PHYSICS

1. (a)

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

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

$= 4.4mT$

2. (c)

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

3. (c)

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

4. (b)

At Brewster angle, only the reflected light is completely polarized, but the refracted light is partially polarized.

5. (d)

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

We know that transformation ratio (r) is $r = \frac{N_S}{N_P} = \frac{V_S}{V_P}$

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

$V_S : V_P = 2:1$

6. (a)

Output for given options.

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

So option (a) is correct.

7. (d)

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

$1VSD = \left(\frac{N}{N+1}\right)$ MSD

L.C = Least count $= 1MSD - 1VSD$

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

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

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

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

8. (c)

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

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

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

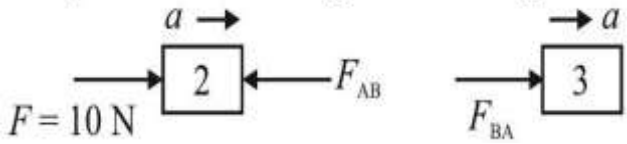
$(\Delta \ell)_{max} = 4\ mm$

9. (a)

In connected motion,

Common acceleration $a = \frac{F_{\text{net}}}{M_{\text{total}}}$ $a = \frac{10}{5} = 2\ m/s^2$

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



Force exerted by block A on block B,

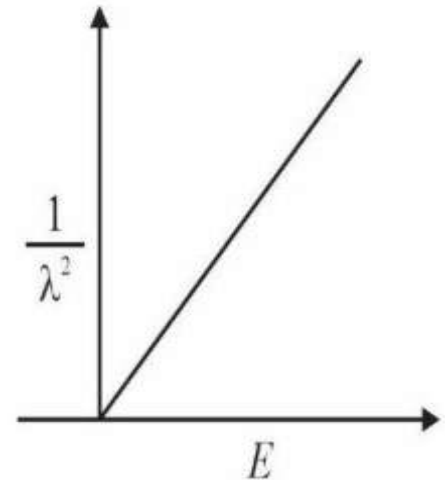
$F_{BA} = (3)\ a$

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

10. (a)

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

11. (b)



$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$

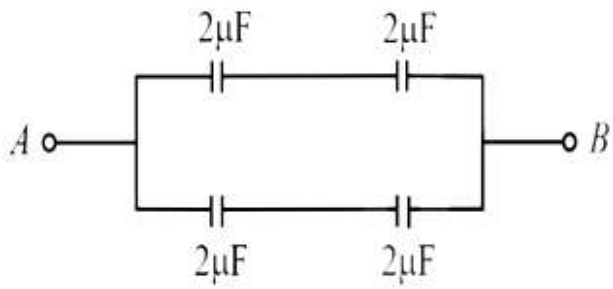
$\lambda = \frac{h}{\sqrt{2mE}}$

$\lambda^2 = \frac{h^2}{2mE}$

$E \propto \frac{1}{\lambda^2}$

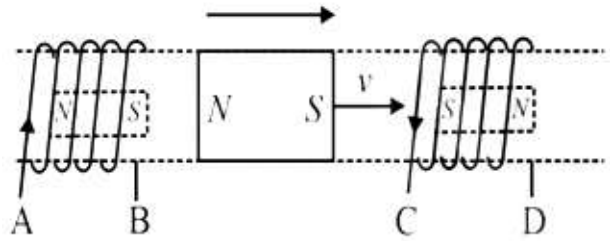
12. (c)

Balanced Wheatstone bridge Equivalent circuit



13. (c)

Lenz Law

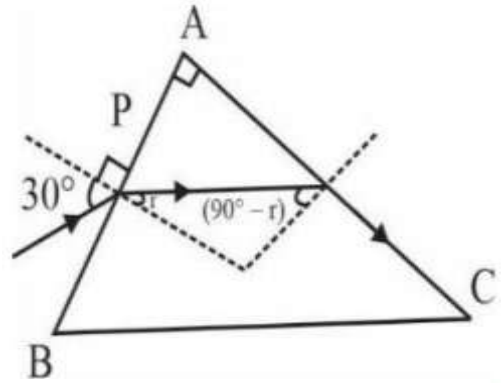


Solenoid-1 Solenoid-2

14. (c)

The $I-V$ characteristics of solar cell is drawn in the fourth quadrant of the coordinate axes. This is because a solar cell does not draw current but supplies the same to the load. In reverse bias condition, the positive terminal is connected to the n-type and the negative terminal is connected to the p-type. Hence, majority charge carriers are swept into terminals and minority charge carriers are repelled by the terminals. Thus, a very small drift current flows through the diode due to minority charge carriers of both n-side and p-side.

15. (d)



For surface AB

$1sin\,30° = \mu sin\,r$.....(i)

For surface AC

$\mu sin(90° - r) = 1$.....(ii)

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

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

From (1) and (2)

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

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

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

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

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

16. (a)

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

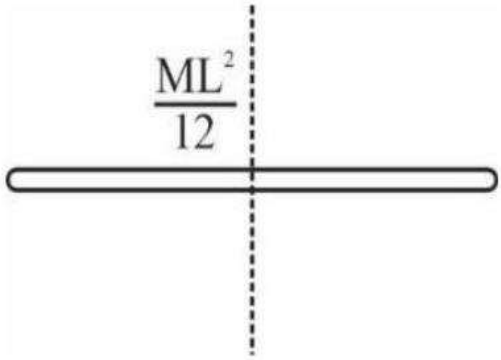
For axial point $\theta = 0°$ or $180°$

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

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

$= \pm 9 \times 10^3$

17. (c)



$\frac{ML^2}{12} = 2400$

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

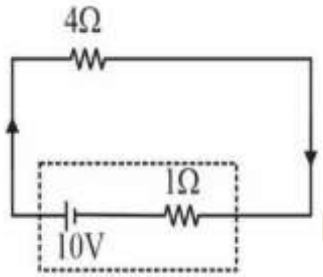
$\Rightarrow L^2 = \frac{2400 \times 12}{400}$

$\Rightarrow L^2 = 72$

$\Rightarrow L = \sqrt{72}$

$\Rightarrow L = 8.5\ cm$

18. (a)



$10 = 5i$

$i = 2\ A$

Terminal voltage $= 10 - 1(2)$

$= 8\ V$

19. (d)

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

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

For $H, Z = 1$ So,

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

For $A\ \lambda = 656.3$

For $B\ \lambda = 486.1$
For $C\ \lambda = 434.1$
For $D\ \lambda = 410.2$

20. (d)

Energy $E = h\nu$
Velocity $= C = \nu\lambda$
$\lambda = \frac{C}{V}$
$P = \frac{h}{\lambda} = \frac{h}{\frac{h}{v}} = \frac{h\nu}{c}$
$F_{\text{ext}} = 0$, So momentum conserved energy conserved.

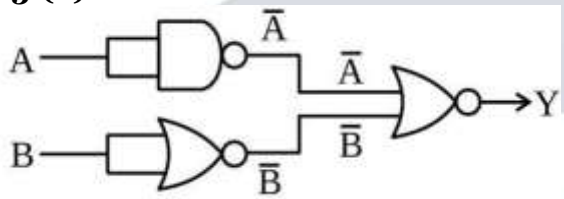
21. (b)

$^{290}_{82}X \xrightarrow{\alpha} {}^{286}80Y \xrightarrow{e^+} {}^{286}79Z \xrightarrow{\beta^-} {}^{286}80P \xrightarrow{e_-} {}^{286}81Q$
For α emission, mass number decreases by 4 and atomic number decreases by 2 .
For e^+, atomic number decreases by 1 and mass number remains unchanged.
For β^-, mass number is unchanged and atomic number increase by 1 .

22.(c)

$s = 2t - 1$
$v = \frac{ds}{dt} = \frac{d}{dt}(2t - 1) = 2$ (SI unit)
Instantaneous power, $P = \vec{F} \cdot \vec{V}$
$= 5 \times 2 = 10$ (SI unit)

23.(b)



$Y = \overline{\bar{A} + \bar{B}} = \bar{\bar{A}} \cdot \bar{\bar{B}}$ (AND gate)

24.(b)

$g = \frac{GM}{R^2} = 9.8\ m/s^2$.....(i)
Now for Planet,
$M' = \frac{M}{10}, D' = \frac{D}{2}$ [D is diameter fo earth]
$\therefore\ R' = \frac{R}{2}$
Now, $g' = \frac{GM'}{(R')^2} = \frac{GM \times 4}{10 \times R^2} = \frac{4}{10} \times \frac{GM}{R^2}$
Substitute value of $\frac{GM}{R^2}$ from equation (i) $g' = 0.4 \times 9.8\ m/s^2 = 3.92\ m/s^2$

25.(a)

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

26.(d)

In case of rolling, the velocity of the point of contact with the surface is zero. Also, the velocity of the point at the highest point of the rolling body is twice the velocity of COM of the body. So, point P moves faster than point Q.

27.(b)

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

28.(c)

For circular disc,
$F_{\text{excess}} = 2\pi rT$
where r is radius of disc and T is surface tension.

Substituting the given values,

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

$= 2 \times \frac{22}{7} \times 4.5 \times 10^{-2} \times 7 \times 10^{-2}$

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

29.(b)

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

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

$T = 2\pi\sqrt{\frac{I}{mB}} \Rightarrow T^2 = \frac{4\pi^2 I}{mB}$

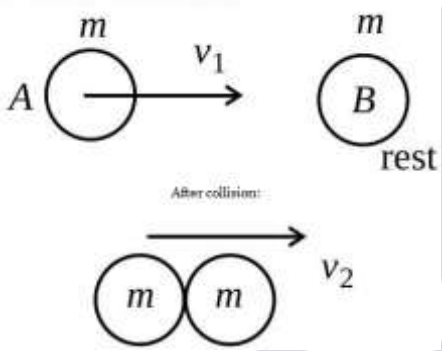
$m = \frac{4\pi^2 I}{T^2 B}$

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

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

30. (d)

Before collision:



Now, from conservations of momentum,

Momentum before collision = Momentum after collision.

$mv_1 + (0) = 2mv_2$

$mv_1 = 2mv_2$

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

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

31. (d)

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

$A = 5\ m$

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

$T = 2\ s$

32.(c)

Strain and angle are also dimensionless

Solid angle is dimensionless.

33.(b)

For spherical shell

$V_{\text{centre}} = V_{\text{surface}}$

Difference in potential is zero.

34.(d)

$T = mw^2 r$

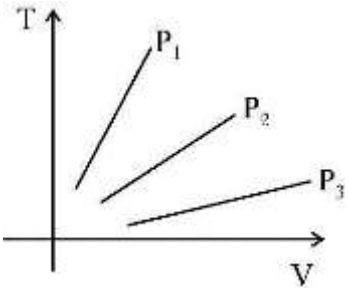
$T \propto w^2$

T becomes 4 times

35.(d)

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

36. (b) According to Charle's law $V \propto T$



$P_1 > P_2 > P_3$

37. (d)

As capacitor is being charged the displacement current is

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

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

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

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

$$I = \frac{dQ}{dt} = I_{\text{conduction}}$$

38.(b)

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

39.(a)

To Balance Bridge $\frac{P}{Q} = \frac{R}{S}$

Here $P = 10\Omega$
$Q = 10\Omega$
$R = 15\Omega$
and $S = 5 + R_{diode}$
where R_{diode} should be 10Ω to Balance bridge.

40. (d)

Keeping the battery connected
V remains same
$C = \frac{\varepsilon_0 A}{d}$ d is reduced
$\therefore$ C increases
From
$Q = CV$
As $C \uparrow Q \uparrow \Rightarrow A$ is correct
$E = \frac{1}{2}CV^2$ As $C \uparrow E$ increases $\Rightarrow B$ is incorrect
Capacitance increases $\Rightarrow C$ is correct
Product of charge and voltage increases
$\Rightarrow E$ is correct.

41. (d)

$F = \alpha t^2 + \beta t$
$[MLT^{-2}] = \alpha[T^2]$
$\alpha = [MLT^{-4}]$
$[MLT^{-2}] = \beta[T]$
$\beta = [MLT^{-3}]$

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

42.(d)

Thermal stress = thermal strain $\times Y$

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

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

$$F = 50 \times 10^3\ N$$

43.(d)

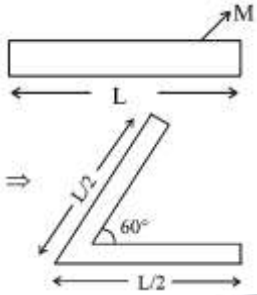
$f_0 = 140\ cm, f_e = 5\ cm$

For normal adjustment

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

44.(d)

$M = mL$



Magnetic pole strength remains the same

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

45.(d)

$V_{rms} = 210$ volt,

$V_0 = 210\sqrt{2}$ volt

$V_0 = I_0 X_C$

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

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

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

$$I_0 = 0.932\ A$$

46.(d)

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

For parallel combination

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

For series combination

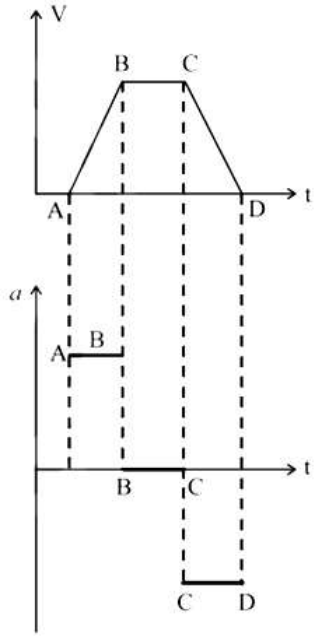
$$\frac{1}{P_{\text{series}}} = \frac{1}{P_1} + \frac{1}{P_2} = 1 + \frac{1}{2}$$

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

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

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

47.(a)



a = slope of $v - t$ graph
A to B → slope is positive and constant
⇒ so acceleration is positive & constant
B to C → slope is zero ⇒ acceleration is zero.
C to D → slope is negative and constant
⇒ so acceleration is negative & constant

48. (d)

$m' = 3\ m$

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

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

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

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

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

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

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

49.(c)

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

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

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

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

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

Minimum energy required

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

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

50.(d)

If sheet is magnetic, then force is required to hold the sheet because magnetic pole exert force on sheet

As sheet is conducting, eddy current formed which oppose the way by which it is produced, so forced is required.

As sheet is non conducting & non polar, so no magnetization occur in sheet hence no force is required

CHEMISTRY

51. (c)

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

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

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

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

52.(b)

Change in oxidation state of elements means redox reaction:

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

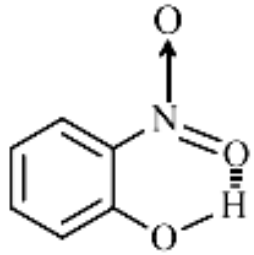
$\overset{+2}{Ba}\overset{-1}{Cl_2} + \overset{+1}{Na_2}\overset{-2}{SO_4} \rightarrow \overset{+2}{Ba}\overset{-2}{SO_4} + 2\overset{+1}{Na}\overset{-1}{Cl}$

(No change in oxidation state hence not redox reaction)

$\overset{0}{Zn} + \overset{+2}{CuSOSu_4} \rightarrow \overset{+2}{ZnSO_4} + \overset{0}{Cu}$ (Redox reaction)

$2KClO_3^{+5} + \overset{0}{I_2} \rightarrow 2KIO_3^{+5} + \overset{0}{Cl_2}$ (Redox reaction)

53.(c)



Intramolecular hydrogen bonding is observed in ortho nitrophenol.

54.(c) Fehling's solution 'A' is aqueous copper sulphate.

55.(d)

$NaOH + HCl \rightarrow NaCl + H_2O$

Mass of $NaOH = 1\ g$

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

$= 0.025$ moles

$= 25$ millimoles

Millimoles of $HCl = MV = 25 \times 0.75$

$= 18.75$ millimoles

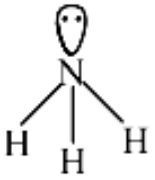
Millimoles of $NaOH$ unreacted

$= 25 - 18.75$

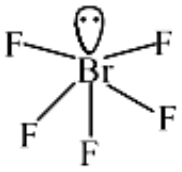
$= 6.25$ millimoles

Mass $= 40 \times 6.25 = 250mg$

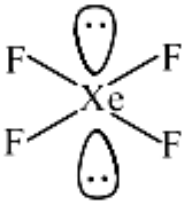
56.(c)



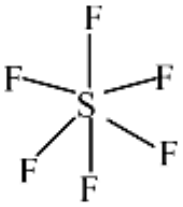
Trigonal Pyramidal



Square Pyramidal



Square Planner



Octahedral

57. (c)

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

58. (b)

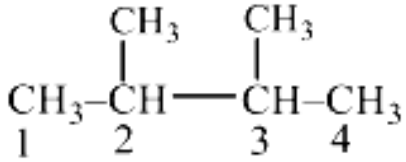
(A) Isothermal process → at constant temperature
(B) Isochoric process → at constant volume
(C) Isobaric process → at constant pressure
(D) Adiabatic process → No heat exchange

59. (b)

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

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

60. (a)



IUPAC name: 2,3-dimethyl butane

61. (c)

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

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

62.(c)

$F = 4.0$

$O = 3.5$

$N = 3.0$ electronegativity

$C = 2.5$

$Si = 1.8$

Hence order will be:

Si $< C < N < O < F$

63.(b)

3° alcohols react with Lucas reagent instantaneously.

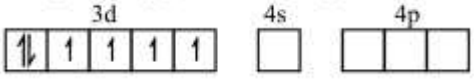
2° alcohols react with Lucas reagent after 5 minute.

1° alcohols do not react with Lucas reagent at ordinary temperature.

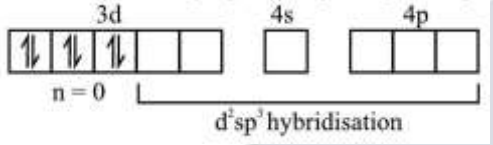
64.(c)

Both $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ are octahedral complex because coordination number are six.

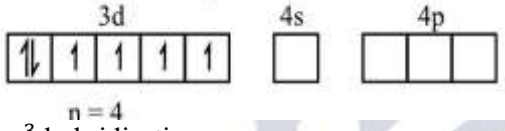
Electronic configuration of Co^{3+} in $[Co(NH_3)_6]^{3+}$ is $Co^{3+}: [Ar]3\ d^6 4\ s^0 4p^0$



As NH_3 is a strong ligand, so pairing takes place



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



sp^3 hybridisation

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

65.(c)

The boiling point of hydrides of group 16 are in the order $H_2O > H_2Te > H_2Se > H_2\ S$.

It is due to the presence of extensive H-bonding in H_2O.

66.(d)

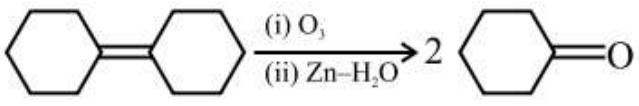
(A) $m_l \rightarrow$ orientation of orbital.

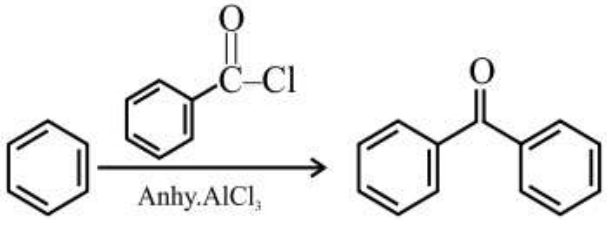
(B) $m_s \rightarrow$ orientation of spin of electron.

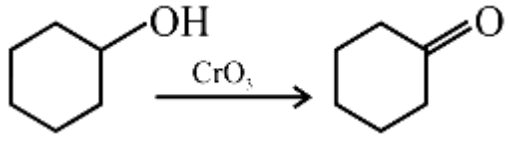
(C) $l \rightarrow$ shape of orbital.

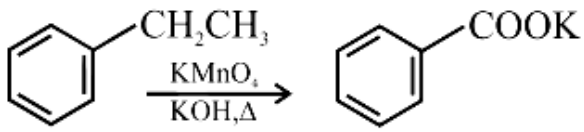
(D) $n \rightarrow$ size of orbital.

67.(a)

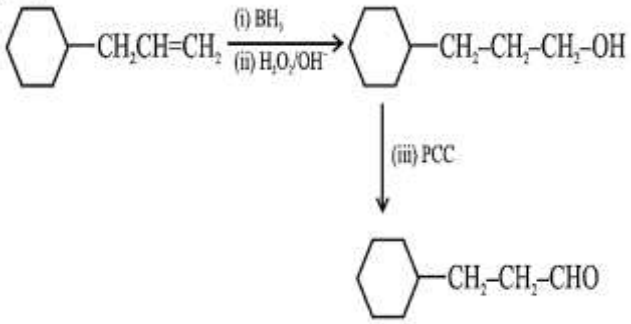
(A) 

(B) 

(C) 

(D) 

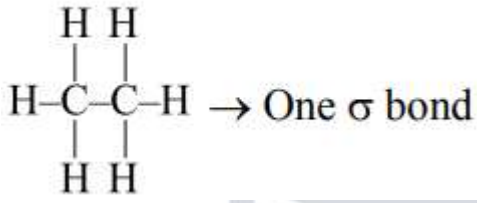
68. (d)



69.(a)

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

70.(a)



(A)

(B) $H_2C = CH_2$ → One σ-bond and one π-bond

(C) C_2 → Two π-bonds

(D) $HC \equiv CH$ → One σ-bond and two π-bonds

71. (b)

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

72.(a)

$2\ A \rightleftharpoons B + C$

$$K_C = \frac{[B][C]}{[A]^2} = \frac{[2 \times 10^{-3}][2 \times 10^{-3}]}{[2 \times 10^{-3}]^2}$$

$Q_C = 1$

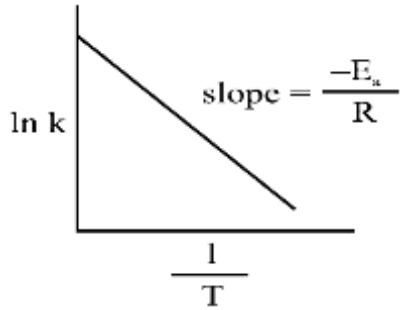
$Q_C > K_C$

Reaction has a tendency to go in backward direction.

73. (b)

Arrhenius equation is;

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



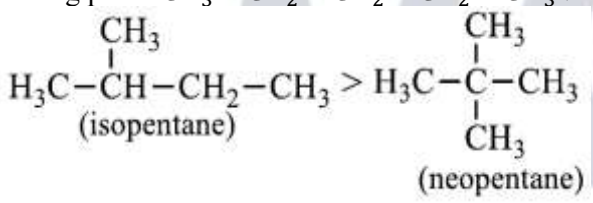
Graph between $ln\ k$ vs $\frac{1}{T}$ with intercept $= log\ A$ and slope $= -\frac{E_a}{R}$

74.(c)

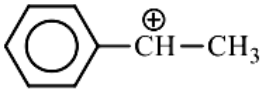
(1) $CO(g) + H_2O(g) \rightleftharpoons CO_2(\ g) + H_2(\ g)$

$K_C = \frac{[CO_2][H_2]}{[CO][H_2O]}$
$\Delta n = 2 - 2 = 0$
$K_p = K_C(RT)\Delta n_g$
$K_p = K_C(RT)^0$
$K_p = K_C$
(2) $2BrCl(g) \rightleftharpoons Br_2(g) + Cl_2(g)$
$\Delta n_g = 2 - 2 = 0$
$K_C = \frac{[Br_2][Cl_2]}{[BrCl]^2}$
$K_p = K_C(RT)\Delta n_g$
$K_p = K_C(RT)^0$
$K_p = K_C$
(3) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
$\Delta n_g = 2 - 1 = 1$
$K_C = \frac{[PCl_3][Cl_2]}{[PCl_5]}$
$K_p = K_C(RT)\Delta n_g$
$K_p = K_C(RT)^1$
Here, $K_p \neq K_C$
(4) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
$\Delta n_g = 2 - 2 = 0$
$K_C = \frac{[HI]^2}{[H_2][I_2]}$
$K_p = K_C(RT)\Delta n_g$
$K_p = K_C(RT)^0$
Here, $K_p = K_C$

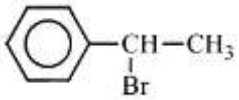
75. (c)
Boiling point decreases with increase in branching as the intermolecular forces decreases
Boiling point: $CH_3 - CH_2 - CH_2 - CH_2 - CH_3 >$



76. (b)
S_N1 reaction are fastest in those compound, where the intermediate carbocation is resonance stabilized.



is resonance stabilized carbocation among given options. So, rate of S_N1 reaction will be fastest in



77. (c)
For He^+ion; Energy $= -x$ J, Z = 2, n = 1
Energy $= \frac{-2.18\times10^{-18}Z^2}{n^2}\ J$
$-x = \frac{-2.18 \times 10^{-18} \times (2)^2}{(1)^2}\ J$
$x = 2.18 \times 10^{-18} \times 4\ J$
For Be^{3+} ion; $Z = 4, n = 2$

$(E_2)_{Be^{3+}} = \frac{-2.18 \times 10^{-18} Z^2}{n^2} J$

$= \frac{-2.18 \times 10^{-18} \times (4)^2}{(2)^2} J$

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

$= -XJ$

78.(a)

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

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

(C) In the given reaction, $2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$

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

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

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

79.(d)

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

80. (c)

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

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

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

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

So correct option is:

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

81.(c)

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

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

82.(d)

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

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

83.(c)

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

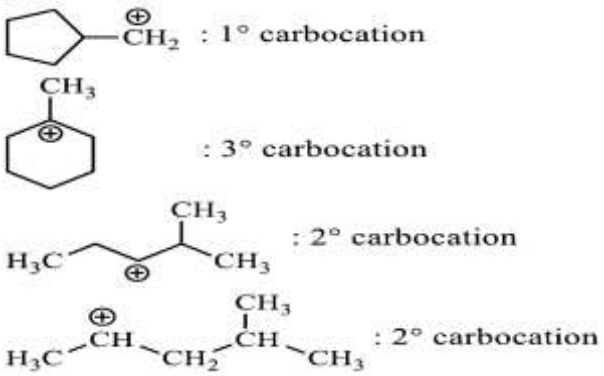
Atoms in 2.271098 L of Helium at $STP = \frac{2.271098}{22.4} \times N_A = 0.101\, N_A$

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

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

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

84. (b)



Stability order of carbocation : 3° > 2° > 1°.

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

85.(d)

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

So, solubility order:

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

86. (d)

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

Hence, empirical formula is ABC_3

87.(b)

$3ROH + PCl_3 \rightarrow 3RCl + H_3PO_3$ (A)

$ROH + PCl_5 \rightarrow RCl + HCl + POCl_3$ (B)

Hence, $A: H_3PO_3$ and $B: POCl_3$

88. (c)

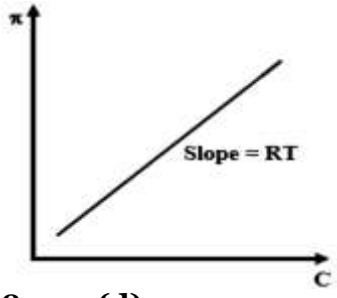
$\pi =$ CRT

$\therefore$ slope = RT = 25.73 $Lbarmol^{-1}$

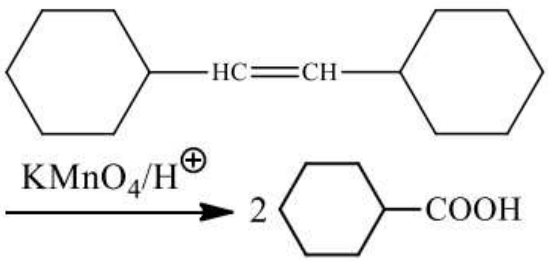
$\therefore T = \frac{25.73}{0.083}$

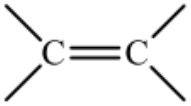
$= 310\ K$

$= 37°C$



89. (d)





Will be completely oxidized in presence of acidified $KMnO_4$ into carboxylic acid.

90. (c)

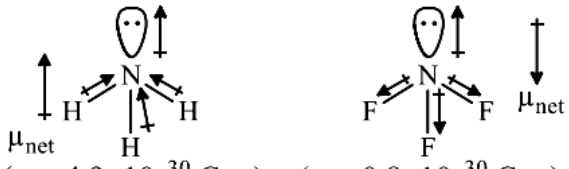
Homoleptic complex is one which contains only one kind of ligands. Heteroleptic complex is one which contains two or more kinds of ligand.

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

91. (b)

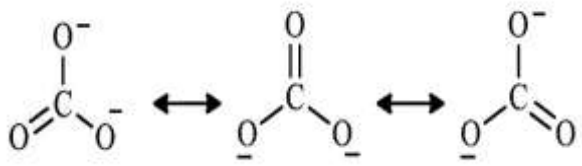
Fe^{2+} ion undergoes hydrolysis, therefore, while preparing aqueous solution of ferrous sulphate in water, 2-3 ml of dilute sulphuric acid is added to prevent the hydrolysis of Mohr's salt.

92.(b)



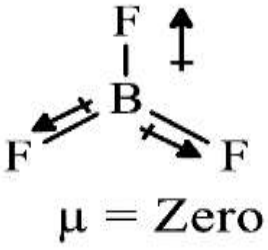
($\mu = 4.9\times10^{-30}$ C m) ($\mu = 0.8\times10^{-30}$ C m)

CO_3^{2-} has three canonical forms.



Two resonating structures can be drawn for ozone.

BF_3 has trigonal planar structures. Its net dipole moment is Zero.

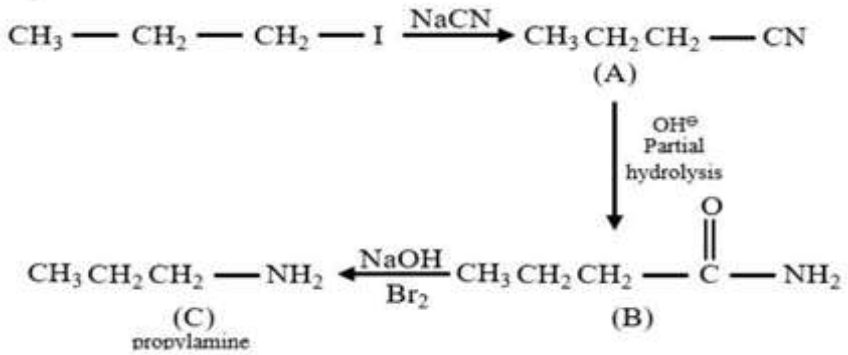


93.(c)

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

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

94.(c)



95.(c)

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

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

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

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

$= 38037.7\ J/mol$

$= 38.0377\ kJ/mol$

$\simeq 38.04\ kJ/mol$

96.(b)

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

At t = 0 0.1M - -

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

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

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

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

$\alpha = 0.717$

97.(d)

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

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

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

$= -413.14$ Calories

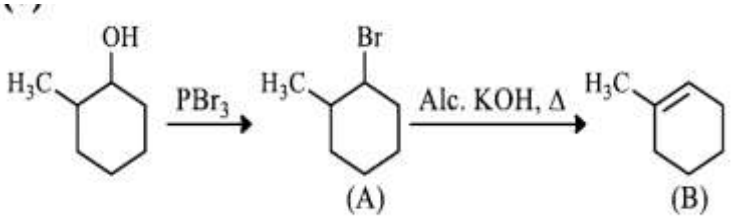
98. (d)

$W = Z\times i\times t$

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

$= 0.315\ g$

99.(c)



100. (c)

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

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

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

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

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

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

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

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

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

BOTANY

101. (b)

Both wind and water pollinated flowers are not very colourful and do not produce nectar. In most of the water-pollinated species, pollen grains are protected from wetting by a mucilaginous covering. Some examples of water pollinated plants are Vallisneria and Hydrilla which grow in fresh water and several marine sea-grasses such as Zostera. Not all aquatic plants use water for pollination. In a majority of aquatic plants such as water hyacinth and water lily, the flowers emerge above the level of water and are pollinated by insects or wind as in most of the land Plants. In another group of water pollinated plants such as seagrasses, female flowers remain submerged in water and the pollen grains are released inside the water. Pollen grains in many such species are long, ribbon like and they are carried passively inside the water; some of them reach the stigma and achieve pollination.

102. (d)

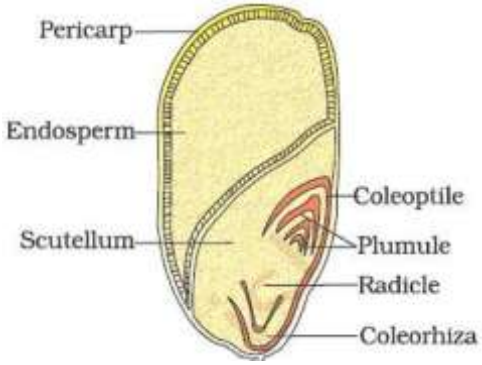
Ex situ Conservation- In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. Zoological parks, botanical gardens and wildlife safari parks serve this purpose.

103. (a)

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

104. (a)

The primary root, or radicle is the first organ to appear when a seed germinates.



105. (c)

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

106. (a)

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

107. (a)

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

108. (d)

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

109. (c)

Speciation is generally a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification. Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialization and lead to a greater species diversity. There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

110. (d)

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

111. (b)

For every CO_2 molecule entering the Calvin cycle, 3 molecules of ATP and 2 of NADPH are required. The Calvin cycle can be described under three stages: carboxylation, reduction and regeneration. Reduction step involve utilization of 2 molecules of ATP for phosphorylation and two of NADPH for reduction per CO_2 molecule fixed. The regeneration steps require one ATP for phosphorylation to form RuBP.

112. (b)

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

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

113. (c)

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

114. (a)

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

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

Where $N =$ Population density at time t

$r =$ Intrinsic rate of natural increase

$K =$ Carrying capacity

115. (d)

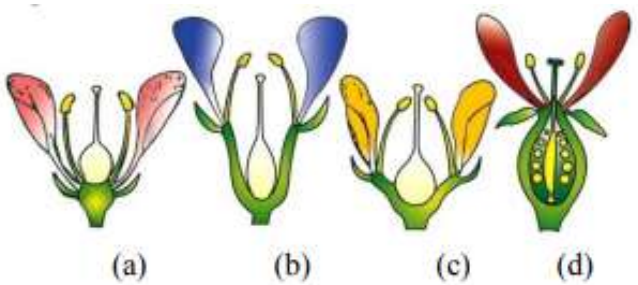
The key features of metaphase are:

I. Spindle fibres attach to kinetochores of chromosomes.

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

116. (b)

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



position of floral parts on thalamus: (a) hypogynous (b) and (c) perigynous (d) epigynous

117. (c)

Some common members of basidiomycetes are Agaricus (mushroom) , Ustilago (smut) and Puccinia (rust fungus). Rhizopus is also known as the bread mould. It belongs to Phycomycetes.

118. (d)

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

119. (d)

Pink flowered snapdragon plant (Rr) × Red flowered snapdragon plant (RR)

Pink flower	R	r
R	RR	Rr
R	RR	Rr

Red flower →

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

120. (a)

Two or more alternative forms of a gene- Allele
Cross of F_1 progeny with homozygous recessive parent- Test cross
Cross of F1 progeny with any of the parents- Back cross
Number of chromosome sets in plant- Ploidy

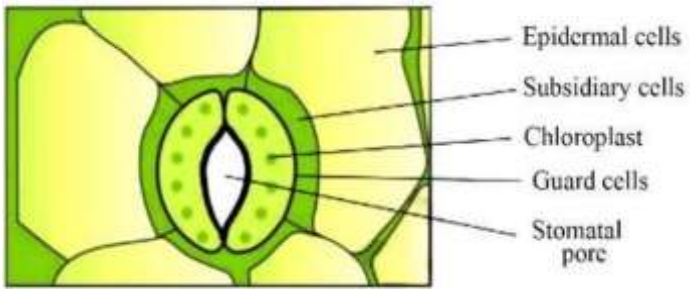
121. (d)

Lecithin or phosphatidyl choline is an example of phospholipid.

122. (a)

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

123. (c)



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

124. (c)

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

125. (b)

A transcription unit in DNA is defined primarily by the three regions in the DNA:
(i) A Promoter

(ii) The Structural gene
(iii) A Terminator

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

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

128. (c)
Metal ions are the common cofactors. Cofactor for enzyme carboxypeptidase is zinc

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

130. (d)
Alleles show expressions in the F_2 generation.

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

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

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

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

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

136. (d)
Chloroplast contains small, double- stranded circular DNA molecules and ribosomes.

137. (a)
In somatic hybridisation, protoplasts are fused involving two varieties of plants.

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

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

140. (d)

Frederick Griffith	Transformation

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

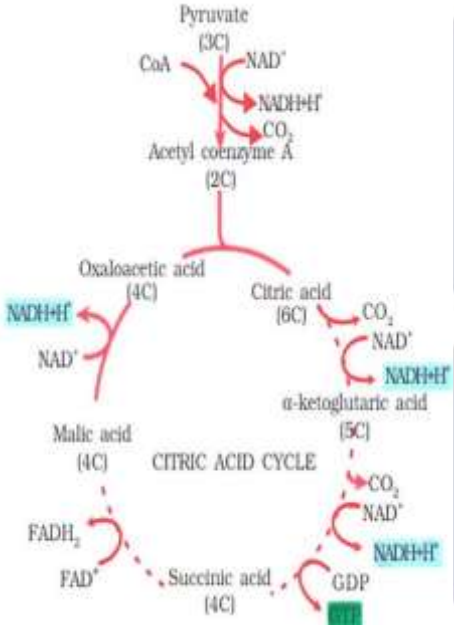
141. (c)

GLUT-4 enables glucose transport into cells.
Insulin is a hormone secreted by pancreas.
Trypsin is an example of enzyme.
Collagen is the most abundant protein in animal world, which is an intercellular ground substances

142. (a)

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

143. (a)



144. (d)

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

145. (b)

The DNA-dependent DNA polymerase $_{\text{EhColi}}$ catalyse polymerisation only in one direction, that is $5' \rightarrow 3'$.

146. (d, a)

The NPP of the first trophic level is the GPP of the second trophic level and the NPP of the 2nd trophic level is GPP is 3rd trophic level.
According to the 10% law 90 per cent is the respiratory loss (R) at each trophic level.
$NPP = GPP - R$
At the first trophic level NPP is $100x$ which is GPP of second trophic level.
At second trophic level NPP is 10% of GPP $= 10x$ Since the GPP of the 3rd trophic level is the same as the NPP of the second trophic level, it is equal to $10x$.

147. (c)

Rose	Perigynous flower
Pea	Marginal placentation
Cotton	Twisted aestivation
Mango	Drupe

148. (d)

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

149. (c)

Monoadelphous	China rose
Diadelphous	Pea
Polyadelphous	Citrus
Epiphyllous	Lily

150. (a)
Sexual reproduction can be isogamous, anisogamous or oogamous in phaeophycean.

ZOOLOGY
SECTION-A

151. (d)

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

152. (b)

List-I	List-II

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

153. (a)
The presence or absence of hymen is not a reliable indicator of virginity or sexual experience. However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horseback riding, cycling, etc. In some women the hymen persists even after coitus.

154. (d)
A pair of jointed filamentous structures called anal cerci are present in the 10^{th} abdominal segment in both sexes of cockroaches.

155. (d)

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

156. (b)
Glucagon is a peptide hormone secreted by the alpha cells of Islets of Langerhans of pancreas.
Remaining are steroidal hormones.

157. (c)
The process of copying genetic information from one strand of the DNA into RNA is termed as transcription. The process of transcription is catalyzed by the enzyme DNA dependent RNA polymerase in only one direction, that is, $5' \rightarrow 3'$, the strand of DNA that has the polarity $3' \rightarrow 5'$ acts as a template, and is also referred to as template strand.
The given template strand of DNA is:
3'-TACATGGCAAATATCCATTCA 5'
So, the transcribed strand of RNA will be:
5'AUGUACCGUUUAUAGGUAAGU 3'

158. (d)
Skeletal muscles: Triceps
Smooth muscles: Stomach
Cardiac muscles: Heart

159. (b)
The correct sequence of stages of cell division is:
Gap-1 phase → Synthesis phase → Gap-2 phase → Karyokinesis → Cytokinesis

160. (d)

Myasthenia gravis, Rheumatoid arthritis and Systemic Lupus Erythematosus are autoimmune disorders.
Gout is a skeletal disorder affecting joints and Muscular dystrophy is genetic disorder affecting muscles.

161. (a)

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

162. (a)

The flippers of Penguins and Dolphins are analogous organs and thus are examples of convergent evolution. Other examples of analogy are the eye of the octopus and of mammals.

163. (c)

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

164. (b)

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

165. (b)

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

166. (c)

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

167. (d)

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

168. (a)

List-I	List-II
α-1-antitrypsin	protein is used to treat emphysema.

cryIAb	controls corn borer
cryIAc	cotton bollworms.
Enzyme replacement therapy	treat ADA deficiency.

169. (b)
FSH acts upon ovarian follicles in females and sertoli cells in males.
170. (d)
X - ori and Y - rop
Ori responsible for controlling copy number of the linked DNA.
Rop codes for the proteins involved in the replication of the plasmid.
171. (b)

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

172. (d)
Annelids - True coelomates
Poriferans to Platyhelminthes - Acoelomates
Aschelminthes - Pseudocoelomates
173. (d)
Descending limb of Henle's loop - Permeable to water and impermeable to electrolytes.
Proximal convoluted tubule - Lined by simple cuboidal brush border epithelium.
174. (b)

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

175. (b)

Vaults - Barrier method.

176. (d)

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

177. (b)

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

178. (a)

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

179. (a)

Diakinesis - Completion of terminalisation of chiasmata
Pachytene - Appearance of recombination nodules
Zygotene - Synaptonemal complex formation
Leptotene - Chromosomes look like thin threads

180. (a)

Common cold is caused by rhinoviruses.
Haemozoin is toxic substance released from ruptured RBCs.
Widal test is used for diagnosis of typhoid.
Allergy is exaggerated response of immune system caused by allergens (Dust mites etc).

181. (c)

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

182. (d)

Scientific name of Angel fish is Pterophyllum.
Myxine is also known as hagfish.
Scientific name of saw fish is Pristis.
Scientific name of flying fish is Exocetus.

183. (a)

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

184. (c)

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

185. (a)

Down's syndrome - 21st chromosomes
α-thalassemia - 16th chromosomes
β-thalassemia - 11th chromosomes
Klinefelter's syndrome - ' X ' chromosome

186. (a)

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

187. (b)

Mesozoic Era - Birds and reptiles
Proterozoic Era - Lower invertebrates
Coenozoic Era - Mammals
Paleozoic Era - Fish and amphibians

188. (a)

The cerebral hemispheres are connected by a tract of nerve fibres called corpus callosum. Three major regions make up the brain stem; mid brain, pons and medulla oblongata. Cerebrum is the part of forebrain.

189. (c)

A - FSH
B - Leydig cell
C - Sertoli cells
D - Spermiogenesis

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

190. (b)

A. RNA Polymerase III - SnRNAs, tRNA
B. Termination of transcription - Rho factor
C. Splicing of exons - snRNPs
D. TATA box - Promoter

191. (b)

Exophthalmic goiter is a form of hyperthyroidism, characterized by enlargement of the thyroid gland, protrusion of the eyeballs, increased basal metabolic rate, and weight loss, also called Graves' disease. Acromegaly is the excessive secretion of growth hormone. Cushing's syndrome is caused by excessive secretion of cortisol. Cretinism is the hyposecretion of thyroid hormone during pregnancy which leads to stunted growth (cretinism), mental retardation, low intelligence quotient, abnormal skin, deaf-mutism, etc.

192. (a)

Goblet cells of alimentary canal is an example of unicellular glandular epithelium. Compound epithelium is present in the dry surface of the skin, the moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and of pancreatic ducts. Salivary gland is an example of multicellular glandular epithelium. Pancreas is a type of endocrine glandular epithelium. It secretes insulin and glucagon hormone.

193. (c)

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

194. (c)

The structure used for storing food in cockroaches is Crop. A ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut, which secrete digestive juice. At the junction of midgut and hindgut is present another ring of 100-150 yellow coloured thin filamentous Malpighian tubules. Gizzard helps in grinding the food particles in cockroach.

195. (a)

In juxtamedullary nephron, the loop of Henle is very long and runs deep into the medulla. Cortical nephron is present in majority w.r.t juxtamedullary nephron.

196. (d)

In ECG, The P-wave represents the electrical excitation (or depolarisation) of the atria, which leads to the contraction of both the atria. The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The T-wave represents the return of the ventricles from excited to normal state (repolarisation). The end of the T-wave marks the end of systole. T-P gap represents joint diastole of heart, in which heart muscles are electrically silent.

197. (c)

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

198. (b)

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

199. (c)

The correct sequential steps in the enzyme action is as follows:
A. Substrate binding to active site.
B. Substrate enzyme complex formation.
C. Chemical bonds of the substrate broken.
D. Release of products.
E. Free enzyme ready to bind with another substrate.

200. (c , a)

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