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Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2024
Test-6

MM : 720   Time : 3 Hrs. 20 Mins.

Topics covered :

Physics : Current Electricity, Moving Charges and Magnetism, Magnetism and Matter, Electromagnetic Induction

Chemistry : The *p*-Block Elements (Group 15-18), The *d* and *f*-Block Elements, Coordination Compounds

Botany : Principles of Inheritance and Variation, Molecular Basis of Inheritance

**Zoology** : Reproductive Health and Evolution

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Instructions :

(i)   There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.

(ii) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.

(iii) Use blue/black ballpoint pen only to darken the appropriate circle.

(iv) Mark should be dark and completely fill the circle.

(v)   Dark only one circle for each entry.

(vi) Dark the circle in the space provided only.

(vii) Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

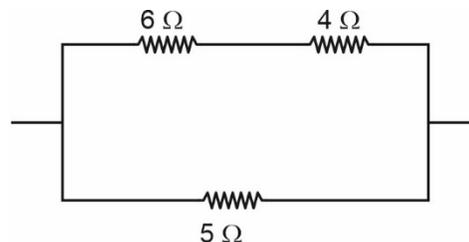## PHYSICS

Choose the correct answer :

SECTION-A

1. In the given diagram, the reading of the ammeter is (when internal resistance of the battery is zero)
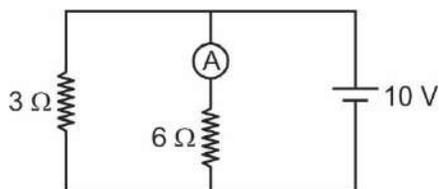
(1) $\dfrac{5}{3}$ A

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

(3) 2 A

(4) 3 A

2. In a circuit shown in figure, the heat produced in 5 Ω resistor due to current flowing in it is 20 J. The heat produced in 6 Ω resistor is


(1) 12 J

(2) 6 J

(3) 20 J

(4) 8 J

3. Three resistance *P*, *Q*, *R* each of 3 Ω and an unknown resistance *S* form the four arms of a Wheatstone bridge circuit. When a resistance of 6 Ω is connected in parallel to *S* the bridge get balanced. What is the value of *S*?

    (1) 6 Ω   (2) 4 Ω

    (3) 3 Ω   (4) 9 Ω

4. A square loop, carrying a steady current *I*, is placed in a horizontal plane near to a long straight conductor carrying a steady current $\dfrac{I}{2}$ at a distance *r* from the conductor as shown in figure. The loop will experience
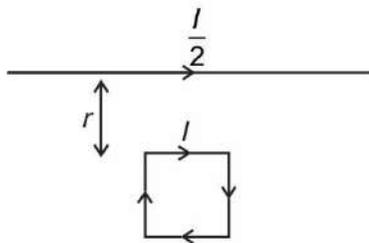

    (1) A net attractive force towards the conductor

    (2) A net repulsive force away from the conductor

    (3) A net torque acting upward perpendicular to the horizontal plane

    (4) A net torque acting downward perpendicular to the horizontal plane

5. A charged particle of mass *m* and charge *q* travels on a circular path of radius *r* in a uniform perpendicular magnetic field *B*. The time taken by the particle to complete half revolution is

    (1) $\dfrac{2\pi m}{qB}$ (2) $\dfrac{\pi m}{qB}$

    (3) $\dfrac{q\pi}{mB}$ (4) $\dfrac{2\pi q}{mB}$

6. An electron and a proton enter a magnetic field perpendicularly. Both have the same kinetic energy. Which of the following is true?

    (1) Trajectory of proton is less curved

    (2) Trajectory of electron is less curved

    (3) Both trajectories are equally curved

    (4) Both move on a straight line path

7. Two cells *A* and *B*, each of emf 20 V, are connected in series to an external resistance *R* = 10 Ω. If the internal resistance of cell *A* is 2 Ω and that of cell *B* is 3 Ω, then potential difference between the terminals of cell *B* is
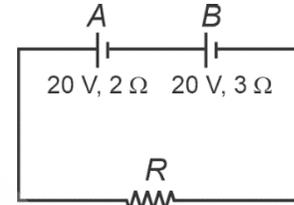
    (1) 10 V   (2) 12 V

    (3) 11 V   (4) 14 V

8. If a copper wire is stretched to make it 0.4% longer, then its resistance is

    (1) Decreased by 0.4%   (2) Increased by 0.4%

    (3) Increased by 0.8%   (4) Decreased by 0.8%

9. A conducting circular loop carrying current *I* is placed in a uniform magnetic field normally into the plane of the loop as shown in figure. The loop will have the tendency to
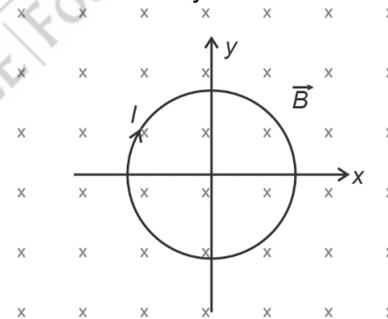
    (1) Contract

    (2) Expand

    (3) Move towards positive *x*-axis

    (4) Move towards negative *x*-axis

Space for Rough Work

10. A wire of length 5 m is placed in uniform magnetic field of 2 mT. It makes 30° with the field. If 4 A current is flowing in the wire, then force per unit length on wire is
   (1) 1 mN m^{-1}　　　　　　(2) 2 mN m^{-1}
    (3) 5 mN m^{-1}　　　　　　(4) 4 mN m^{-1}

11. A magnetic rod has a magnetic moment M and length L. If it is bent into a semicircular arc, then its new magnetic moment will be
    (1) $\dfrac{\pi}{2}M$　　　　　　(2) $\dfrac{2}{\pi}M$
    (3) M　　　　　　(4) πM

12. In a coil of resistance 100 Ω, a current is induced by changing the magnetic flux through it, as shown in the figure. The magnitude of net change in flux through the coil is
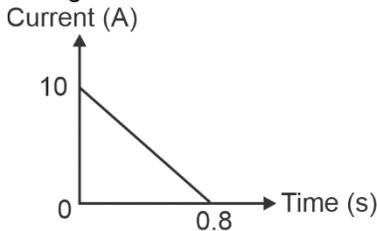

    (1) 400 Wb　　　　　　(2) 200 Wb
    (3) 250 Wb　　　　　　(4) 175 Wb

13. All substances, to some extent, exhibit
    (1) Paramagnetism　　　(2) Diamagnetism
    (3) Ferromagnetism　　　(4) Both (1) and (3)

14. The energy stored in the inductor long time after switch S is closed is (steady state)
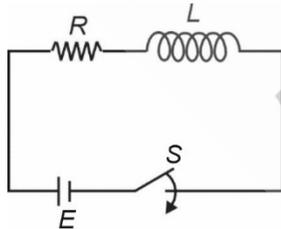
    (1) $\dfrac{LE^2}{R}$　　　　　　(2) Zero
   (3) $\dfrac{LE^2}{2R^2}$　　　　　　(4) $\dfrac{LE^2}{4R^2}$

15. In the given branch PQ of a circuit, electric current $i = (5t + 2)$ A is flowing, where t is time in second. At $t = 1$ s, the magnitude of potential difference between points P and Q is
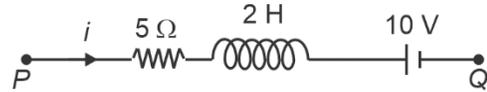
    (1) Zero　　　　　　(2) 20 V
    (3) 10 V　　　　　　(4) 55 V

16. In electromagnetic induction, the induced EMF in a coil depends on
    (1) Change in magnetic field
    (2) Area of coil
    (3) Angle between magnetic field and area vector of coil
    (4) All of these

17. The mutual inductance between two coils is 2.25 H. If the rate of change of current in one coil is 40 ampere/second, then the induced EMF in the other coil is
    (1) 90 V　　　　　　(2) 30 V
    (3) 50 V　　　　　　(4) 100 V

18. Consider the following two statements regarding moving coil galvanometer.
    a. Increasing the current sensitivity of a moving coil galvanometer necessarily increases the voltage sensitivity.
    b. To convert a moving coil galvanometer to a voltmeter, a small resistance is connected in series.
    The correct statement(s) is/are
   (1) Only a　　　　　　(2) Only b
    (3) Both a and b　　　　(4) Neither a nor b

Space for Rough Work

19. A variable current is flowing in a wire which is given by $i = (2t + 3)$A, where t is in second. The amount of charge flown through the wire in first two seconds will be

    (1) 14 C   (2) 9 C

    (3) 10 C   (4) 12 C

20. The nature of electric field generated by time varying magnetic field is

    (1) Conservative

    (2) Non-conservative

    (3) May be conservative or may not be conservative

    (4) Electric field is not generated in the given condition

21. For a substance, the magnetic susceptibility at room temperature is negative. The substance is

    (1) Paramagnetic   (2) Diamagnetic

    (3) Ferromagnetic   (4) None of these

22. **Assertion (A):** Terminal voltage of a cell is smaller than its emf during discharging of the cell.

    Reason (R): The emf of a cell increases during discharging of the cell.

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

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

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

    (4) Both (A) and (R) are false

23. At a given instant in the following circuit, the current through the inductor is 2 A and increasing at a rate of one ampere per second. The value of emf of the cell is
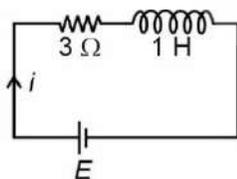
    (1) 5 V   (2) 8 V

    (3) 6 V   (4) 7 V

24. Two coils of self inductance 8 H and 4 H are wound on an insulating core. The coefficient of mutual inductance for them may be

    (1) 32 H   (2) 6 H

    (3) 5 H   (4) 16 H

25. A magnetic needle of magnetic moment 0.3 A m² is placed in a region with uniform magnetic field of 2 T. The maximum torque acting on the needle will be

    (1) 1.2 N m   (2) 0.6 N m

    (3) 0.3 N m   (4) Zero

26. A galvanometer of resistance 10 Ω gives full scale deflection of 3 mA current. What should be the value of shunt resistance so that it can measure a current of 18 mA?

    (1) 60 Ω   (2) 6 Ω

    (3) 30 Ω   (4) 2 Ω

27. Three electric bulbs whose resistance are in the ratio of 3 : 2 : 1 are connected in series to a voltage source. The power dissipated in them has the ratio

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

    (3) 9 : 4 : 1   (4) 1 : 4 : 9

28. The effective resistance between A and B for the network shown in the figure

    (1) 6 Ω   (2) $\dfrac{1}{2}$ Ω

    (3) $\dfrac{3}{2}$ Ω   (4) 7 Ω
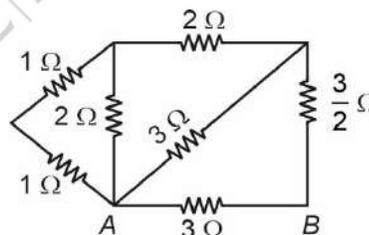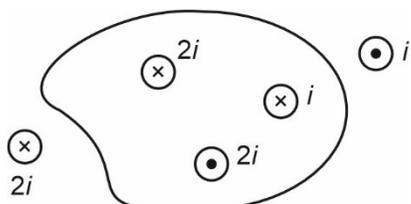
Space for Rough Work

29. A coil of radius 10 cm having 200 turns carries current of 2.5 A. The magnetic field at the centre of the coil is

    (1) 3.14×10^{-3} T   (2) 3.14×10^{-4} T

    (3) 6.28×10^{-3} T   (4) 6.28×10^{-4} T

30. Current density at an area $\vec{A} = \left(2\hat{i} - \hat{j}\right)\, cm^2$ is $\vec{J} = \left(2\hat{i} + \hat{j}\right)\, A/m^2$. The current through the area is

    (1) 100 μA   (2) 500 μA

    (3) 200 μA   (4) 300 μA

31. For the loop as shown below, the value of $\oint \vec{B} \cdot \vec{dl}$ is equal to

    (1) $\mu_0 i$ (2) $2\mu_0 i$

    (3) $3\mu_0 i$ (4) Zero

32. Which of the following statement is correct?

    (1) Voltmeter should have low resistance

    (2) Ammeter should have low resistance

    (3) Ammeter is placed parallel across the resistance in a circuit

    (4) Voltmeter is placed in series with the resistance in a circuit

33. A straight current carrying wire is placed along the axis of a current carrying loop, then force between them is

    (1) Zero

    (2) Repulsive

    (3) Attractive

    (4) Cannot be determined

34. Consider two similar nature magnetic monopoles of strength 2 A m and 8 A m are placed at a distance of 1.6 m in air. At which point on the line joining the two poles, the force on another north pole will be zero?

    (1) $\dfrac{320}{3}$ cm from 2 A m

    (2) $\dfrac{160}{3}$ cm from 2 A m

    (3) $\dfrac{160}{5}$ cm from 8 A m

    (4) $\dfrac{80}{3}$ cm from 8 A m

35. A superconductor is kept in a uniform external magnetic field B. If the net magnetic field inside the substance is B', then

    (1) $B' = B$ (2) $B' > B$

    (3) $B' < B$ (4) $B' = 0$

SECTION-B

36. The core of electromagnets are made of ferromagnetic materials which have

    (1) High retentivity and high permeability

    (2) High retentivity and low permeability

    (3) Low retentivity and high permeability

    (4) Low retentivity and low permeability

37. A solenoid has a core of material with relative permeability 400. The winding of the solenoid are insulated from the core and carry a current 4 A. If the number of turns is 2000 per metre, the value of magnetic field B inside the solenoid is nearly

    (1) 1 T   (2) 4 T

    (3) 2 T   (4) 6 T

Space for Rough Work

38. The equivalent resistance between A and B in network shown in the figure is
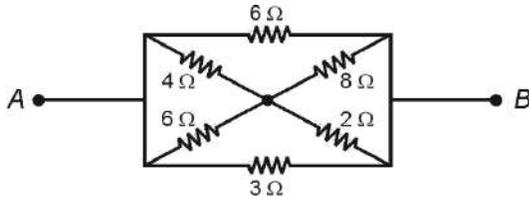
    (1) $\dfrac{4}{3}\,\Omega$ (2) $\dfrac{3}{4}\,\Omega$

    (3) $\dfrac{7}{3}\,\Omega$ (4) $\dfrac{8}{3}\,\Omega$

39. When the current i is flowing through a conductor, the drift velocity is v. If $4i$ current is flown through the same conductor but having double the area of cross-section, then the drift velocity will be

    (1) $\dfrac{v}{2}$ (2) v

    (3) $4v$ (4) $2v$

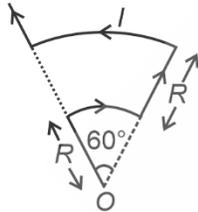40. The magnetic field at the centre (O) of a current carrying wire as shown in the figure is

    (1) $\dfrac{\mu_0 i}{24R}$ into the plane

    (2) $\dfrac{\mu_0 i}{24R}$ out of the plane

    (3) $\dfrac{\mu_0 i}{12R}$ into the plane

    (4) $\dfrac{\mu_0 i}{12R}$ out of the plane

41. A particle having charge q and mass m, enters a uniform magnetic field B as shown. The displacement of the particle when it exit the field is

$$d = \dfrac{\sqrt{3}}{2}\dfrac{mv}{qB}$$
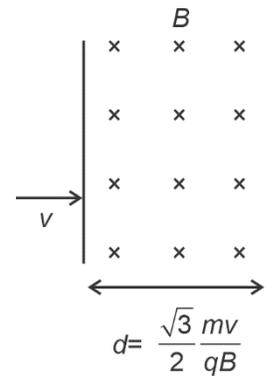
    (1) $\dfrac{mv}{2qB}$ (2) $\dfrac{mv}{qB}$

    (3) $\dfrac{\sqrt{3}mv}{2qB}$ (4) $\dfrac{2}{\sqrt{3}}\dfrac{mv}{qB}$

42. A conducting circular loop is placed in a uniform magnetic field of induction B with its plane normal to the field. Now the radius of the loop starts shrinking at the rate $\left(\dfrac{dr}{dt}\right)$. Then, the induced emf at the instant when the radius is r will be

    (1) $\pi r B\left(\dfrac{dr}{dt}\right)$

    (2) $2\pi r B\left(\dfrac{dr}{dt}\right)$

    (3) $\pi r^2\left(\dfrac{dB}{dt}\right)$

    (4) $\left(\dfrac{\pi r^2}{2}\right)B\left(\dfrac{dr}{dt}\right)$

Space for Rough Work

43. A conducting loop of area 2500 cm^2 and resistance 10 Ω is placed perpendicular to a magnetic field whose value varies as $B = (t^2 + 4t)$ tesla, where t is in second. Based on the above information match the columns and choose the correct option. All the parameters in column II are in SI units.

	Column I		Column II
(A)	Emf in the loop at $t = 2$ s	(P)	3
(B)	Magnetic flux passing through the loop at $t = 2$ s	(Q)	0.25
(C)	Current flowing in the loop at $t = 3$ s	(R)	2
(D)	Average induced emf from $t = 2$ s to $t = 4$ s	(S)	2.5

(1) (A) → (R); (B) → (P); (C) → (S); (D) → (Q)

(2) (A) → (P); (B) → (Q); (C) → (R); (D) → (S)

(3) (A) → (P); (B) → (R); (C) → (Q); (D) → (S)

(4) (A) → (R); (B) → (P); (C) → (Q); (D) → (S)

44. The magnetic field at point O due to the given current carrying wire will be

(1) $\dfrac{\mu_0 i}{4r}\left[\dfrac{2}{\pi} - \dfrac{1}{2}\right]$ (2) $\dfrac{\mu_0 i}{4r}\left[\dfrac{2}{\pi} + \dfrac{1}{2}\right]$

(3) $\dfrac{\mu_0 i}{2r}\left[\dfrac{2}{\pi} + \dfrac{1}{2}\right]$ (4) $\dfrac{\mu_0 i}{2r}\left[\dfrac{1}{\pi} + \dfrac{1}{2}\right]$

45. The power dissipation in an unknown resistance R is maximum when connected across a battery of emf 10 V and internal resistance 1 Ω. The value of R is

(1) 1 Ω   (2) 2 Ω

(3) 6 Ω   (4) 12 Ω

46. A proton and an α particle are thrown normally into a uniform magnetic field with same kinetic energy, then ratio of radii of their circular path is

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

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

47. The dimensional formula of magnetic flux is

(1) $[MLT^{-1}A]$ (2) $[ML^2TA]$

(3) $[ML^2T^{-1}A^{-1}]$ (4) $[ML^2T^{-2}A^{-1}]$

48. A square loop enters into a uniform magnetic field B which is perpendicular to the plane of the loop and it is confined in a region. Its front edge enters into magnetic field at $t = 0$ and the loop is moved with constant speed, then the curve which represents best the variation of induced emf in the loop as

49. Which of the following statement is **incorrect**?

   (1) A magnetic dipole may have non-zero torque and zero force in uniform magnetic field

   (2) It is not possible to have magnetic monopole independently

   (3) Magnetic field lines from a bar magnet form closed loops

   (4) The SI unit of magnetic moment is A m

50. The formula of energy density in magnetic field B is (symbols have their usual meanings)

   (1) $\dfrac{1}{2}\mu_0 B^2$ (2) $\dfrac{1}{2\mu_0}B^2$

   (3) $\dfrac{1}{4}\mu_0 H^2$ (4) $\dfrac{1}{2\mu_0}H^2$

CHEMISTRY

SECTION-A

51. Acid containing $S - O - O - S$ bond is

   (1) $H_2S_2O_5$ (2) $H_2S_2O_7$

   (3) $H_2S_2O_6$ (4) $H_2S_2O_8$

52. The complexes $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of isomerism?

   (1) Geometrical isomerism

   (2) Coordination isomerism

   (3) Ionisation isomerism

   (4) Linkage isomerism

53. The crystal field stabilisation energy of the complex ion $[Cr(H_2O)_6]^{3+}$ is

   (1) $-1.2\,\Delta_0$ (2) $-0.4\,\Delta_0$

   (3) $-0.8\,\Delta_0$ (4) $-1.8\,\Delta_0$

54. In which of the following complex ions, central ion is d^2sp^3 hybridised?

   (1) $[CoF_6]^{3-}$

   (2) $[FeF_6]^{3-}$

   (3) $[Co(NH_3)_6]^{3+}$

   (4) $[MnCl_6]^{3-}$

55. Consider the following statements regarding hydrides of group 16 elements

   I. Reducing character increases from H_2S to H_2Te

   II. The thermal stability increases from H_2O to H_2Po.

   III. H_2O possess the highest bond angle (HOH) among all hydrides of group 16.

   IV. Acidic character increases from H_2O to H_2Te.

   The correct statements are

   (1) I, III only   (2) I, II, IV only

   (3) I, III, IV only   (4) II, IV only

56. Deacon's process is used for the manufacture of

   (1) HCl   (2) Cl_2

   (3) N_2O (4) HF

57. Which one of the following is least likely to exist?

   (1) HOF   (2) $HClO_4$

   (3) HIO_3 (4) $HBrO_2$

58. Given below are the two statements

   Statement I: Hardness of water is estimated by simple titration with Na_2EDTA.

   Statement II: During the titration of hard water with EDTA, the Ca^{2+} and Mg^{2+} ions form stable complexes with EDTA.

   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 correct

   (2) Both statement I and statement II are incorrect

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

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

Space for Rough Work

59. Match List I and List II.

	List I (Coordination Entity)		List II (Wavelength absorbed)
a.	$[Co(NH_3)_6]^{3+}$	(i)	λ = 600 nm
b.	$[Co(CN)_6]^{3-}$	(ii)	λ = 310 nm
c.	$[Cu(H_2O)_4]^{2+}$	(iii)	λ = 475 nm
d.	$[Ti(H_2O)_6]^{3+}$	(iv)	λ = 498 nm

Choose the correct answer from the options given below.

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

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

60. Brass is an alloy of

(1) Copper and Iron　　(2) Zinc and Tin

(3) Copper and Zinc　　(4) Copper and Tin

61. Which of the following ligands shows synergic bonding?

(1) H_2O　　　　　　　(2) CO

(3) NH_3　　　　　　　(4) OH^-

62. Given below are the two statements

Statement I: Both manganate and permanganate ions are tetrahedral.

Statement II: The green manganate ion is diamagnetic but the permanganate ion is paramagnetic.

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 correct

(2) Both statement I and statement II are incorrect

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

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

63. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii?

(1) Zr and Hf　　　　　(2) Zr and Nb

(3) Ti and Zr　　　　　(4) Sc and Zr

64. Which of the following exhibit colour in aqueous solutions?

(1) V^{3+}　　　　　　　(2) Sc^{3+}

(3) Ti^{4+}　　　　　　　(4) Zn^{2+}

65. Pair of ions having equal spin only magnetic moment value is

(1) Mn^{2+}, Cu^{2+}　　　(2) Cu^{2+}, Ti^{3+}

(3) Ti^{4+}, Cu^{2+}　　　(4) Ti^{3+}, Ni^{2+}

66. Correct order of melting point of the given compounds is

(1) $SbH_3 > AsH_3 > PH_3 > NH_3$

(2) $SbH_3 > NH_3 > AsH_3 > PH_3$

(3) $NH_3 > SbH_3 > PH_3 > AsH_3$

(4) $NH_3 > SbH_3 > AsH_3 > PH_3$

67. Zinc and copper each on reaction with dilute nitric acid respectively give

(1) NO and N_2　　　　(2) N_2O and NO

(3) N_2O and NO_2　　(4) NO_2 and N_2O

68. Correct order of basic strength of the given compounds is

(1) $Er(OH)_3 > Nd(OH)_3 > Eu(OH)_3$

(2) $Nd(OH)_3 > Er(OH)_3 > Eu(OH)_3$

(3) $Eu(OH)_3 > Nd(OH)_3 > Er(OH)_3$

(4) $Nd(OH)_3 > Eu(OH)_3 > Er(OH)_3$

69. Reaction which does not form $N_2(g)$ as one of the products is

(1) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$

(2) $NH_4Cl + Ca(OH)_2 \longrightarrow$

(3) $Ba(N_3)_2 \xrightarrow{\Delta}$

(4) $NH_4Cl + NaNO_2 \longrightarrow$

70. Consider the following statements

(a) In laboratory, phosphine is prepared by heating white phosphorus with concentrated NaOH solution in an inert atmosphere of CO_2

(b) In pure state, phosphine is non-inflammable

(c) Phosphine explodes in contact with traces of oxidising agents
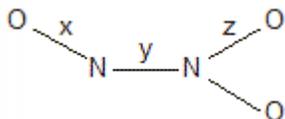
The correct statement(s) is/are

(1) (a) only　　　　　　(2) (a) and (b) only

(3) (a), (b) and (c)　　(4) (a) and (c) only

Space for Rough Work

71. On heating, H_3PO_3 gives
    (1) P_2O_5 and PH_3 (2) H_3PO_4 and PH_3
    (3) H_3PO_2 and H_3PO_4 (4) H_3PO_2 and PH_3

72. The IUPAC name of $[Co(NH_3)_6]Cl_3$ is
    (1) Hexaamminecobalt(III) chloride
    (2) Hexaamminecobalt(II) chloride
    (3) Hexaamminetrichloride cobalt(II)
    (4) Hexaamminetrichloride cobalt(III)

73. Given below are the two statements

    Statement I: O_3 is the resonance hybrid of two canonical structures.

    Statement II: O_3 acts as an oxidising agent in the manufacture of potassium permanganate.

    In the light of the above statements, choose the correct answer.
    (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

74. Heteroleptic complex containing didentate ligand is
    (1) $[Co(NH_3)_4Cl_2]Cl$
    (2) $[Co(H_2O)_6]Cl_3$
    (3) $K[Co(H_2O)_2(Cl)(CN)_3]$
    (4) $[Co(en)_2 ClBr]I$

75. The species which is not formed on complete hydrolysis of XeF_4 is
    (1) Xe   (2) F_2
    (3) HF   (4) O_2

76. Negative heat of hydration of which of the given ions is highest?
    (1) Ti^{2+} (2) Ni^{2+}
    (3) Cr^{2+} (4) Fe^{2+}

77. The element which does not show +4 oxidation state is
    (1) Ac   (2) Th
    (3) Pa   (4) U

78. The compound which reacts most easily with sodium is
    (1) $Cr(CO)_6$ (2) $V(CO)_6$
    (3) $Ni(CO)_4$ (4) $Fe(CO)_5$

79. The correct electronic configuration of the central metal ion in $[MnCl_6]^{3-}$ based on crystal field theory is
    (1) $t_{2g}^4 e_g^0$ (2) $t_{2g}^2 e_g^2$
    (3) $t_{2g}^3 e_g^1$ (4) $e^2 t_2^2$

80. Basic oxide among the following is
    (1) V_2O_5 (2) CrO
    (3) Cr_2O_3 (4) CrO_3

81. Outer orbital complex among the following is
    (1) $[Co(H_2O)_6]^{3+}$ (2) $[Cr(H_2O)_6]^{3+}$
    (3) $[Mn(CN)_6]^{3-}$ (4) $[CoF_6]^{3-}$

82. Which among the following has highest first ionisation enthalpy?
    (1) Mn   (2) Fe
    (3) Cu   (4) Ni

83. Incorrect statement among the following is
    (1) Permanganate titration in presence of HCl is unsatisfactory
    (2) Cu^+ ion is not stable in aqueous solution
    (3) Density of Fe is more than Ni
    (4) Most common oxidation state of Ti is +4

84. Select the incorrect statement about lanthanoid metals.
    (1) All lanthanoids are silvery white soft metals.
    (2) Many trivalent lanthanoid ions are coloured both in solid state and in aqueous solutions.
    (3) The first ionisation enthalpies of the lanthanoids is around 1200 kJ mol^{-1}
    (4) Hardness increases with increase in atomic number.

Space for Rough Work

85. Match column I with column II.

	Column I		Column II
(a)	$XeOF_4$	(i)	Pyramidal
(b)	PCl_5	(ii)	Trigonal planar
(c)	XeO_3	(iii)	Square pyramidal
(d)	SO_3	(iv)	Trigonal bipyramidal

The correct match is

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

SECTION-B

86. Given below are the two statements

Statement I: $Cr(CO)_6$ is an organometallic compound.

Statement II: The metal-carbon bond in $Cr(CO)_6$ possess both σ and π character.

In the light of the above statements, choose the correct answer.

(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

87. Which of the following is the strongest acid?

(1) $HClO$
(2) $HClO_2$
(3) $HClO_3$
(4) $HClO_4$

88. During the oxidation of iodine by concentrated nitric acid, the oxidation state of iodine atom changes from

(1) Zero to –1
(2) Zero to +5
(3) Zero to +1
(4) Zero to +3

89. Match the underlined atom of compounds given in List-I with their oxidation state in List-II.

	List-I		List-II
(a)	$H_4\underline{P}_2O_5$	(i)	+1
(b)	$H_4\underline{P}_2O_6$	(ii)	+3
(c)	$H_3\underline{P}O_2$	(iii)	+4
(d)	$H_4\underline{P}_2O_7$	(iv)	+5

Choose the correct answer from 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)-(iii), (c)-(i), (d)-(iv)
(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

90. Correct order of enthalpy of atomisation of given elements is

(1) Cu > Ni > Co > Fe
(2) Ni > Co > Fe > Cu
(3) Co > Cu > Ni > Fe
(4) Fe > Co > Ni > Cu

91. When I^- is oxidised by MnO_4^- in faintly alkaline medium, I^- converts into

(1) IO_3^-
(2) I_2
(3) IO_4^-
(4) IO^-

92. Facial and meridional isomers are observed in

(1) $[Co(NH_3)_4Cl_2]^+$
(2) $[Co(NH_3)_3(NO_2)_3]$
(3) $[Co(en)_3]^{3+}$
(4) $[Pt(en)_2Cl_2]^{2+}$

93. Which of the following organometallic compounds will have weakest C – O bond?

(1) $[Co(CO)_4]^-$
(2) $[Ni(CO)_4]$
(3) $[Mn(CO)_6]^+$
(4) $[Cr(CO)_6]$

94. The incorrect statement about rhombic sulphur is

(1) It is insoluble in water

(2) S_8 ring in rhombic sulphur is puckered and has a crown shape

(3) It is white in colour

(4) Its melting point is lower than monoclinic sulphur

Space for Rough Work

95. The gas evolved on the reaction of aqua regia with gold is
    (1) N_2O (2) NO_2
    (3) NO (4) N_2

96. The correct order of bond lengths x, y and z in N_2O_3 is

    (1) y > z > x   (2) z > y > x
    (3) x = z < y   (4) x > y > z

97. Which among the following will absorb the radiation of maximum wavelength?
    (1) $[Cr(CN)_6]^{3-}$ (2) $[Cr(en)_3]^{3+}$
    (3) $[CrF_6]^{3-}$ (4) $[Cr(H_2O)_6]^{3+}$

98. The correct order of ligand field strength is
    (1) $H_2O < Cl^- < en < CO$
    (2) $Cl^- < H_2O < en < CO$
    (3) $H_2O < en < CO < Cl^-$
    (4) $Cl^- < en < H_2O < CO$

99. Consider the following statements
    (i) Copper does not liberate hydrogen on reaction with dilute H_2SO_4.
    (ii) Metallic radius of titanium is greater than vanadium.
    (iii) Zn and Cd are not regarded as transition elements.
    The correct statements are
    (1) (i) and (ii) only   (2) (ii) and (iii) only
    (3) (i) and (iii) only   (4) (i), (ii) and (iii)

100. The brown coloured complex formed in brown ring test is
    (1) $[Fe(CN)_6]^{4-}$ (2) $[Fe(CN)_5(NOS)]^{4-}$
    (3) $[Fe(H_2O)_5NO]^{2+}$ (4) $[Fe(CN)_5NO]^{2-}$

BOTANY

SECTION-A

101. In human genome, SNPs are
    (1) All the genes that expressed as RNA
    (2) Present only on sex chromosomes
    (3) The locations where single base DNA differences occur
    (4) Stretches of DNA sequences that are repeated many times

102. Out of 64 universal genetic codons, for how many codon(s) there is no tRNAs?
    (1) Six   (2) Four
    (3) One   (4) Three

103. In *lac* operon, the synthesis of enzyme which is primarily responsible for the hydrolysis of lactose into galactose and glucose is coded by
    (1) *z*-gene   (2) *a*-gene
    (3) *i*-gene   (4) *y*-gene

104. Mark the **incorrect** statement among the following.
    (1) Principle of complementarity governs the process of transcription.
    (2) Both replication and transcription are seen inside the tobacco mosaic virus.
    (3) During replication, both the strands of DNA act as template.
    (4) Transcription can also be seen in mitochondria.

105. Through the experiments conducted by Alfred Hershey and Martha Chase, it was proved that
    (1) DNA has sulphur but not phosphorus
    (2) RNA is the genetic material
    (3) Both DNA and RNA are genetic material
    (4) DNA act as genetic material

Space for Rough Work

106. To which carbon of a pentose sugar in DNA, the nitrogenous base is linked?

    (1) 5′   (2) 1′

    (3) 2′   (4) 3′

107. To which part of tRNA, an amino acid is bound?

    (1) Anticodon loop

    (2) 3′ end

    (3) Ribosomal binding loop

    (4) 5′ end

108. Histones are

    (1) Negatively charged proteins

    (2) Responsible for DNA packaging in prokaryotes

    (3) Organised to form a unit of four molecules in nucleosomes of eukaryotes

    (4) Rich in basic amino acid

109. For replication of long DNA molecules, the two strands of DNA cannot be separated in its entire length in one go due to

    (1) Its helical structure

    (2) Its very high molecular weight

    (3) Requirement of very low concentration of enzymes

    (4) Very high requirement of energy

110. In the first phase of translation

    (1) Peptidyl transferase catalyses the transfer of amino acid on mRNA

    (2) Amino acids are activated and linked to their cognate tRNA

    (3) Peptide bond is formed between two amino acids

    (4) rRNA of ribosomes pair with mRNA at the corresponding location

111. RNA molecule can act as

    a. Adapter molecule

    b. Energy currency of the cell

    c. Catalyst

    d. Structural molecule

    The **correct** ones are

    (1) c and d only   (2) All a, b, c and d

    (3) a, c and d only   (4) a and b only

112. Pyrimidine present in both RNA and DNA is/are

    (1) Guanine and Cytosine

    (2) Thymine only

    (3) Cytosine, Thymine and Uracil

    (4) Cytosine only

113. In the field of molecular genetics, what was the contribution of Watson and Crick?

    (1) They found that sugar molecule in nucleic acid is 5-carbon molecule

    (2) They proposed a simple double helix model for the structure of DNA

    (3) They discovered the molecular structure of nitrogenous bases present in DNA

    (4) They described the process of the synthesis of DNA

114. Regarding reverse central dogma of molecular biology that occurs in some viruses, the flow of information is from

    (1) DNA to mRNA

    (2) Polypeptide to mRNA

    (3) RNA to DNA

    (4) DNA to polypeptide

115. The regions in chromatin which are lightly stained

    (1) Are called heterochromatin

    (2) Are densely packed

    (3) Do not participate in chromosome formation

    (4) Are transcriptionally active

Space for Rough Work

116. In the experiment conducted by Hershey and Chase, the supernatant had

    (1) DNA of bacteriophage

    (2) Genetic material of *E. coli*

    (3) Protein coats of bacteriophage

    (4) Cell walls of *E. coli*

117. Which of the following criteria is **not** true for the molecules that act as genetic material?

    (1) It should chemically and structurally be stable

    (2) It should be able to express itself in the form of Mendelian characters

    (3) It should provide the scope for high mutation rate

    (4) It should be able for replication

118. Study the given pedigree chart and select the statement which is **true** for the trait.

    (Shaded symbols represent the affected individuals)
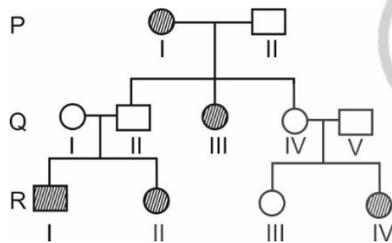
    (1) The trait is X–linked recessive

    (2) All the unaffected individuals in generation Q are heterozygous for that trait

    (3) This pedigree chart can explain the inheritance of myotonic dystrophy

    (4) The trait in this pedigree chart is holandric

119. If a dihybrid cross is performed between two parents of genotype RRYY and rryy (round and yellow seed with wrinkled and green seed) in pea

plants and the progeny of F_1 generation is selfed then the ratio between parental to recombinant phenotypes in the F_2 generation will be respectively

    (1) 9 : 7   (2) 5 : 3

    (3) 7 : 9   (4) 15 : 1

120. The phenomenon in which a single gene can exhibit multiple phenotypic expression is called

    (1) Polygenic inheritance

    (2) Polymorphism

    (3) Pleiotropy

    (4) Codominance

121. Which among the following is **correctly** matched pair?

    (1) Colour-blindness   –   X linked dominant

    (2) Sickle cell anaemia – Autosomal recessive

    (3) Myotonic dystrophy – X linked recessive

    (4) Phenylketonuria   – Autosomal dominant

122. In the dihybrid cross carried out by T.H. Morgan in *Drosophila* between yellow-bodied, white-eyed females and brown-bodied, red-eyed males and intercrossing their F_1 progeny, it was observed that in F_2 generation, the recombinants were only

    (1) 50%   (2) 37.2%

    (3) 62.8%   (4) 1.3%

123. In pedigree analysis standard symbols are used to trace the inheritance of a specific trait. Which of the following symbols is used when the sex is unspecified?

    (1)   (2)

    (3)   (4)

Space for Rough Work

124. Select the **correct** match w.r.t. sex determination.

    (1) XX-XY – Males and females bear different number of autosomes

    (2) ZW type – Seen in birds

    (3) X body – It is observed only in females

    (4) XX-XY type – Homogametic males in human

125. The map distance between genes A and B is 3 units, B and C is 10 units and C and A is 7 units. The order of the genes in a linkage map constructed from the above data will be

    (1) A, B, C   (2) A, C, B

    (3) B, C, A   (4) B, A, C

126. Match the terms given in column I with appropriate explanation in column II and select the **correct** option.

	Column I		Column II
(a)	Genetic maps	(i)	Physical association of two genes on a chromosome
(b)	Polygenic inheritance	(ii)	Generation of non-parental gene combinations
(c)	Linkage	(iii)	Predicts sequence of genes on the chromosome
(d)	Recombination	(iv)	Traits are spread across a gradient

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

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

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

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

127. In honey bees, males

    (1) Have 32 chromosomes

    (2) Are diploid

    (3) Are sterile

    (4) Are parthenogenetically produced

128. Mark the **incorrect** statement.

    (1) Recessive trait is not expressed in homozygous condition of recessive alleles

    (2) Dominant trait can also be expressed in heterozygous condition

    (3) Phenotype is observable morphological appearance

    (4) Dihybrid cross involves two pairs of contrasting traits of two characters

129. Read the following statements.

    Assertion (A): Mutation is the only phenomenon that leads to variation in DNA.

    Reason (R): Mutation arises due to change in single base pair of DNA or segment of DNA.

    In the light of above statements choose the **correct** option.

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

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

    (3) (A) is true and (R) is false

    (4) (A) is false and (R) is true

130. The heterozygous round-yellow seeded pea plants were selfed and total 400 seeds are collected. What is the total number of seeds showing wrinkled-yellow phenotype?

    (1) 200   (2) 75

    (3) 150   (4) 100

Space for Rough Work

131. T.H. Morgan worked with the tiny fruit flies *Drosophila melanogaster* for experimental verification of chromosomal theory of inheritance, as they are very suitable for such studies due to having many feature. Which one of the following is amongst them?

    (1) They do not grow on simple synthetic medium

    (2) The male and female flies are indistinguishable

    (3) It has many types of hereditary variations that can be seen with low power microscope

    (4) A single mating produces only one offspring

132. Select the **correct** match.

    (1) F_1 progeny   – Always resembles both the parents

    (2) Pure line   – Produced by continuous cross-pollination

    (3) Gregor Mendel   – Conducted artificial pollination experiments using true breeding pea lines

    (4) Test cross   – It determines the phenotype of plant in F_2 generation

133. If individuals with genotype AaBBCc and AaBbCc are crossed the percentage of true-breeding or pureline offspring for all the three characters will be

    (1) 50%   (2) 25%

    (3) 12.5%   (4) 6.25%

134. Regarding flower colour mark the **incorrect** option in case when cross between true-breeding red-flowered (RR) and white-flowered (rr) plants of *Antirrhinum majus* is done.

    (1) Phenotype of F_1 individuals would be in between the two parents

    (2) Red flowers will not be produced in the F_2 generation if F_1 individuals are selfed

    (3) When F_1 individual are selfed, the genotypic and phenotypic ratio in F_2 generation would be the same

    (4) Pink flowered plant would be heterozygous for the responsible genes

135. Match the terms given in column-I with their proper explanation given in column-II and select the most appropriate option.

	Column-I		Column-II
a.	Homozygous	(i)	Unit of inheritance
b.	Co-dominance	(ii)	The allelic pair of genes are identical
c.	Monohybrid	(iii)	F_1 resembles both parents
d.	Genes	(iv)	Heterozygous for one character

    (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)

SECTION-B

136. Identify the following statements as true (T) or false (F) and choose the option accordingly.

    Statement A: Two genes present on different chromosome segregate independently during gamete formation.

    Statement B: For mendelian trihybrid cross maximum possible phenotypes obtained will be four.

	A	B
(1)	F	T
(2)	F	F
(3)	T	T
(4)	T	F

Space for Rough Work

137. Which of the following traits of pea plant cannot express itself in heterozygous condition?

    (1) Green pod colour

    (2) Yellow seed colour

    (3) Terminally placed flower

    (4) Violet flower

138. Blood group of both mother and father is O. What percent of their children will be with blood group O?

    (1) 75%

    (2) 25%

    (3) 50%

    (4) 100%

139. Read the following statements.

    Assertion (A): DNA dependent DNA polymerase catalyse polymerisation only in one direction that is $5' \to 3'$.

    Reason (R): On template with polarity $3' \to 5'$ replication is discontinuous while on the template with polarity $5' \to 3'$ replication is continuous.

    In the light of above statements choose the **correct** option.

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

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

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

    (4) Both (A) and (R) are false

140. β-thalassemia is controlled by a single gene HBB, which is present on chromosome

    (1) 9   (2) 11

    (3) 10   (4) 12

141. A woman carrier for haemophilia marries a normal man. Which of the following statements should be **true** for their children?

    (1) All of them would be haemophilic

    (2) All the daughters would be haemophilic

    (3) Some of the daughters would be haemophilic

    (4) Some of the sons would be haemophilic

142. Select the **wrong** statement w.r.t. sickle-cell anaemia.

    (1) Allele for this trait is present on autosome

    (2) The disease is controlled by a single pair of allele Hb^A and Hb^S

    (3) Homozygous individuals for Hb^S appear apparently unaffected by the disease

    (4) The defect is caused by a point mutation in the gene responsible for the synthesis of beta globin chain of haemoglobin molecule

143. Mendel proposed a second set of generalisations based on his observations on crosses between plants differing in two traits, *i.e.*, the dihybrid cross. It is called

    (1) Law of dominance

    (2) Law of segregation

    (3) Law of purity of gametes

    (4) Law of Independent Assortment

144. Match the following columns and select the **correct** option w.r.t. transcription.

	Column I		Column II
(a)	Rho factor	(i)	Also helps in the opening of DNA helix
(b)	Sigma factor	(ii)	Only catalyses the process of elongation
(c)	Core enzyme	(iii)	Required for termination of transcription
(d)	RNA polymerase	(iv)	Confers specificity for initiation of transcription

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

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

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

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

Space for Rough Work

145. All of the following are present in a primary transcript in eukaryotes, **except**

    (1) Adenylate residues at 5′ end

    (2) Phosphoester linkage

    (3) Split-gene arrangement

    (4) N-glycosidic linkage

146. The base sequence in mRNA transcribed from DNA having base sequence 5′ CTTAG 3′ in its coding strand would be

    (1) 3′ GAAUC 5′   (2) 5′ GAAUC 3′

    (3) 3′ CUUAG 5′   (4) 5′ CUUAG 3′

147. Heterogeneous nuclear RNA synthesis in eukaryotes is catalysed by

    (1) RNA polymerase II

    (2) DNA primase

    (3) RNA polymerase I

    (4) Both RNA polymerase I and II

148. During capping, the nucleotide that is added to hnRNA is

    (1) Methyl adenosine triphosphate

    (2) Ethyl guanosine triphosphate

    (3) Ethyl adenosine triphosphate

    (4) Methyl guanosine triphosphate

149. Read the following statements and choose the option which is **true** for them.

    Statement-A : Post-transcription processing of hnRNA occurs in nucleus.

    Statement-B : Tailing of hnRNA occurs at 5′ end.

    (1) Only statement A is correct

    (2) Only statement B is correct

    (3) Both the statements are correct

    (4) Both the statements are incorrect

150. All of the following are true w.r.t. satellite DNA known as VNTRs, **except**

    (1) These are small DNA sequences arranged tandemly in many copy numbers

    (2) Their DNA sequences usually code for various types of proteins

    (3) Their copy number varies from chromosome to chromosome in an individual

    (4) The number of repeats show very high degree of polymorphism

ZOOLOGY

SECTION-A

151. The ART that involves fertilization of egg outside the female body, followed by the transfer of zygote or early embryo (upto 8 blastomeres) into the oviduct is called

    (1) ICSI   (2) ZIFT

    (3) AI   (4) IUI

152. The contraceptive device which provides protection to the user against STIs is

    (1) Implant   (2) Vault

    (3) Condom   (4) Diaphragm

153. The first human-like being the hominid, whose cranial capacity was in between 650-800 cc was

    (1) *Ramapithecus*   (2) *Homo habilis*

    (3) *Homo erectus*   (4) *Homo sapiens*

154. The biggest land reptile among the following which is now extinct was

    (1) *Ichthyosaurus*   (2) *Archaeopteryx*

    (3) *Tyrannosaurus*   (4) Pelycosaurs

Space for Rough Work

155. How many of the contraceptives given in the box below require intervention of doctors or expert nurses for their insertion in the uterus through vagina?

Progestasert, LNG-20, Cu7, Lippes loop, Vaults, Multiload 375

    Select the **correct** option.
    (1) Five
    (2) Three
    (3) Two
    (4) Four

156. Evolution does not occur in a large population where mating is random, mutations do not occur and gene frequencies from generation to generation remain constant. This explanation is based on the principle given by
    (1) Thomas Malthus
    (2) A.R Wallace
    (3) Hardy and Weinberg
    (4) Ernst Haeckel

157. Read the following statements and choose the **correct** option.

    Statement A : Branching descent and natural selection are the two key concepts of Darwinian Theory of Evolution.

    Statement B : Natural selection can be stabilising, directional or disruptive in nature.
    (1) Both statements A and B are incorrect
    (2) Only statement A is correct
    (3) Only statement B is correct
    (4) Both statements A and B are correct

158. During the course of evolution, the first mammals on the Earth were like
    (1) Horses
    (2) Elephants
    (3) Shrews
    (4) Apes

159. Select the disease/disorder that cannot be detected by amniocentesis.
    (1) Haemophilia
    (2) Sickle-cell anemia
    (3) Down syndrome
    (4) Graves' disease

160. In which year, 'Family planning programmes' were initiated in India?
    (1) 1972   (2) 1947
    (3) 1951   (4) 1930

161. Select the **incorrect** match w.r.t. examples of IUD.
    (1) Progestogen – Hormone releasing IUD
    (2) Multiload 375 – Copper releasing IUD
    (3) Lippes loop – Non-medicated IUD
    (4) Cu7 – Copper releasing IUD

162. Which of the following can be used as industrial pollution indicators?
    (1) Predators   (2) Lichens
    (3) Dark-winged moths (4) Industrial smoke

163. Select the **incorrect** match among the following
    (1) Big Bang theory – Origin of Universe
    (2) Louis Pasteur – Disproved the theory of spontaneous generation
    (3) Appearance of life – 500 million years before the formation of Earth
    (4) Panspermia – Transfer of spores on Earth

164. Compounds that were synthesised during Miller's experiment conducted for the first time by S.L. Miller were
    (1) Amino acids   (2) Lipids
    (3) Sugars   (4) Nucleic acids

165. In 2011 the world population was around
    (1) 6 billion
    (2) 6 million
    (3) 7.2 billion
    (4) 7.2 million

Space for Rough Work

166. Match column I with column II and select the correct option w.r.t. methods of contraception/ contraceptive devices and their respective mode of action.

	Column I		Column II
(a)	Vaults	(i)	Makes cervix hostile to the sperms
(b)	LNG-20	(ii)	Entry of sperms through cervix is blocked
(c)	Multiload 375	(iii)	Withdrawal of penis from vagina just before ejaculation
(d)	Coitus interruptus	(iv)	Suppresses sperm motility

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

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

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

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

167. Use of which of the following birth control methods/pills has/have the highest failure rate?

(1) IUDs

(2) Oral contraceptive pills

(3) Lactational amenorrhea

(4) Implants

168. Which of the following is not considered as early symptoms/complications of STIs?

(1) Abortion

(2) Itching in genital regions

(3) Fluid discharge through genitals

(4) Slight pain in the genital region

169. According to MTP (Amendment) act, 2017, the opinion of how many medical practitioner(s) is/are required, if the pregnancy has lasted for less than 64 days?

(1) Two   (2) Three

(3) One   (4) Four

170. Which of the following pairs of animals exhibits convergent evolution?

(a) Wolf and Tasmanian wolf

(b) Anteater and Numbat

(c) Lemur and Spotted cuscus

(d) Koala and Bandicoot

Select the **correct** option.

(1) a and d only

(2) b and d only

(3) c and d only

(4) a, b and c only

171. Which of the following is a postulate of theory given by Hugo de Vries?

(1) Mutations are predictable

(2) Mutations occur in a fixed direction

(3) Mutations are gradual variations

(4) Mutations are random and directionless

172. **Assertion (A):** Primitive atmosphere on Earth was of reducing type.

Reason (R): Water vapour, methane, oxygen and ammonia covered the Earth surface.

In the light of above statements, select the **correct** option.

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

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

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

(4) Both (A) and (R) are false

Space for Rough Work

173. Choose the **correct** option to fill the blanks A and B correctly.

"Evolution is ___A___ process in the sense of determinism. It is a stochastic process based on chance events in nature and chance ___B___ in the organism".

	A	**B**
(1)	A directed	Adaptation
(2)	A directed	Selection
(3)	Not a directed	Mutation
(4)	Not a directed	Adaptation

174. In a population that is in Hardy-Weinberg equilibrium, the frequency of homozygous recessive genotype of eye colour is 0.09. Calculate the percentage of individuals homozygous for dominant allele.

(1) 91%   (2) 49%

(3) 64%   (4) 24%

175. One could remain free from venereal diseases by following all of the conditions mentioned below, **except**

(1) Avoiding sexual intercourse with multiple partners

(2) Avoiding sexual intercourse with unknown partners

(3) Avoiding use of condoms during coitus

(4) In case of doubt, one should go to a qualified doctor for early detection

176. Which of the following contraceptives works on the principle of preventing the physical meeting of ovum and sperm and is made of thin rubber/latex sheath?

(1) LNG-20

(2) CuT

(3) Condom

(4) Implant

177. A surgical intervention technique that blocks gamete transport in female is 'X'. Choose the **incorrect** statement w.r.t. X.

(1) In this technique, a small part of the fallopian tube is removed.

(2) The process is known as tubectomy.

(3) It is the terminal method to prevent any more pregnancies.

(4) It inhibit ovulation and implantation.

178. Read the following statements.

a. All sexually transmitted infections are completely curable.

b. Abortions can happen spontaneously too.

c. Decrease in IMR could attribute to increase in population size.

Select the **correct** option.

	a	**b**	**c**
(1)	T	T	F
(2)	F	T	F
(3)	F	T	T
(4)	T	F	F

179. As a method of contraception, steroidal oral pills have to be taken by adult human females in which of the following manner to prevent conception?

(1) Only for a period of 5 days

(2) Daily for a period of 21 days, starting preferably within first 5 days of menstrual cycle

(3) Once in a week

(4) Only during the days of luteal phase of menstrual cycle

180. How many of the phenomenon given in the box below may accentuate variations leading to appearance of new species and hence evolution?

> Habitat fragmentation, Selective mating, Random mating, Mutation, Genetic drift

Space for Rough Work

Select the **correct** option.

(1) Four   (2) Three

(3) Five   (4) Two

181. Select the **correct** sequence w.r.t. evolution of life forms.

   (1) Chlorophyte ancestors → Rhynia-type plants → Zosterophyllum → Arborescent lycopods

   (2) Tracheophyte ancestors → Rhynia-type plants → Psilophyton → Chlorophyte ancestors

   (3) Synapsids → Therapsids → Pelycosaurs → Birds

   (4) Psilophyton → Progymnosperms → Seed ferns → Cycads

182. Fossils are most abundantly found in which type of rocks?

   (1) Metamorphic

   (2) Igneous

   (3) Sedimentary

   (4) Volcanic

183. Select the **correct** statement w.r.t. evolution of man.

   (1) The story of evolution of modern man is most interesting and appears to parallel evolution of human brain and language.

   (2) The skull of baby chimpanzee is more like adult chimpanzee skull than adult human skull.

   (3) During ice age between 75,000 – 10,000 years ago *Homo erectus* arose.

   (4) Agriculture came around 1,00,000 years back and human settlements started.

184. Within how many days of coitus, emergency contraceptives (made of progestogens alone) have been found to be very effective?

   (1) 7 days

   (2) 6 days

   (3) 10 days

   (4) 3 days

185. Karl Ernst von Baer noted that

   (1) Embryos never pass through the adult stages of other animals

   (2) Embryos pass through the adult stages of other animals

   (3) Only embryonic stage is dissimilar in all vertebrates

   (4) Embryonic and adult stages are common in all vertebrates

SECTION-B

186. Select the **incorrect** option w.r.t. reproductive health.

   (1) Reproductive health means a total well-being in terms of physical, emotional, behavioural and social aspects of reproduction.

   (2) Marriageable age of males in India is 21 years.

   (3) According to the 2011 census report Indian population growth rate was more than 2 per cent.

   (4) RCH stands for 'Reproductive and Child Health Care'.

187. Use of which contraceptive methods/ devices inhibits both ovulation and implantation?

   (1) Steroidal oral pill

   (2) Cervical cap

   (3) Lippes loop

   (4) CuT

188. Cave paintings by Pre-historic humans can be seen at Bhimbetka rock shelter in Raisen district of

   (1) Madhya Pradesh

   (2) Uttar Pradesh

   (3) Andhra Pradesh

   (4) Arunachal Pradesh

Space for Rough Work

189. Match column I with column II and select the **correct** option.

	Column I		Column II
(a)	*Triceratops*	(i)	Large triangular bony plates along the back and spiked tail
(b)	*Stegosaurus*	(ii)	Three-horned face dinosaur
(c)	*Tyrannosaurus rex*	(iii)	Long giraffe-like neck
(d)	*Brachiosaurus*	(iv)	20 feet in height, had huge fearsome dagger-like teeth

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

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

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

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

190. How many of the following given statements are **correct**?

(a) Homology indicates common ancestry.

(b) Flippers of penguins and dolphins are the examples of convergent evolution.

(c) Natural selection where more individuals acquire specific character value other than mean character value, leads to disruptive selection.

(d) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.

(e) Genetic drift operates in small isolated population.

Select the **correct** option.

(1) Four

(2) Three

(3) Five

(4) Two

191. Complete the analogy and select the **correct** option.

Coitus interruptus : Natural method of contraception :: Diaphragm : ___

(1) IUDs

(2) Emergency contraceptives

(3) Implants

(4) Barrier method of contraception

192. Suppose the duration of a female's menstrual cycle is of 30 days. Select the most appropriate option representing days of her menstrual cycle during which she must avoid sexual intercourse to prevent chances of conception.

(1) From day 8 to 12

(2) From day 20 to 24

(3) From day 12 to 19

(4) From day 7 to 12

193. Select the correct option that represents artificial selection by anthropogenic action.

(1) Industrial melanism

(2) Herbicide resistant weeds

(3) Breeds of dogs created by man

(4) Antibiotic resistant bacteria

194. Which of the following options represents the proper sequence of fossils record of following vertebrates from the oldest to latest ?

a. Dinosaurs

b. Early reptiles

c. Sauropsids

d. Thecodonts

Select the **correct** option.

(1) b → c → d → a

(2) a → d → c → b

(3) a → b → c → d

(4) d → a → b → c

Space for Rough Work

195. Read the following statements.

     Statement A: The origin of life on Earth can be understood only against the background of origin of Universe especially Earth.

     Statement B: Formation of biomolecules preceded the appearance of the first cellular forms of life.

     Select the **correct** option.

     (1) Both statements A and B are correct

     (2) Both statements A and B are incorrect

     (3) Only statement A is correct

     (4) Only statement B is correct

196. Progestogens alone or in combination with estrogens can be used as a contraceptive in the form of

     a. Implants

     b. Injections

     c. Steroidal pills

     d. Saheli

     Select the **correct** option.

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

     (3) a, b and c only   (4) c and d only

197. A female who cannot produce an ovum but can provide suitable environment for fertilisation and further development has been recommended a technique which is best suited for her. Identify the technique and select the **correct** option.

     (1) GIFT   (2) IUT

     (3) ICSI   (4) AI

198. Select the Australian marsupial among the following.

     (1) Mole   (2) Bobcat

     (3) Numbat   (4) Lemur

199. Chemical evolution was more or less accepted after the experimental evidence provided by

     (1) Louis Pasteur

     (2) S.L. Miller

     (3) Hugo de Vries

     (4) Ernst Haeckel

200. Some of the land reptiles went back into water to evolve into fish-like reptiles probably

     (1) 300 mya   (2) 200 mya

     (3) 200 bya   (4) 350 mya

❑ ❑ ❑

Scan the QR Code for Detailed Video Solutions

(*Video will be available to access post 8 p.m. on 9ᵗʰ April, 2024 onwards)

Space for Rough Work

Edition: 2024-25

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# FINAL TEST SERIES for NEET-2024

MM : 720 **Test - 6** Time : 3 Hrs. 20 Mins.

Answers

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

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FINAL TEST SERIES for NEET-2024

MM : 720

Test - 6

Time : 3 Hrs. 20 Mins.

Answers and Solutions

PHYSICS

SECTION-A

1. Answer (1)
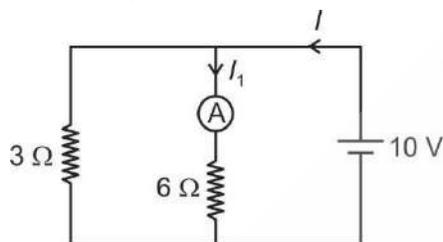
$V = IR$

$I_1 = \dfrac{10}{6}$

$= \dfrac{5}{3}$ A

2. Answer (2)
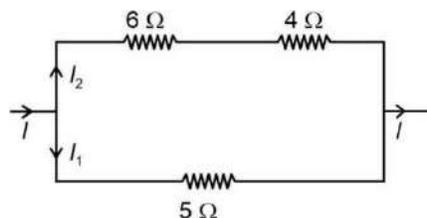
$I_1^2 5 = 20$

$I_1 = 2$ A

$I_1 = \dfrac{10I}{15}$

$2 = \dfrac{10I}{15}$

$\Rightarrow I = 3$ A

Hence $I_2 = 1$ A

$\Rightarrow H = I_2^2 6$

$= 6$ J

3. Answer (1)

$\dfrac{P}{Q} = \dfrac{R}{\dfrac{6 \times S}{6 + S}}$

$\dfrac{6 \times S}{6 + S} = 3$

$6S = 18 + 3S$

$S = 6 \ \Omega$

4. Answer (1)

$\vec{\tau} = \vec{M} \times \vec{B}$

$\Rightarrow$ Magnetic field due to wire is in $-z$ direction

$\Rightarrow \vec{M} = iA(-\hat{k})$

Hence $\vec{\tau} = 0$

$\Rightarrow \vec{F}_{net} \neq 0$ because more force will act on the side near to the straight conductor.

5. Answer (2)

$t = \dfrac{T}{2}$

$T = \dfrac{2\pi m}{qB}$

$t = \dfrac{\pi m}{qB}$

6. **Answer (1)**

$$r = \frac{mv}{qB} = \frac{\sqrt{2mK}}{qB}$$

$$\Rightarrow \left| e_P \right| = \left| e_e \right|$$

$$\Rightarrow m_P > m_e$$

$$\Rightarrow r_P > r_e$$

7. **Answer (2)**

$$i = \frac{40}{10+5} \Rightarrow \frac{40}{15} = \frac{8}{3} A$$

then $\Delta V_B = 20 - \frac{8}{3} \times 3 = 12$ V

8. **Answer (3)**

$$R = \frac{\rho \ell^2}{V}$$

$$R \propto \ell^2$$

So, $\dfrac{\Delta R}{R} = 2\dfrac{\Delta l}{l}$

9. **Answer (2)**

Net force on the loop is zero.

Hence the loop will not displace itself.

But it would expand due to radially outward force acting on it.

10. **Answer (4)**

$F = ILB \sin\theta \Rightarrow \dfrac{F}{L} = IB \sin\theta = 4 \times 2 \times 10^{-3} \times \dfrac{1}{2}$

= 4 mN m^{-1}

11. **Answer (2)**

$$\pi r = L \Rightarrow r = \frac{L}{\pi}$$

Since, $M = m \times L$

M' = Pole strength × Effective length = $m \times (2r)$

$$M' = m \cdot 2 \cdot \frac{L}{\pi} = \frac{2}{\pi} M$$

12. **Answer (1)**

$$|e| = \frac{d\phi}{dt}$$

$$d\phi = iR\, dt$$

$$\Delta\phi = R \cdot \int i\, dt = R \cdot (\text{area under } i-t \text{ curve})$$

$$= 100 \times 10 \times \frac{0.8}{2} = 400 \text{ Wb}$$

13. **Answer (2)**

Diamagnetism character is showcased by all substances.

14. **Answer (3)**

$$U = \frac{1}{2} L \left(\frac{E}{R} \right)^2$$

15. **Answer (4)**

At $t = 1$, $i = 7$ A, $\dfrac{di}{dt} = 5$ A/s

$V_P - (7 \times 5) - (2 \times 5) - 10 - V_Q = 0$

$V_P - V_Q = 55$ V

16. **Answer (4)**

Magnetic flux, $\phi = \vec{B} \cdot \vec{A}$

Induced emf $= \dfrac{-d\phi}{dt} = -\dfrac{d}{dt}\left(\vec{B} \cdot \vec{A} \right)$

17. **Answer (1)**

We know that,

$\phi = MI$

$E = \dfrac{d\phi}{dt} = M\dfrac{dI}{dt}$

$\therefore E = 2.25 \times 40 = 90$ V

18. **Answer (4)**

On increasing current sensitivity, voltage sensitivity may not increase. To convert a moving coil galvanometer into a voltmeter a large resistance is connected in series.

19. **Answer (3)**

$i = \dfrac{dq}{dt} \Rightarrow \int dq = \int i\, dt$

$$\int_0^Q dq = \int_0^2 (2t+3)\, dt$$

$$Q = \frac{2t^2}{2}\Big|_0^2 + 3t\Big|_0^2 \Rightarrow Q = 4 + 6 = 10 \text{ C}$$

20. **Answer (2)**

Time varying magnetic field produce non-conservative electric field.

21. **Answer (2)**

Magnetic susceptibility is negative for diamagnetic substance.

22. **Answer (3)**

Emf of a cell is a constant quantity.

During discharging: $V = E - iR \Rightarrow V < E$

23. Answer (4)

In the given circuit:

$E = \dfrac{L\,di}{dt} + iR \Rightarrow E = (1 \times 1) + (2 \times 3)$

$E = 1 + 6 = 7$ V

24. Answer (3)

$M = K\sqrt{L_1 L_2}$

where K is coupling factor ($0 \leq K \leq 1$)

$\therefore\ M \leq \sqrt{8 \times 4} \Rightarrow M \leq \sqrt{32}$ H

25. Answer (2)

$\vec{\tau} = \vec{M} \times \vec{B}$ or $\tau = MB\sin\theta$

$\tau_{max} = MB = 0.3 \times 2 = 0.6$ N m

26. Answer (4)
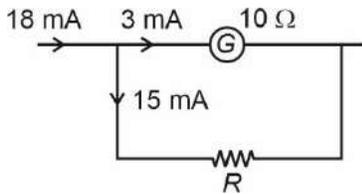
$3\ mA \times 10\ \Omega = 15\ mA \times R$

$R = 2\ \Omega$

27. Answer (1)

In series, current in all the resistors will be same.

$P = i^2 R \Rightarrow P \propto R$

28. Answer (3)
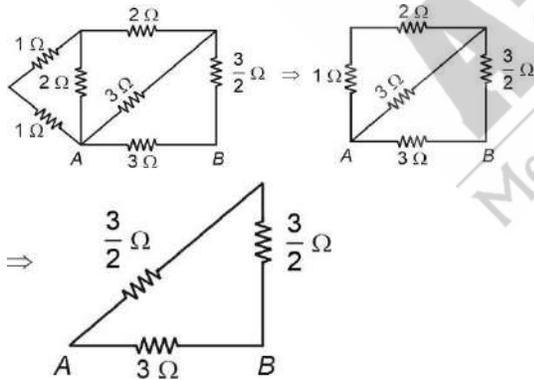
$R_{eq} = \dfrac{3}{2}\ \Omega$

29. Answer (1)

Magnetic field at the centre of a circular coil is given by

$B = \dfrac{\mu_0 Ni}{2R} \Rightarrow B = \dfrac{4\pi \times 10^{-7} \times 200 \times 2.5}{2 \times 10 \times 10^{-2}}$

$B = 3.14 \times 10^{-3}$ T

30. Answer (4)

$i = \int \vec{J}.d\vec{A}$

$i = \vec{J}.\int d\vec{A} = \vec{J}.\vec{A}$

$i = \left(2\hat{i} + \hat{j}\right).\left(2\hat{i} - \hat{j}\right) \times 10^{-4}$

$i = (4 - 1) \times 10^{-4}$

$i = 3 \times 10^{-4}$ A $= 300\ \mu A$

31. Answer (1)

$\oint \vec{B}.\,\overline{dl} = \mu_0 i_{enc} = \mu_0\left(2i + i - 2i\right)$

$\oint \vec{B}.\,\overline{dl} = \mu_0 i$

32. Answer (2)

• Voltmeter should have high resistance and ammeter should have low resistance.

• Ammeter is placed in series while voltmeter is placed in parallel to the circuit.

33. Answer (1)

Magnetic field produced by current loop is along its axis and since straight wire is also placed on its axis, then

$\vec{F} = i\,\vec{dl} \times \vec{B},$ $\theta = 180°$ or $0°$

$\therefore$ Net force will be zero.

34. Answer (2)
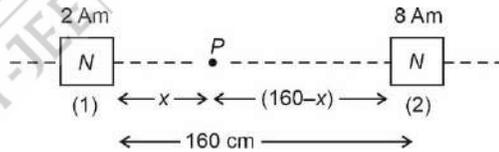
$B = \dfrac{\mu_0 m}{4\pi r^2}$, where m is pole strength.

$B_1 = B_2 \Rightarrow \dfrac{\mu_0 \times 2}{4\pi \times x^2} = \dfrac{\mu_0 \times 8}{4\pi \times (160 - x)^2}$

$(160 - x)^2 = 4x^2 \Rightarrow 160 - x = 2x$

$3x = 160 \Rightarrow x = \dfrac{160}{3}$ cm

35. Answer (4)

Superconductor is a perfect diamagnetic material and hence net magnetic field inside will become zero.

SECTION-B

36. Answer (3)

Core of electromagnets have high permeability and low retentivity.

37. **Answer (2)**

The magnetic field $B = \mu_r \mu_0 ni$

$= 400 \times 4\pi \times 10^{-7} \times 8 \times 10^3$

$\approx 4\ T$

38. **Answer (1)**
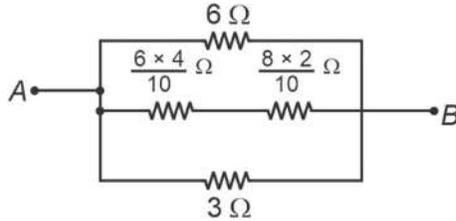
$\dfrac{1}{R_{eq}} = \dfrac{1}{3} + \dfrac{1}{6} + \dfrac{1}{4} \qquad \Rightarrow \qquad \dfrac{1}{R_{eq}} = \dfrac{8+4+6}{24}$

$\Rightarrow \quad \dfrac{1}{R_{eq}} = \dfrac{18}{24}$

$\Rightarrow \quad R_{eq} = \dfrac{4}{3}\ \Omega$

39. **Answer (4)**

$i = neAv_d$

$\therefore \quad v_d \propto \dfrac{i}{A}$

$v \propto \dfrac{i}{A}$

$v' \propto \dfrac{4i}{2A}$

$\therefore \quad \dfrac{v'}{v} = \dfrac{2iA}{A \times i}$

$v' = 2v$

40. **Answer (1)**

$B = \dfrac{\mu_0 I.\dfrac{\pi}{3}}{4\pi R} - \dfrac{\mu_0 I\dfrac{\pi}{3}}{4\pi(2R)} = \dfrac{\mu_0 I}{12R} - \dfrac{\mu_0 I}{24R} = \dfrac{\mu_0 I}{24R} \otimes$

41. **Answer (2)**

$R \sin\theta = d$
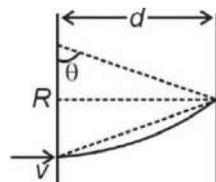
$\sin\theta \dfrac{mv}{qB} = \dfrac{\sqrt{3}}{2}\dfrac{mv}{qB}$

$\sin\theta = \dfrac{\sqrt{3}}{2},\ \theta = \dfrac{\pi}{3}$

Displacement $= R = \dfrac{mv}{qB}$

42. **Answer (2)**

If the radius is r at time t, then the instantaneous magnetic flux ϕ is given by :

$\phi = \pi r^2 B$

Now, induced emf e is given by :

$e = -\dfrac{d\phi}{dt} = -\dfrac{d}{dt}(\pi r^2 B)$

$= -\pi B\left(2r\dfrac{dr}{dt}\right) = -2\pi Br\left(\dfrac{dr}{dt}\right)$

Induced emf $= 2\pi Br\left(\dfrac{dr}{dt}\right)$ numerically as $\left(\dfrac{dr}{dt}\right)$ is negative.

43. **Answer (4)**

$B = t^2 + 4t, \qquad A = 2500 \times 10^{-4} = \dfrac{1}{4}\ m^2$

$\phi = \vec{B}.\vec{A} \Rightarrow \phi = \left(t^2 + 4t\right) \times \dfrac{1}{4}$

- $\phi(t = 2\ s) = (4 + 8) \times \dfrac{1}{4} = 3\ Wb$

- $E = \dfrac{d\phi}{dt} = (2t + 4) \times \dfrac{1}{4} \Rightarrow E(t = 2\ s) = 8 \times \dfrac{1}{4} = 2\ V$

- $E_{avg} = \dfrac{\Delta\phi}{\Delta t} = \dfrac{\phi_f - \phi_i}{\Delta t} = \dfrac{\left[\dfrac{\left(4^2 + 4 \times 4\right)}{4}\right] - \left[\dfrac{2^2 + 4 \times 2}{4}\right]}{(4 - 2)}$

$E_{avg} = \dfrac{8 - 3}{2} = \dfrac{5}{2}\ V$

- $E(t = 3\ s) = (2 \times 3 + 4) \times \dfrac{1}{4} = \dfrac{10}{4}\ V$

$i = \dfrac{E}{R} \Rightarrow i = \dfrac{\dfrac{10}{4}}{10} = \dfrac{1}{4}\ A$

44. **Answer (2)**

$B_1 = \dfrac{\mu_0 i}{2\pi r} \times \dfrac{1}{2} \qquad \odot$

$B_2 = \dfrac{\mu_0 i}{2r} \times \dfrac{1}{4} \qquad \odot$

$B_3 = \dfrac{\mu_0 i}{2\pi r} \times \dfrac{1}{2} \qquad \odot$
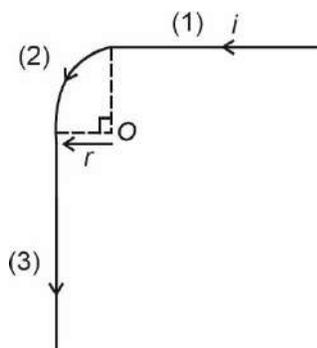
$$B_{net} = B_1 + B_2 + B_3 = \frac{\mu_0 i}{4r}\left[\frac{1}{\pi} + \frac{1}{2} + \frac{1}{\pi}\right] = \frac{\mu_0 i}{4r}\left[\frac{2}{\pi} + \frac{1}{2}\right]$$

45. **Answer (1)**

Power across external resistance R is maximum when $R = r$

46. **Answer (3)**

$$R = \frac{mV}{qB} = \frac{\sqrt{2mK}}{qB}$$

where K is kinetic energy

proton: mass m_0, charge e

α-particle: mass $4m_0$, charge $2e$

$$\frac{R_P}{R_\alpha} = \sqrt{\frac{2m_P K}{2m_\alpha K}} \times \frac{q_\alpha B}{q_P B} \Rightarrow \frac{R_P}{R_\alpha} = \sqrt{\frac{m_0}{4m_0}} \times \frac{2e}{e} = 1$$

47. **Answer (4)**

$$F = qvB \Rightarrow B = \frac{F}{qv}$$

$$\phi = BA \Rightarrow \phi = \frac{F}{qv} \times A$$

Unit of $\phi = \dfrac{kg\,ms^{-2}}{A\,s\,ms^{-1}} \times m^2$

$[\phi] = [ML^2T^{-2}A^{-1}]$

48. **Answer (4)**

When the loop is entering into the field:

$$\varepsilon = \frac{-d\phi}{dt} = -B\frac{dA}{dt} = (-ve)\ constant$$

When the loop is inside the field:

$$\varepsilon = -\frac{d\phi}{dt} = 0$$

When the loop is coming out of the field:

$$\varepsilon = -\frac{d\phi}{dt} = -B\left(\frac{dA}{dt}\right) = (+ve)\ constant.$$

49. **Answer (4)**

SI unit of magnetic moment is A m²

50. **Answer (2)**

Energy density due to magnetic field $B = \dfrac{B^2}{2\mu_0}$.

CHEMISTRY

SECTION-A

51. **Answer (4)**
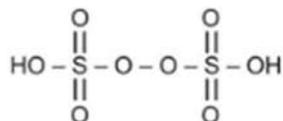
52. **Answer (2)**

$[Co(NH_3)_6][Cr(CN)_6]$ and $[Co(CN)_6][Cr(NH_3)_6]$ are the example of coordination isomerism.

53. **Answer (1)**

Electronic configuration of Cr in $[Cr(H_2O)_6]^{3+}$ is $t_{2g}^3 e_g^0$

CFSE = $(-0.4 \times 3)\Delta_0 = -1.2\Delta_0$

54. **Answer (3)**

• NH₃ is a strong field ligand

∴ Pairing will take place

So, hybridization of Co in $[Co(NH_3)_6]^{3+}$ is d^2sp^3.

55. **Answer (3)**

The thermal stability decreases from H_2O to H_2Po.

56. **Answer (2)**

Deacon's process is used in the manufacture of Cl_2 by using $CuCl_2$ as catalyst.

57. **Answer (4)**

$HBrO_2$ is least likely to exist among the given compounds

58. **Answer (1)**

Ca^{2+} and Mg^{2+} ions form stable complexes with EDTA.

59. **Answer (2)**

Stronger the ligand field strength, more will be the CFSE value, lesser will be the value of λ.

60. **Answer (3)**

• Brass is an alloy of copper and zinc.

• Bronze is an alloy of copper and tin.

61. **Answer (2)**

Ligands which accept electrons from metal by π-bond, show synergic bonding.

62. **Answer (3)**

The green manganate ion is paramagnetic because of unpaired electron

The permanganate ion is diamagnetic because of absence of unpaired electron.

63. **Answer (1)**

Zr and Hf both are in same group and because of lanthanoid contraction Zr and Hf have nearly same size.

64. **Answer (1)**

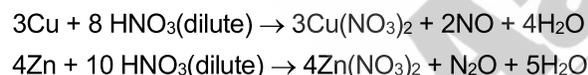Aqueous solution of *d*-block ions, which has partially filled *d* orbitals are coloured.

65. **Answer (2)**

Cu^{2+} and Ti^{3+} contain same number of unpaired electrons.

66. **Answer (4)**

Compounds	Melting point (K)
NH_3	195.2
PH_3	139.5
AsH_3	156.7
SbH_3	185

67. **Answer (2)**

$3Cu + 8 HNO_3(dilute) \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$

$4Zn + 10 HNO_3(dilute) \rightarrow 4Zn(NO_3)_2 + N_2O + 5H_2O$

68. **Answer (4)**

As the atomic number of lanthanoid metal increases the basic nature of their hydroxide decreases.

69. **Answer (2)**

$2NH_4Cl + Ca(OH)_2 \rightarrow 2NH_3 + 2H_2O + CaCl_2$
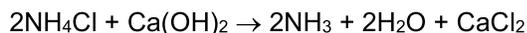
70. **Answer (3)**

- $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$

- Phosphine explodes in contact with trace amount of oxidizing agents like HNO_3.

71. **Answer (2)**

$4H_3PO_3 \xrightarrow{\Delta} 3H_3PO_4 + PH_3$
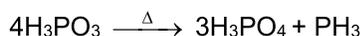
72. **Answer (1)**

$[Co(NH_3)_6]Cl_3$: IUPAC nomenclature Hexaamminecobalt (III) chloride.

73. **Answer (3)**

O_3 is resonance hybrid of two canonical forms.
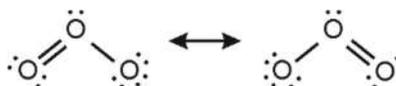
74. **Answer (4)**

Heteroleptic complex contains different ligands in its coordination entity. (Ethylene-1,2-diamine) (en) is a didentate ligand.

75. **Answer (2)**

$6XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$

76. **Answer (2)**

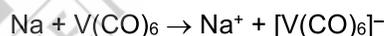| Ions	$\Delta_{hyd}H°$(kJ mol^{-1})
Ti^{2+}	−1866
Ni^{2+}	−2121
Cr^{2+}	−1925
Fe^{2+}	−1998

77. **Answer (1)**

Actinium (Ac) shows only +3 oxidation state.

78. **Answer (2)**

$V(CO)_6$ accepts one electron from sodium and effective atomic number of V becomes 36. This increases the stability of the complex.

$Na + V(CO)_6 \rightarrow Na^+ + [V(CO)_6]^-$

79. **Answer (3)**

Cl^- is a weak field ligand hence pairing in t_{2g} orbital will not occur in octahedral field. The electronic configuration will be $t_{2g}^3 e_g^1$.

80. **Answer (2)**

V_2O_5 and CrO_3 : Acidic

Cr_2O_3 : amphoteric

CrO : basic

81. **Answer (4)**

Hybridization of Co in $[CoF_6]^{3-}$ is sp^3d^2, which is outer orbital complex.

82. **Answer (2)**

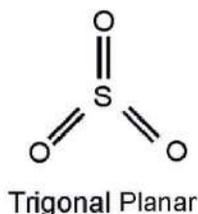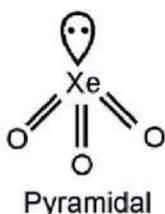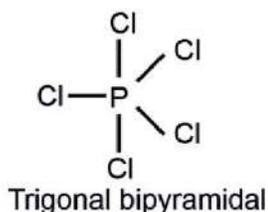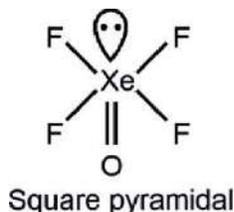| Metal	Ionisation enthalpy (kJ mol^{-1})
Mn	717
Fe	762
Cu	745
Ni	736

83. Answer (3)

Density of nickel is more than iron.

84. Answer (3)

First ionization enthalpy of lanthanoid metals is about 600 kJ mol^{-1}.

85. Answer (1)

Square pyramidal

Trigonal bipyramidal

Pyramidal

Trigonal Planar

SECTION-B

86. Answer (3)

- $Cr(CO)_6$ possess metal-carbon bond hence it is an organometallic compound.

- M–C σ bond is formed by the donation of lone pair of electrons on the carbonyl carbon into a vacant orbital of the metal. The M-C π bond is formed by the donation of a pair of electrons from a filled d orbital of metal into vacant antibonding π* orbital of CO.

87. Answer (4)

More stable is the conjugate base, stronger is the acid.

88. Answer (2)

I_2 + 10HNO$_3$ (conc.) → 2HIO$_3$ + 10NO$_2$ + 4H$_2$O
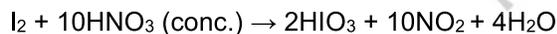
Let the oxidation state of I in HIO$_3$ is x

$1 + x + 3(-2) = 0 \Rightarrow x = + 5$

89. Answer (3)

Formula	Oxidation state of phosphorus
H_3PO_2	+1
$H_4P_2O_5$	+3
$H_4P_2O_6$	+4
$H_4P_2O_7$	+5

90. Answer (2)

Element	$\Delta_aH°$ (kJ mol^{-1})
Fe	416
Co	425
Ni	430
Cu	339

91. Answer (1)

I$^-$ converts into IO_3^- when it is oxidised in neutral or faintly alkaline solution with MnO_4^- .

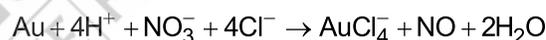$2MnO_4^- + H_2O + I^- \rightarrow 2MnO_2 + 2OH^- + IO_3^-$

92. Answer (2)

(Fac)

(Mer)
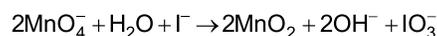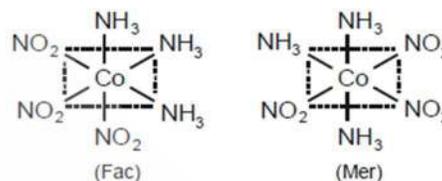
93. Answer (1)

Higher is the electron density on metal, stronger is the back donation of electron from metal to ligand and weaker is C – O bond.
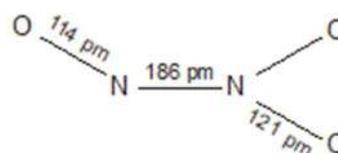
94. Answer (3)

Rhombic sulphur is yellow in colour.

95. Answer (3)

$Au + 4H^+ + NO_3^- + 4Cl^- \rightarrow AuCl_4^- + NO + 2H_2O$

96. Answer (1)

N_2O_3 is

97. Answer (3)

Weaker is the ligand field strength, lower is the value of Δ_0 and higher will be the wavelength of light absorbed.

98. Answer (2)

Ligand field strength order : Cl$^-$ < H$_2$O < en < CO.

99. Answer (4)

$E^°_{Cu^{2+}/Cu} = +0.34$ V . Hence H$^+$ will not be reduced by copper.

100. Answer (3)

[Fe(H$_2$O)$_5$(NO)]$^{2+}$ is brown ring complex.

BOTANY

SECTION-A

101. Answer (3)

SNPs (Single Nucleotide Polymorphism) are locations where single base DNA differences occur in humans.

102. Answer (4)

There is no tRNAs for stop codons UAA, UAG and UGA.

103. Answer (1)

The z-gene codes for beta galactosidase, which is primary responsible for the hydrolysis of disaccharide, lactose into its monomeric units galactose and glucose.

104. Answer (2)

In viruses, neither transcription nor replication takes place. Their genetic material replicates inside the host.

105. Answer (4)

The unequivocal proof that DNA is the genetic material came from the experiments of Hershey and Chase.

106. Answer (2)

In DNA, a nitrogenous base is attached to OH of $1'$ carbon of pentose sugar through a N-glycosidic linkage to form a nucleoside.

107. Answer (2)

Amino acid is bound to $3'$ end of tRNA.

108. Answer (4)

Histones are rich in basic amino acid residues lysine and arginine.

109. Answer (4)

For replication of long DNA molecules the two strands cannot be separated in its entire length in one go due to very high requirement of energy.

110. Answer (2)

In the first phase of translation, amino acids are activated in the presence of ATP and linked to their cognate tRNA, a process commonly called charging of tRNA.

111. Answer (3)

RNA molecules can act as an adapter molecule, structural molecule and as a catalyst.

112. Answer (4)

Pyrimidines are cytosine, thymine and uracil. Cytosine is the only pyrimidine that is present in both DNA and RNA.

113. Answer (2)

Watson and Crick proposed a simple double helix model for the structure of DNA.

114. Answer (3)

In reverse central dogma, some viruses produce an enzyme reverse transcriptase which can synthesize DNA over RNA template.

115. Answer (4)

Lightly stained regions in chromatin are called euchromatin which is transcriptionally active.

116. Answer (3)

In Hershey and Chase experiment, supernatant had only protein coats of bacteriophage.

117. Answer (3)

The molecules that act as genetic material should provide the scope for slow mutation rate.

118. Answer (2)

Pedigree shows autosomal recessive trait.

119. Answer (2)

In the Mendelian dihybrid cross the phenotypic ratio is 9 : 3 : 3 : 1.

Of this 9 + 1 = 10 are parental phenotypes and 3 + 3 = 6 are the recombinant types. So the ratio will be 10 : 6, *i.e.*, 5 : 3.

120. Answer (3)

A single gene can exhibit multiple phenotypic expression.

Such genes are called pleiotropic genes.

The effect of a gene on metabolic pathways contribute towards different phenotypes.

121. Answer (2)

Colour-blindness is X linked recessive trait.

Sickle cell anaemia and phenylketonuria are autosomal recessive trait.

Myotonic dystrophy is an autosomal dominant trait.

122. Answer (4)

T.H. Morgan found that the genes for white-eye and yellow-body were very tightly linked and present on X-chromosome of *Drosophila*. It showed only 1.3% recombination and deviated very significantly from the 9 : 3 : 3 : 1 ratio.
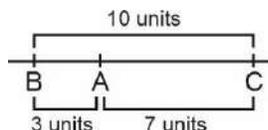
123. Answer (3)

In pedigree analysis symbol ◇ is used for sex unspecified.

124. Answer (2)

X body was observed by Henking during spermatogenesis in a few insects. In XX-XY type, number of autosomes are same in both male and female. Males are heterogametic in humans.

125. Answer (4)

The order of the genes will be

126. Answer (2)

Genetic maps show position of genes on chromosome. Polygenic inheritance shows a trait expression across a gradient. Recombination generates non-parental gene combination and linkage is physical association of genes on a chromosome.

127. Answer (4)

Honey bees exhibit haplodiploid type of sex determination. Males are haploid and have 16 chromosomes.

128. Answer (1)

Recessive trait is expressed only in homozygous condition. Dominant trait can be expressed in both homozygous and heterozygous conditions.

129. Answer (4)

Both mutation and recombination can lead to variation in DNA.

130. Answer (2)

In Mendelian dihybrid cross regarding seed shape and seed colour, out of 16 seeds, 3 are wrinkled-yellow. Therefore, out of 400 seeds, wrinkled-yellow seeds would be $400 \times \dfrac{3}{16} = 75$.

131. Answer (3)

Drosophila is the ideal material to study experimental genetics.

It has a short life-cycle and can be grown on simple synthetic medium in lab. It shows sexual dimorphism. A single mating produces a large number of offspring and all show lot of variations.

132. Answer (3)

F₁ does not resemble either of the two parents in incomplete dominance. Pure line is produced by

self-pollination and test-cross determines genotypes of individuals showing dominant phenotype.

Mendel conducted cross-pollination experiments on true-breeding pea plants.

133. Answer (3)

The probability of pure-line offsprings *i.e.*, AA/aa, BB/bb and CC/cc will be $\dfrac{1}{2} \times \dfrac{1}{2} \times \dfrac{1}{2}$

$= \dfrac{1}{8}$ or 12.5%

134. Answer (2)

Antirrhinum majus shows incomplete dominance for flower colour inheritance.

In this monohybrid cross, the phenotypic ratio and genotypic ratio is same in F₂ generation.

135. Answer (2)

Genes are units of inheritance and alleles are slightly different forms of the same gene.

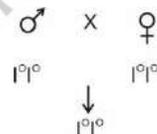Monohybrids are heterozygous for one character.

SECTION-B

136. Answer (4)

Maximum number of possible phenotypes in trihybrid cross will be $2^3 = 8$.

137. Answer (3)

Terminal position of flower is the recessive trait in pea plant and it does not express in heterozygous condition.

138. Answer (4)

All offspring will have O blood group.

139. Answer (3)

On template strand of DNA with polarity $3' \rightarrow 5'$ replication is continuous and on the other template strand where polarity is $5' \rightarrow 3'$ replication is discontinuous.

140. Answer (2)

β-thalassemia is controlled by a single gene on chromosome 11.

141. Answer (4)

Haemophilia is a sex-linked recessive disorder.

It can be transmitted from unaffected carrier female to some of the male progeny.

The possibility of a female becoming a haemophilic is extremely rare.

142. Answer (3)

Homozygous individuals for Hb^S, i.e., Hb^S Hb^S show the diseased phenotype.

Heterozygous (Hb^{A}Hb^S) individuals appear apparently unaffected but they are carriers of the disease.

The disease is caused due to a single base substitution at the 6th codon of beta globin gene from GAG to GUG.

143. Answer (4)

Law of dominance and law of segregation is based on monohybrid cross.

Law of independent assortment is based on dihybrid crosses.

144. Answer (4)

Rho factor is required for termination of transcription. Core enzyme catalyses the process of elongation only.

145. Answer (1)

During post-transcriptional modification, adenylate residues are added at 3′-end of the primary transcript.

146. Answer (4)

5′ CTTAG 3′ Coding strand of DNA

3′ GAATC 5′ Template strand of DNA

↓

5′ CUUAG 3′ Base sequence in mRNA

147. Answer (1)

RNA polymerase II catalyses the synthesis of hnRNA (heterogeneous nuclear RNA).

148. Answer (4)

During capping, methyl guanosine triphosphate is added to hnRNA at 5′ end.

149. Answer (1)

Tailing of hnRNA occurs at 3′ end.

150. Answer (2)

DNA sequences in VNTRs usually do not code for any proteins.

ZOOLOGY

SECTION-A

151. Answer (2)
GIFT – Gamete Intra Fallopian Transfer
IUI – Intra Uterine Insemination
ICSI – Intra cytoplasmic sperm injection

152. Answer (3)
Condoms are the barrier methods of contraception and they prevent the users from STIs. 'Nirodh' is a popular brand of condom for males.

153. Answer (2)
The creature 'Homo habilis' was called the first human-like being the hominid. Their brain capacities were in between 650-800 cc. They probably did not eat meat.

154. Answer (3)
Tyrannosaurus rex was about 20 feet in height and was the biggest among dinosaurs.

155. Answer (1)
Intra Uterine Devices are inserted by doctors or expert nurses in the uterus through vagina.
Intra Uterine Devices are presently available as the non-medicated IUDs (e.g., Lippes loop), copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20).

156. Answer (3)
Hardy-Weinberg's equilibrium states that allele frequencies in a population remains constant generation to generation.

157. Answer (4)
Branching descent and natural selection are the two key concepts of Darwinian Theory of Evolution.
Darwin suggested that nature selects individuals on the basis of their reproductive fitness.

158. Answer (3)
Mammals were evolved from reptiles. The first mammals were like shrews. Their fossils are small sized.

159. Answer (4)
Graves' disease is a type of metabolic disorder and amniocentesis is used to test for the presence of genetic disorders.

160. Answer (3)
'Family planning programmes' were initiated in 1951 in India.

161. Answer (1)
Progestasert is a hormone releasing IUD.
Progestogen is a steroidal hormone.

162. Answer (2)
Lichens cannot grow in polluted atmosphere. So, they are considered as pollution indicators.

163. Answer (3)
Life appeared 500 million years after the formation of Earth.

164. **Answer (1)**

Alanine, glycine and aspartic acid were the amino acids formed as a result of Miller's experiment.

In similar experiments others observed, formation of sugars, nitrogenous bases, pigments and fats.

165. **Answer (3)**

The world population was around 6 billion by 2000 and 7.2 billion in 2011.

166. **Answer (2)**

Vaults – Entry of sperms through cervix is blocked.

Cu^{+2} releasing IUDs – Suppress sperm motility.

Coitus interruptus – Withdrawal of penis from vagina just before ejaculation.

167. **Answer (3)**

Lactational amenorrhea has the highest failure rate among the other mentioned birth control methods as it is a natural method of contraception.

168. **Answer (1)**

All are the early symptoms associated with sexually transmitted infections (STIs) except abortions which are considered as late complications of STIs.

169. **Answer (3)**

If the pregnancy has lasted for more than 12 weeks, but fewer than 24 weeks, two registered medical practitioners must be of the opinion, formed in good faith, that the required ground exists.

170. **Answer (4)**

Koala and Bandicoot are Australian marsupials and they show adaptive radiation.

171. **Answer (4)**

Mutations are random and non-directional while Darwinian variations are small and directional.

172. **Answer (3)**

Water vapour, methane, carbon dioxide and ammonia released from molten mass covered the Earth surface.

173. **Answer (3)**

Evolution is not a directed process in the sense of determinism. It is a stochastic process based on chance events in nature and chance mutation in the organism.

174. **Answer (2)**

Frequency of homozygous recessive genotype = $q^2 = 0.09$

$\therefore q = \sqrt{0.09} = 0.3$

According to the Hardy-Weinberg equilibrium,

$p + q = 1$

$p = 1 - q \Rightarrow 1 - 0.3 \Rightarrow 0.7$

Frequency of homozygous dominant genotype = $p^2 = (0.7)^2 = 0.49$

Percentage of individuals homozygous for dominant allele = 49%

175. **Answer (3)**

One should always use condoms during coitus to avoid STIs.

176. **Answer (3)**

Condoms are made up of thin rubber/ latex sheath which prevent ovum and sperm from physically meeting with each other. Female's condom is known as femidom.

177. **Answer (4)**

The surgical method of contraception in female is known as tubectomy.

In this technique, a small part of the fallopian tube is removed.

Its reversibility is very poor but it is highly effective. It does not inhibit ovulation but it prevents ovum transport.

178. **Answer (3)**

Except for genital herpes, hepatitis-B and HIV infections, other STIs are completely curable if detected early and treated properly.

179. **Answer (2)**

Pills have to be taken daily for a period of 21 days starting preferably within first 5 days of menstrual cycle.

180. **Answer (1)**

Habitat fragmentation, random mating, mutation and genetic drift may accentuate variation leading to appearance of new species and hence evolution.

181. **Answer (4)**

- Chlorophyte ancestors → Tracheophyte ancestors → Zosterophyllum → Arborescent lycopods → Herbaceous lycopods

- Synapsids → Pelycosaurs → Therapsids → Mammals

182. **Answer (3)**

Fossils are most abundantly found in sedimentary rocks.

183. **Answer (1)**

The skull of baby chimpanzee is more like adult human skull than adult chimpanzee skull.

During ice age between 75,000 – 10,000 years ago modern *Homo sapiens* arose.

Agriculture came around 10,000 years back and human settlements started.

184. **Answer (4)**

Administration of progestogens or progestogen estrogen combinations or IUDs within 72 hours of coitus have been found to be very effective as emergency contraceptive.

185. **Answer (1)**

Karl Ernst von Baer noted that embryos never pass through the adult stages of other animals.

SECTION-B

186. **Answer (3)**

According to the 2011 census report, the population growth rate of India was less than 2 per cent.

187. **Answer (1)**

CuT suppresses sperm motility and the fertilising capacity of sperms. Steroidal oral contraceptive pills inhibit ovulation and implantation.

188. **Answer (1)**

Cave paintings by Pre-historic humans can be seen at Bhimbetka rock shelter in Raisen district of Madhya Pradesh.

189. **Answer (1)**

Triceratops – Three horned dinosaurs with bony frill around the back of its head.

Stegosaurus – Large triangular bony plates along the back and spiked tail.

Tyrannosaurus rex – 20 feet in height, had huge fearsome dagger-like teeth.

Brachiosaurus – Long giraffe-like neck.

190. **Answer (1)**

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

191. **Answer (4)**

Diaphragm, cervical caps and vaults are barriers made up of rubber that are inserted into the female reproductive tract to cover the cervix during coitus.

These come under barrier methods of contraception.

192. **Answer (3)**

Periodic abstinence is one such method in which couples should avoid or abstain from coitus from day 10 to 17 of the 28 days menstrual cycle when ovulation could be expected.

In a 30 days menstrual cycle, from day 12 to 19 should be avoided for sexual intercourse to prevent conception.

193. **Answer (3)**

Breeds of dogs created by man is the artificial selection by anthropogenic action.

194. **Answer (1)**

The proper sequence of fossils record from oldest to latest is

Early reptiles → Sauropsids → Thecodonts → Dinosaurs

195. **Answer (1)**

The origin of life on Earth can be understood only against the background of origin of Universe especially Earth. Most scientists believe in chemical evolution *i.e.*, formation of biomolecules preceded the appearance of the first cellular forms of life.

196. **Answer (3)**

Progesterone alone or in combination with estrogen can be used as a contraceptives in the form of implants, injections, pills. Saheli contains chemical compound called centchroman.

197. **Answer (1)**

Transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one, but can provide suitable environment for fertilization and further development is known as Gamete Intra Fallopian Transfer.

198. **Answer (3)**

Numbat (Banded anteater) is an Australian marsupial.

199. **Answer (2)**

Chemical evolution was more or less accepted after the experimental proof given by Miller in 1953.

200. **Answer (2)**

Some of the land reptiles went back into water to evolve into fish-like reptiles probably 200 mya. (*e.g. Ichthyosaurs*).

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