ANSWER KEY

51. [A]	52. [C]	53. [A]	54. [A]	55. [A]	56. [C]
57. [B]	58. [B]	59. [D]	60. [C]	61. [C]	62. [D]
63. [B]	64. [D]	65. [B]	66. [C]	67. [A]	68. [A]
69. [A]	70. [B]	71. [A]	72. [B]	73. [A]	74. [B]
75. [A]	76. [B]	77. [A]	78. [C]	79. [C]	80. [B]
81. [C]	82. [A]	83. [D]	84. [C]	85. [C]	86. [C]
87. [B]	88. [A]	89. [C]	90. [C]	91. [B]	92. [D]
93. [B]	94. [D]	95. [B]	96. [B]	97. [C]	98. [D]
99. [D]	100. [B]				

1. Molar conductance is the conducting power of all the ions produced by dissolving 1 g- mole of an electrolyte. Therefore, molar conductance α number of ions produced.

Werner complex	Modern - notation	Ionisation
$COCl_3 \cdot 3NH_3$	$[Co(NH_3)_3Cl_3]$	$[Co(NH_3)_3Cl_3]$ (No ionization)
$COCl_3 \cdot 4NH_3$	$[Co(NH_3)_4Cl_2]Cl$	$[Co(NH_3)_4Cl_2]^+ Cl^-$ (2 ions)
$COCl_3 \cdot 5NH_3$	$[Co(NH_3)_5Cl]Cl$	$[Co(NH_3)_5Cl]^{2+} 2Cl^-$ (3 ions)
$COCl_3 \cdot 6NH_3$	$[Co(NH_3)_6]Cl_3$	$[Co(NH_3)_6]^{3+} 3Cl^-$ (4 ions)

From above table it is clear that, molar conduction of the complexes will be in the following order

$a < b < c < d$

2. $2H_2O_2 \longrightarrow 2H_2O + O_2$

2 mol 1 mol

$= 2 \times 34 = 68$ g 22400 mL

$\because$ At STP, 68 g H_2O_2 produced

$O_2 = 22400$ mL

$\therefore$ At STP, 0.68 g H_2O_2 will produces

$$O_2 = \frac{22400 \times 0.68}{68} = 224 \text{ mL}$$

3. Given reaction is $O_3(g) + O(g) \longrightarrow 2O_2(g)$

Also, rate law expression is given as :

$$\text{rate} = k[O_3][O] \quad \ldots\ldots\ldots \text{(i)}$$

Now, since molecularity is simply the sum of reactant molecules in a single step of a chemical reaction. So, molecularity is two for this reaction.

On the other hand, order is the sum of the powers raised to the concentration of reactant molecules.

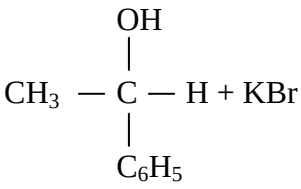
From Eq. (i) order is $1 + 1 = 2$

$\therefore$ The molecularity is 2 and order is also 2.

4. $RX + KOH \xrightarrow[\text{hydrolysis}]{\text{alkaline}} ROH + KX$

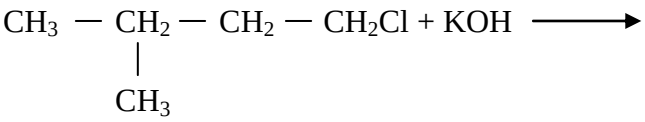
(a) $CH_3 - \underset{\displaystyle C_6H_5}{\underset{|}{CH}} - Br + KOH$

1-bromo-1-phenyl ethane

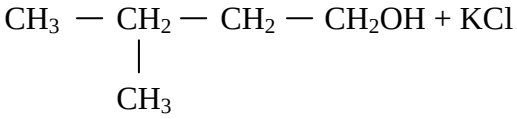


1-phenyl ethanol

Due to production of compound having chiral carbon, this hydrolysis will lead to the formation of a recemate.

(b) 

1-chloro-3-methyl butane



3-methyl butanol

(c) $CH_3CH_2Br + KOH \longrightarrow CH_3CH_2OH + KBr$

Bromo ethane — Ethanol

(d) $CH_3CH_2CH_2Cl + KOH \longrightarrow CH_3CH_3CH_2OH + KCl$

1-chloro propane — Propanol

Since, products of (b), (c) and (d) do not have any chiral carbon atom, so these cannot form a racemate.

5. We have the definition for molarity as, the number of moles of solute present in one litre of the solution.

$1\ L = 1\ dm^3$

$\therefore$ Molarity (M) = $\frac{\text{Number of moles of solute}}{\text{Volume of solution (in L)}}$

6.

Sr. No.	Element	Allotropes
a	Polonium	α and β-polonium
b	Tellurium	None
c	Selenium	Trigonal, rhombohedral, three deep red monoclinic forms (α, β and γ-amorphous red, black vitrous selenium)
d	Oxygen	Dioxygen and ozone

7. KCl has large hydration energy than its lattice energy, so it evolves energy on dissolving in water. Consequently, with rise in temperature, its solubility increases.

8. (i) $H_2(g) + ½\ O_2(g) \longrightarrow H_2O(l)$; $\Delta_cH = -286$ kJ

(ii) $H_2O(s) \longrightarrow H_2O(l)$; $\Delta_{fus}H = +6$ kJ

18g

On subtracting (ii) from (i)

$H_2(g) + ½\ O_2(g) \longrightarrow H_2O(s)$;

$\Delta H = -286 - 6 = -292$ kJ

On formation of 18g ice, change in enthalpy = -292 kJ

On formation of 100g ice, change in enthalpy $= -\frac{292 \times 100}{18} = -1622$ kJ

9. For adiabatic expansion, there is no change in heat which means no change in temperature also.

$dq = 0$, T = Constant

$\therefore dT = 0$

10. Orbital angular momentum,

$$mvr = \frac{h}{2\pi}\sqrt{l(l+1)}$$

For f-orbital, $l = 3$

$\therefore$ Orbital angular momentum,

$$mvr = \frac{h}{2\pi}\sqrt{3(3+1)}$$

$$= \frac{\sqrt{3}\,h}{2\pi}$$

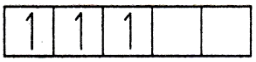
11. C_{60} (fullerene) looks like a soccer ball and contains 20 six membered rings and 12 five membered rings of carbon atoms. Six membered rings are fused with both six membered as well as five membered rings while five membered rings are attached only with six membered rings.

12. During the determination of cell constant, only standard solution of KCl is taken. Here options (a), (b) and (c) are standard solutions while (d) i.e. saturated KCl is not a standard solution, hence it is not used in cell constant determination.

13. $_{22}Ti = [Ar]\, 3d^2 4s^2 \Rightarrow Ti^{4+} = [Ar]$

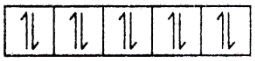
(No unpaired electron)

$_{24}Cr = [Ar]\, 3d^5\, 4s^1 \Rightarrow Cr^{3+} = [Ar]\, 3d^3$



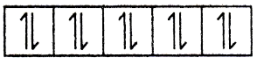
(Three unpaired electrons)

$_{30}Zn = [Ar]\, 3d^{10}\, 4s^2 \Rightarrow Zn^{2+} = [An]\, 3d^{10}$



(All electrons paired)

$_{29}Zn = [Ar]\, 3d^{10} 4s^1 \Rightarrow Zn^{+} = [Ar]\, 3d^{10}$



(All electrons paired)

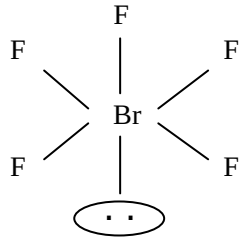
Since, Cr^{3+} ion has 3 unpaired electrons, therefore its salt, i.e., $CrCl_3$ will be coloured.

14.

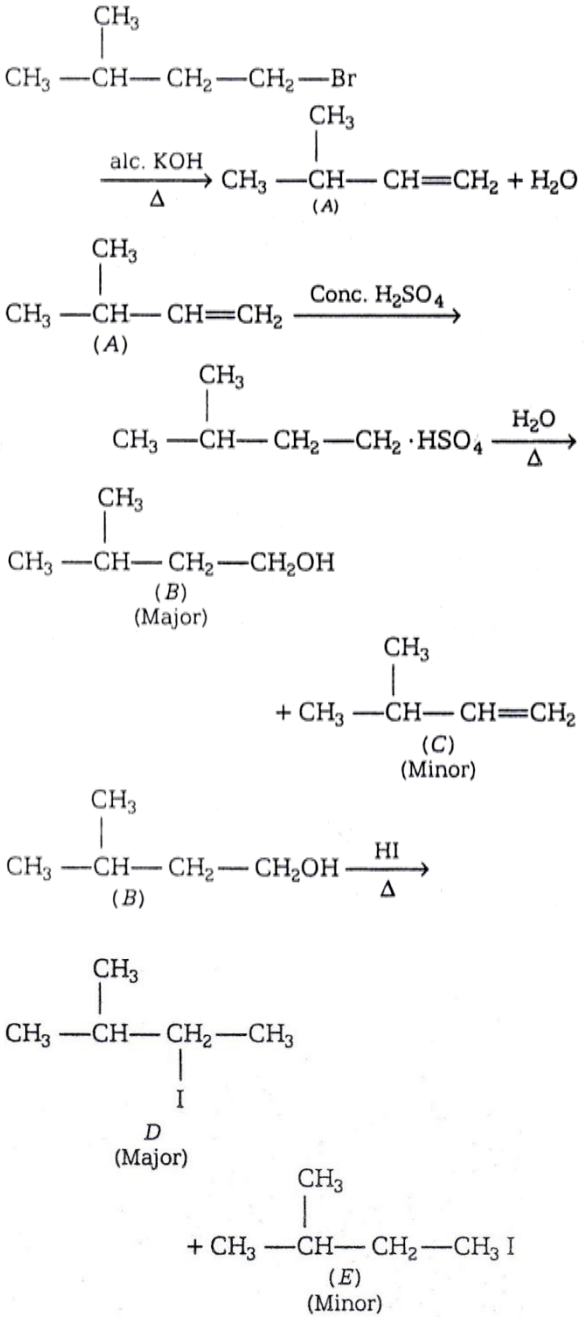
Sr. No.	Element	Type of packing
a	Fe	bcc
b	Rb	bcc
c	U	bcc
d	Pt	fcc

15. Valium is a tranquilizer, aspirin is an analgesic. Penicillin is an antibiotic while sulphanilamide is an antimicrobial.

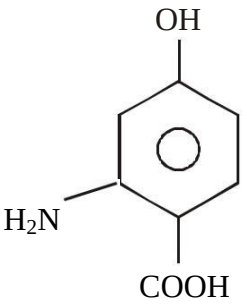
16. BrF_5 shows square pyramidal geometry due to the presence of lone pair of electron on Br atom.



17.



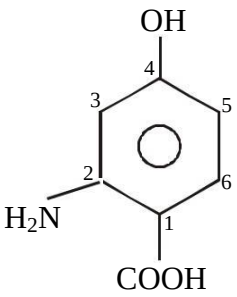
18.



Priority order of functional groups is

$-COOH > -OH > -NH_2$

Therefore, IUPAC name of the compound is as follows



2-amino-4-hydroxybenzoic acid

19. Cathodic protection of iron involves using another more reactive metal or a sacrificial anode. Since, in electrochemical series, Zn is placed above Fe, so it is used for such action.

20. (a) Nitric oxide, NO $x - 2 = 0 \Rightarrow x = +2$

(b) Nitrous oxide, N_2O $2x - 2 = 0 \Rightarrow x = +1$

(c) Nitrogen dioxide, NO_2

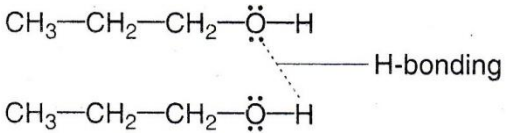
$x + 2(-2) = 0 \Rightarrow x = +4$

(d) Nitrogen trioxide NO_3

$x + 2x(-3) = 0 \Rightarrow x = +6$

Thus, in nitrous oxide, oxidation number of nitrogen in lowest.

21. As branching increases, boiling point decreases. While due to the presence of H-bonding in the compound, boiling point becomes highest in that case. Hence, propan-1-ol shows H-bonding, and it has highest boiling point.

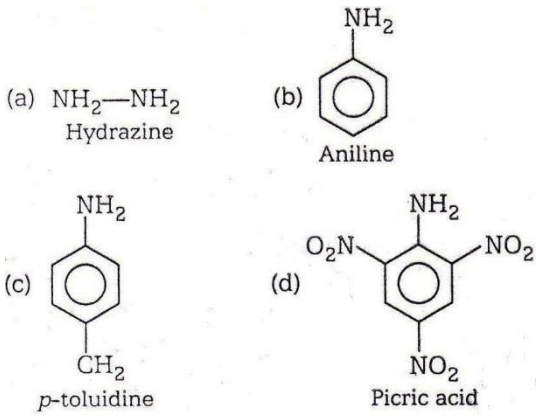


22. For reaction; $A + B \longrightarrow$ product

$$\frac{dx}{dt} = k[A]^2[B] \Rightarrow 0.22 = k(1)^2\,(0.25)$$

$$\therefore \quad k = \frac{0.22}{0.25} = 0.88\ M^{-2}s^{-1}$$

23. Lassaigne's method is used to detect the presence of elements like N, S, F, Cl, Br, I, etc in an organic sample.

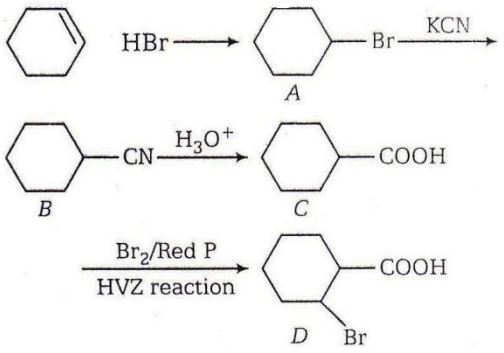


Since, hydrazine is not an organic compound, thus it cannot detect by Lassaigne method.

24. Substances which show permanent magnetism even in the absence of the magnetic field are called ferromagnetic substances.
Eg.: Fe, Ni, Co, Gd and CrO_2.

25. Passivation is the process in which metal surface is made inactive.

26.



27. A gas can be liquified when its temperature is below critical temperature, by cooling or compressing it.
Gases which have high critical temperatures (such as Cl_2, NH_3, CO_2, SO_2, etc.) can be liquified by applying a suitable pressure alone. Permanent gases (such as H_2, N_2, O_2, etc.) cannot be liquified by the action of pressure and cooling.

28. Among the lanthanoids, promethium is the only radioactive element.

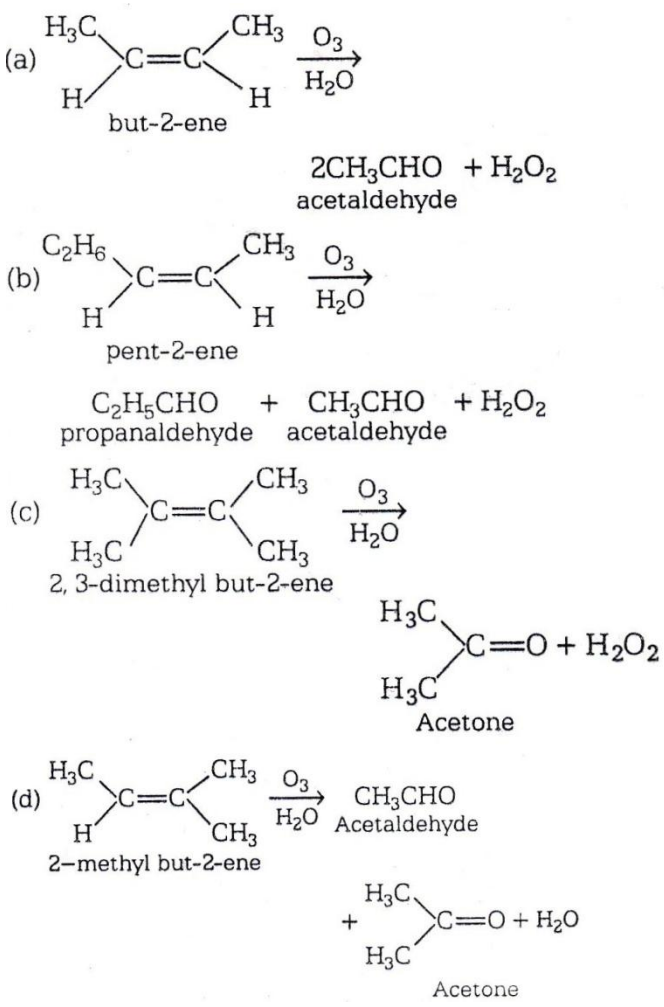
29. Oxygen is the most abundant element on the earth making up about 47% of the earth's mass. Silicon, is the second, making up 28%.

30. Moseley, gave modern periodic law. He showed that atomic number is more, fundamental property of an element than its atomic mass as follows
" The square root of the frequency of a line (of X-ray spectrum) is related to the atomic number Z of the target material as,

$$\sqrt{v} = a(Z - b)$$

where, a = proportionality constant
Z = atomic number
b = another constant
L it has the same value for all the lines of X-rays spectrum.

31.

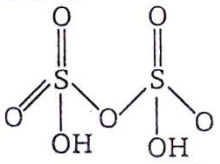


32. Metals like Na, K, Mg, Ca, Al etc, are reduced by electrolytic method.

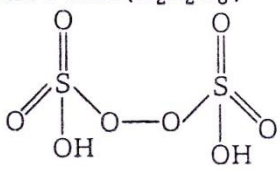
33. Dextron is a polyacetic acid polyglycolic acid polymer. The monomers used are lactic acid and glycolic acid. It is copolymer and has ester linkage. It is used as friction modifier. It is added to lubricants to reduce surface friction.

34.

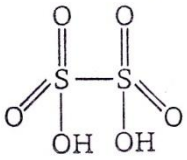
(a) Oleum ($H_2S_2O_7$)



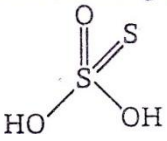
(b) Marshall's acid ($H_2S_2O_8$)



(c) Dithionic acid ($H_2S_2O_6$)



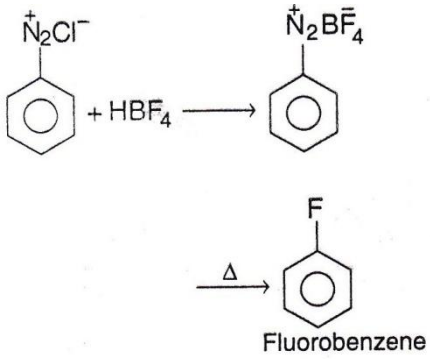
(d) Thiosulphuric acid ($H_2S_2O_3$)



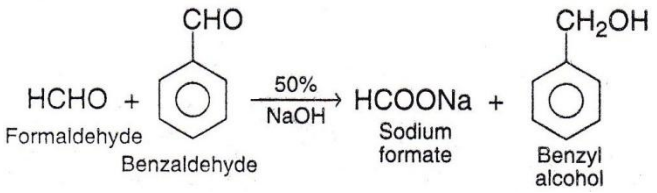
Thus, in dithionic acid, S-S single bond is present.

35. Ionization enthalpy increases on moving from left to right in a period and decreases on moving down in a group. Thus, order of ionization enthalpy is
Be > Mg > Na > K

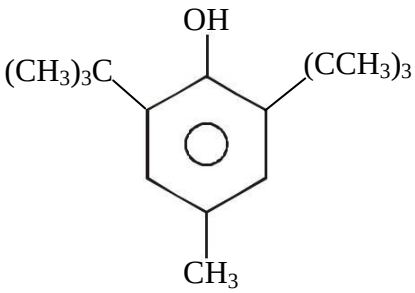
36. When diazonium salt is treated with fluoroboric acid (HBF_4), benzene diazonium fluoroborate is precipitated, which on heating gives fluorobenzene. This reaction is called Balz-Schiemann reaction.



37. When a mixture of benzaldehyde and formaldehyde treated with 50% NaOH, it forms sodium formate and benzyl alcohol. This reaction is called cross Canniccaro reaction. This reaction looks like,



38. Butylated hydroxyl toluene (BHT) is used as an antioxidant. It retards the action of oxygen on the food material and thereby helps in preventing oxidative rancidity of fats.



BHT

39. Degeneration of spinal cord is also known as lichtheims disease. It arises due to deficiency of vitamin-B_{12} (i.e., cyanocobalamine, $C_{63}H_{88}N_{14}PCO$). It is usually associated with pernicious anemia. Sources of vitamin-B_{12} are liver of ox, sheep, pig, fish, etc.

40. (a) F_2 molecule

$= \sigma 1s^2, \sigma^* 1s^2, \sigma\, 2s^2, \sigma^* 2s^2, \sigma 2p_z^2,$

$\pi 2p_x^2 \approx \pi 2p_y^2, \pi^* 2p_x^2 \approx \pi^* 2p_y^2$

$$\text{Bond order} = \frac{1}{2}(N_b - N_a) = \frac{1}{2}(10 - 8) = 1$$

(b) O_2 molecule

$= \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2,$

$\pi 2p_x^2 \approx \pi 2p_y^2, \pi^* 2p_x^1 \approx \pi^* 2p_y'$

$$\text{Bond order} = \frac{1}{2}(10 - 6) = 2$$

(c) Be_2 molecule

$= \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2$

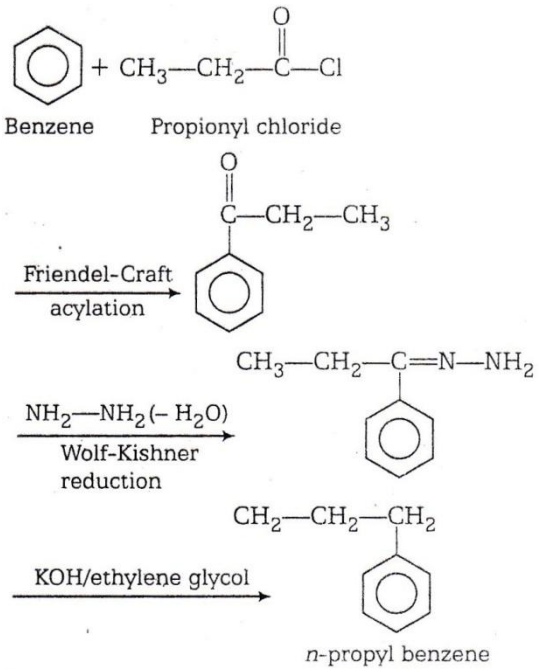
$$\text{Bond order} = \frac{1}{2}(4 - 4) = 0$$

(d) Li_2 molecule $= \sigma 1s^2, \sigma^* 1s^2, \sigma\, 2s^2$

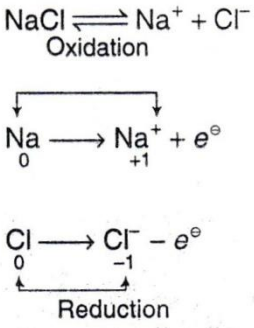
$$\text{Bond order} = \frac{1}{2}(4 - 2) = 1$$

Therefore, Be_2 molecule has zero bond order.

41.

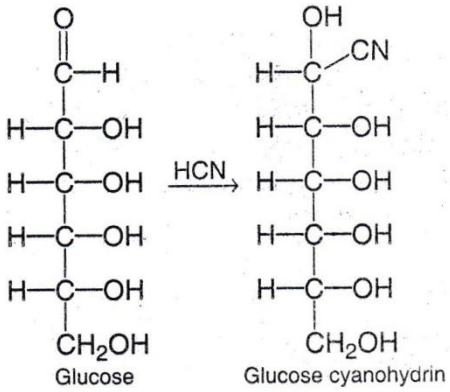


42. During the electrolysis of fused NaCl, oxidation of sodium atoms takes place at anode and reduction of chlorine at cathode. The reaction looks like



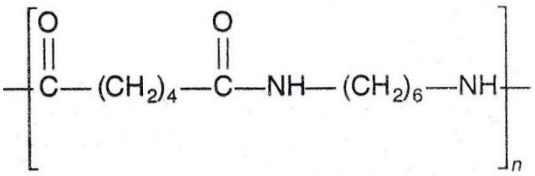
Hence, oxidation takes place at anode.

43.



Hence, during this conversion, aldehydic group is replaced.

44. Polythene, nylon-6 and Teflon are homopolymer while nylon-6 6 is a heteropolymer.



Nylon-6 6.

45. We have the formula for half-life of a first order reaction,

$$t_{½} = \frac{0.693}{k}$$

where, k = rate constant

$$\therefore 6.93\ h = \frac{0.693}{k}$$

$$\therefore\ k = \frac{0.693}{6.93\ h}$$

$$\therefore\ k = 0.1\ h^{-1}$$

46. $-\!\!-$ CN has been given the highest priority while assigning the R-S configuration. The priority order is written for the following as :

$-\!\!-CN > -\!\!-C_6H_5 > -\!\!-C_2H_5 > -\!\!-CH_3$

47. Nicol prism consists of a rhombohedral crystal of iceland span which is a variety of calcite, i.e. $CaCO_3$. Hence, the composition is $CaCO_3$.

48. Hydrogen Cyanide (HCN) undergoes nucleophilic addition reaction towards aldehydes and ketones. Aldehydes and ketones containing more electrophilic carbonyl carbon are more reactive towards nucleophilic addition reaction.
Among the given compounds, reactivity order is

$HCHO > CH_3CHO > CH_3COCH_3$

49. During the purification of copper metal, an impure metal is placed on sloping hearth of a reverberatory furnace and heated that above its melting point in the absence of air.

50. Leaching is the method of extraction of aluminium from its ore (bauxite). By the treatment of powdered ore with a concentrated solution of NaOH resulting in dissolution of Al2O3, leaving impurities behind as,

$$Al_2O_3(s) + 2OH^-(aq) + 3H_2O \longrightarrow 2[Al(OH)_4]^-(aq)$$

This process is called Baeyer's process.