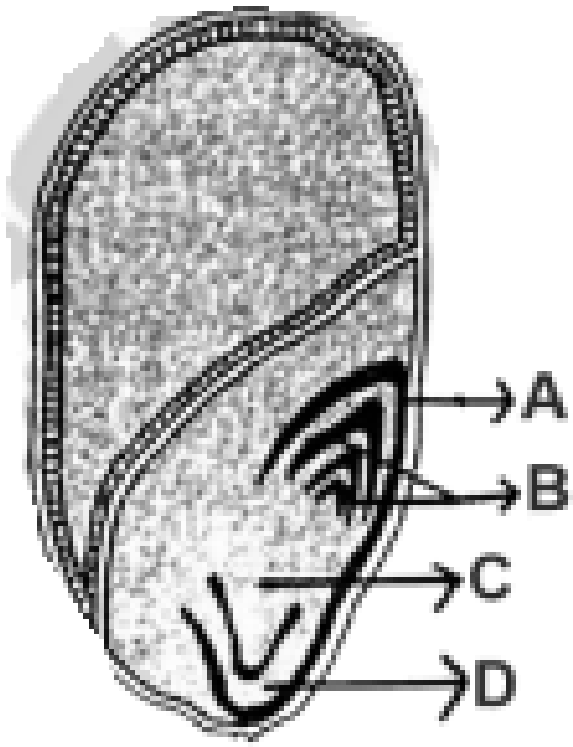
---

126. What is the fate of a piece of DNA carrying only the gene of interest which is transferred into an alien organism?
A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.
B. It may get integrated into the genome of the recipient.
C. It may multiply and be inherited along with the host DNA.
D. The alien piece of DNA is not an integral part of the chromosome.
E. It shows the ability to replicate.

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

---

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



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

---

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

---

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

---

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

---

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

---

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

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

---

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

---

134. 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
(3) BB/Bb
(4) BB

---

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

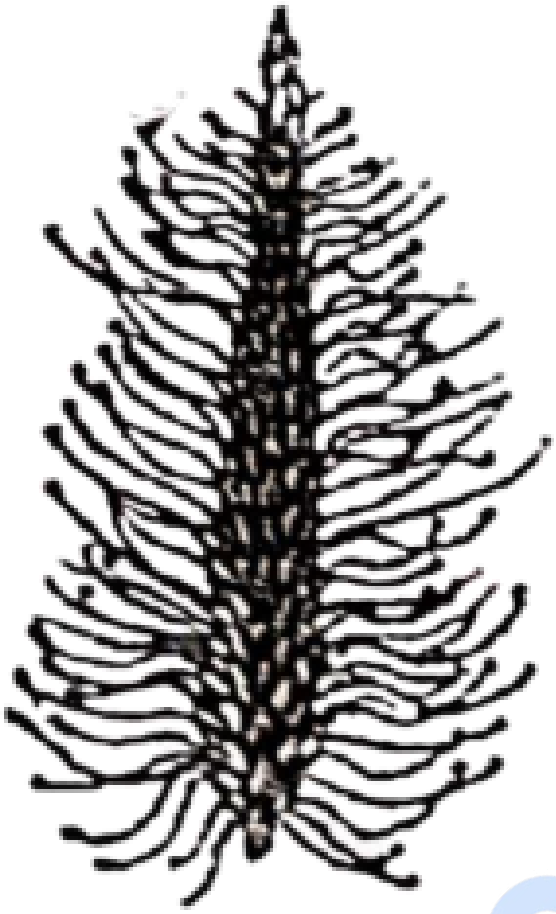
Section B

136. Given below are two statements:
Statement I: In C_3 plants, some O_2 binds to RuBisCO, hence CO_2 fixation is decreased.
Statement II: In C_4 plants, mesophyll cells show very little photorespiration while bundle sheath cells do not show photorespiration.

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

---

137. Identify the correct description about the given figure:



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

---

138. Match List I with List II:

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

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

---

139. The DNA present in chloroplast is:
(1) Circular, double stranded

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

---

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

---

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

---

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

---

143. Match List I with List II:

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

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

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

145. Match List I with List II:

List-I	List-II
A. Frederick Griffith	III. Transformation
B. Francois Jacob	IV. Lac operon
C. Har Gobind Khorana	I. Genetic code
D. Meselson	II. Semi-conservative mode of DNA replication

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

146. Match List I with List II:

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

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

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

---

148. Match List I with List II:

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

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

---

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

---

150. Match List I with List II:

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

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

Zoology

Section A

151. Match List I with List II:

List-I (Types of Joints)	List-II (Example)
A. Fibrous joints	III. Skull, don't allow any movement
B. Cartilaginous joints	I. Adjacent vertebrae, limited movement
C. Hinge joints	IV. Knee, help in locomotion
D. Ball and socket joints	II. Humerus and Pectoral girdle, rotational movement

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

---

152. Match List I with List II:

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

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

---

153. Match List I with List II:

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

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

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

---

154. Given below are two statements:
Assertion (A): FSH acts upon ovarian follicles in females and Leydig cells in males.
Reason (R): Growing ovarian follicles secrete estrogen in females while interstitial cells secrete androgen in males.

In the light of the above statements, choose the correct answer from the options given below:
(1) Both A and R are true but R is NOT the correct explanation of A
(2) A is true but R is false
(3) A is false but R is true
(4) Both A and R are true and R is the correct explanation of A

---

155. The "Ti plasmid" of Agrobacterium tumefaciens stands for:
(1) Tumor independent plasmid
(2) Tumor inducing plasmid
(3) Temperature independent plasmid
(4) Tumor inhibiting plasmid

---

156. Given below are two statements:
Statement I: In the nephron, the descending limb of loop of Henle is impermeable to water and permeable to electrolytes.
Statement II: The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

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

---

157. Match List I with List II:

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

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

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

---

158. Match List I with List II:

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

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

---

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

---

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

Stages of Evolution	Order
A. Homo habilis	1st
B. Homo sapiens	4th
C. Homo neanderthalensis	3rd
D. Homo erectus	2nd

Choose the correct sequence of human evolution from the options given below:
(1) B-A-D-C
(2) C-B-D-A
(3) A-D-C-B
(4) D-A-C-B

---

161. Match List I with List II:

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

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

---

162. Given below are two statements:
Statement I: The presence or absence of hymen is not a reliable indicator of virginity.
Statement II: The hymen is torn during the first coitus only.

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

---

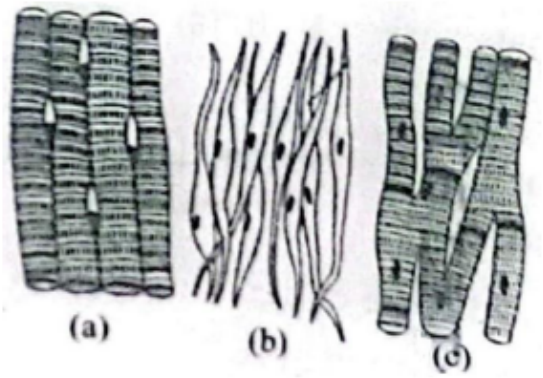
163. Match List I with List II:

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

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

---

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



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

---

165. Match List I with List II:

List-I (Disease)	List-II (Causative Agent)
A. Typhoid	IV. Bacteria
B. Leishmaniasis	III. Protozoa
C. Ringworm	I. Fungus
D. Filariasis	II. Nematode

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

---

166. Match List I with List II:

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

Choose the correct answer from the options given below:

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

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

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168. Match List I with List II:

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

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

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169. Following are the stages of the 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 the pathway from the options given below:
(1) A-E-C-B-D
(2) B-D-E-C-A
(3) E-A-D-B-C
(4) E-C-A-D-B

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170. The flippers of the Penguins and Dolphins are the example of:

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

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

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172. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R:
Assertion A: Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby. **Reason R:** Colostrum contains several antibodies absolutely essential to develop resistance for the newborn baby.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both A and R are correct but R is NOT the correct explanation of A
(2) A is correct but R is not correct
(3) A is not correct but R is correct
(4) Both A and R are correct and R is the correct explanation of A

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

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174. Consider the following statements:
A. Annelids are true coelomates. B. Poriferans are pseudocoelomates. C. Aschelminthes are acoelomates. D. Platyhelminthes are pseudocoelomates.
Choose the correct answer from the options given below:
(1) A only
(2) C only
(3) D only
(4) B only

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

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

177. Match List I with List II:

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

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

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

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

180. Match List I with List II:

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

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

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181. Which of the following is not a component of the Fallopian tube?
(1) Isthmus
(2) Infundibulum
(3) Ampulla
(4) Uterine fundus

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182. Match List I with List II:

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

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

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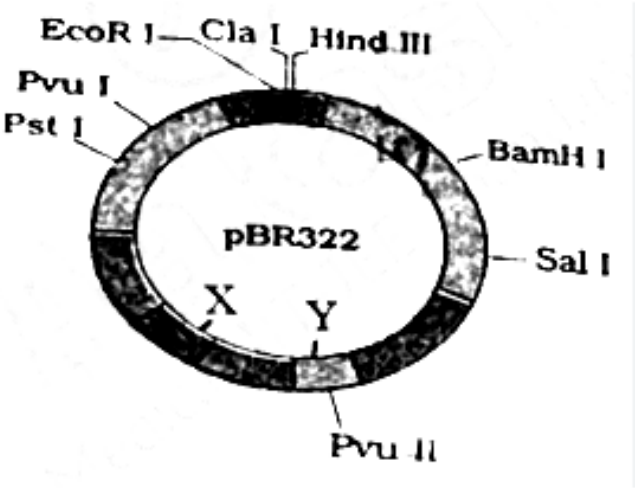
183. The following diagram showing restriction sites in E. coli cloning vector pBR322. Find the role of 'X' and 'Y' genes:



(1) The gene 'X' is responsible for controlling the copy number of the linked DNA and 'Y' for protein involved in the replication of Plasmid.
(2) The gene 'X' is for protein involved in replication of Plasmid and 'Y' for resistance to antibiotics.
(3) Gene 'X' is responsible for recognitions sites and 'Y' is responsible for antibiotic resistance.
(4) The gene 'X' is responsible for resistance to antibiotics and 'Y' for protein involved in the replication of Plasmid.

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184. Which of the following are Autoimmune disorders?
(1) A, B & E only
(2) B, C & E only
(3) C, D & E only
(4) A, B & D only

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185. Match List I with List II:

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

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

Section B

186. Match List I with List II:

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

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

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187. Given below are two statements: Statement I: The cerebral hemispheres are connected by a nerve tract known as corpus callosum.
Statement II: The brain stem consists of the medulla oblongata, pons, and cerebrum.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both Statement I and Statement II are incorrect
(2) Statement I is correct but Statement II is incorrect
(3) Statement I is incorrect but Statement II is correct
(4) Both Statement I and Statement II are correct

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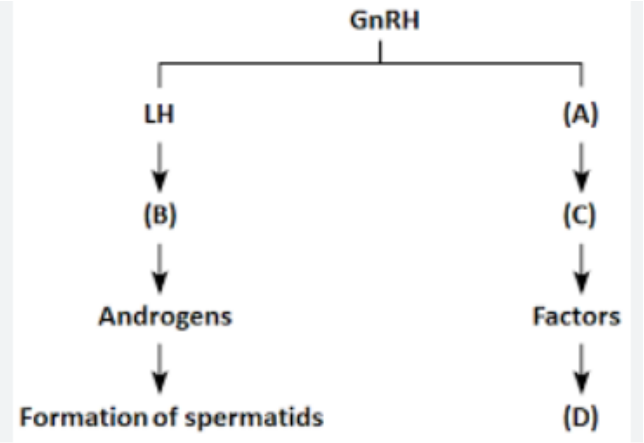
188. Given below are two statements: Statement I: Mitochondria and chloroplasts are both double membrane-bound organelles.
Statement II: The inner membrane of mitochondria is relatively less permeable compared to chloroplast.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both Statement I and Statement II are incorrect
(2) Statement I is correct but Statement II is incorrect
(3) Statement I is incorrect but Statement II is correct
(4) Both Statement I and Statement II are correct

189.



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

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

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190. 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 microenvironments for the development and maturation of T-lymphocytes.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both Statement I and Statement II are incorrect
(2) Statement I is correct but Statement II is incorrect
(3) Statement I is incorrect but Statement II is correct
(4) Both Statement I and Statement II are correct

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191. As per ABO blood grouping system, the blood group of father is B^+, mother is A^+, and the child is O^+. Their respective genotype can be:
(1) B only
(2) C & B only
(3) D & E only
(4) A only

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192. Given below are two statements: Statement I: Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely.
Statement II: According to Gause's principle, during competition, the inferior will be eliminated. This may be true if resources are limiting.
In the light of the above statements, choose the correct answer from the options given below:

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

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

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194. Match List I with List II:

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

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

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195. Regarding the catalytic cycle of an enzyme action, select the correct sequential steps:
A. Substrate enzyme complex formation.
B. Free enzyme ready to bind with another substrate.
C. Release of products.
D. Chemical bonds of the substrate broken.
E. Substrate binding to active site.

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

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

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

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197. Match List I with List II:

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

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

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198. Choose the correct statement regarding juxta medullary nephron:
(1) Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.
(2) Loop of Henle of juxta medullary nephron runs deep into medulla.
(3) Juxta medullary nephrons outnumber the cortical nephrons.
(4) Juxta medullary nephrons are located in the columns of Bertini.

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199. Match List I with List II related to the digestive system of cockroach:

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

Choose the correct answer from the options given below:

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

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200. The following are the statements about non-chordates:
A. Pharynx is perforated by gill slits.
B. Notochord is absent.
C. Central nervous system is dorsal.
D. Heart is dorsal if present.
E. Post-anal tail is absent.

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