All India Aakash Test Series for NEET - 2026

TEST - 2 (Code-A)

Click here for Code-B Sol.

Test Date : 05/10/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: Use $P = I^2R$

Sol.: $i = \frac{E}{R+r}$

$P_1 = I_1^2 R_1$

$= \left(\frac{E}{R_1+r}\right)^2 R_1$

$P_2 = \left(\frac{E}{R_2+r}\right)^2 R_2$

$P_1 = P_2$

$\frac{E^2}{(R_1+r)^2} R_1 = \frac{E^2}{(R_2+r)^2} R_2$

$r = \sqrt{R_1 R_2} = \sqrt{9\times 4} = 6\ \Omega$

2. Answer (4)

Hint: $R = \rho\frac{l}{A}$

Sol.: $R_1 = 9\rho\frac{L}{A}$

$R_2 = \rho\frac{L}{A}$

$R_3 = 4\rho\frac{L}{A}$

$R_4 = \rho\frac{L}{4A}$

3. Answer (4)

Hint & Sol.: Wheatstone bridge can be used to compare two unknown resistances and metre bridge works on the principle of Wheatstone bridge.

Current density, $|\vec{J}| = \frac{i}{A}$

4. Answer (1)

Hint & Sol.: Use, $R = \rho\frac{l}{A}$

Here volume remains same

$Al = l_1\frac{A}{9}$

$l_1 = 9l$

$R_1 = \rho\frac{9l}{\frac{A}{9}} = 81\left(\frac{\rho l}{A}\right)$

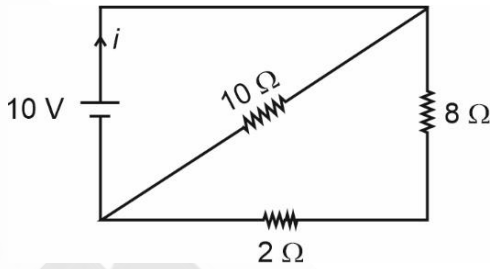
$= 81 \times 12$

$= 972\ \Omega$

5. Answer (4)

Hint: Use formula $P = I^2R$

Sol.:



$I = \frac{10}{5} = 2$ A

Current through 8 Ω resistance is $\frac{I}{2}$ = 1 A

$P = I^2R$

$= I^2 \times 8 \Rightarrow P = 8$ W

6. Answer (4)

Hint: Apply concept of balanced Wheatstone bridge

Sol.: $\frac{4}{12} = \frac{R+6}{30}$

$\frac{1}{3} = \frac{R+6}{30}$

$3R + 18 = 30$

$R = 4\ \Omega$

7. Answer (2)

Hint: $i = \left(\frac{q}{t}\right)$

Sol.: $i = \left(\frac{q}{t}\right)$

$i = \frac{ne}{t}$

$\frac{n}{t} = \frac{i}{e}$

$= \frac{4.8}{1.6\times 10^{-19}}$

$= 3 \times 10^{19}$

8. Answer (1)

Hint: Current will be same through all cross-section of conductor

Sol.: $v_d = \frac{I}{nAe}$, $J = \frac{i}{A}$ and $J = \sigma E$

9. Answer (2)

Hint: Resistance of a metal increases with increase in temperature.

Sol.: $V = iR$

$\frac{V}{i} = R$

$\frac{i}{V} = \frac{1}{R}$

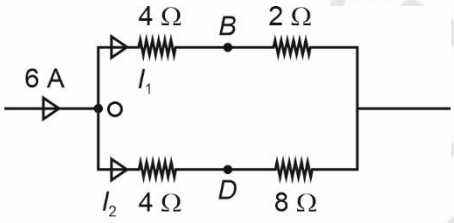
$R_3 < R_2 < R_1$

$t_3 < t_2 < t_1$

10. Answer (3)

Hint: Use, $V = IR$

Sol.:



$I_1 = \frac{6 \times 12}{18}$ = 4 A

$I_2 = \frac{6 \times 6}{18}$ = 2 A

$V_0 - V_B = 4 \times 4$ …(1)

$V_0 - V_D = 4 \times 2$ …(2)

From equation (1) and (2), we have

$V_B - V_D = -8$ V

11. Answer (4)

Hint: Use formula $P = \frac{V^2}{R}$

Sol.: When both bulbs are connected in series across 220 V supply, then using KVL voltage across each bulb will be 110 V i.e. voltage is halved. Using $P \propto V^2$, power will become $\frac{1}{4}$ *i.e.* 100 watt.

12. Answer (1)

Hint: In series combination,

$R_s = R_1 + R_2 + ... + R_n$

In parallel combination, $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + ...\frac{1}{R_n}$

Sol.: Both the 8 Ω resistances are in parallel and their equivalent is in series with 4 Ω.

$R_{AB} = \frac{R \times 8}{8 + R}$

$4 = \frac{8R}{8 + R}$

$8 + R = 2R \quad \Rightarrow R = 8\ \Omega$

13. Answer (1)

Hint: Use the concept of series and parallel combination of resistors.

Sol.: Before closing switch, R_1 and R_2 are short circuited, therefore $R_{eq} = R \Rightarrow P_i = \frac{V^2}{R}$

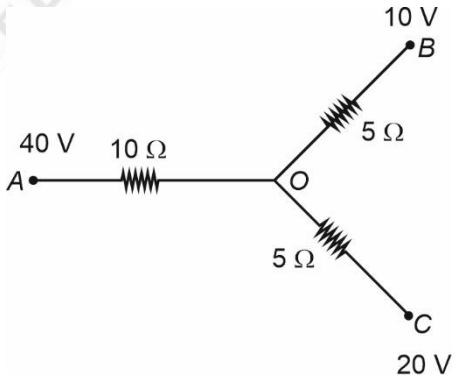
After closing switch, $R_{eq} = \frac{3R}{5} \Rightarrow P_f = \frac{V^2}{\frac{3R}{5}}$

$\Rightarrow$ % change $\approx 67\%$

14. Answer (2)

Hint: Use Kirchhoff's current law

Sol.:



$\frac{V_A - V_0}{10} + \frac{V_C - V_0}{5} + \frac{V_B - V_0}{5} = 0$

$\frac{40 - V_0}{10} + \frac{20 - V_0}{5} + \frac{10 - V_0}{5} = 0$

$40 - V_0 + 40 - 2V_0 + 20 - 2V_0 = 0$

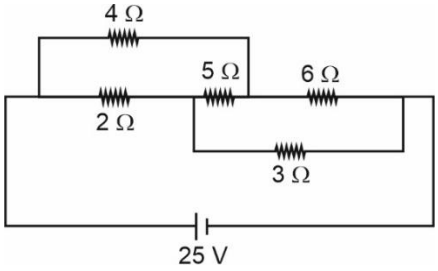
$5V_0 = 100$

$V_0 = 20$ V

15. Answer (1)

Hint: Use concept of balanced Wheatstone bridge

Sol.:



Given circuit is balanced Wheatstone bridge so no current flows through 5 Ω resistance.

Current through 2 Ω resistance = $\frac{25}{5}$

= 5 A

Power dissipated in 2 Ω resistance = I^2R

= 25 × 2

= 50 W

Current through 6 Ω resistance = $\frac{25}{10}$

= $\frac{5}{2}$ A

Current flowing through battery = $\frac{5}{2}$ + 5

= $\frac{15}{2}$ A

Power delivered by battery = VI

= 25 × $\frac{15}{2}$

= 187.5 W

16. Answer (2)

Hint & Sol.: Specific resistance of wire is independent of dimension; it depends on nature of material.

17. Answer (3)

Hint: Use, $I_{avg} = \frac{\int I dt}{\int dt}$

Sol.: $I = 2t + 3t^2$

$dq = (2t + 3t^2)dt$

$$I_{avg} = \frac{\int dq}{\int dt}$$

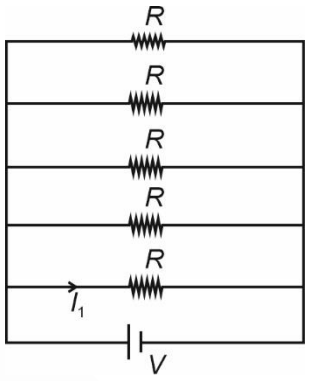
$$= \frac{\int (2t + 3t^2)dt}{\int dt}$$

$$= \left[\frac{t^2 + t^3}{2}\right]_0^2 = 6 \text{ A}$$

18. Answer (1)

Hint: Use KVL

Sol.:



$I_1 = \frac{V}{R}$

19. Answer (1)

Hint: Equivalent emf $E_{eff} = \left(\frac{\frac{E_1}{r_1} + \frac{E_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}}\right)$

Sol.: $E_{eff} = \frac{\frac{10}{2} + \frac{10}{2}}{\frac{1}{2} + \frac{1}{2}}$

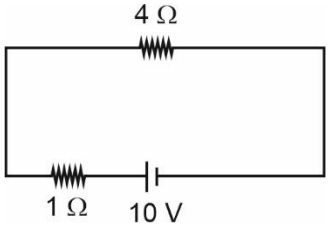
$E_{eff} = 10$ V

$r_{eff} = \frac{r_1 r_2}{r_1 + r_2}$

$= \frac{2 \times 2}{2 + 2} = 1\ \Omega$

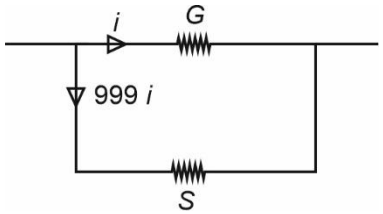
$I = \frac{10}{5}$

= 2 A



20. Answer (1)

Hint & Sol.:



$iG = 999iS$

$S = \frac{G}{999}$

21. Answer (2)

Hint: Use, $B = \left(\frac{\mu_0 i}{2r}\right)$

Sol.: $i = \frac{2q}{T}$

$T = \left(\frac{2\pi r}{v}\right)$

$i = \frac{2q}{\left(\frac{2\pi r}{v}\right)} = \left(\frac{qv}{\pi r}\right)$

$B = \frac{\mu_0 qv}{2\pi r^2}$

22. Answer (4)

Hint: $\oint \vec{B} \cdot \vec{dl} = \mu_0 I_{enc}$

Sol.: I_{enc} =5 + 4 – 1

= 8 A

$\oint \vec{B} \cdot \vec{dl} = \mu_0 I_{enc}$

$= 8\mu_0$

23. Answer (3)

Hint: $F_m = \int (i\vec{dl} \times \vec{B})$

Sol.: For closed loop $\oint \vec{dl} = 0$

$\therefore$ Magnetic force on a current carrying closed loop will be zero in a uniform magnetic field.

24. Answer (4)

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

Sol.: $M = NIA$

$= 10^3 \times 5 \times 10^{-3} \times 200 \times 10^{-4}$

$= \frac{1}{10}$

$\tau = MB\sin 30°$

$= \frac{1}{10} \times 10^{-3} \times \frac{1}{2}$

$= 5 \times 10^{-5}$ N m

25. Answer (1)

Hint: Time period of charged particle, $T = \frac{2\pi m}{qB}$

Sol.: $T = \frac{2\pi m}{qB} \Rightarrow t = \frac{T}{4} \Rightarrow \vec{v}_i = v\hat{i}$

$\vec{v}_f = v\hat{j}$

$\overrightarrow{\Delta v} = v\hat{j} - v\hat{i}$

$|\Delta \vec{v}| = \sqrt{2}\, v$

26. Answer (3)

Hint: Use, $B = \left(\frac{\mu_0 I}{2R}\right) \times \frac{\phi}{2\pi}$

Sol.: Here $\phi = 2\pi - \frac{\pi}{2} = \left(\frac{3\pi}{2}\right)$

$B = \frac{\mu_0 i}{2R} \times \frac{3\pi}{4\pi} = \left(\frac{3\mu_0 i}{8R}\right)$

27. Answer (2)

Hint & Sol.: $T = \frac{2\pi m}{qB}$

$\vec{F} = q(\vec{v} \times \vec{B})$ and this magnetic force provides necessary centripetal acceleration.

28. Answer (1)

Hint & Sol.: Dipole moment of a current carrying loop = NiA

It is independent of magnetic field in which it is placed.

29. Answer (4)

Hint: Magnetic field due to current carrying infinite wire at perpendicular distance r is $B = \frac{\mu_0 i}{2\pi r}$

Sol.: $B_{net} = B_1 - B_2$

$B_1 = \frac{\mu_0 i}{2\pi\left(\frac{d}{2}\right)}$

$B_1 = \left(\frac{\mu_0 i}{\pi d}\right)$

$B_2 = \frac{2\mu_0 i}{2\pi \frac{d}{2}}$

$B_{net} = \left|\frac{\mu_0 i}{\pi d} - \frac{2\mu_0 i}{\pi d}\right| = \frac{\mu_0 I}{\pi d} = 15$ tesla (given)

When 2nd wire current (4 A) is switched off

$\vec{B} = \frac{\mu_0 I}{\pi d} = 15$ tesla $\otimes$

30. Answer (2)

Hint: $U = -\vec{M} \cdot \vec{B}$

Sol.: $\vec{M} = \pi R^2 I(-\vec{k})$

$\vec{B} = -B\,\vec{k}$

$U = -\pi R^2 I(-\vec{k}) \cdot (-\vec{k})$

$= -\pi R^2 IB$

31. Answer (4)

Hint & Sol.: If $E \neq 0, B = 0$ then proton must accelerate and in all other conditions proton may have zero acceleration.

32. Answer (2)

Hint: Magnetization (I) = $\chi_m H$

Sol.: $H = ni \Rightarrow I = \chi_m \times n \times i$

$\Rightarrow I = 2.3 \times 10^{-5} \times 40 \times 10^2 \times 2$

$\Rightarrow I = 8 \times 2.3 \times 10^{-2}$

$\Rightarrow I =$ 0.184 A/m

33. Answer (2)

Hint: Use, $\vec{\tau} = \vec{M} \times \vec{B}$

Sol.: $\vec{\tau} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & 0 \\ 1 & 2 & 1 \end{vmatrix}$

$= \hat{i}(1-0) - \hat{j}(2-0) + \hat{k}(4-1)$

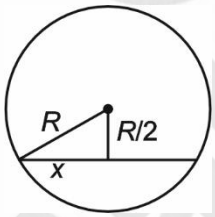
$= (\hat{i} - 2\hat{j} + 3\hat{k})$

34. Answer (2)

Hint: Use the concept of motional emf

Sol.: We know that, $\varepsilon = BLv$

$v = \sqrt{2 \times a \times \frac{R}{2}} = \sqrt{aR}$



$\Rightarrow x = \sqrt{R^2 - \frac{R^2}{4}} = \frac{\sqrt{3}\,R}{2}$

$\Rightarrow L = 2\alpha = \sqrt{3}\,R$

$\varepsilon = B \times \sqrt{3}\,R \times \sqrt{aR} = \sqrt{3a}B(R)^{3/2}$

35. Answer (4)

Hint: Use, $B_{axial} = \frac{2\mu_0 M}{4\pi r^3}$

Sol.: $B_{axial} = \frac{10^{-7} \times 2 \times 400}{2^3}$

= 10^{-5} T

36. Answer (3)

Hint & Sol.: A ferromagnetic material is placed in an external magnetic field. The magnetic domains may increase or decrease in size.

37. Answer (2)

Hint: Relative permeability $\mu_r = \frac{\mu}{\mu_0}$

Sol.: $\mu_r = \frac{3\pi \times 10^{-4}}{4\pi \times 10^{-7}}$

= 0.75 × 10^3

= 750

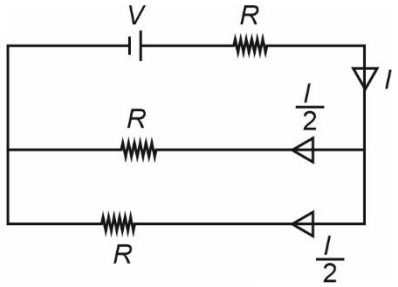
$\chi = \mu_r - 1$

= 749

38. Answer (3)

Hint: In steady state inductor becomes short-circuited.

Sol.:



$i = \frac{V}{R_{eff}} = \frac{V}{\frac{3R}{2}}$

$i = \left(\frac{2V}{3R}\right)$

Current through inductor = $\frac{i}{2}$

$U = \frac{1}{2}Li^2 = \frac{1}{2}L\left(\frac{V}{3R}\right)^2 = \left(\frac{LV^2}{18R^2}\right)$

39. Answer (1)

Hint & Sol.: Self inductance is inertia of electricity. Self inductance and mutual inductance have same unit.

40. Answer (4)

Hint: Self inductance of solenoid $L = \mu_0 n^2 Al$

Sol.: $L_1 = \mu_0 \left(\frac{n}{2}\right)^2 A\left(\frac{l}{2}\right)$

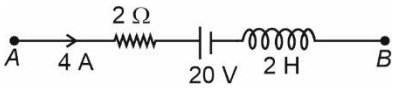
$L_1 = \frac{\mu_0 n^2 Al}{8}$

$L_1 = \frac{1}{8} \times L$

41. Answer (3)

Hint: Voltage across inductor $V_L = -L\frac{di}{dt}$

Sol.:



$V_A - V_B = 8 + 20 + 2 \times 2$

= 32 V

42. Answer (2)

Hint & Sol.: $M = k\sqrt{L_1 L_2}$

For maximum value of M, $k = 1$

$M = \sqrt{L_1 L_2}$

$6 = \sqrt{9 \times L_2}$

$36 = 9 \times L_2$

$L_2 = 4$ H

43. Answer (2)

Hint: Induced emf $\varepsilon = -\frac{d\phi}{dt}$

Sol.: $\varepsilon = -\frac{d\phi}{dt}(4t^2 - 2t)$

$\varepsilon = -8t + 2$

$\varepsilon_{t=2} = -14$

$i = \frac{|\varepsilon|}{R} = \frac{14}{2} = 7$ A

44. Answer (1)

Hint & Sol.:

The induced emf is expected to be constant only in case of rectangular loop. In case of circular loop, the rate of change of area of the loop during its passage out of the field region is not constant, hence induced emf will vary accordingly.

45. Answer (1)

Hint: Use, $\phi = MI = \vec{B} \cdot \vec{A}$

Sol.: $\phi = BA\cos\theta$

$= \frac{\mu_0 i}{2r} \times l^2 \cos 60^\circ$

$= \frac{\mu_0 i \cdot l^2}{4r}$

$\Rightarrow Mi = \frac{\mu_0 i\, l^2}{4r}$

$M = \frac{\mu_0 l^2}{4r}$

[CHEMISTRY]

46. Answer (2)

Hint: The primary valences ae normally ionisable

Sol.:

$$NiCl_2 \cdot 6H_2O + \underset{\text{(excess)}}{AgNO_3} \rightarrow [Ni(H_2O)_6]^{2+} + 2AgCl\downarrow$$

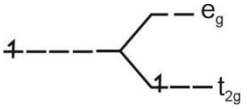
$$CoCl_3 \cdot 4NH_3 + \underset{\text{(excess)}}{AgNO_3} \rightarrow [Co(NH_3)_4Cl_2] + AgCl$$

$$CoCl_3 \cdot 6NH_3 + \underset{\text{(excess)}}{AgNO_3} \rightarrow [Co(NH_3)_6]^{3+} + 3AgCl$$

47. Answer (1)

Hint & Sol.: $[Ti(H_2O)_6]^{3+}$

$Ti^{3+} \Rightarrow [Ar]4s^0 3d^1$



It is violet in colour due to t_{2g} to e_g e^- transition.

48. Answer (3)

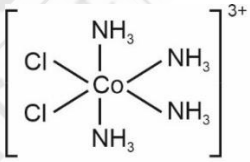
Hint: Ligand which can ligate through two different atom but at a time it can ligate by only one atom is called ambidentate ligand.

Sol.: NO_2^- ion and SCN^- ion can coordinate either through nitrogen or through oxygen to a central metal atom/ion.

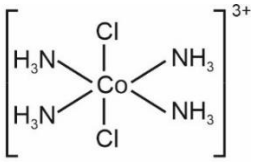
49. Answer (3)

Hint: Complexes in which a metal is bound to only one kind of donor groups are known as homoleptic complex.

Sol.: $[Co(NH_3)_6]^{3+}$ does not show geometrical isomerism.



cis-isomer



trans-isomer

50. Answer (4)

Hint & Sol.: The correct IUPAC name is Dichloridobis(ethane-1, 2-diamine) cobalt (III)

51. Answer (3)

Hint: [Mabcd] type square planar complex show geometrical isomerism.

Sol.:

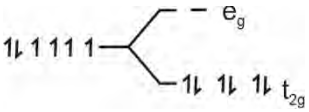
$[Pt(Cl)(NO_2)(NO_3)(SCN)]^{2-}$ show 12 possible isomers

- $[Pt(Cl)(ONO)(NO_3)(SCN)]^{2-}$ — 3 isomers
- $[Pt(Cl)(NO_2)(NO_3)(SCN)]^{2-}$ — 3 isomers
- $[Pt(Cl)(NO_2)(NO_3)(NCS)]^{2-}$ — 3 isomers
- $[Pt(Cl)(ONO)(NO_3)(NCS)]^{2-}$ — 3 isomers

52. Answer (2)

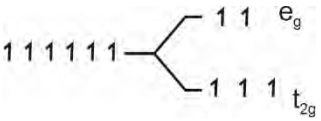
Hint: Water ligand with Co^{3+} act as strong field ligand.

Sol.: In $[Co(H_2O)_6]^{3+}$



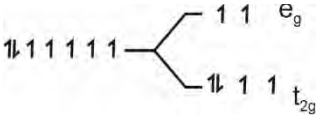
In $[FeF_6]^{3-}$

$Fe^{3+} \Rightarrow [Ar]4s^0 3d^5$



In $[CoF_6]^{3-}$

$Co^{3+} \Rightarrow [Ar]4s^0 3d^6$



53. Answer (3)

Hint: For a given metal cation, stronger is the ligand field, higher is the value of Δ_0, lesser is the wavelength of light absorbed.

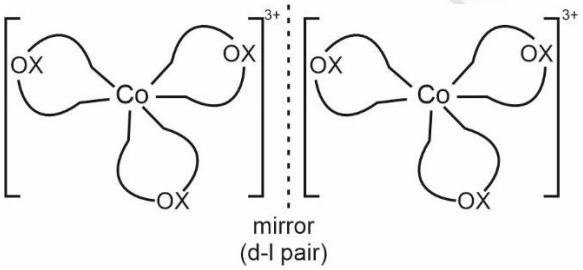
Sol.:

Coordination entity	Wavelength of light absorbed (nm)
$[CoCl(NH_3)_5]^{2+}$	535
$[Co(NH_3)_5(H_2O)]^{3+}$	500
$[Co(CN)_6]^{3-}$	310

54. Answer (1)

Hint: $C_2O_4^{2-}$ (oxalate) ligand is strong field ligand. while Cl^- is weak field ligand.

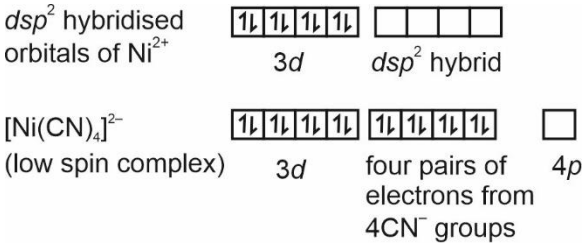
Sol.: In $[Co(C_2O_4)_3]^{3-}$ cobalt has d^2sp^3 hybridisation.



55. Answer (4)

Hint: $[Ni(CN)_4]^{2-}$ has dsp^2 hybridisation.

Sol.:



56. Answer (1)

Hint & Sol.: The correct order of increasing field strength of ligands in spectrochemical series is

$edta^{4-} < en < CN^- < CO$

57. Answer (3)

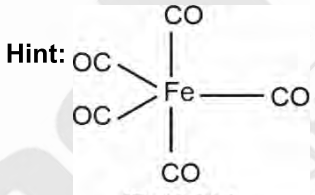
Hint: In metal carbonyls, M $\rightarrow$ ligand back bonding increases, C – O bond length also increases.

Sol.: The correct decreasing C – O bond length order is

$[Ti(CO)_4]^{2-} > [V(CO)_6]^- > [Cr(CO)_6] > [Mn(CO)_6]^+$

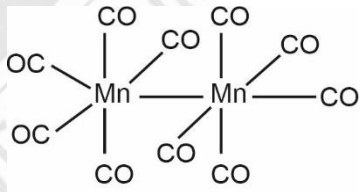
58. Answer (2)

Hint:

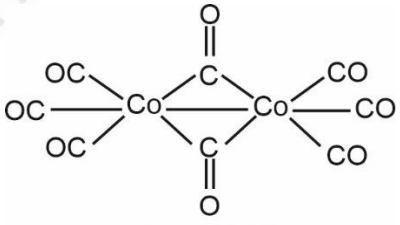


$[Fe(CO)_5]$

Sol.:



$[Mn_2(CO)_{10}]$

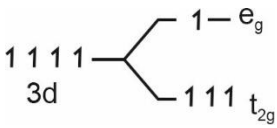


$[Co_2(CO)_8]$

59. Answer (1)

Hint: In $[Mn(Cl)_6]^{3-}$

$Mn^{3+} \Rightarrow [Ar]4s^0 3d^4$



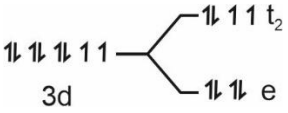
Crystal field stabilization energy (CFSE)

$= -0.4\ \Delta_0 \times 3 + 0.6\ \Delta_0 \times 1 = -0.6\ \Delta_0$

60. Answer (4)

Hint & Sol.: In $[NiCl_4]^{2-}$

$Ni^{2+} \Rightarrow [Ar]4s^0 3d^8$



61. Answer (1)

Hint: Linkage isomerism arises in a coordination compound containing ambidentate ligand.

Sol.: The coordination number of a metal ion in a complex is defined as the number of ligand donor atoms to which the metal is directly bonded.

62. Answer (4)

Hint: Vitamin B_{12} is also known as cyanocobalamine

Sol.:

Vitamin B_{12}	–	Cobalt
Haemoglobin	–	Iron
Chlorophyll	–	Magnesium
Wilkinson catalyst	–	Rhodium

63. Answer (1)

Hint: Spin only magnetic moment (μ) $= \sqrt{n(n+2)}$ BM

n = Number of unpaired electron(s).

Sol.: $Ti^{3+} \Rightarrow [Ar]3d^1$

$Mn^{3+} \Rightarrow [Ar]3d^4$

$Fe^{3+} \Rightarrow [Ar]3d^5$

$Co^{2+} \Rightarrow [Ar]3d^7$

64. Answer (3)

Hint: Enthalpy of atomisation depends upon the types of structure and metallic bond strength.

Sol.:

Element	Heat of atomisation/(kJ mol^{-1})
Sc	326
Ti	473
V	515
Cr	397

65. Answer (3)

Hint: Generally, there is an increase in ionisation enthalpy along each series of the transition elements from left to right.

Sol.:

Element	First ionisation enthalpy (kJ mol^{-1})
Cr	653
Mn	717
Fe	762
Co	758

66. Answer (2)

Hint: Scandium does not show variable oxidation states.

Sol.:

	$\Delta_{hyd}H^{\ominus}$
Mn^{2+}	-1862 (kJmol^{-1})

CrO is basic while Cr_2O_3 is amphoteric.

Brass is an alloy of copper and zinc.

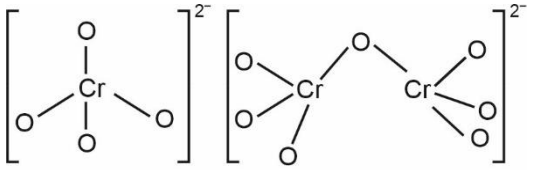
67. Answer (4)

Hint: Zinc atom has completely filled *d* orbitals ($3d^{10}$) in its ground state as well as in its oxidised state, hence it is not regarded as a transition element.

Sol.: $E^{\ominus}$ value for the Mn^{3+}/Mn^{2+} couple is more positive than that of Cr^{3+}/Cr^{2+} because Mn has much larger third ionisation enthalpy than the Cr.

68. Answer (1)

Hint:



Chromate ion (Yellow) Dichromate ion (Orange)

Sol.: Sodium dichromate is more soluble than potassium dichromate due to more hydration energy of sodium ion.

69. Answer (1)

Hint & Sol.: Permanganate titration is unsatisfactory if performed in presence of hydrochloric acid because hydrochloric acid is oxidised to chlorine.

70. Answer (4)

Hint & Sol.: The correct order of oxidising power is $MnO_4^- > Cr_2O_7^{2-} > VO_2^+$

71. Answer (2)

Hint: Interstitial compounds are those which are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

Sol.: They have high melting points, higher than those of pure metals.

72. Answer (3)

Hint: MnO_4^{2-} is manganate ion whereas MnO_4^- is permanganate ion.

Sol.: $MnO_2 \xrightarrow[\text{Oxidised with air}]{\text{Fused with KOH,}} MnO_4^{2-}$

$MnO_4^{2-} \xrightarrow[\text{Alkaline solution}]{\text{Electrolytic oxidation in}} MnO_4^-$

73. Answer (1)

Hint: Neptunium and Thorium are actinoids whereas Terbium and Lutetium are lanthanoids.

Sol.: • $Lu^{3+} \Rightarrow [Xe]4f^{14}$ does not have unpaired electrons so it is colourless.

• Pr, Nd, Tb and Dy also exhibit +4 oxidation state but only in oxides.

• Thorium show only +4 oxidation state.

• Neptunium show +3 to +7 oxidation states.

74. Answer (1)

Hint: La^{3+} electronic configuration = $[Xe]5d^06s^0$

Lu^{3+} electronic configuration = $[Xe]4f^{14}5d^0$

Sol.: Mischmetal consists of a lanthanoid metal (~95%) and iron (~5%) and traces of S, C, Ca and Al.

$Ce(OH)_3$ is more basic than $Tm(OH)_3$.

75. Answer (3)

Hint: Curium is an actinoid.

Sol.: The correct electronic configuration of curium is $[Rn]5f^76d^17s^2$

76. Answer (1)

Hint & Sol.: Due to lanthanoid contraction ionic radii from lanthanum to lutetium decreases and Zr and Hf have almost identical radii.

77. Answer (3)

Hint: $r = \frac{1}{3}\frac{d[Br_2]}{dt} = \frac{-1}{5}\frac{d[Br^-]}{dt}$

Sol.: $\frac{5}{3} \times 0.6 = -\frac{d[Br^-]}{dt}$

$-\frac{d[Br^-]}{dt} = 1.0 \text{ mol } L^{-1} s^{-1}$

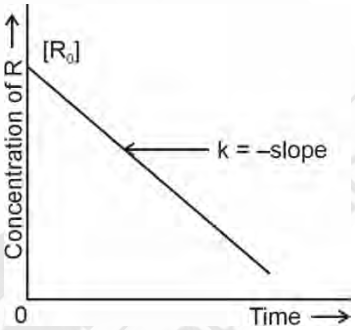
78. Answer (1)

Hint: The decomposition of gaseous ammonia on a hot platinum surface is a zero-order reaction.

Sol.: For zero order reaction.

$[R] = [R]_0 - kt$

$t_{1/2} = \frac{a_0}{2k}$



79. Answer (1)

Hint: Slowest step is rate determining step.

$r = k[A][B_2]$

Sol.: $K_c = \frac{[A]^2}{[A_2]}$

$[A] = K_c^{1/2}[A_2]^{1/2}$

$r = kK_c^{1/2}[A_2]^{1/2}[B_2]$

80. Answer (2)

Hint: Rate of reaction $\propto$ [concentration]^n

Sol.: When concentration of A is constant then rate of reaction becomes double

$\left(\frac{0.4}{1.6}\right)^n = \left(\frac{8 \times 10^{-2}}{16 \times 10^{-2}}\right)$

$\frac{1}{2} = \left(\frac{1}{4}\right)^n$

$(2)^{-1} = (2)^{-2n}$

n = 0.5 with respect to [B]

When concentration of B is constant when rate of reaction becomes double.

$$\left(\frac{0.2}{0.4}\right)^n = \left(\frac{4\times10^{-2}}{8\times10^{-2}}\right)$$

$$\left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)$$

n = 1 with respect to [A]

81. Answer (2)

Hint: $\ln k = \ln A - \frac{E_a}{RT}$

slope = $-\frac{E_a}{R}$ and intercept = lnA

Sol.: slope = $-\frac{E_a}{R}$

$-\frac{E_a}{R} = -2\times10^2$

$E_a = 2\times10^2\times8.314$

$= 1.662$ kJ mol^{-1}

82. Answer (2)

Hint: $t = \frac{2.303}{k}\log\frac{[A]_0}{[A]_t}$

Sol.: $t_{90\%} = \frac{2.303}{k}\log\frac{100}{10} \Rightarrow \frac{2.303}{k}$

$t_{99.9\%} = \frac{2.303}{k}\log\frac{100}{0.1} \Rightarrow \frac{3\times2.303}{k}$

$\frac{t_{90\%}}{t_{99.9\%}} = \frac{\frac{2.303}{k}}{\frac{2.303\times3}{k}} = 1:3$

83. Answer (3)

Hint: $\frac{k_2}{k_1} = (\mu)^{\frac{\Delta T}{10}}$

Sol.: $\frac{k_2}{k_1} = (2)^{\frac{60}{10}}$

$k_2 = 64\, k_1$

84. Answer (4)

Hint: $\log\frac{k_2}{k_1} = \frac{E_a}{2.303\,R}\left[\frac{1}{T_1}-\frac{1}{T_2}\right]$

Sol.: $\log\frac{2k_1}{k_1} = \frac{E_a}{2.303\times8.314}\left[\frac{1}{283}-\frac{1}{298}\right]$

$E_a = 32.4$ kJ mol^{-1}

85. Answer (4)

Hint: According to collision theory of chemical reactions,

Rate of reaction (Rate) = $Z_{AB}e^{-E_a/RT}$

Sol.: $\Rightarrow$ For bimolecular elementary reaction,

A + B $\rightarrow$ Products

Rate of reaction each be expressed as:

Rate = $Z_{AB}e^{-E_a/RT}$

AB represents the collision frequency of reactants, A and B.

$\Rightarrow$ Catalyst catalyses the spontaneous reaction but does not catalyse non-spontaneous reactions.

$\Rightarrow$ $\underset{\text{(Cane sugar)}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{(Glucose)}}{C_6H_{12}O_6} + \underset{\text{(Fructose)}}{C_6H_{12}O_6}$

Rate = k[$C_{12}H_{22}O_{11}$]

86. Answer (1)

Hint: $t_{1/2} = \frac{0.693}{k}$

Sol.: $k = \frac{0.693}{69.3}$

$\Rightarrow 10^{-2}$

$t = \frac{2.303}{10^{-2}}\log\frac{0.4}{0.1}$

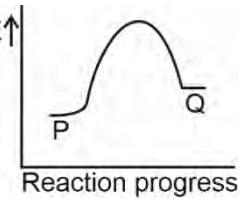
$= 2.303\times100\times2\times0.3010$

$= 138.6$ s

87. Answer (1)

Hint: For endothermic reaction, ΔH = +ve

Sol.:



88. Answer (2)

Hint: For zero order reaction

x = kt

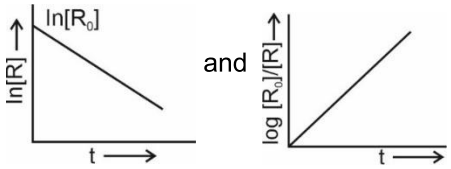
Sol.: $k = \frac{40}{20} \Rightarrow 2$ mol L^{-1}s^{-1}

$t_{1/2} = \frac{[A_0]}{2k} = \frac{100}{2\times2} = 25$ s

89. Answer (3)

Hint: For first order reaction

$r = k[R_0]$

Sol.: 

are first order graphs

90. Answer (3)

Hint & Sol.: $2N_2O_5(g) \longrightarrow 2N_2O_4(g) + O_2(g)$

t = 0	0.2	0	0
t = 100	0.2 – 2x	2x	x

$P_t = 0.2 - 2x + 2x + x$

$0.22 = 0.2 + x$

$x = 0.02$

$P_{N_2O_5} = 0.2 - 2 \times 0.02$

$0.2 - 0.04$

$= 0.16$ atm

$$k = \frac{2.303}{100}\log\frac{0.2}{0.16}$$

$$= \frac{2.303}{100}\log\frac{5}{4}$$

$$= \frac{2.303}{100}[\log 5 - 2\log 2]$$

$$= \frac{2.303}{100} \times 0.097$$

$k = 0.22 \times 10^{-2}$

$= 2.2 \times 10^{-3}\ s^{-1}$

[BOTANY]

91. Answer (1)

Hint: PCR was developed by Carry Mullis.

Sol.: Sanger is credited with developing the method of DNA and amino acid sequencing.

92. Answer (1)

Hint: RNA is the genetic material in some viruses.

Sol.: QB bacteriophage has RNA as the genetic material.

93. Answer (1)

Hint: This pedigree shows the inheritance pattern of X-linked dominant, autosomal dominant and autosomal recessive traits.

Sol.: In the given pedigree both parents cannot be homozygous, one of them will be heterozygous. Cystic fibrosis is an autosomal recessive disorder thus; homozygous recessive individuals will be affected from the disorder but II-3 and II-4 are unaffected.

94. Answer (1)

Hint: If promoter sequence of the gene is unable to bind to RNA polymerase it will inhibit the transcription of that specific gene.

Sol.: As the promotor sequence of regulatory gene is mutated in such a way that it is not able to bind to RNA polymerase, its transcription won't take place. Thus, no repressor molecule will be available to regulate the expression of structural genes. This leads to the constitutive expression of structural genes and thereby allowing the rapid catabolism of lactose in the cell from the surrounding medium.

95. Answer (2)

Hint: HGP was closely associate with the rapid development of a new area in biology called bioinformatics.

Sol.: *Caenorhabditis elegans* is a free-living non-pathogenic nematode.

96. Answer (1)

Hint: DNA polymorphisms are inheritable and arise due to mutation.

Sol.: As the DNA polymorphisms are inheritable from parents to children, DNA fingerprinting is the basis of paternity testing, in case of disputes.

97. Answer (1)

Hint: During HGP, scientists have identified about 1.4 million locations where single-base DNA differences (SNPs–single nucleotide polymorphism) occur in humans.

Sol.: UTRs are required for efficient translation process. All the genes that are expressed as RNA are referred to as ESTs. The packaging of chromatin at higher level requires additional set of proteins that collectively are referred to as non-histone chromosomal (NHC) proteins.

98. Answer (2)

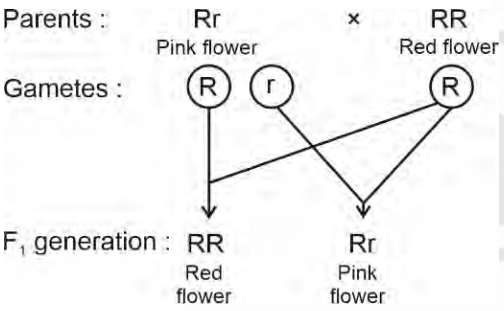
Hint: If more than one variant (allele) at a locus occurs in human population with a frequency greater than 0.01, then it is referred to as DNA polymorphism.

Sol.: If an inheritable mutation is observed in a population at high frequency, it is referred to as DNA polymorphism. Inheritance of a character is not only affected by the sequence of structural genes but also affected by promoter and regulatory sequence of a structural gene.

99. Answer (4)

Hint: Flower colour in snapdragon exhibits incomplete dominance.

Sol.:



100. Answer (2)

Sol.: When a single gene exhibits multiple phenotypic expressions such a gene is called a pleiotropic gene.

101. Answer (4)

Hint: DNA fingerprinting technique was developed by Alec Jeffreys that begins with DNA isolation.

Sol.: The technique of DNA fingerprinting includes

(i) Isolation of DNA

(ii) Digestion of DNA by restriction endonucleases

(iii) Separation of DNA fragments by electrophoresis

(iv) Transferring (blotting) of separated DNA fragments to synthetic membranes.

(v) Hybridisation using labelled VNTR probe

(vi) Detection of hybridised DNA fragments by autoradiography.

102. Answer (2)

Hint: In 1900, de Vries, Correns and von Tschermak independently rediscovered Mendel's results on the inheritance of characters.

Sol.: Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and 'mapped' their position on the chromosome. T.H. Morgan coined the term linkage to describe this physical association of genes on a chromosome. Henking could trace a specific nuclear structure all through spermatogenesis in a few insects.

103. Answer (3)

Hint: Taylor and colleagues used a eukaryotic organism as their experimental organism.

Sol.: Matthew Meselson and Franklin Stahl used *Escherichia coli* to propose semi conservative mode of DNA replication. Taylor and colleagues performed experiments on *Vicia faba* to prove that the DNA in chromosomes also replicate semi conservatively.

104. Answer (1)

Hint: σ factor helps in initiating DNA transcription in prokaryotes.

Sol.: In a transcription unit, the terminator is located towards 3′–end (downstream) of the coding strand.

105. Answer (1)

Hint: Repetitive sequences make up very large portion of the human genome.

Sol.: Repetitive sequences are thought to have no direct coding functions, but they shed light on chromosome structure, dynamics and evolution.

106. Answer (2)

Hint: It is an autosome.

Sol.: According to human genome project, chromosome 1 has most genes (2968), and the Y has the fewest (231)

107. Answer (1)

Hint: hnRNA undergoes splicing to form mRNA.

Sol.: Transcription produces hnRNA that requires splicing to form mRNA. Only replication uses both strands of DNA as template.

108. Answer (1)

Hint: James Watson and Francis Crick proposed double helix model for the structure of DNA.

Sol.: Erwin Chargaff proposed that for a dsDNA, the ratios between adenine and thymine and guanine and cytosine are constant. Rest all are the contributions of Francis Crick.

109. Answer (3)

Hint: A translational unit in mRNA is the sequence of RNA that is flanked by the start codon and the stop codon.

Sol.: DNA → 3′–TAC GCG GTT TGA CTG TGC ATC – 5′

RNA → 5′ AUG CGC CAA ACU GAC ACG UAG – 3′

Protein → Met Arg Gln Thr Asp Thr Stop

110. Answer (2)

Hint: Mendel's work only suggested that factors were discrete units.

Sol.: Mendel's could not provide any physical proof for the existence of factors or say what they were made of. Law of segregation is based on the fact that the alleles do not show any blending.

111. Answer (3)

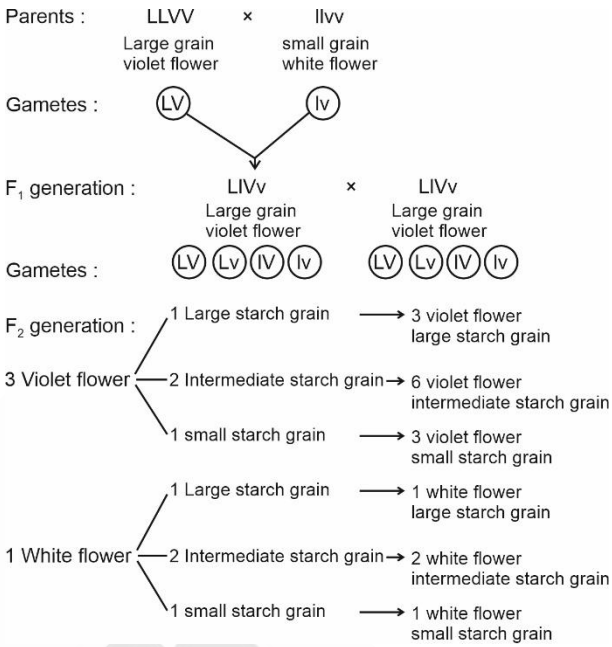
Hint: Alteration in chromosomes results in aberrations.

Sol.: One DNA helix runs continuously from one end to the other in each chromatid in a highly supercoiled form. Therefore, loss or gain of a segment of DNA, result in alteration in chromosome.

112. Answer (4)

Hint: In pea plant, starch grain size inheritance shows incomplete dominance and flower colour inheritance shows complete dominance.

Sol.:



113. Answer (3)

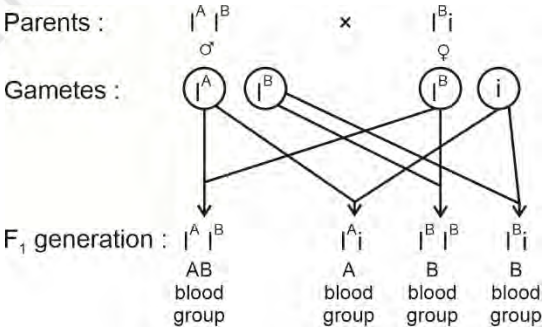
Hint: Thalassemia is caused due to reduced rate of synthesis of one of the globin chains.

Sol.: Thalassemia differs from sickle-cell anaemia in that the former is a quantitative problem of synthesising too few globin molecules while the latter is a qualitative problem of synthesising an incorrectly functioning globin.

114. Answer (4)

Hint: The mother will be having the genotype I^Bi.

Sol.:



115. Answer (4)

Hint: A gene is defined as the functional unit of inheritance.

Sol.: In eukaryotes, the monocistronic structural genes have interrupted coding sequences because the genes in eukaryotes are split.

116. Answer (4)

Hint: The law states that 'when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters.'

Sol.: Law of independent assortment is derived from dihybrid cross.

117. Answer (3)

Hint: Adenine and guanine are purines.

Sol.: Purines are found in both DNA and RNA.

118. Answer (2)

Hint: T.H. Morgan used *Drosophila melanogaster* as the experimental organisms.

Sol.: *Drosophila melanogaster* shows life cycle of two weeks, clear differentiation of sexes, ability to grow on synthetic medium and also produce large number of progenies.

119. Answer (4)

Hint: Klinefelter's syndrome results into a karyotype of 47, XXY.

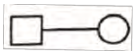
Sol.: Individual affected with Klinefelter's syndrome has overall masculine development, however, the feminine development (development of breast, i.e; Gynaecomastia) is also expressed.

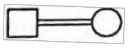
120. Answer (4)

Hint: This RNA is a constituent of ribosomes.

Sol.: rRNAs play structural and catalytic role during translation.

121. Answer (3)

Hint:  shows mating.

Sol.:  shows consanguineous mating.

122. Answer (1)

Hint: Recessive trait express itself only in homozygous condition in pea plant.

Sol.: Yellow pod colour express itself only in homozygous condition in pea plant.

123. Answer (2)

Hint: In honey bee, males are haploid while females are diploid.

Sol.: Male honeybees produce sperms by mitosis; they do not have father and thus cannot have sons. They are produced by means of parthenogenesis.

124. Answer (1)

Hint: In polygenic inheritance, the effect of each allele is additive.

Sol.: Human skin colour is a polygenic trait where the phenotype reflects the contribution of each allele.

125. Answer (4)

Hint: This disorder is autosome linked recessive blood disease.

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

126. Answer (1)

Hint: The given figure is the electron micrograph of chromatin showing beads on string structure.

Sol.: The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome. Nucleosome constitute the repeating unit of a structure in nucleus called chromatin, thread-like stained (coloured) bodies seen in nucleus.

127. Answer (2)

Hint: Stop codons do not have cognate tRNA.

Sol.: UAA, UAG and UGA are stop codons and thus they do not have cognate tRNA.

128. Answer (1)

Hint: This organism shows XX-XO type of sex determination.

Sol.: In grasshoppers, males have one less chromosome than females.

129. Answer (3)

Hint: Mendelian disorders are mainly determined by alteration or mutation in the single gene.

Sol.: Turner's syndrome is a chromosomal disorder.

130. Answer (2)

Hint: hnRNA is the precursor of mRNA.

Sol.: The RNA polymerase II transcribes precursor of mRNA, the hnRNA. hnRNA contains both exonic and intronic sequences. mRNA act as template molecule during translation. In bacteria, the mRNA does not require any processing to become active.

131. Answer (2)

Sol.: The human genome project was coordinated by the U.S. Department of Energy and the National Institute of Health. During the early years of the HGP, the Wellcome Trust (UK) became a major partner. The honours to Watson with Crick include the John Collins Warren Prize of the Massachusetts General Hospital in 1959.

132. Answer (2)

Hint: When the small subunit of ribosome encounters on mRNA, the process of translation begins.

Sol.: At the end, a release factor binds to the stop codon, terminating translation and releasing the complete polypeptide from the ribosome.

133. Answer (3)

Hint: This enzyme is also known as Severo Ochoa enzyme.

Sol.: Polynucleotide phosphorylase is helpful in polymerising RNA with defined sequence in a template independent manner.

134. Answer (1)

Hint: Pink flower colours in dog flower shows incomplete dominance.

Sol.: AB blood group in humans shows co-dominance

135. Answer (2)

Hint: hnRNA undergoes splicing to form mRNA.

Sol.: Capping, tailing and splicing are the post-transcriptional modifications.

[ZOOLOGY]

136. Answer (4)

Hint: Rod-like cylindrical structure that is placed under the skin

Sol.: Implants are hormone containing devices which are implanted subdermally through a small incision.

Vaults and cervical caps act as barrier contraceptives. These devices can be self-inserted by the users.

Saheli, a non-steroidal preparation, is once a week pill.

137. Answer (4)

Hint: Contraceptives should be able to avoid unwanted conception.

Sol.: Characteristics of an ideal contraceptive are:

(i) They should be user-friendly

(ii) They should be reversible

(iii) They should be easy available to the users

(iv) They should not have side effects

(v) They should be completely effective against pregnancy / conception.

138. Answer (4)

Hint: 'Nirodh' is a popular brand of condom.

Sol.: Condoms are categorised as barrier methods of contraception. Condoms can be used by both males and females.

Fem shield is a female condom.

Multiload-375 and progestasert are IUDs, which are inserted in the uterus to prevent conception.

Injectable contraceptives are used by females. These injectables contain progestin and estradiol derivatives that prevent ovulation and implantation.

139. Answer (3)

Hint: 20 years after the initiation of 'family planning' programmes in India.

Sol.: The Government of India legalised MTP in 1971 with some strict conditions to avoid its misuse.

The MTP (Amendment) act, 2017, was enacted by the Government of India with the intention of reducing the incidences of illegal abortion and consequent maternal mortality and morbidity.

In India, the 'family planning' programmes were initiated in 1951.

140. Answer (4)

Hint: Incidences of STIs are high among individuals belonging to age group of 15-24 years.

Sol.: Hepatitis-B, genital herpes and HIV infections are not curable, even if detected early and treated properly.

STIs like hepatitis-B and HIV infection can spread by sharing of injection needles, surgical instruments, *etc*., with an infected individual.

STIs primarily spread through sexual contact with an infected person.

Though all individuals are vulnerable to STIs, their incidences are reported to be very high among individuals in the age of 15-24 years.

141. Answer (4)

Hint: Equal to the number of false ribs

Sol.: In 2011, the world population was 7.2 billion whereas the population of India crossed 1.2 billion. Hence, former was six times than the latter.

142. Answer (3)

Hint: Look for the barrier method of contraception.

Sol.: Condoms, like Nirodh, are mechanical devices which prevent the deposition of sperms into the vagina.

Lactational amenorrhea is absence of menstruation. This is the period of intense lactation following parturition in which ovulation does not occur.

Tubectomy is a surgical method of contraception in which a portion of both the fallopian tube is removed or tied up to block the passage of ovum through them.

Saheli is a 'once a week' pill that inhibits implantation.

Basically, the other three methods do not create any physical barrier to prevent insemination in females.

143. Answer (3)

Hint: By the end of the first trimester, most of the major organ systems are formed in the foetus.

Sol.: According to the MTP amendment Act, 2017, a pregnancy may be terminated on certain considered grounds within the first 12 weeks of pregnancy on the opinion of one registered medical practitioner.

If the pregnancy has lasted 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 grounds exist.

The first movements of the foetus are usually observed during the fifth month of pregnancy.

144. Answer (4)

Hint: Female foeticide is a widespread menace in India.

Sol.: Amniocentesis involves withdrawing some of the amniotic fluid that bathes the developing foetus and analysing the foetal cells and dissolved substances.

It is a pre-natal diagnostic test.

This procedure is used to test for the presence of certain genetic disorders such as down syndrome, sickle cell anaemia, haemophilia (sex-linked disorder) *etc.*

In India, there is a statutory ban on amniocentesis for sex-determination to legally check the increasing menace of female foeticide.

145. Answer (3)

Hint: Assistance for infertile couples is available in our country, if they want to conceive.

Sol.: An overall improvement in reproductive health has taken place in our country as indicated by reduced maternal and infant mortality rates, early detection and cure of STIs, assistance to infertile couples, *etc*.

IUDs are contraceptive devices that prevent conception.

Assisted reproductive techniques (ARTs) have been developed to assist the infertile couples.

146. Answer (2)

Hint: Choose the natural method of contraception.

Sol.: Natural methods of contraception are least effective.

Periodic abstinence/Rhythm method is a natural method of contraception in which couples avoid or abstain from coitus from days 10 to 17 of the 28 days menstrual cycle, when ovulation is expected.

Vaults are barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through the cervix.

Multiload 375 is a copper-releasing IUD. It is more effective than the condoms.

Implants are considered to be the most effective method of contraception, with less than 1 per cent chances of failure.

147. Answer (3)

Hint: Medicated IUD

Sol.: Progestasert – This intrauterine device (IUD) releases progesterone, which thickens the cervical mucus and alters the uterine lining.

Steroidal Oral Contraceptive Pills (OCPs) – These primarily prevent ovulation by inhibiting follicle-stimulating hormone (FSH) and luteinizing hormone (LH).

LNG-20 (Levonorgestrel-releasing IUD) – This releases levonorgestrel, which thickens the cervical mucus, inhibits sperm motility, and prevents implantation by altering the uterine lining.

CuT (Copper releasing IUD) – Copper ions are toxic to sperms, preventing fertilization, but it does not block sperms from entering the urethra (which is part of the male reproductive system).

148. Answer (4)

Hint: Recall the structure which opens directly into the ejaculatory duct.

Sol.: In humans, the pathway of sperms is:

Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory ducts → Urethra

In a vasectomised individual, the transport of spermatozoa will be blocked from the vas deferens to ejaculatory duct because the procedure involves cutting and sealing of these tubes, preventing sperms from passing through them.

149. Answer (1)

Hint: Exclude Cu releasing IUD.

Sol.: Inert IUD or non-medicated IUD, like lippes loop, is made up of polyethylene impregnated with barium sulphate or stainless steel.

Multiload 375 is a copper releasing IUD.

Progestasert and LNG-20 are hormone releasing IUDs.

150. Answer (2)

Hint: He quoted the example of giraffe to explain his theory.

Sol.: Even before Darwin, a French naturalist Lamarck had said that evolution of life forms had occurred but driven by use and disuse of organs, which explains that muscular hypertrophy formed as a result of muscular exercise would be passed to the succeeding generations. He gave the example of giraffes who in an attempt to forage leaves on tall trees had to adapt by elongation of their necks.

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

Alfred Wallace, a naturalist who worked in Malay Archipelago, had also come to similar conclusions as Darwin around the same time.

The work of Thomas Malthus on populations influenced Darwin.

151. Answer (3)

Hint: Education and awareness play a key role in maintaining reproductive health.

Sol.: The popularity of different contraceptive methods can vary significantly based on factors like location (rural or urban), socio-economic status, education levels, and access to healthcare services.

Oral pills are very popular contraceptives among the urban women than the women living in rural areas.

A spontaneous abortion or miscarriage is the natural loss of a pregnancy.

The lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the menstrual cycle does not occur during the period of intense lactation following parturition. However, this method has been reported to be effective only upto a maximum period of six months following parturition.

The complete removal of gonads cannot be a contraceptive option because it will lead to infertility and the unavailability of certain hormones that are required for the normal functioning of accessory reproductive parts.

152. Answer (2)

Hint: Change in allele frequency due to random event

Sol.: The change in allele frequency due to a random event (such as a desert storm) affecting a small, isolated population is an example of genetic drift.

Genetic drift occurs when chance events randomly alter allele frequencies, especially in small populations, leading to a loss of genetic variation.

Founder effect → This is a type of genetic drift but occurs when a small group splits off to form a new population. Since the event here is a storm reducing population size rather than migration, this is not a founder effect.

Natural selection → Natural selection favors alleles that provide a survival or reproductive advantage. However, the storm is a random event, not a selective pressure based on traits.

Stabilizing selection → This favors the average phenotype and reduces variation, but the scenario describes a random reduction in population size, not selection for a specific trait.

153. Answer (2)

Hint: Its capital is Bhopal.

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

154. Answer (4)

Hint: Highly effective for longer periods

Sol.: IUDs have long-lasting effects and they are not replaced after every 6 months. Depending on the type, IUDs are replaced usually after 3-5 years.

IUDs are ideal contraceptives for the females who want to delay pregnancy and/or space children. It is one of the most widely accepted methods of contraception in India.

Emergency contraception, otherwise known as post-coital contraception, is the intervention that allows women to avoid unintended pregnancy after unprotected intercourse. IUDs are very effective, just as emergency contraceptives.

IUDs are made up of plastic, metal or a combination of the two.

155. Answer (2)

Hint: Infertile couples can be assisted through ART

Sol.: Contraceptives are not the regular requirements for the maintenance of reproductive health. They are practiced against a natural reproductive event, *i.e.,* conception/pregnancy.

The inability to conceive or produce children even after 2 years of unprotected sexual co-habitation is called infertility.

156. Answer (4)

Hint: One a week pill

Sol.: Saheli, the new oral contraceptive for the females, contains a non-steroidal preparation. It is a 'once-a-week' pill with very few side effects and high contraceptive value.

CDRI (Lucknow) took upon the task to develop this indigenous non-hormonal contraceptive pill.

It is a selective estrogen receptor modulator (SERM). It modulates the effect of estrogen to prevent implantation of the embryo and reduces thickness of endometrium.

157. Answer (4)

Hint: Choose a protozoan STI.

Sol.:

STIs	Causative pathogens
Chlamydiasis	*Chlamydia trachomatis* (bacteria)
Gonorrhoea	*Neisseria gonorrhoeae* (bacteria)
Syphilis	*Treponema pallidum* (bacteria)
Trichomoniasis	*Trichomonas vaginalis* (protozoa)

158. Answer (3)

Hint: Choose the method that involves *in vitro* fertilisation.

Sol.: Intra cytoplasmic sperm injection (ICSI) is a specialised procedure to form an embryo in the laboratory in which a sperm is directly injected into the ovum.

ZIFT–Zygote Intra Fallopian Transfer - The zygote or early embryos (with upto 8 blastomeres) is transferred into the fallopian tube.

IUT – Intra Uterine Transfer - Embryos with more than 8 blastomeres is transferred into the uterus to complete its further development.

GIFT – Gamete Intra Fallopian Transfer - Transfer of an ovum collected from a donor into the fallopian tube.

159. Answer (2)

Hint: Survival of the fittest

Sol.: Darwin's natural selection explains that individuals with traits that provide a survival advantage (brown coloration for better camouflage) are more likely to survive and reproduce, passing on their traits.

Mutations occur randomly, but they do not cause an individual to change during its lifetime.

Natural selection does not involve intentional elimination by individuals but rather survival differences due to environmental factors.

160. Answer (3)

Hint: Prolactin inhibits GnRH secretion.

Sol.: During lactational amenorrhea, elevated prolactin (protein hormone) levels can inhibit GnRH secretion from the hypothalamus. This leads to decreased levels of FSH and LH, which are essential for follicular development and ovulation. As a result, ovulation does not occur (anovulation), leading to infertility.

Complications of STIs include pelvic inflammatory diseases, abortions, still births, ectopic pregnancies, *etc.*

A tubal pregnancy is a type of ectopic pregnancy where the fertilized egg implants and grows inside the fallopian tube instead of the uterus.

161. Answer (3)

Hint: None of the factors should bring about a change in the genetic equilibrium

Sol.: The Hardy-Weinberg equilibrium remains stable only if five conditions are met:

1. No mutations
2. No natural selection
3. No gene flow (migration)
4. Large population size (no genetic drift)
5. Random mating

Selective predation introduces natural selection, which violates Hardy-Weinberg equilibrium by favouring certain alleles over others.

162. Answer (4)

Hint: Disruptive selection favors both extremes while selecting against the average.

Sol.: • If spiders with two distinct colour patterns survive better than those with an intermediate colour, it fits disruptive selection.

- Chihuahua breeding selects for smaller dogs, making this an example of directional selection.
- Tiger cubs that are too small may not survive, and those too large may cause complications during birth, so this is stabilizing selection.
- The development of antibiotic resistance is an example of directional selection, not disruptive selection.
- The resistant bacteria survive, while the susceptible ones die, causing a shift towards a population dominated by resistant bacteria.

163. Answer (2)

Hint: Variations provide the raw material for evolution

Sol.: Not all genetic changes lead to visible or functional differences in an organism.

Some nucleotide changes do affect function and fitness. Neutral mutations exist, but not all nucleotide variations are neutral.

Darwinian variations are small and directional.

164. Answer (1)

Hint: Right after the formation of Earth

Sol.: About 2000 mya, the first cellular forms of life appeared on Earth.

165. Answer (1)

Hint: Blockage of fallopian tubes will not allow natural conception

Sol.: Her bilateral tubal blockage prevents success of any *in vivo* fertilization method. IVF is the only ART method that can help her conceive using her own gametes.

IUT bypasses the blocked fallopian tubes by fertilizing the egg with sperm in a lab followed by the transfer of the resulting embryo directly into the uterus.

IUT (Intra Uterine Transfer) can be successful in this scenario as it involves transfer of embryo, with more than 8 blastomeres, into the uterus.

GIFT and IUI (Intra Uterine Insemination) require functional fallopian tubes, as fertilization occurs naturally within the body.

Artificial Insemination (AI) is essentially the same as IUI, where sperm is placed inside the uterus, but this method still depends on unblocked (normal) fallopian tubes for fertilization, making it ineffective in her case.

166. Answer (2)

Hint: Oparin and Haldane talked about the prebiotic soup.

Sol.: Conventional religious literature tells us about the theory of special creation. This theory has three connotations. One, that all living organisms (species or types) that we see today were created as such. Two, that the diversity was always the same since creation and will be the same in future also. Three, that Earth is about 4000 years old.

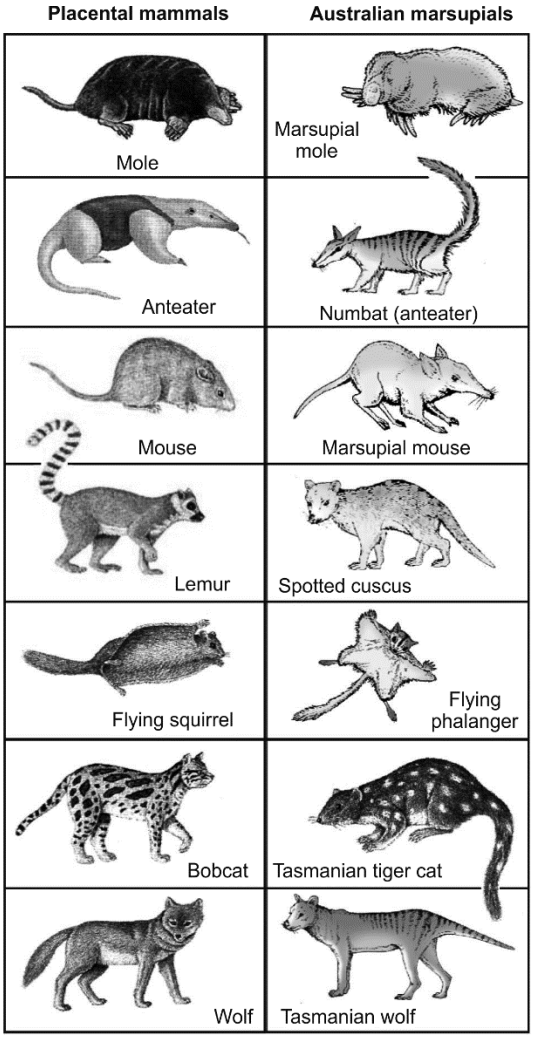
Louis Pasteur by careful experimentation demonstrated that life comes only from pre-existing life.

Oparin of Russia and Haldane of England proposed that the first form of life could have come from pre-existing non-living organic molecules and that formation of life was preceded by chemical evolution.

167. Answer (3)

Hint: Look for an Australian marsupial

Sol.:



168. Answer (2)

Hint: Fossils are studied to derive evolutionary relationship.

Sol.: A study of fossils in different sedimentary layers indicates the geological period in which they existed.

Different aged rock sediments contain fossils of different life forms who probably died during the formation of that particular sediment.

169. Answer (4)

Hint: Evolution of modern man is one of the interesting aspects of evolution.

Sol.: While human evolution involves adaptation and diversification, it's not an example of adaptive radiation, which is a rapid diversification of a single ancestral lineage into multiple species adapted to different ecological niches.

Descent with modification is supported by homologous structures, which are similar structures found in different species that originated from a common ancestor. These structures may have different functions in the different species, but their similar structure and development suggest a common origin.

170. Answer (1)

Hint: Converge towards one direction for performing similar type of function

Sol.: The eyes of the *Octopus* and that of mammals, represents analogous structures.

Analogous structures are not anatomically similar structures though they perform similar functions. Hence, analogous structures are a result of convergent evolution - different structures evolving for the same function and hence having similarity.

171. Answer (2)

Hint: Less than twice the number of ommatidia present in the eyes of a cockroach

Sol.: According to Hardy-Weinberg equilibrium :

$p^2 + q^2 + 2pq = 1$

- Total population = 14400
- Recessive phenotype (aa) = 3,600
- Since aa = q^2, we set up the equation:

$$q^2 = \frac{3,600}{14400} = \frac{1}{4}$$

$$q = \frac{1}{2} = 0.5$$

(Dominant allele frequency):

$p = 1 - 0.5 = 0.5$

Thus, heterozygote frequency (2pq) will be:

$2pq = 2 \times 0.5 \times 0.5 = 0.50$

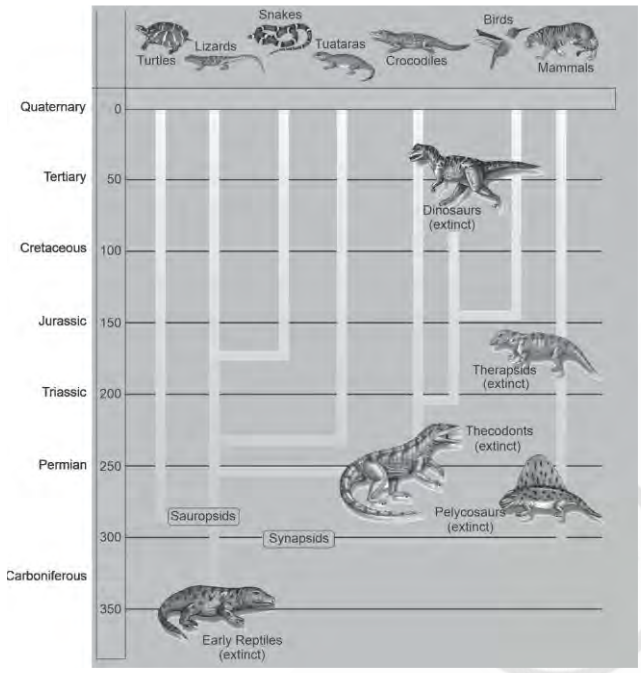
Finally, the number of heterozygous individuals:

$14400 \times 0.5 = 7200$

172. Answer (3)

Hint: Organisms with flight adaptions evolved from reptiles.

Sol.:



173. Answer (3)

Hint: The first ape man

Sol.: Two mya, *Australopithecines* probably lived in East African grasslands. Evidence shows they hunted with stone weapons but essentially ate fruits.

The cranial capacity of the modern *Homo sapiens* is 1350cc.

The cranial capacity of *Homo sapiens neanderthalensis* is 1400cc.

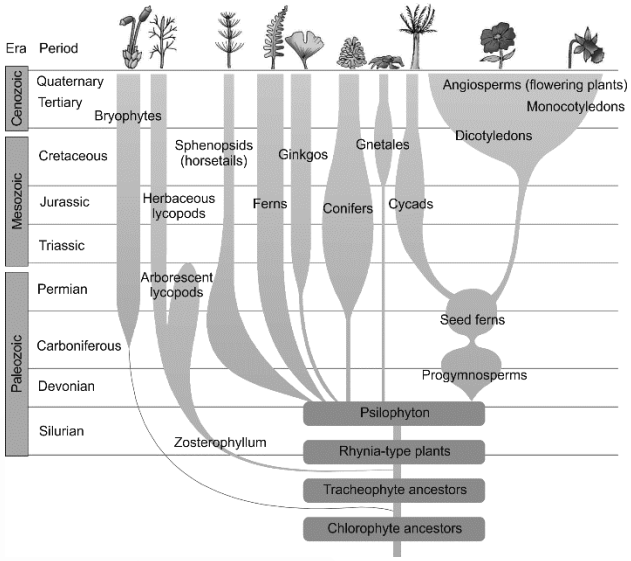
The cranial capacity of the *Homo habilis* is 650-800cc.

About 15 mya, primates called *Dryopithecus* and *Ramapithecus* were existing.

174. Answer (4)

Hint: Equal to the number of bones in pectoral girdle in human body.

Sol.:



175. Answer (4)

Hint: Finches diverged into multiple species, each specialized for its ecological niche.

Sol.: Darwin's finches are one of the most famous examples of adaptive radiation and natural selection, helping Charles Darwin's theory of evolution.

All species of Darwin's finches evolved from a single ancestral species that arrived from South America. Over time, they diverged into different species, each adapted to a specific type of food and habitat.

Finches with advantageous beak traits survived better, passed on genes, and over generations, populations evolved.

176. Answer (1)

Hint: Devoid of oxygen

Sol.: Miller's experiment (1953) was designed to test the chemical theory of evolution proposed by Oparin and Haldane, which suggested that life originated under reducing (not oxidizing) conditions on primitive Earth.

The spark discharge chamber (electrodes) simulated lightening, providing energy for chemical reactions.

After a few days, monomeric organic compounds such as amino acids (glycine, alanine, *etc.*) were detected, supporting the idea that life's building blocks could have formed naturally under early Earth conditions.

177. Answer (4)

Hint: Adaptive ability has a genetic basis.

Sol.: In the context of Darwinian evolution, fitness refers to an organism's ability to survive and reproduce in its environment.

Organisms with better adaptive traits have a higher likelihood of getting selected by nature, leading to evolution over generations.

Adaptive ability can be inherited if it is based on genetic variation.

While some temporary adaptations (e.g., acclimatization to climate) may be environmentally induced, evolutionary adaptations occur due to genetic changes that can be passed on.

178. Answer (3)

Hint: Exclude the one who gave the theory on population

Sol.: Hugo de Vries worked on evening primrose and gave the idea of mutation.

179. Answer (4)

Hint: First form of originated in water.

Sol.: The first cellular form of life did not possibly originate till about 2000 million years ago. These were probably single-cells. All life forms were in water environment only.

The earliest life forms on Earth were anaerobic and non-photosynthetic because the early Earth's atmosphere had no free oxygen (O_2) and was highly reducing (rich in gases like methane, ammonia and hydrogen).

These primitive organisms were likely chemoheterotrophs, meaning they obtained energy by breaking down organic molecules present in their environment.

180. Answer (3)

Hint: One of the traits was being favoured

Sol.: Industrial melanism in *Biston betularia* (peppered moths) is a classic example of natural selection influenced by human activity (anthropogenic action).

While the frequency of light-colored moths decreased during industrial pollution, they were never completely eliminated.

Industrial melanism is an example of directional selection, not disruptive selection.

The dark coloration was due to a pre-existing genetic variation that became advantageous under new environmental conditions. This was not caused by new mutations accumulating over generations, but rather by natural selection acting on existing variations.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2026

TEST - 2 (Code-B)

Click here for Code-A Sol.

Test Date : 05/10/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint: Use, $\phi = MI = \vec{B} \cdot \vec{A}$

Sol.: $\phi = BA\cos\theta$

$= \frac{\mu_0 i}{2r} \times l^2 \cos 60^\circ$

$= \frac{\mu_0 i \cdot l^2}{4r}$

$\Rightarrow Mi = \frac{\mu_0 i\, l^2}{4r}$

$M = \frac{\mu_0 l^2}{4r}$

2. Answer (1)

Hint & Sol.:

The induced emf is expected to be constant only in case of rectangular loop. In case of circular loop, the rate of change of area of the loop during its passage out of the field region is not constant, hence induced emf will vary accordingly.

3. Answer (2)

Hint: Induced emf $\varepsilon = -\frac{d\phi}{dt}$

Sol.: $\varepsilon = -\frac{d\phi}{dt}(4t^2 - 2t)$

$\varepsilon = -8t + 2$

$\varepsilon_{t=2} = -14$

$i = \frac{|\varepsilon|}{R} = \frac{14}{2} = 7$ A

4. Answer (2)

Hint & Sol.: $M = k\sqrt{L_1 L_2}$

For maximum value of M, $k = 1$

$M = \sqrt{L_1 L_2}$

$6 = \sqrt{9 \times L_2}$

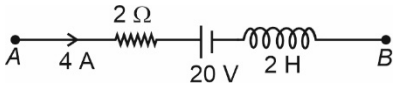
$36 = 9 \times L_2$

$L_2 = 4$ H

5. Answer (3)

Hint: Voltage across inductor $V_L = -L\frac{di}{dt}$

Sol.:



$V_A - V_B = 8 + 20 + 2 \times 2$

$= 32$ V

6. Answer (4)

Hint: Self inductance of solenoid $L = \mu_0 n^2 Al$

Sol.: $L_1 = \mu_0 \left(\frac{n}{2}\right)^2 A\left(\frac{l}{2}\right)$

$L_1 = \frac{\mu_0 n^2 Al}{8}$

$L_1 = \frac{1}{8} \times L$

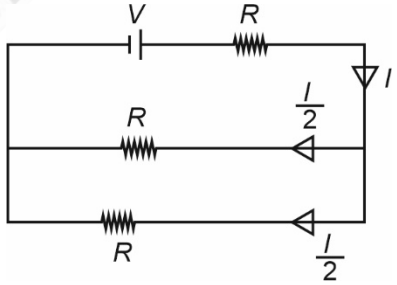
7. Answer (1)

Hint & Sol.: Self inductance is inertia of electricity. Self inductance and mutual inductance have same unit.

8. Answer (3)

Hint: In steady state inductor becomes short-circuited.

Sol.:



$i = \frac{V}{R_{eff}} = \frac{V}{\frac{3R}{2}}$

$i = \left(\frac{2V}{3R}\right)$

Current through inductor = $\frac{i}{2}$

$U = \frac{1}{2}Li^2 = \frac{1}{2}L\left(\frac{V}{3R}\right)^2 = \left(\frac{LV^2}{18R^2}\right)$

9. Answer (2)

Hint: Relative permeability $\mu_r = \frac{\mu}{\mu_0}$

Sol.: $\mu_r = \frac{3\pi \times 10^{-4}}{4\pi \times 10^{-7}}$

$= 0.75 \times 10^3$

$= 750$

$\chi = \mu_r - 1$

$= 749$

10. Answer (3)

Hint & Sol.: A ferromagnetic material is placed in an external magnetic field. The magnetic domains may increase or decrease in size.

11. Answer (4)

Hint: Use, $B_{axial} = \frac{2\mu_0 M}{4\pi r^3}$

Sol.: $B_{axial} = \frac{10^{-7} \times 2 \times 400}{2^3}$

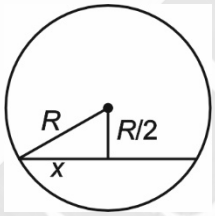
$= 10^{-5}$ T

12. Answer (2)

Hint: Use the concept of motional emf

Sol.: We know that, $\varepsilon = BLv$

$v = \sqrt{2 \times a \times \frac{R}{2}} = \sqrt{aR}$



$\Rightarrow x = \sqrt{R^2 - \frac{R^2}{4}} = \frac{\sqrt{3}\,R}{2}$

$\Rightarrow L = 2\alpha = \sqrt{3}\,R$

$\varepsilon = B \times \sqrt{3}\,R \times \sqrt{aR} = \sqrt{3a}B(R)^{3/2}$

13. Answer (2)

Hint: Use, $\vec{\tau} = \vec{M} \times \vec{B}$

Sol.: $\vec{\tau} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & 0 \\ 1 & 2 & 1 \end{vmatrix}$

$= \hat{i}(1-0) - \hat{j}(2-0) + \hat{k}(4-1)$

$= (\hat{i} - 2\hat{j} + 3\hat{k})$

14. Answer (2)

Hint: Magnetization (I) = $\chi_m H$

Sol.: $H = ni \Rightarrow I = \chi_m \times n \times i$

$\Rightarrow I = 2.3 \times 10^{-5} \times 40 \times 10^2 \times 2$

$\Rightarrow I = 8 \times 2.3 \times 10^{-2}$

$\Rightarrow I =$ 0.184 A/m

15. Answer (4)

Hint & Sol.: If $E \neq 0, B = 0$ then proton must accelerate and in all other conditions proton may have zero acceleration.

16. Answer (2)

Hint: $U = -\vec{M} \cdot \vec{B}$

Sol.: $\vec{M} = \pi R^2 I(-\vec{k})$

$\vec{B} = -B\,\vec{k}$

$U = -\pi R^2 I(-\vec{k}) \cdot (-\vec{k})$

$= -\pi R^2 IB$

17. Answer (4)

Hint: Magnetic field due to current carrying infinite wire at perpendicular distance r is $B = \frac{\mu_0 i}{2\pi r}$

Sol.: $B_{net} = B_1 - B_2$

$B_1 = \frac{\mu_0 i}{2\pi\left(\frac{d}{2}\right)}$

$B_1 = \left(\frac{\mu_0 i}{\pi d}\right)$

$B_2 = \frac{2\mu_0 i}{2\pi \frac{d}{2}}$

$B_{net} = \left|\frac{\mu_0 i}{\pi d} - \frac{2\mu_0 i}{\pi d}\right| = \frac{\mu_0 I}{\pi d} = 15$ tesla (given)

When 2nd wire current (4 A) is switched off

$\vec{B} = \frac{\mu_0 I}{\pi d} = 15$ tesla $\otimes$

18. Answer (1)

Hint & Sol.: Dipole moment of a current carrying loop = NiA

It is independent of magnetic field in which it is placed.

19. Answer (2)

Hint & Sol.: $T = \frac{2\pi m}{qB}$

$\vec{F} = q(\vec{v} \times \vec{B})$ and this magnetic force provides necessary centripetal acceleration.

20. Answer (3)

Hint: Use, $B = \left(\frac{\mu_0 I}{2R}\right) \times \frac{\phi}{2\pi}$

Sol.: Here $\phi = 2\pi - \frac{\pi}{2} = \left(\frac{3\pi}{2}\right)$

$B = \frac{\mu_0 i}{2R} \times \frac{3\pi}{4\pi} = \left(\frac{3\mu_0 i}{8R}\right)$

21. Answer (1)

Hint: Time period of charged particle, $T = \frac{2\pi m}{qB}$

Sol.: $T = \frac{2\pi m}{qB} \Rightarrow t = \frac{T}{4} \Rightarrow \vec{v}_i = v\hat{i}$

$\vec{v}_f = v\hat{j}$

$\overrightarrow{\Delta v} = v\hat{j} - v\hat{i}$

$|\Delta \vec{v}| = \sqrt{2}\, v$

22. Answer (4)

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

Sol.: $M = NIA$

$= 10^3 \times 5 \times 10^{-3} \times 200 \times 10^{-4}$

$= \frac{1}{10}$

$\tau = MB\sin 30°$

$= \frac{1}{10} \times 10^{-3} \times \frac{1}{2}$

$= 5 \times 10^{-5}\ \text{N m}$

23. Answer (3)

Hint: $F_m = \int (id\vec{l} \times \vec{B})$

Sol.: For closed loop $\oint d\vec{l} = 0$

$\therefore$ Magnetic force on a current carrying closed loop will be zero in a uniform magnetic field.

24. Answer (4)

Hint: $\oint \vec{B} \cdot \vec{dl} = \mu_0 I_{enc}$

Sol.: I_{enc} =5 + 4 – 1

= 8 A

$\oint \vec{B} \cdot \vec{dl} = \mu_0 I_{enc}$

$= 8\mu_0$

25. Answer (2)

Hint: Use, $B = \left(\frac{\mu_0 i}{2r}\right)$

Sol.: $i = \frac{2q}{T}$

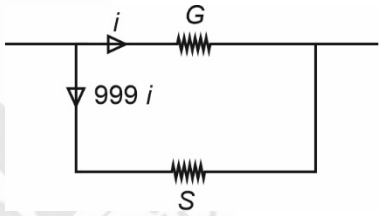
$T = \left(\frac{2\pi r}{v}\right)$

$i = \frac{2q}{\left(\frac{2\pi r}{v}\right)} = \left(\frac{qv}{\pi r}\right)$

$B = \frac{\mu_0 qv}{2\pi r^2}$

26. Answer (1)

Hint & Sol.:



$iG = 999iS$

$S = \frac{G}{999}$

27. Answer (1)

Hint: Equivalent emf $E_{eff} = \left(\frac{\frac{E_1}{r_1} + \frac{E_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}}\right)$

Sol.: $E_{eff} = \frac{\frac{10}{2} + \frac{10}{2}}{\frac{1}{2} + \frac{1}{2}}$

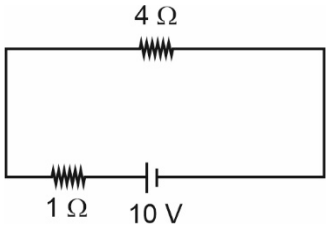
$E_{eff} = 10\ \text{V}$

$r_{eff} = \frac{r_1 r_2}{r_1 + r_2}$

$= \frac{2 \times 2}{2 + 2} = 1\ \Omega$

$I = \frac{10}{5}$

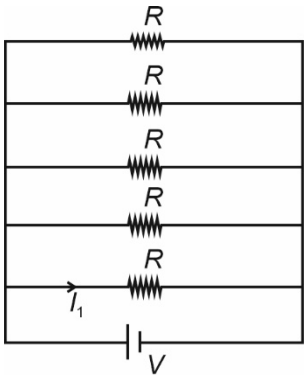
= 2 A



28. Answer (1)

Hint: Use KVL

Sol.:



$I_1 = \frac{V}{R}$

29. Answer (3)

Hint: Use, $I_{avg} = \frac{\int I dt}{\int dt}$

Sol.: $I = 2t + 3t^2$

$dq = (2t + 3t^2)dt$

$$I_{avg} = \frac{\int dq}{\int dt}$$

$$= \frac{\int (2t + 3t^2)dt}{\int dt}$$

$$= \left[\frac{t^2 + t^3}{2}\right]_0^2 = 6 \text{ A}$$

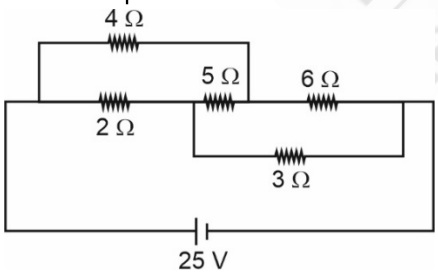
30. Answer (2)

Hint & Sol.: Specific resistance of wire is independent of dimension; it depends on nature of material.

31. Answer (1)

Hint: Use concept of balanced Wheatstone bridge

Sol.:



Given circuit is balanced Wheatstone bridge so no current flows through 5 Ω resistance.

Current through 2 Ω resistance = $\frac{25}{5}$

= 5 A

Power dissipated in 2 Ω resistance = I^2R

= 25 × 2

= 50 W

Current through 6 Ω resistance = $\frac{25}{10}$

= $\frac{5}{2}$ A

Current flowing through battery = $\frac{5}{2}$ + 5

= $\frac{15}{2}$ A

Power delivered by battery = VI

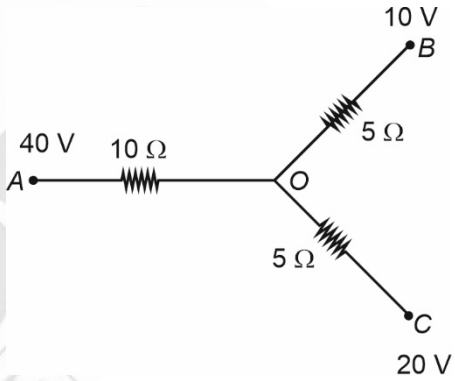
= 25 × $\frac{15}{2}$

= 187.5 W

32. Answer (2)

Hint: Use Kirchhoff's current law

Sol.:



$$\frac{V_A - V_0}{10} + \frac{V_C - V_0}{5} + \frac{V_B - V_0}{5} = 0$$

$$\frac{40 - V_0}{10} + \frac{20 - V_0}{5} + \frac{10 - V_0}{5} = 0$$

$$40 - V_0 + 40 - 2V_0 + 20 - 2V_0 = 0$$

$5V_0 = 100$

$V_0 = 20$ V

33. Answer (1)

Hint: Use the concept of series and parallel combination of resistors.

Sol.: Before closing switch, R_1 and R_2 are short circuited, therefore $R_{eq} = R \Rightarrow P_i = \frac{V^2}{R}$

After closing switch, $R_{eq} = \frac{3R}{5} \Rightarrow P_f = \frac{V^2}{\frac{3R}{5}}$

$\Rightarrow$ % change $\approx 67\%$

34. Answer (1)

Hint: In series combination,

$R_s = R_1 + R_2 + ... + R_n$

In parallel combination, $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + ...\frac{1}{R_n}$

Sol.: Both the 8 Ω resistances are in parallel and their equivalent is in series with 4 Ω.

$R_{AB} = \frac{R \times 8}{8 + R}$

$4 = \frac{8R}{8 + R}$

$8 + R = 2R \quad \Rightarrow R = 8\ \Omega$

35. Answer (4)

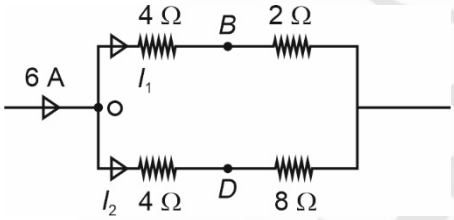
Hint: Use formula $P = \frac{V^2}{R}$

Sol.: When both bulbs are connected in series across 220 V supply, then using KVL voltage across each bulb will be 110 V i.e. voltage is halved. Using $P \propto V^2$, power will become $\frac{1}{4}$ *i.e.* 100 watt.

36. Answer (3)

Hint: Use, $V = IR$

Sol.:



$I_1 = \frac{6 \times 12}{18}$ = 4 A

$I_2 = \frac{6 \times 6}{18}$ = 2 A

$V_0 - V_B = 4 \times 4$ …(1)

$V_0 - V_D = 4 \times 2$ …(2)

From equation (1) and (2), we have

$V_B - V_D = -8$ V

37. Answer (2)

Hint: Resistance of a metal increases with increase in temperature.

Sol.: $V = iR$

$\frac{V}{i} = R$

$\frac{i}{V} = \frac{1}{R}$

$R_3 < R_2 < R_1$

$t_3 < t_2 < t_1$

38. Answer (1)

Hint: Current will be same through all cross-section of conductor

Sol.: $v_d = \frac{I}{nAe}$, $J = \frac{i}{A}$ and $J = \sigma E$

39. Answer (2)

Hint: $i = \left(\frac{q}{t}\right)$

Sol.: $i = \left(\frac{q}{t}\right)$

$i = \frac{ne}{t}$

$\frac{n}{t} = \frac{i}{e}$

$= \frac{4.8}{1.6 \times 10^{-19}}$

$= 3 \times 10^{19}$

40. Answer (4)

Hint: Apply concept of balanced Wheatstone bridge

Sol.: $\frac{4}{12} = \frac{R + 6}{30}$

$\frac{1}{3} = \frac{R + 6}{30}$

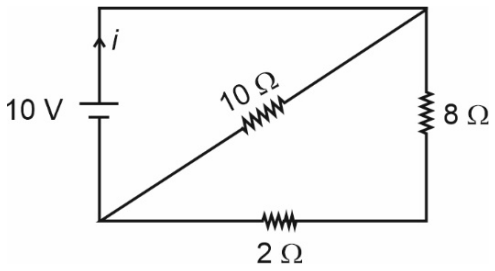
$3R + 18 = 30$

$R = 4\ \Omega$

41. Answer (4)

Hint: Use formula $P = I^2R$

Sol.:



$I = \frac{10}{5} = 2$ A

Current through 8 Ω resistance is $\frac{I}{2}$ = 1 A

$P = I^2R$

$= I^2 \times 8 \Rightarrow P = 8$ W

42. Answer (1)

Hint & Sol.: Use, $R = \rho\frac{l}{A}$

Here volume remains same

$Al = l_1\frac{A}{9}$

$l_1 = 9l$

$R_1 = \rho\frac{9l}{\frac{A}{9}} = 81\left(\frac{\rho l}{A}\right)$

= 81 × 12

= 972 Ω

43. Answer (4)

Hint & Sol.: Wheatstone bridge can be used to compare two unknown resistances and metre bridge works on the principle of Wheatstone bridge.

Current density, $|\vec{J}| = \frac{i}{A}$

44. Answer (4)

Hint: $R = \rho\frac{l}{A}$

Sol.: $R_1 = 9\rho\frac{L}{A}$

$R_2 = \rho\frac{L}{A}$

$R_3 = 4\rho\frac{L}{A}$

$R_4 = \rho\frac{L}{4A}$

45. Answer (2)

Hint: Use $P = I^2R$

Sol.: $i = \frac{E}{R + r}$

$P_1 = I_1^2R_1$

$= \left(\frac{E}{R_1 + r}\right)^2 R_1$

$P_2 = \left(\frac{E}{R_2 + r}\right)^2 R_2$

$P_1 = P_2$

$\frac{E^2}{(R_1 + r)^2}R_1 = \frac{E^2}{(R_2 + r)^2}R_2$

$r = \sqrt{R_1R_2} = \sqrt{9 \times 4}$ = 6 Ω

[CHEMISTRY]

46. Answer (2)

Hint: The primary valences ae normally ionisable

Sol.:

$NiCl_2 \cdot 6H_2O + \underset{\text{(excess)}}{AgNO_3} \rightarrow [Ni(H_2O)_6]^{2+} + 2AgCl\downarrow$

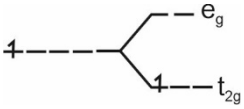
$CoCl_3 \cdot 4NH_3 + \underset{\text{(excess)}}{AgNO_3} \rightarrow [Co(NH_3)_4Cl_2] + AgCl$

$CoCl_3 \cdot 6NH_3 + \underset{\text{(excess)}}{AgNO_3} \rightarrow [Co(NH_3)_6]^{3+} + 3AgCl$

47. Answer (1)

Hint & Sol.: $[Ti(H_2O)_6]^{3+}$

$Ti^{3+} \Rightarrow [Ar]4s^03d^1$



It is violet in colour due to t_{2g} to e_g e^- transition.

48. Answer (3)

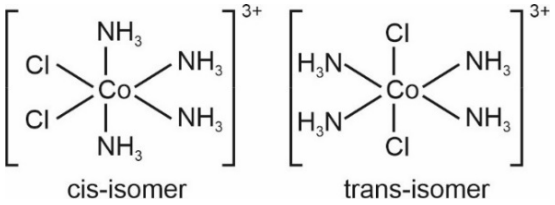
Hint: Ligand which can ligate through two different atom but at a time it can ligate by only one atom is called ambidentate ligand.

Sol.: NO_2^- ion and SCN^- ion can coordinate either through nitrogen or through oxygen to a central metal atom/ion.

49. Answer (3)

Hint: Complexes in which a metal is bound to only one kind of donor groups are known as homoleptic complex.

Sol.: $[Co(NH_3)_6]^{3+}$ does not show geometrical isomerism.



cis-isomer trans-isomer

50. Answer (4)

Hint & Sol.: The correct IUPAC name is Dichloridobis(ethane-1, 2-diamine) cobalt (III)

51. Answer (3)

Hint: [Mabcd] type square planar complex show geometrical isomerism.

Sol.:

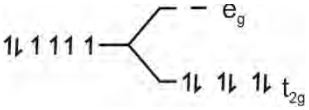
$[Pt(Cl)(NO_2)(NO_3)(SCN)]^{2-}$ show 12 possible isomers

- $[Pt(Cl)(ONO)(NO_3)(SCN)]^{2-}$ 3 isomers
- $[Pt(Cl)(NO_2)(NO_3)(SCN)]^{2-}$ 3 isomers
- $[Pt(Cl)(NO_2)(NO_3)(NCS)]^{2-}$ 3 isomers
- $[Pt(Cl)(ONO)(NO_3)(NCS)]^{2-}$ 3 isomers

52. Answer (2)

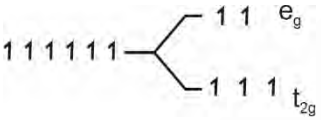
Hint: Water ligand with Co^{3+} act as strong field ligand.

Sol.: In $[Co(H_2O)_6]^{3+}$



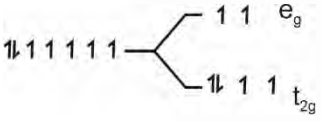
In $[FeF_6]^{3-}$

$Fe^{3+} \Rightarrow [Ar]4s^0 3d^5$



In $[CoF_6]^{3-}$

$Co^{3+} \Rightarrow [Ar]4s^0 3d^6$



53. Answer (3)

Hint: For a given metal cation, stronger is the ligand field, higher is the value of Δ_0, lesser is the wavelength of light absorbed.

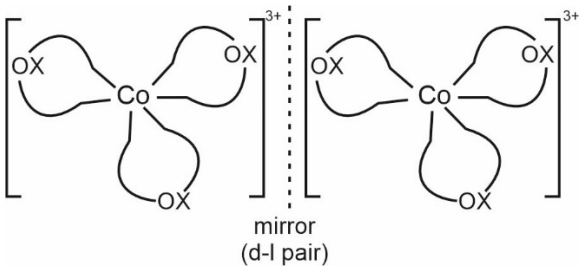
Sol.:

Coordination entity	Wavelength of light absorbed (nm)
$[CoCl(NH_3)_5]^{2+}$	535
$[Co(NH_3)_5(H_2O)]^{3+}$	500
$[Co(CN)_6]^{3-}$	310

54. Answer (1)

Hint: $C_2O_4^{2-}$ (oxalate) ligand is strong field ligand. while Cl^- is weak field ligand.

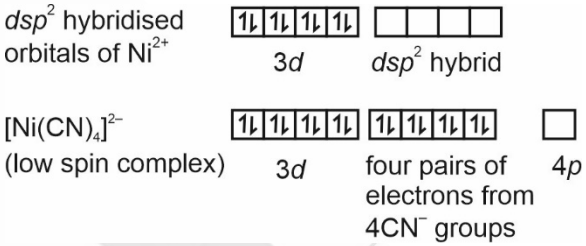
Sol.: In $[Co(C_2O_4)_3]^{3-}$ cobalt has d^2sp^3 hybridisation.



55. Answer (4)

Hint: $[Ni(CN)_4]^{2-}$ has dsp^2 hybridisation.

Sol.:



56. Answer (1)

Hint & Sol.: The correct order of increasing field strength of ligands in spectrochemical series is $edta^{4-} < en < CN^- < CO$

57. Answer (3)

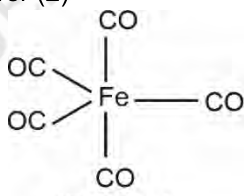
Hint: In metal carbonyls, M → ligand back bonding increases, C – O bond length also increases.

Sol.: The correct decreasing C – O bond length order is

$[Ti(CO)_4]^{2-} > [V(CO)_6]^- > [Cr(CO)_6] > [Mn(CO)_6]^+$

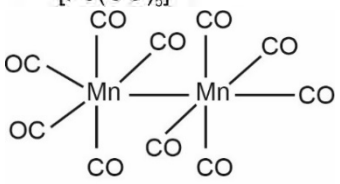
58. Answer (2)

Hint:

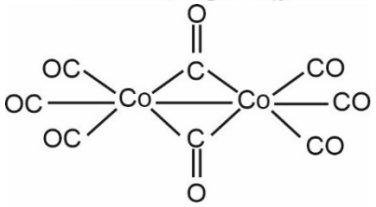


$[Fe(CO)_5]$

Sol.:



$[Mn_2(CO)_{10}]$

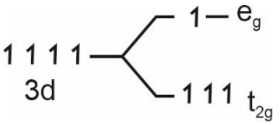


$[Co_2(CO)_8]$

59. Answer (1)

Hint: In $[Mn(Cl)_6]^{3-}$

$Mn^{3+} \Rightarrow [Ar]4s^0 3d^4$



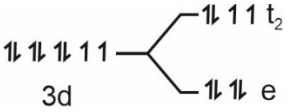
Crystal field stabilization energy (CFSE)

$= -0.4\ \Delta_0 \times 3 + 0.6\ \Delta_0 \times 1 = -0.6\ \Delta_0$

60. Answer (4)

Hint & Sol.: In $[NiCl_4]^{2-}$

$Ni^{2+} \Rightarrow [Ar]4s^0 3d^8$



61. Answer (1)

Hint: Linkage isomerism arises in a coordination compound containing ambidentate ligand.

Sol.: The coordination number of a metal ion in a complex is defined as the number of ligand donor atoms to which the metal is directly bonded.

62. Answer (4)

Hint: Vitamin B_{12} is also known as cyanocobalamine

Sol.:

Vitamin B_{12}	–	Cobalt
Haemoglobin	–	Iron
Chlorophyll	–	Magnesium
Wilkinson catalyst	–	Rhodium

63. Answer (1)

Hint: Spin only magnetic moment (μ) $= \sqrt{n(n+2)}$ BM

n = Number of unpaired electron(s).

Sol.: $Ti^{3+} \Rightarrow [Ar]3d^1$

$Mn^{3+} \Rightarrow [Ar]3d^4$

$Fe^{3+} \Rightarrow [Ar]3d^5$

$Co^{2+} \Rightarrow [Ar]3d^7$

64. Answer (3)

Hint: Enthalpy of atomisation depends upon the types of structure and metallic bond strength.

Sol.:

Element	Heat of atomisation/(kJ mol^{-1})
Sc	326
Ti	473
V	515
Cr	397

65. Answer (3)

Hint: Generally, there is an increase in ionisation enthalpy along each series of the transition elements from left to right.

Sol.:

Element	First ionisation enthalpy (kJ mol^{-1})
Cr	653
Mn	717
Fe	762
Co	758

66. Answer (3)

Hint & Sol.: $2N_2O_5(g) \longrightarrow 2N_2O_4(g) + O_2(g)$

t = 0	0.2	0	0
t = 100	0.2 – 2x	2x	x

$P_t = 0.2 - 2x + 2x + x$

$0.22 = 0.2 + x$

$x = 0.02$

$P_{N_2O_5} = 0.2 - 2 \times 0.02$

$0.2 - 0.04$

$= 0.16$ atm

$$k = \frac{2.303}{100}\log\frac{0.2}{0.16}$$

$$= \frac{2.303}{100}\log\frac{5}{4}$$

$$= \frac{2.303}{100}[\log 5 - 2\log 2]$$

$$= \frac{2.303}{100} \times 0.097$$

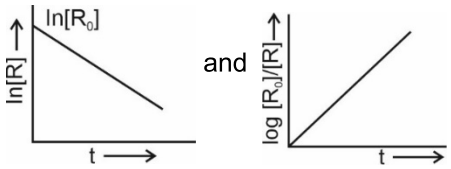
$k = 0.22 \times 10^{-2}$

$= 2.2 \times 10^{-3}\ s^{-1}$

67. Answer (3)

Hint: For first order reaction

$r = k[R_0]$

Sol.: 

are first order graphs

68. Answer (2)

Hint: For zero order reaction

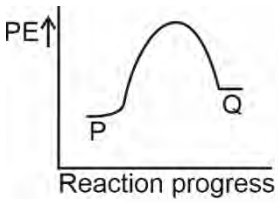
$x = kt$

Sol.: $k = \frac{40}{20} \Rightarrow 2\ mol\ L^{-1}s^{-1}$

$t_{1/2} = \frac{[A_0]}{2k} = \frac{100}{2 \times 2} = 25\ s$

69. Answer (1)

Hint: For endothermic reaction, ΔH = +ve

Sol.: 

70. Answer (1)

Hint: $t_{1/2} = \frac{0.693}{k}$

Sol.: $k = \frac{0.693}{69.3}$

$\Rightarrow 10^{-2}$

$t = \frac{2.303}{10^{-2}} \log \frac{0.4}{0.1}$

$= 2.303 \times 100 \times 2 \times 0.3010$

$= 138.6\ s$

71. Answer (4)

Hint: According to collision theory of chemical reactions,

Rate of reaction (Rate) = $Z_{AB}e^{-E_a/RT}$

Sol.: $\Rightarrow$ For bimolecular elementary reaction,

$A + B \rightarrow$ Products

Rate of reaction each be expressed as:

Rate = $Z_{AB}e^{-E_a/RT}$

AB represents the collision frequency of reactants, A and B.

$\Rightarrow$ Catalyst catalyses the spontaneous reaction but does not catalyse non-spontaneous reactions.

$\Rightarrow \underset{\text{(Cane sugar)}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{(Glucose)}}{C_6H_{12}O_6} + \underset{\text{(Fructose)}}{C_6H_{12}O_6}$

Rate = $k[C_{12}H_{22}O_{11}]$

72. Answer (4)

Hint: $\log \frac{k_2}{k_1} = \frac{E_a}{2.303\,R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$

Sol.: $\log \frac{2k_1}{k_1} = \frac{E_a}{2.303 \times 8.314}\left[\frac{1}{283} - \frac{1}{298}\right]$

$E_a = 32.4\ kJ\ mol^{-1}$

73. Answer (3)

Hint: $\frac{k_2}{k_1} = (\mu)^{\frac{\Delta T}{10}}$

Sol.: $\frac{k_2}{k_1} = (2)^{\frac{60}{10}}$

$k_2 = 64\ k_1$

74. Answer (2)

Hint: $t = \frac{2.303}{k} \log \frac{[A]_0}{[A]_t}$

Sol.: $t_{90\%} = \frac{2.303}{k} \log \frac{100}{10} \Rightarrow \frac{2.303}{k}$

$t_{99.9\%} = \frac{2.303}{k} \log \frac{100}{0.1} \Rightarrow \frac{3 \times 2.303}{k}$

$\frac{t_{90\%}}{t_{99.9\%}} = \frac{\frac{2.303}{k}}{\frac{2.303 \times 3}{k}} = 1:3$

75. Answer (2)

Hint: $\ln k = \ln A - \frac{E_a}{RT}$

slope = $-\frac{E_a}{R}$ and intercept = lnA

Sol.: slope = $-\frac{E_a}{R}$

$-\frac{E_a}{R} = -2 \times 10^2$

$E_a = 2 \times 10^2 \times 8.314$

$= 1.662\ kJ\ mol^{-1}$

76. Answer (2)

Hint: Rate of reaction $\propto$ [concentration]^n

Sol.: When concentration of A is constant then rate of reaction becomes double

$$\left(\frac{0.4}{1.6}\right)^n = \left(\frac{8\times10^{-2}}{16\times10^{-2}}\right)$$

$$\frac{1}{2} = \left(\frac{1}{4}\right)^n$$

$(2)^{-1} = (2)^{-2n}$

n = 0.5 with respect to [B]

When concentration of B is constant when rate of reaction becomes double.

$$\left(\frac{0.2}{0.4}\right)^n = \left(\frac{4\times10^{-2}}{8\times10^{-2}}\right)$$

$$\left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)$$

n = 1 with respect to [A]

77. Answer (1)

Hint: Slowest step is rate determining step.

$r = k[A][B_2]$

Sol.: $K_c = \frac{[A]^2}{[A_2]}$

$[A] = K_c^{1/2}[A_2]^{1/2}$

$r = kK_c^{1/2}[A_2]^{1/2}[B_2]$

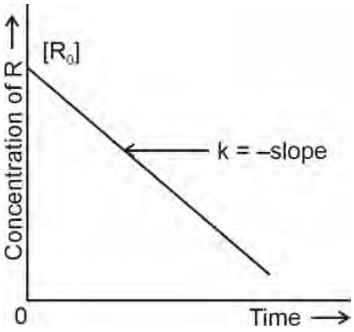
78. Answer (1)

Hint: The decomposition of gaseous ammonia on a hot platinum surface is a zero-order reaction.

Sol.: For zero order reaction.

$[R] = [R]_0 - kt$

$t_{1/2} = \frac{a_0}{2k}$



79. Answer (3)

Hint: $r = \frac{1}{3}\frac{d[Br_2]}{dt} = \frac{-1}{5}\frac{d[Br^-]}{dt}$

Sol.: $\frac{5}{3}\times0.6 = -\frac{d[Br^-]}{dt}$

$-\frac{d[Br^-]}{dt}$ = 1.0 mol L^{-1} s^{-1}

80. Answer (1)

Hint & Sol.: Due to lanthanoid contraction ionic radii from lanthanum to lutetium decreases and Zr and Hf have almost identical radii.

81. Answer (3)

Hint: Curium is an actinoid.

Sol.: The correct electronic configuration of curium is [Rn]$5f^7 6d^1 7s^2$

82. Answer (1)

Hint: La^{3+} electronic configuration = [Xe]$5d^0 6s^0$

Lu^{3+} electronic configuration = [Xe]$4f^{14} 5d^0$

Sol.: Mischmetal consists of a lanthanoid metal (~95%) and iron (~5%) and traces of S, C, Ca and Al.

$Ce(OH)_3$ is more basic than $Tm(OH)_3$.

83. Answer (1)

Hint: Neptunium and Thorium are actinoids whereas Terbium and Lutetium are lanthanoids.

Sol.: • $Lu^{3+} \Rightarrow [Xe]4f^{14}$ does not have unpaired electrons so it is colourless.

• Pr, Nd, Tb and Dy also exhibit +4 oxidation state but only in oxides.

• Thorium show only +4 oxidation state.

• Neptunium show +3 to +7 oxidation states.

84. Answer (3)

Hint: MnO_4^{2-} is manganate ion whereas MnO_4^- is permanganate ion.

Sol.: $MnO_2 \xrightarrow[\text{Oxidised with air}]{\text{Fused with KOH,}} MnO_4^{2-}$

$MnO_4^{2-} \xrightarrow[\text{Alkaline solution}]{\text{Electrolytic oxidation in}} MnO_4^-$

85. Answer (2)

Hint: Interstitial compounds are those which are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

Sol.: They have high melting points, higher than those of pure metals.

86. Answer (4)

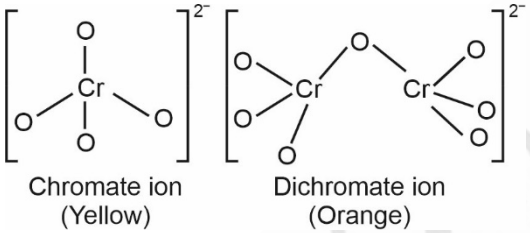
Hint & Sol.: The correct order of oxidising power is $MnO_4^- > Cr_2O_7^{2-} > VO_2^+$

87. Answer (1)

Hint & Sol.: Permanganate titration is unsatisfactory if performed in presence of hydrochloric acid because hydrochloric acid is oxidised to chlorine.

88. Answer (1)

Hint:



Chromate ion (Yellow) Dichromate ion (Orange)

Sol.: Sodium dichromate is more soluble than potassium dichromate due to more hydration energy of sodium ion.

89. Answer (4)

Hint: Zinc atom has completely filled *d* orbitals ($3d^{10}$) in its ground state as well as in its oxidised state, hence it is not regarded as a transition element.

Sol.: $E^{\ominus}$ value for the Mn^{3+}/Mn^{2+} couple is more positive than that of Cr^{3+}/Cr^{2+} because Mn has much larger third ionisation enthalpy than the Cr.

90. Answer (2)

Hint: Scandium does not show variable oxidation states.

Sol.:

	$\Delta_{hyd}H^{\ominus}$
Mn^{2+}	$-1862\ (kJmol^{-1})$

CrO is basic while Cr_2O_3 is amphoteric.

Brass is an alloy of copper and zinc.

[BOTANY]

91. Answer (2)

Hint: hnRNA undergoes splicing to form mRNA.

Sol.: Capping, tailing and splicing are the post-transcriptional modifications.

92. Answer (1)

Hint: Pink flower colours in dog flower shows incomplete dominance.

Sol.: AB blood group in humans shows co-dominance

93. Answer (3)

Hint: This enzyme is also known as Severo Ochoa enzyme.

Sol.: Polynucleotide phosphorylase is helpful in polymerising RNA with defined sequence in a template independent manner.

94. Answer (2)

Hint: When the small subunit of ribosome encounters on mRNA, the process of translation begins.

Sol.: At the end, a release factor binds to the stop codon, terminating translation and releasing the complete polypeptide from the ribosome.

95. Answer (2)

Sol.: The human genome project was coordinated by the U.S. Department of Energy and the National Institute of Health. During the early years of the HGP, the Wellcome Trust (UK) became a major partner. The honours to Watson with Crick include the John Collins Warren Prize of the Massachusetts General Hospital in 1959.

96. Answer (2)

Hint: hnRNA is the precursor of mRNA.

Sol.: The RNA polymerase II transcribes precursor of mRNA, the hnRNA. hnRNA contains both exonic and intronic sequences. mRNA act as template molecule during translation. In bacteria, the mRNA does not require any processing to become active.

97. Answer (3)

Hint: Mendelian disorders are mainly determined by alteration or mutation in the single gene.

Sol.: Turner's syndrome is a chromosomal disorder.

98. Answer (1)

Hint: This organism shows XX-XO type of sex determination.

Sol.: In grasshoppers, males have one less chromosome than females.

99. Answer (2)

Hint: Stop codons do not have cognate tRNA.

Sol.: UAA, UAG and UGA are stop codons and thus they do not have cognate tRNA.

100. Answer (1)

Hint: The given figure is the electron micrograph of chromatin showing beads on string structure.

Sol.: The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome. Nucleosome constitute the repeating unit of a structure in nucleus called chromatin, thread-like stained (coloured) bodies seen in nucleus.

101. Answer (4)

Hint: This disorder is autosome linked recessive blood disease.

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

102. Answer (1)

Hint: In polygenic inheritance, the effect of each allele is additive.

Sol.: Human skin colour is a polygenic trait where the phenotype reflects the contribution of each allele.

103. Answer (2)

Hint: In honey bee, males are haploid while females are diploid.

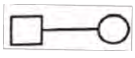
Sol.: Male honeybees produce sperms by mitosis; they do not have father and thus cannot have sons. They are produced by means of parthenogenesis.

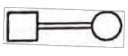
104. Answer (1)

Hint: Recessive trait express itself only in homozygous condition in pea plant.

Sol.: Yellow pod colour express itself only in homozygous condition in pea plant.

105. Answer (3)

Hint:  shows mating.

Sol.:  shows consanguineous mating.

106. Answer (4)

Hint: This RNA is a constituent of ribosomes.

Sol.: rRNAs play structural and catalytic role during translation.

107. Answer (4)

Hint: Klinefelter's syndrome results into a karyotype of 47, XXY.

Sol.: Individual affected with Klinefelter's syndrome has overall masculine development, however, the feminine development (development of breast, i.e; Gynaecomastia) is also expressed.

108. Answer (2)

Hint: T.H. Morgan used *Drosophila melanogaster* as the experimental organisms.

Sol.: *Drosophila melanogaster* shows life cycle of two weeks, clear differentiation of sexes, ability to grow on synthetic medium and also produce large number of progenies.

109. Answer (3)

Hint: Adenine and guanine are purines.

Sol.: Purines are found in both DNA and RNA.

110. Answer (4)

Hint: The law states that 'when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters.'

Sol.: Law of independent assortment is derived from dihybrid cross.

111. Answer (4)

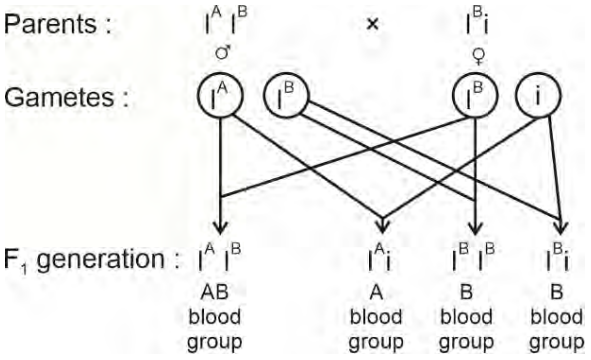
Hint: A gene is defined as the functional unit of inheritance.

Sol.: In eukaryotes, the monocistronic structural genes have interrupted coding sequences because the genes in eukaryotes are split.

112. Answer (4)

Hint: The mother will be having the genotype I^Bi.

Sol.:



113. Answer (3)

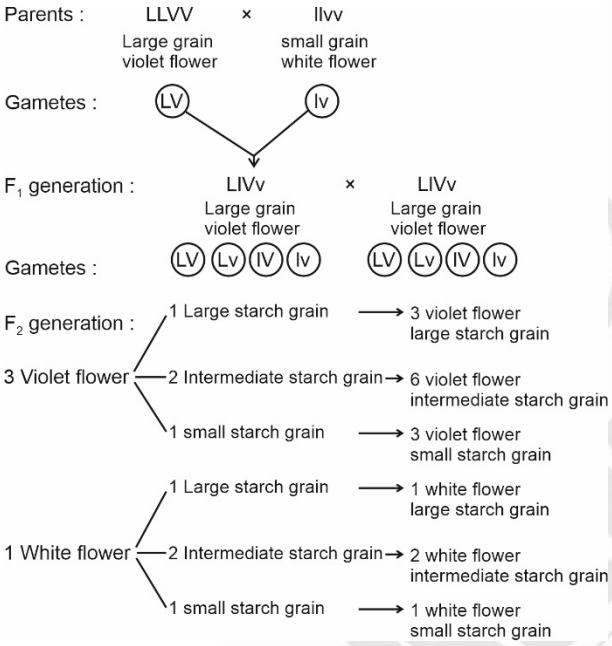
Hint: Thalassemia is caused due to reduced rate of synthesis of one of the globin chains.

Sol.: Thalassemia differs from sickle-cell anaemia in that the former is a quantitative problem of synthesising too few globin molecules while the latter is a qualitative problem of synthesising an incorrectly functioning globin.

114. Answer (4)

Hint: In pea plant, starch grain size inheritance shows incomplete dominance and flower colour inheritance shows complete dominance.

Sol.:



115. Answer (3)

Hint: Alteration in chromosomes results in aberrations.

Sol.: One DNA helix runs continuously from one end to the other in each chromatid in a highly supercoiled form. Therefore, loss or gain of a segment of DNA, result in alteration in chromosome.

116. Answer (2)

Hint: Mendel's work only suggested that factors were discrete units.

Sol.: Mendel's could not provide any physical proof for the existence of factors or say what they were made of. Law of segregation is based on the fact that the alleles do not show any blending.

117. Answer (3)

Hint: A translational unit in mRNA is the sequence of RNA that is flanked by the start codon and the stop codon.

Sol.: DNA $\rightarrow$ 3′–TAC GCG GTT TGA CTG TGC ATC – 5′

RNA $\rightarrow$ 5′ AUG CGC CAA ACU GAC ACG UAG – 3′

Protein $\rightarrow$ Met Arg Gln Thr Asp Thr Stop

118. Answer (1)

Hint: James Watson and Francis Crick proposed double helix model for the structure of DNA.

Sol.: Erwin Chargaff proposed that for a dsDNA, the ratios between adenine and thymine and guanine and cytosine are constant. Rest all are the contributions of Francis Crick.

119. Answer (1)

Hint: hnRNA undergoes splicing to form mRNA.

Sol.: Transcription produces hnRNA that requires splicing to form mRNA. Only replication uses both strands of DNA as template.

120. Answer (2)

Hint: It is an autosome.

Sol.: According to human genome project, chromosome 1 has most genes (2968), and the Y has the fewest (231)

121. Answer (1)

Hint: Repetitive sequences make up very large portion of the human genome.

Sol.: Repetitive sequences are thought to have no direct coding functions, but they shed light on chromosome structure, dynamics and evolution.

122. Answer (1)

Hint: σ factor helps in initiating DNA transcription in prokaryotes.

Sol.: In a transcription unit, the terminator is located towards 3′–end (downstream) of the coding strand.

123. Answer (3)

Hint: Taylor and colleagues used a eukaryotic organism as their experimental organism.

Sol.: Matthew Meselson and Franklin Stahl used *Escherichia coli* to propose semi conservative mode of DNA replication. Taylor and colleagues performed experiments on *Vicia faba* to prove that the DNA in chromosomes also replicate semi conservatively.

124. Answer (2)

Hint: In 1900, de Vries, Correns and von Tschermak independently rediscovered Mendel's results on the inheritance of characters.

Sol.: Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and 'mapped' their position on the chromosome. T.H. Morgan coined the term linkage to describe this physical association of genes on a chromosome. Henking could trace a specific nuclear structure all through spermatogenesis in a few insects.

125. Answer (4)

Hint: DNA fingerprinting technique was developed by Alec Jeffreys that begins with DNA isolation.

Sol.: The technique of DNA fingerprinting includes

(i) Isolation of DNA

(ii) Digestion of DNA by restriction endonucleases

(iii) Separation of DNA fragments by electrophoresis

(iv) Transferring (blotting) of separated DNA fragments to synthetic membranes.

(v) Hybridisation using labelled VNTR probe

(vi) Detection of hybridised DNA fragments by autoradiography.

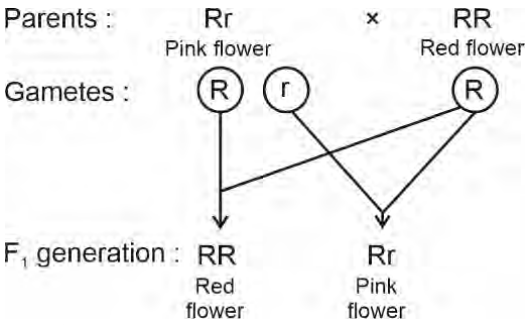
126. Answer (2)

Sol.: When a single gene exhibits multiple phenotypic expressions such a gene is called a pleiotropic gene.

127. Answer (4)

Hint: Flower colour in snapdragon exhibits incomplete dominance.

Sol.:



128. Answer (2)

Hint: If more than one variant (allele) at a locus occurs in human population with a frequency greater than 0.01, then it is referred to as DNA polymorphism.

Sol.: If an inheritable mutation is observed in a population at high frequency, it is referred to as DNA polymorphism. Inheritance of a character is not only affected by the sequence of structural genes but also affected by promoter and regulatory sequence of a structural gene.

129. Answer (1)

Hint: During HGP, scientists have identified about 1.4 million locations where single-base DNA differences (SNPs–single nucleotide polymorphism) occur in humans.

Sol.: UTRs are required for efficient translation process. All the genes that are expressed as RNA are referred to as ESTs. The packaging of chromatin at higher level requires additional set of proteins that collectively are referred to as non-histone chromosomal (NHC) proteins.

130. Answer (1)

Hint: DNA polymorphisms are inheritable and arise due to mutation.

Sol.: As the DNA polymorphisms are inheritable from parents to children, DNA fingerprinting is the basis of paternity testing, in case of disputes.

131. Answer (2)

Hint: HGP was closely associate with the rapid development of a new area in biology called bioinformatics.

Sol.: *Caenorhabditis elegans* is a free-living non-pathogenic nematode.

132. Answer (1)

Hint: If promoter sequence of the gene is unable to bind to RNA polymerase it will inhibit the transcription of that specific gene.

Sol.: As the promotor sequence of regulatory gene is mutated in such a way that it is not able to bind to RNA polymerase, its transcription won't take place. Thus, no repressor molecule will be available to regulate the expression of structural genes. This leads to the constitutive expression of structural genes and thereby allowing the rapid catabolism of lactose in the cell from the surrounding medium.

133. Answer (1)

Hint: This pedigree shows the inheritance pattern of X-linked dominant, autosomal dominant and autosomal recessive traits.

Sol.: In the given pedigree both parents cannot be homozygous, one of them will be heterozygous. Cystic fibrosis is an autosomal recessive disorder thus; homozygous recessive individuals will be affected from the disorder but II-3 and II-4 are unaffected.

134. Answer (1)

Hint: RNA is the genetic material in some viruses.

Sol.: QB bacteriophage has RNA as the genetic material.

135. Answer (1)

Hint: PCR was developed by Carry Mullis.

Sol.: Sanger is credited with developing the method of DNA and amino acid sequencing.

[ZOOLOGY]

136. Answer (3)

Hint: One of the traits was being favoured

Sol.: Industrial melanism in *Biston betularia* (peppered moths) is a classic example of natural selection influenced by human activity (anthropogenic action).

While the frequency of light-colored moths decreased during industrial pollution, they were never completely eliminated.

Industrial melanism is an example of directional selection, not disruptive selection.

The dark coloration was due to a pre-existing genetic variation that became advantageous under new environmental conditions. This was not caused by new mutations accumulating over generations, but rather by natural selection acting on existing variations.

137. Answer (4)

Hint: First form of originated in water.

Sol.: The first cellular form of life did not possibly originate till about 2000 million years ago. These were probably single-cells. All life forms were in water environment only.

The earliest life forms on Earth were anaerobic and non-photosynthetic because the early Earth's atmosphere had no free oxygen (O_2) and was highly reducing (rich in gases like methane, ammonia and hydrogen).

These primitive organisms were likely chemoheterotrophs, meaning they obtained energy by breaking down organic molecules present in their environment.

138. Answer (3)

Hint: Exclude the one who gave the theory on population

Sol.: Hugo de Vries worked on evening primrose and gave the idea of mutation.

139. Answer (4)

Hint: Adaptive ability has a genetic basis.

Sol.: In the context of Darwinian evolution, fitness refers to an organism's ability to survive and reproduce in its environment.

Organisms with better adaptive traits have a higher likelihood of getting selected by nature, leading to evolution over generations.

Adaptive ability can be inherited if it is based on genetic variation.

While some temporary adaptations (e.g., acclimatization to climate) may be environmentally induced, evolutionary adaptations occur due to genetic changes that can be passed on.

140. Answer (1)

Hint: Devoid of oxygen

Sol.: Miller's experiment (1953) was designed to test the chemical theory of evolution proposed by Oparin and Haldane, which suggested that life originated under reducing (not oxidizing) conditions on primitive Earth.

The spark discharge chamber (electrodes) simulated lightening, providing energy for chemical reactions.

After a few days, monomeric organic compounds such as amino acids (glycine, alanine, *etc.*) were detected, supporting the idea that life's building blocks could have formed naturally under early Earth conditions.

141. Answer (4)

Hint: Finches diverged into multiple species, each specialized for its ecological niche.

Sol.: Darwin's finches are one of the most famous examples of adaptive radiation and natural selection, helping Charles Darwin's theory of evolution.

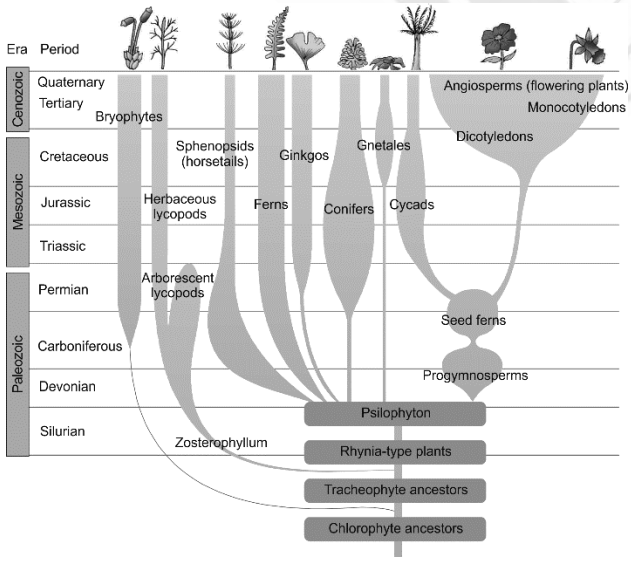
All species of Darwin's finches evolved from a single ancestral species that arrived from South America. Over time, they diverged into different species, each adapted to a specific type of food and habitat.

Finches with advantageous beak traits survived better, passed on genes, and over generations, populations evolved.

142. Answer (4)

Hint: Equal to the number of bones in pectoral girdle in human body.

Sol.:



143. Answer (3)

Hint: The first ape man

Sol.: Two mya, *Australopithecines* probably lived in East African grasslands. Evidence shows they hunted with stone weapons but essentially ate fruits.

The cranial capacity of the modern *Homo sapiens* is 1350cc.

The cranial capacity of *Homo sapiens neanderthalensis* is 1400cc.

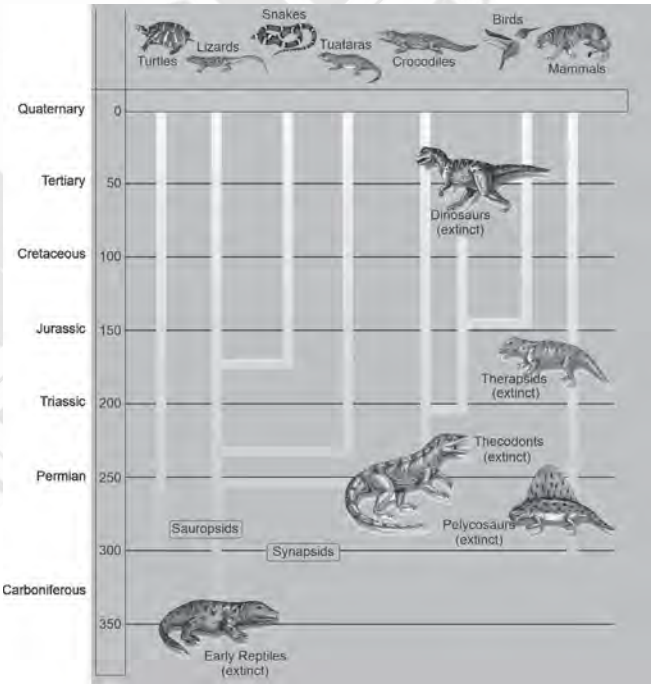
The cranial capacity of the *Homo habilis* is 650-800cc.

About 15 mya, primates called *Dryopithecus* and *Ramapithecus* were existing.

144. Answer (3)

Hint: Organisms with flight adaptions evolved from reptiles.

Sol.:



145. Answer (2)

Hint: Less than twice the number of ommatidia present in the eyes of a cockroach

Sol.: According to Hardy-Weinberg equilibrium :

$p^2 + q^2 + 2pq = 1$

- Total population = 14400
- Recessive phenotype (aa) = 3,600

- Since aa = q^2, we set up the equation:

$$q^2 = \frac{3,600}{14400} = \frac{1}{4}$$

$$q = \frac{1}{2} = 0.5$$

(Dominant allele frequency):

p = 1 – 0.5 = 0.5

Thus, heterozygote frequency (2pq) will be:

2pq = 2 × 0.5 × 0.5 = 0.50

Finally, the number of heterozygous individuals:

14400 × 0.5 = 7200

146. Answer (1)

Hint: Converge towards one direction for performing similar type of function

Sol.: The eyes of the *Octopus* and that of mammals, represents analogous structures.

Analogous structures are not anatomically similar structures though they perform similar functions. Hence, analogous structures are a result of convergent evolution - different structures evolving for the same function and hence having similarity.

147. Answer (4)

Hint: Evolution of modern man is one of the interesting aspects of evolution.

Sol.: While human evolution involves adaptation and diversification, it's not an example of adaptive radiation, which is a rapid diversification of a single ancestral lineage into multiple species adapted to different ecological niches.

Descent with modification is supported by homologous structures, which are similar structures found in different species that originated from a common ancestor. These structures may have different functions in the different species, but their similar structure and development suggest a common origin.

148. Answer (2)

Hint: Fossils are studied to derive evolutionary relationship.

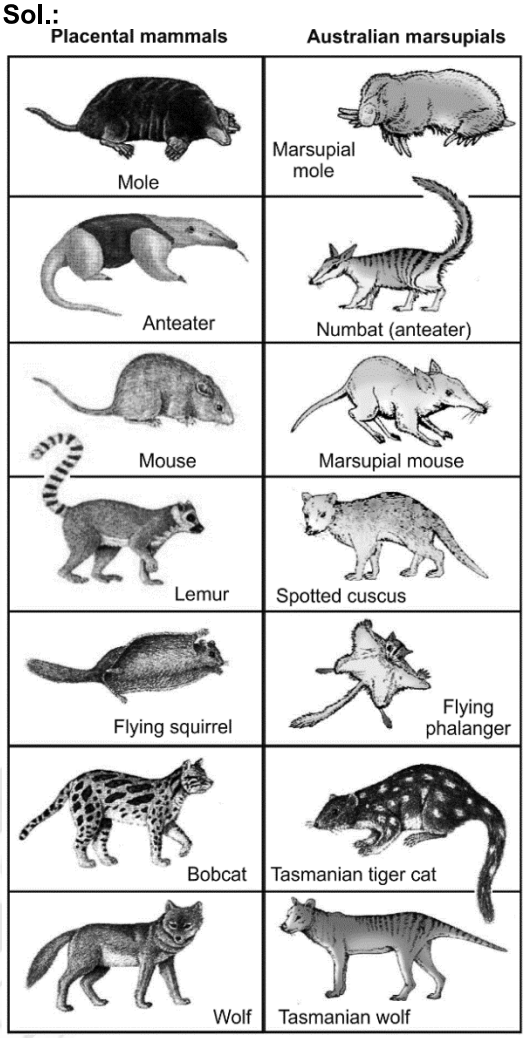
Sol.: A study of fossils in different sedimentary layers indicates the geological period in which they existed.

Different aged rock sediments contain fossils of different life forms who probably died during the formation of that particular sediment.

149. Answer (3)

Hint: Look for an Australian marsupial

Sol.:



150. Answer (2)

Hint: Oparin and Haldane talked about the prebiotic soup.

Sol.: Conventional religious literature tells us about the theory of special creation. This theory has three connotations. One, that all living organisms (species or types) that we see today were created as such. Two, that the diversity was always the same since creation and will be the same in future also. Three, that Earth is about 4000 years old.

Louis Pasteur by careful experimentation demonstrated that life comes only from pre-existing life.

Oparin of Russia and Haldane of England proposed that the first form of life could have come from pre-existing non-living organic molecules and that formation of life was preceded by chemical evolution.

151. Answer (1)

Hint: Blockage of fallopian tubes will not allow natural conception

Sol.: Her bilateral tubal blockage prevents success of any *in vivo* fertilization method. IVF is the only ART method that can help her conceive using her own gametes.

IUT bypasses the blocked fallopian tubes by fertilizing the egg with sperm in a lab followed by the transfer of the resulting embryo directly into the uterus.

IUT (Intra Uterine Transfer) can be successful in this scenario as it involves transfer of embryo, with more than 8 blastomeres, into the uterus.

GIFT and IUI (Intra Uterine Insemination) require functional fallopian tubes, as fertilization occurs naturally within the body.

Artificial Insemination (AI) is essentially the same as IUI, where sperm is placed inside the uterus, but this method still depends on unblocked (normal) fallopian tubes for fertilization, making it ineffective in her case.

152. Answer (1)

Hint: Right after the formation of Earth

Sol.: About 2000 mya, the first cellular forms of life appeared on Earth.

153. Answer (2)

Hint: Variations provide the raw material for evolution

Sol.: Not all genetic changes lead to visible or functional differences in an organism.

Some nucleotide changes do affect function and fitness. Neutral mutations exist, but not all nucleotide variations are neutral.

Darwinian variations are small and directional.

154. Answer (4)

Hint: Disruptive selection favors both extremes while selecting against the average.

Sol.: • If spiders with two distinct colour patterns survive better than those with an intermediate colour, it fits disruptive selection.

- Chihuahua breeding selects for smaller dogs, making this an example of directional selection.
- Tiger cubs that are too small may not survive, and those too large may cause complications during birth, so this is stabilizing selection.
- The development of antibiotic resistance is an example of directional selection, not disruptive selection.
- The resistant bacteria survive, while the susceptible ones die, causing a shift towards a population dominated by resistant bacteria.

155. Answer (3)

Hint: None of the factors should bring about a change in the genetic equilibrium

Sol.: The Hardy-Weinberg equilibrium remains stable only if five conditions are met:

1. No mutations
2. No natural selection
3. No gene flow (migration)
4. Large population size (no genetic drift)
5. Random mating

Selective predation introduces natural selection, which violates Hardy-Weinberg equilibrium by favouring certain alleles over others.

156. Answer (3)

Hint: Prolactin inhibits GnRH secretion.

Sol.: During lactational amenorrhea, elevated prolactin (protein hormone) levels can inhibit GnRH secretion from the hypothalamus. This leads to decreased levels of FSH and LH, which are essential for follicular development and ovulation. As a result, ovulation does not occur (anovulation), leading to infertility.

Complications of STIs include pelvic inflammatory diseases, abortions, still births, ectopic pregnancies, *etc.*

A tubal pregnancy is a type of ectopic pregnancy where the fertilized egg implants and grows inside the fallopian tube instead of the uterus.

157. Answer (2)

Hint: Survival of the fittest

Sol.: Darwin's natural selection explains that individuals with traits that provide a survival advantage (brown coloration for better camouflage) are more likely to survive and reproduce, passing on their traits.

Mutations occur randomly, but they do not cause an individual to change during its lifetime.

Natural selection does not involve intentional elimination by individuals but rather survival differences due to environmental factors.

158. Answer (3)

Hint: Choose the method that involves *in vitro* fertilisation.

Sol.: Intra cytoplasmic sperm injection (ICSI) is a specialised procedure to form an embryo in the laboratory in which a sperm is directly injected into the ovum.

ZIFT–Zygote Intra Fallopian Transfer - The zygote or early embryos (with upto 8 blastomeres) is transferred into the fallopian tube.

IUT – Intra Uterine Transfer - Embryos with more than 8 blastomeres is transferred into the uterus to complete its further development.

GIFT – Gamete Intra Fallopian Transfer - Transfer of an ovum collected from a donor into the fallopian tube.

159. Answer (4)

Hint: Choose a protozoan STI.

Sol.:

STIs	**Causative pathogens**
Chlamydiasis	*Chlamydia trachomatis* (bacteria)
Gonorrhoea	*Neisseria gonorrhoeae* (bacteria)
Syphilis	*Treponema pallidum* (bacteria)
Trichomoniasis	*Trichomonas vaginalis* (protozoa)

160. Answer (4)

Hint: One a week pill

Sol.: Saheli, the new oral contraceptive for the females, contains a non-steroidal preparation. It is a 'once-a-week' pill with very few side effects and high contraceptive value.

CDRI (Lucknow) took upon the task to develop this indigenous non-hormonal contraceptive pill.

It is a selective estrogen receptor modulator (SERM). It modulates the effect of estrogen to prevent implantation of the embryo and reduces thickness of endometrium.

161. Answer (2)

Hint: Infertile couples can be assisted through ART

Sol.: Contraceptives are not the regular requirements for the maintenance of reproductive health. They are practiced against a natural reproductive event, *i.e.,* conception/pregnancy.

The inability to conceive or produce children even after 2 years of unprotected sexual co-habitation is called infertility.

162. Answer (4)

Hint: Highly effective for longer periods

Sol.: IUDs have long-lasting effects and they are not replaced after every 6 months. Depending on the type, IUDs are replaced usually after 3-5 years.

IUDs are ideal contraceptives for the females who want to delay pregnancy and/or space children. It is one of the most widely accepted methods of contraception in India.

Emergency contraception, otherwise known as post-coital contraception, is the intervention that allows women to avoid unintended pregnancy after unprotected intercourse. IUDs are very effective, just as emergency contraceptives.

IUDs are made up of plastic, metal or a combination of the two.

163. Answer (2)

Hint: Its capital is Bhopal.

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

164. Answer (2)

Hint: Change in allele frequency due to random event

Sol.: The change in allele frequency due to a random event (such as a desert storm) affecting a small, isolated population is an example of genetic drift.

Genetic drift occurs when chance events randomly alter allele frequencies, especially in small populations, leading to a loss of genetic variation.

Founder effect → This is a type of genetic drift but occurs when a small group splits off to form a new

population. Since the event here is a storm reducing population size rather than migration, this is not a founder effect.

Natural selection → Natural selection favors alleles that provide a survival or reproductive advantage. However, the storm is a random event, not a selective pressure based on traits.

Stabilizing selection → This favors the average phenotype and reduces variation, but the scenario describes a random reduction in population size, not selection for a specific trait.

165. Answer (3)

Hint: Education and awareness play a key role in maintaining reproductive health.

Sol.: The popularity of different contraceptive methods can vary significantly based on factors like location (rural or urban), socio-economic status, education levels, and access to healthcare services.

Oral pills are very popular contraceptives among the urban women than the women living in rural areas.

A spontaneous abortion or miscarriage is the natural loss of a pregnancy.

The lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the menstrual cycle does not occur during the period of intense lactation following parturition. However, this method has been reported to be effective only upto a maximum period of six months following parturition.

The complete removal of gonads cannot be a contraceptive option because it will lead to infertility and the unavailability of certain hormones that are required for the normal functioning of accessory reproductive parts.

166. Answer (2)

Hint: He quoted the example of giraffe to explain his theory.

Sol.: Even before Darwin, a French naturalist Lamarck had said that evolution of life forms had occurred but driven by use and disuse of organs, which explains that muscular hypertrophy formed as a result of muscular exercise would be passed to the succeeding generations. He gave the example of giraffes who in an attempt to forage leaves on tall trees had to adapt by elongation of their necks.

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

Alfred Wallace, a naturalist who worked in Malay Archipelago, had also come to similar conclusions as Darwin around the same time.

The work of Thomas Malthus on populations influenced Darwin.

167. Answer (1)

Hint: Exclude Cu releasing IUD.

Sol.: Inert IUD or non-medicated IUD, like lippes loop, is made up of polyethylene impregnated with barium sulphate or stainless steel.

Multiload 375 is a copper releasing IUD.

Progestasert and LNG-20 are hormone releasing IUDs.

168. Answer (4)

Hint: Recall the structure which opens directly into the ejaculatory duct.

Sol.: In humans, the pathway of sperms is:

Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory ducts → Urethra

In a vasectomised individual, the transport of spermatozoa will be blocked from the vas deferens to ejaculatory duct because the procedure involves cutting and sealing of these tubes, preventing sperms from passing through them.

169. Answer (3)

Hint: Medicated IUD

Sol.: Progestasert – This intrauterine device (IUD) releases progesterone, which thickens the cervical mucus and alters the uterine lining.

Steroidal Oral Contraceptive Pills (OCPs) – These primarily prevent ovulation by inhibiting follicle-stimulating hormone (FSH) and luteinizing hormone (LH).

LNG-20 (Levonorgestrel-releasing IUD) – This releases levonorgestrel, which thickens the cervical mucus, inhibits sperm motility, and prevents implantation by altering the uterine lining.

CuT (Copper releasing IUD) – Copper ions are toxic to sperms, preventing fertilization, but it does not block sperms from entering the urethra (which is part of the male reproductive system).

170. Answer (2)

Hint: Choose the natural method of contraception.

Sol.: Natural methods of contraception are least effective.

Periodic abstinence/Rhythm method is a natural method of contraception in which couples avoid or abstain from coitus from days 10 to 17 of the 28 days menstrual cycle, when ovulation is expected.

Vaults are barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through the cervix.

Multiload 375 is a copper-releasing IUD. It is more effective than the condoms.

Implants are considered to be the most effective method of contraception, with less than 1 per cent chances of failure.

171. Answer (3)

Hint: Assistance for infertile couples is available in our country, if they want to conceive.

Sol.: An overall improvement in reproductive health has taken place in our country as indicated by reduced maternal and infant mortality rates, early detection and cure of STIs, assistance to infertile couples, *etc*.

IUDs are contraceptive devices that prevent conception.

Assisted reproductive techniques (ARTs) have been developed to assist the infertile couples.

172. Answer (4)

Hint: Female foeticide is a widespread menace in India.

Sol.: Amniocentesis involves withdrawing some of the amniotic fluid that bathes the developing foetus and analysing the foetal cells and dissolved substances.

It is a pre-natal diagnostic test.

This procedure is used to test for the presence of certain genetic disorders such as down syndrome, sickle cell anaemia, haemophilia (sex-linked disorder) *etc.*

In India, there is a statutory ban on amniocentesis for sex-determination to legally check the increasing menace of female foeticide.

173. Answer (3)

Hint: By the end of the first trimester, most of the major organ systems are formed in the foetus.

Sol.: According to the MTP amendment Act, 2017, a pregnancy may be terminated on certain considered grounds within the first 12 weeks of pregnancy on the opinion of one registered medical practitioner.

If the pregnancy has lasted 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 grounds exist.

The first movements of the foetus are usually observed during the fifth month of pregnancy.

174. Answer (3)

Hint: Look for the barrier method of contraception.

Sol.: Condoms, like Nirodh, are mechanical devices which prevent the deposition of sperms into the vagina.

Lactational amenorrhea is absence of menstruation. This is the period of intense lactation following parturition in which ovulation does not occur.

Tubectomy is a surgical method of contraception in which a portion of both the fallopian tube is removed or tied up to block the passage of ovum through them.

Saheli is a 'once a week' pill that inhibits implantation.

Basically, the other three methods do not create any physical barrier to prevent insemination in females.

175. Answer (4)

Hint: Equal to the number of false ribs

Sol.: In 2011, the world population was 7.2 billion whereas the population of India crossed 1.2 billion. Hence, former was six times than the latter.

176. Answer (4)

Hint: Incidences of STIs are high among individuals belonging to age group of 15-24 years.

Sol.: Hepatitis-B, genital herpes and HIV infections are not curable, even if detected early and treated properly.

STIs like hepatitis-B and HIV infection can spread by sharing of injection needles, surgical instruments, *etc.*, with an infected individual.

STIs primarily spread through sexual contact with an infected person.

Though all individuals are vulnerable to STIs, their incidences are reported to be very high among individuals in the age of 15-24 years.

177. Answer (3)

Hint: 20 years after the initiation of 'family planning' programmes in India.

Sol.: The Government of India legalised MTP in 1971 with some strict conditions to avoid its misuse.

The MTP (Amendment) act, 2017, was enacted by the Government of India with the intention of reducing the incidences of illegal abortion and consequent maternal mortality and morbidity.

In India, the 'family planning' programmes were initiated in 1951.

178. Answer (4)

Hint: 'Nirodh' is a popular brand of condom.

Sol.: Condoms are categorised as barrier methods of contraception. Condoms can be used by both males and females.

Fem shield is a female condom.

Multiload-375 and progestasert are IUDs, which are inserted in the uterus to prevent conception.

Injectable contraceptives are used by females. These injectables contain progestin and estradiol derivatives that prevent ovulation and implantation.

179. Answer (4)

Hint: Contraceptives should be able to avoid unwanted conception.

Sol.: Characteristics of an ideal contraceptive are:

(i) They should be user-friendly

(ii) They should be reversible

(iii) They should be easy available to the users

(iv) They should not have side effects

(v) They should be completely effective against pregnancy / conception.

180. Answer (4)

Hint: Rod-like cylindrical structure that is placed under the skin

Sol.: Implants are hormone containing devices which are implanted subdermally through a small incision.

Vaults and cervical caps act as barrier contraceptives. These devices can be self-inserted by the users.

Saheli, a non-steroidal preparation, is once a week pill.

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