1. $S = \frac{G}{n-1} = \frac{G}{99}$

(c)

2. $P = \frac{h}{\lambda}$

(b)

3. $V = \frac{3}{4}V_C$

(b)

$$\frac{9}{16}\frac{Gmm}{R} = \frac{GMm}{R} = -\frac{GMm}{r}$$

$$r = \frac{16R}{7}$$

4. $\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

(a)

$$f_a < f_\omega$$

5. (a)Electric field lines as $\perp_r$ to equipotential surface

6. $t \propto \frac{1}{(Aperture)^2}, \frac{t_2}{t_1} = \left(\frac{d_1}{d_2}\right)^2 = 4$

(d)

7. $P_C = I^2R,\ P_{rated} \propto \frac{1}{R}$

(a)

$$\text{Brightness} \propto \frac{1}{\text{Pr}ated}$$

8. $T = 2\pi\sqrt{\frac{I}{MB}}$

(b)

$$3 = 2\pi\sqrt{\frac{I}{MB}}$$

$$3\sqrt{2} = 2\pi\sqrt{\frac{I}{MB_H}}$$

$$\frac{3}{3\sqrt{2}} = \sqrt{\frac{B_H}{B}}, \cos\theta = \frac{1}{2}$$

9. (a) $I = neAVd$

10. $F = \frac{q_1q_2}{4\pi\varepsilon_0 r^2}$

(b)

$$4F = \frac{q_1q_2}{4\pi\varepsilon_0 16(r)^2}$$

$$r_1 = \frac{r}{8}$$

11. $v_r = \sqrt{\frac{3RT}{M}}$

(c)

$$T^1 = 2T, M^1 = \frac{M}{2}$$

$$v_r = 2v$$

12. $Z = \sqrt{R^2 + x_2^2}$, $P = y_r I_r \cos\phi$,

(b)

$$P = \frac{V_r^2}{Z^2}.R = 200wH$$

13. $I = I_x + I_y + I_z$

(b)

$$I = \frac{ML^2}{3} + \frac{ML^2}{3} + 0 = \frac{2ML^2}{3}$$

14. (b)The rate of change of flux or emf induced in the coil is

$$\varepsilon = \frac{-\Delta\phi}{\Delta t}$$

$\therefore$ Induced current

$$i = \frac{\varepsilon}{R_{eq}} = -\frac{1}{R}\frac{\Delta\phi}{\Delta t} \quad ...(i)$$

Given: $R_{eq.} = R + 4R = 5R$, $\Delta\phi = n(w_2 - w_1)$ A, $\Delta t = t$.

(Here W_1 and W_2 are associated with one turn.)

Putting the given values in eq. (i), we get

$R_{eq.} = R + 4R = 5R$, $\Delta\phi = n(w_2 - w_1)$ A, $\Delta t = t$.

$$\therefore \quad i = -\frac{n}{5R}\frac{(W_2 - W_1)A}{t}$$

15. $E_{K_\alpha} = E_K - E_L = \frac{12.4}{0.126} = 98.4Kcal$,

(d)

$E_L = 17.5KeV, \quad \lambda_2 = \frac{12.4}{17.5} = 0.7A^0$

16. (c)Conceptual

17. $\frac{1}{mx} + \frac{1}{x} = \frac{1}{f}, \quad \frac{1}{-my} + \frac{1}{y} = \frac{1}{f}, \; f = \frac{x+y}{2}$

(a)

18. $C = \frac{\varepsilon_0 A}{d}$, $q_2 = q_3 = 0, \; q_1 = q_4 = q$

(a)

19. $X_C = \frac{\int x dm}{\int dm} =$

(c)

20. $A = \frac{R_0}{R_1}$

(c)

21. (a)Visosity of glycerin is more

22. $MV_0 r - \frac{1}{2} Mr^2 \omega_0 = 0$

(a)

23. (c) $Q = up$, $G = \frac{1}{2} CV^2$

$C^1 = C + \frac{2C}{3} = \frac{5C}{3}, \; V_f = \frac{1}{2}\frac{5C}{3} V^2$

$Q = \frac{5}{3} C_v - V_u = \frac{2}{3} C_V$

Energy given by battery = $V_f - V_i + H$

$\frac{2}{3} CV^2 = \frac{5}{6} CV^2 - \frac{1}{2} CV^2 = H$

24. (a) By equation of continuity
Av =constant …….. (i)
Where A is the area of cross section of tube and v is the velocity of flow.
From (i) It is clear that, when area of cross section of tube is less the velocity of the liquid flow is more.
So the velocity of liquid flow of a construction of tube is more than the other portion of tube.
By Bernoulli's theorem $\mathrm{P} + \frac{1}{2}\rho \mathrm{v}^2 = \mathrm{constant}$
Therefore if v is more, P is less and vice versa.

25. $t = \frac{T_1}{2} + \frac{T_2}{2}$

(b)

$T_1 = 2\pi\sqrt{\frac{L}{g}}, \; T_2 = 2\pi\sqrt{\frac{L}{4g}}$

26. $\frac{K_2}{K_1} = \frac{\left(\frac{3hc}{\lambda_1} - \phi\right)}{\left(\frac{hc}{\lambda_1} - \phi\right)}$

(b)

27. (b) ε = B v l

$= 2 \times 10^{-4} \times 720 \times \frac{5}{18} \times 50$

$= 2 \times 10^{-4} \times 200 \times 50 = 2 \times 5 \times 2 \times 10^{-1}$

$= 2 \times 10 \times 10^{-1} = 2$ volt

28. (c)Potential at $r = 2a$

$V = \frac{KQ}{2a} - \frac{KQ}{2a} + \frac{KQ}{3a} = \frac{KQ}{3a}$

29. $y_{gm} = \frac{2R}{\pi}$

(c)

30. (d) The speed of the centre of mass of the system remains unchanged (equal to v) because no external forces acts on the system. The force involved in running on the trolley are internal to this system.

31. $E_1 = 200 \times 7.4$

(a)

$E_2 = 110 \times 8.2, \; E_3 = 80 \times 8.1$

$E = E_1 + E_2 + E_3$

32. $\frac{d}{6} - \frac{d}{9} = t$

(c)

D=5400 K_m

33. (a) $N = mg\cos\theta + F\sin\theta$, $f = \mu N$, if $mg\sin\theta = F\cos\theta$, then object has not tendency of motion.

34. $g = \dfrac{G.P.\dfrac{4}{3}\pi R^3}{R^2}$

(a)

$g \propto R$

35. (d) $\omega = L^2 Rt =$

36. $\tau = \dfrac{\tau_1\tau_2}{\tau_1+\tau_2}$, $\dfrac{N}{4} = \dfrac{T}{2}t/T$

(c)

37. $q = q_0 1 - e^{-\frac{t}{RC}}$

(a)

$e^{-\frac{t}{RC}} = 0.01, t = 0.92\,ms$

38. (a)Conceptual

39. $\overrightarrow{B_1} = \dfrac{\mu_0 i}{4\pi R}$ up

(b)

$\overrightarrow{B_2} = \dfrac{\mu_0 i\pi}{4\pi R}$ up

$\overrightarrow{B_3} = \dfrac{\mu_0 i}{4\pi R}$ up

$\overrightarrow{B} = \overrightarrow{B_1} + \overrightarrow{B_2} + \overrightarrow{B_3}$

40. $Q = 4V_1 = \dfrac{\varepsilon_0 A}{d}V$

(c)

$\dfrac{\varepsilon_0 A}{0.005}(25) = \dfrac{\varepsilon_0 A(V)}{0.002} + \dfrac{0.003}{10}$ = 11.5V

41. $\overrightarrow{F} = q\left(\overrightarrow{V}\times\overrightarrow{B}\right)$

(d)

42. $y = \left(\overline{A} + \overline{B}\right) = A.B$

(b)

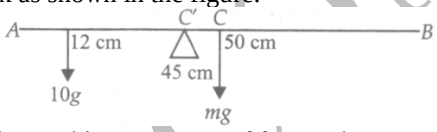
43. $I = I_0\sin\omega t$

(a)

$I_0 = 10,\ \omega = 100\pi$

$e = -M\dfrac{di}{dt}, e_{\max} = MI_0\omega$

44. (b) Let m be the mas of the metre stick concentrated at C, the 50 cm mark as shown in the figure.



In equilibrium, taking moments of forces about C' we get
10g (45-12) = mg (50-45)
10 g × 33 = mg × 5

$\mathrm{m} = \dfrac{10\times 33}{5} = 66\mathrm{g}$

45. (a)Conceptual

46. (b)Impulse = Area

47. (c)e = 1

$V - 1 = 2 + 1, V = 4m/s$

48. $\dfrac{dQ}{dtr} = e\pi AT^4 = \dfrac{msd\theta}{dt}$

(d)

$\dfrac{d\theta}{dt} \propto \dfrac{1}{t_s}$

$P_1 : P_2 : P_3 : P_4 = \dfrac{1}{6} : \dfrac{1}{18} : \dfrac{1}{10}$

49. $P_1 = P\left(1 + \dfrac{10}{100}\right)$

(b)

$P_2 = P_1\left(1 - \dfrac{10}{100}\right)$

$P_1V_1 = P_2V_2$

50. $f_1 = \left(\dfrac{330 - v}{330 - \theta}\right)600$

(d)

$$f_2 = \left(\frac{330+v}{330-\theta}\right)600$$

$$f_2 - f_1 = \omega,\ v = 2.75\,m/s$$

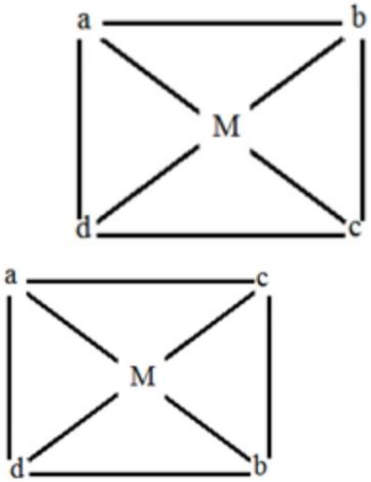
CHEMISTRY

1. (c)Diasteromers are pair of steroisomers which are not mirror image of each other's pair of geometrical isomers are pair of diastereomers.

2. (b)Cysteine is non essential amino acids

3. (b) NH_4Cl is salt of weak base and strong acid addition of NH_4Cl will increase H^+ ion concentration

4. (d)[Mabcol] square planer has three geometrical isomers.



5. (c)Nuclear chemistry is not a part of green chemistry.

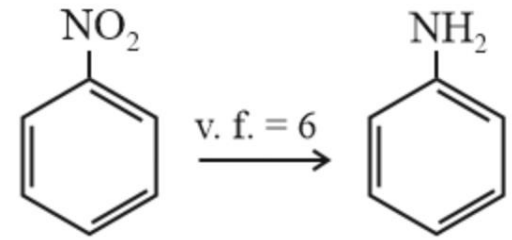
6. (b)Methyle orange is formed from sodium 4-daizobenzenesulphonate and N,N -dimethylamine

7. (a) $2Al + 2NaOH + 2H_2O \rightarrow NaAlO_2 + 3H_2$

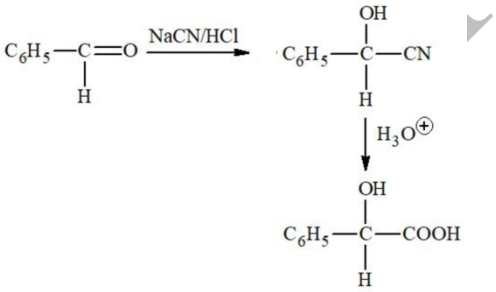
Aluminium dissolves in aqueous alkali thus NaOH cannot be stored in a vessel made of Aluminium.

8. (d)No. of gram equivalent =No. of Faraday

mole x n factor = No. of Faraday



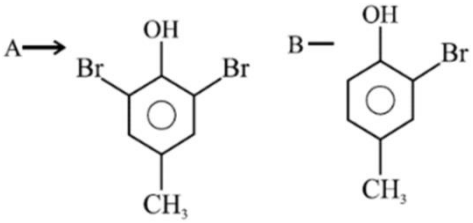
$$0.2\times 6 = 1.2F$$



9. (c)

It is optically active compound but form racemic mixture.

10. (a)Bromination of phenol is solvent dependent reaction i.e. polarity of solvents.



11. (d) $PbCrO_4$ is yellow solution soluble in NaOH

$$PbCrO_4 + 4NaOH \rightarrow NO_2\left[Pb(OH)_4\right] + Na_2CrO_4$$

12. (d) $P_T^0 = P_A^0 X_A + P_B^0 X_B$

$$P^0T = \frac{1}{4}\times 100 + \frac{3}{4}\times 60 = \frac{280}{4} = 70$$

(According to Raoult's law).

13. (d)

14. (d)As particle size increases amount of adsorption decreases.

15. (c) NH_3 is present on product side.Hence on adding NH_3 equilibrium shift to backward thus concentration of $\left[Cu(NH_3)_3SO_3\right]$ would decrease

16. (a)

Let the age of the earth be *t* years

For ^{238}U $\lambda_1 \times t = 2.303 \log \frac{N_0 U_{238}}{N U_{238}}$ .....(i)

For ^{235}U $\lambda_2 \times t = 2.303 \log \frac{N_0 U_{235}}{N U_{235}}$ .....(ii) Subtracting eq. (ii) from eq. (i)

$$t(\lambda_1 - \lambda_2) = 2.303\left[\log \frac{N_0 U_{238}}{N U_{238}} - \log \frac{N_0 U_{235}}{N U_{235}}\right] = 2.303 \log \frac{N_0 U_{238}}{N U_{235}} \cdot \frac{N U_{235}}{N U_{238}}$$

$$t\left(\frac{0.693}{4.5 \times 10^9} - \frac{0.693}{7.13 \times 10^8}\right) = 2.303 \log \frac{1}{140}$$

$$= -(2.303)(2.1461)$$

$$= -4.9425$$

$$t = 6.04 \times 10^9 \text{ years}$$

17. (a)Vulcanized rubber is an elastomer . The molecules of elastomers are held together by weak inter molecular forces

18. (a)

19. (a) Liquid (water droplets) are dispersed in gas (air) in fog.

20. (a)F - centres is electron trapped in anionic vacancies . It is a crystallographic defect also known as color center

21. (c) $A = CH_3CH_3$ it is reduction of carboxylic acid into alkane with Red P/HI and $B = CH_3CH_2OH$, reduction of carboxylic acid into alcohol by lithiumaluminium hydride

22. (a)Boiling point trend is $H_2O > H_2Te > H_2Se > H_2S$. H_2O is highest due to H- bonding

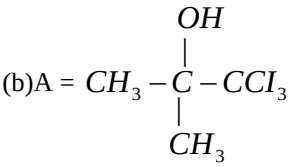
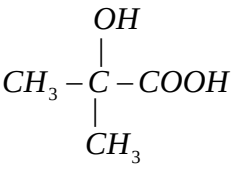
23. (c) KO_2 is super oxide i.e. $\left(O_2^-\right)$ having one unpaired electron.

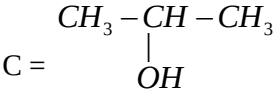
24. (b)Microcosmic salt reacts with coloured ions to form characteristic bead which is due to formation of meta phosphates.

25. (b)Aq. $CuSO_4$ can be stored in a silver bowl because Ag is less reactive than CCl .

26. (b) $OF_2 = 103^0$ $H_2O = 104.5^0$

$OCl_2 = 110^0$ $ClO_2 = 111^0$

27. (b)A =  B = 

C =  D = CH_3COOH

28. (b)The cryoscopic constant is molar freezing point depression constant. It is decreasing in the freezing point of the solution when 1 mole of solute is dissolved in 1 kg of the solvent

29. (b)Libermann's test is given by phenol, phenol with $NaNO_2 / H_2SO_4$ give red coloured Indophenol which in alkaline medium change to blue

30. (a)Zeolites are aluminosilicates of sodium and potassium used in softening of hard water.

31. (b)It is Mac - Arthur cyanide process is a hydromel allurigical process for extraction of gold and silver . In this ore is converted to water soluble coordination complex

32. (b) Δn_g = (No.Moles of products -No.of moles of reactant)=1

$$\Delta n_g = 1$$

$$Kp = \left[K_c\right]^{\Delta n_g} RT$$

33. (c)A symmetric molecule is optically active. Those molecules are non super imposable on their mirror image.

34. (c)Roasitng is heating ore with oxygen it is used to convert sulphide to oxide, remove moisture and volatile impurity.

35. (b)For formation of N_2O_3

$$2N_2 + 3O_2 \rightarrow 2N_2O_3$$

2 moles of N_2 combines with 3 mole of O_2

Given, 7 gm N_2 (80 % only reactants) i.e., 5.6 gm of N_2

Mole of $N_2 = \frac{5.6}{28} = 0.2$

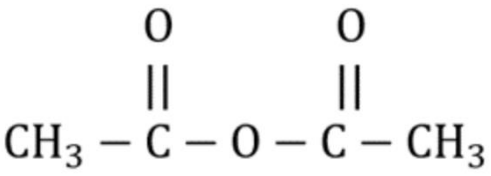
Hence $\frac{2}{0.2} = \frac{3}{X\ mole\ of\ O_2}$

X = 0.3 moles

No. of atoms = $0.3 \times 2 \times 6.023 \times 10^{23} = 3.61 \times 10^{23}$

36. (d)The given reaction is cope elimination and is syn elimination, thus H - atom is (same plane) to oxygen will be eliminated from either side. No deuterium will be lost as it is anti to oxygen.

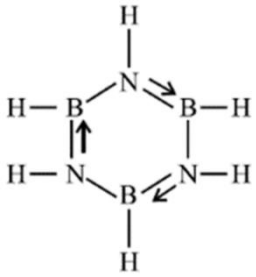
37. (c)Ketene with Acetic acid from anhydride Hence X is



and the formation of Y occurs through Friedel - Craft's acylation reaction.

38. (d)H.V.Z reaction $\alpha -$ halogenation of carboxylic acid and the reaction is given by carboxylic acid containing $\alpha -$ hydrogen.

39. (c)Borazine is inorganic benzene. $B_3N_3H_6$



40. (b)It is an iodoform reaction (oxidation) given by compounds containing methyl ketonic linkage with NaOH

41. (b) $[HCl] = 0.01 [NaOH] = 0.01$

$$M_{mix} = \frac{6 \times 0.01 - 4 \times 0.01}{10} = \frac{0.02}{10}$$

$$[OH^-] = 0.002$$

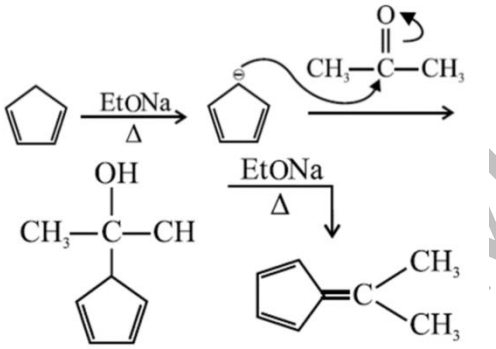
$$pOH = -\log(0.002) = 2.7$$

42. (a)Dissociation of $C-H$ bond is homolytic cleavage, thus consider carbon free radical stability. Higher is the stability of free radical lesser is the amount of energy required for dissociation of bond

$$\alpha < \beta < \gamma < \theta < \lambda$$

43. (d)It is stabilized by resonance. resonance in (D) is maximum with involvement of lone pair of oxygen.

44. (d)



45. (a)Trimethyl amine is $(CH_3)_3 N$ and acrolein is $CH_2 = CH - CHO$

46. (a)Electronic configuration of $Ni = 4s^2 3d^8$.

CO is strong ligand causes inward pairing , thus it is sp^3 hybrised.

$Ni(CO)_4$ is tetrahedral and diamagnetic

47. (d) Gases, liquids or solids can be adsorbed on the solid surfaces.

48. (c)Ester has higher priority than acid chloride hence $-COCl$ group is considered as prefix thus name of compound. Is ethyl-2-(chloro carbonyl) benzoate

49. (c)Ferric ferrocyanide is prusssian blue

50. (d)Both statements are correct. Addition of di positive ion to the Crystals of mono positive ion will produce cation vacancy

BIOLOGY

1. (b)
2. (*c*) *Chlorella* is used for purifying air in space ships. It is also used as food supplements by space travellers.
3. (*b*) Carbon dioxide is usually a limiting factor in photosynthesis under normal conditions particularly, in clear summer days under adequate water supply.
4. (a)
5. (*a*) The energy for ATP synthesis comes from proton gradient, which develops along the inner membrane, e.g. in case of mitochondria in electron transport chain and in chloroplast in the PS-II.
6. (a)
7. C
8. (c)
9. (d)
10. (a)
11. (c)
12. (b)
13. (a)
14. (c)
15. (c)
16. (a) Plant breeding has close relationship with Genetics because Genetic engineering is part of plant breeding and it is the latest method of crop improvement in which instead of involving whole chromosomal set (genome), manipulation of a segment of DNA (gene) is done.
17. (b)
18. (*c*) *Laminaria* is an example of class–Phaeophyceae (brown algae). Their plant body is usually attached to the substratum by a holdfast and has a stalk, the stipe and leaf-like photosynthetic organ, the frond. Other examples, i.e. *Volvox*, *Chara* and *Chlamydomonas* are green algae.
19. (b)
20. (b)
21. (b)
22. B
23. (b)
24. (a) The main aims of plant breeding are
    (i) Development of high yielding variety.
    (ii) Development of disease-resistant variety.
    (iii) Development of drought-resistant variety etc.
25. (a)
26. (a)
27. (a)
28. (d)
29. (a)
30. C
31. (*a*) Bakanae disease is caused by a fungus, *Gibberella fujikuroi*. The effect of gibberellins had been known in Japan for over a century where certain rice plants were found to suffer from 'Bakanae' (foolish seedlings) disease. The disease was found by Kurosawa (1926).
32. (c)
33. (c)
34. C
35. (a)
36. (b)
37. (d)
38. (b)
39. (a)
40. (a)
41. (a)
42. (a)
43. (c)
44. (d)
45. (b)
46. A
47. (d)
48. (c)
49. (b)
50. (d)

1. (b)

2. (d)

3. (d)

4. (d)

5. (a)

6. (b)
7. (d)

8. (d)

9. (c)

10. (a)

11. (a)

12. (a)

13. (d)

14. (a)

15. (d)

16. (b)

17. (a)

18. (c)

19. (b)
20. (a)

21. (a)

22. (b)
23. (c)

24. (c)

25. (d)

26. (c)

27. (d)
28. (b)
29. (c)

30. (b)
31. (c)

32. (d)

33. (a)

34. (d)

35. (a)

36. (b)
37. (c)
38. (c)

39. (d)

40. (a)

41. (d)
42. (b)
43. (a)

44. (a)

45. (b)

46. (d)

47. (a)

48. (c)
49. (b)
50. (c)