SOLUTION & ANSWER FOR KCET-2009
VERSION – A-3

CHEMISTRY

1. In countries nearer to polar region, the roads are

Ans: to minimize the snow fall

Sol: $CaCl_2$ depresses the FP of ice

2. For the reaction $H_2O(l) \rightleftharpoons H_2O(g)$ at 373K

Ans: $\Delta H = T\Delta S$

Sol: At 373K, $H_2O(l)$ is in equilibrium with $H_2O(g)$
$\therefore$ $\Delta G = 0$, then $\Delta H = T\Delta S$

3. A compound of 'A' and 'B' crystallizes in a cubic lattice in which the 'A' atoms

Ans: AB_3

Sol: A occupies corners $= 8 \times \frac{1}{8} = 1$

B occupies face centres $= 6 \times \frac{1}{2} = 3$

$\therefore$ Empirical formula of the compound $= AB_3$

4. In electrophilic aromatic substitution reaction, the nitro group

Ans: decreases electron density at ortho and para positions.

Sol: $-NO_2$ group when present in the benzene nucleus withdraws electrons from ortho and para positions. Thus the electron density at the ortho and para positions decreases. Meta positions become positions of comparatively higher electron density and hence electrophilic attack occurs at meta positions.

5. $CH_3COOH \xrightarrow{LiAlH_4} X \xrightarrow[300°C]{Cu}$

Ans: Aldol

Sol: $CH_3-COOH \xrightarrow{LiAlH_4} \underset{(X)}{CH_3-CH_2OH}$

$\xrightarrow[300°C]{Cu} \underset{(Y)}{CH_3-CHO} \xrightarrow[NaOH]{dilute}$

$\underset{(Z)\ aldol}{CH_3-CHOH-CH_2-CHO}$

6. The best method for the conversion of an alcohol into an alkyl chloride

Ans: $SOCl_2$ in presence of pyridine

Sol: Reaction of alcohol with $SOCl_2$ (thionyl chloride) gives pure alkyl chloride.
$ROH + SOCl_2 \rightarrow RCl + HCl + SO_2$
The other products, being gases, escape leaving behind pure alkyl chloride.

7. The electrophile involved in the sulphonation

Ans: SO_3

Sol: SO_3 produced from concentrated or fuming sulphuric acid acts as the electrophile in sulphonation.

$2H_2SO_4 \rightleftharpoons SO_3 + HSO_4^- + H_3O^+$

8. The carbon–carbon bond length

Ans: In between C_2H_6 and C_2H_4

Sol: The carbon – carbon double bond in benzene is in between that of C – C and C = C; i.e, in between that of C_2H_6 and C_2H_4

9. The compound which is not formed during the dry distillation

Ans: Propanal

Sol: $(HCOO)_2Ca \xrightarrow{\text{dry distillation}} H-CHO + CaCO_3$

$(CH_3COO)_2Ca \xrightarrow{\Delta} CH_3-CO-CH_3 + CaCO_3$

$(HCOO)_2Ca + (CH_3COO)_2Ca \xrightarrow{\Delta} 2CH_3-CHO + 2CaCO_3$

Propanal is not formed.

10. An organic compound X is oxidised by using acidified $K_2Cr_2O_7$.

Ans: $(CH_3)_2CHOH$

Sol: Since the product of oxidation reacts with phenyl hydrazine, it is a carbonyl compound. Since it does not answer silver mirror test, it must be a ketone. Ketones are produced by the oxidation of secondary alcohols. So the compound X is isopropyl alcohol.

$$(CH_3)_2CHOH + [O] \xrightarrow{\text{acid } K_2Cr_2O_7} \underset{\text{propanone}}{CH_3-CO-CH_3} + H_2O$$

11. The reaction involved in the oil of Winter Green test is Salicylic acid $\xrightarrow[\text{Conc.}H_2SO_4]{\Delta}$

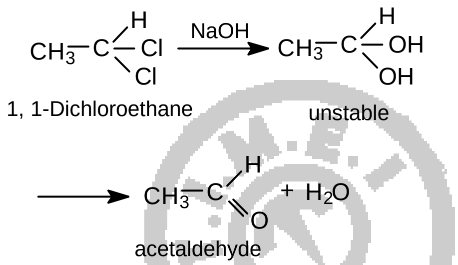
Ans: Methanol

Sol: Methanol reacts with salicylic acid in presence of a few drops of con.H_2SO_4 to form methyl salicylate having the smell of oil of winter green.

12. The compound which forms acetaldehyde when

Ans: 1, 1 Dichloro ethane

Sol:



13. Arrange the following in the increasing order

Ans: $NH_3 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$

Sol: Aliphatic amines are more basic than NH_3 due to the +I effect of alkyl groups. In aqueous solution, $(CH_3)_3N$ (3° amine) is less basic than $(CH_3)_2NH$ because the cation formed by protonation of $(CH_3)_3N$ is less solvated compared to the cation formed by protonation of $(CH_3)_2NH$.

14. The one which has least Iodine

Ans: Ghee

Sol: Ghee is the least unsaturated among the given options.

15. A diabetic person carries a pocket of Glucose

Ans: Glucose increases the blood sugar level almost instantaneously.

Sol: Sometimes the blood sugar level of diabetic patients decreases suddenly. So diabetic patients generally carry a packet of glucose which can increase the blood sugar level almost instantaneously.

16. There are 20 naturally occurring amino acids.

Ans: 8000

Sol: No of tripeptides possible = 20^3 = 8000

17. Cooking is fast in a pressure cooker,

Ans: Water boils at higher temperature inside the pressure cooker.

Sol: Since the pressure is high in the pressure, cooker, water boils at a higher temperature and cooking becomes fast.

18. The ore that is concentrated by Froth Floatation

Ans: Cinnabar

Sol: A sulphide ore (Cinnabar–HgS) is concentrated by froth floatation.

19. The correct set of four Quantum numbers for outermost electron

Ans: 4, 0, 0, $\frac{1}{2}$

Sol: $4s^1$ is the valence electron in potassium.

20. A body of mass x kg is moving with a velocity of 100 ms^{-1}.

Ans: 0.1 kg

Sol: $\lambda = \frac{h}{mv}$

$$m = \frac{h}{\lambda v} = \frac{6.62 \times 10^{-34}}{6.62 \times 10^{-35} \times 100} = 0.1 \text{ kg}$$

21. The correct order of ionisation energy

Ans: C < O < N < F

Sol: F is maximum. N due to stable p^3 configuration comes next.

22. The oxide of an element whose electronic

Ans: Basic

Sol: It is an alkali metal. Alkali metal oxides are basic.

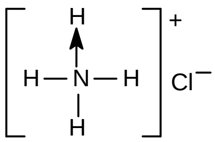
23. The characteristic not related

Ans: High ionisation energy

Sol: Alkali metals have low IE values

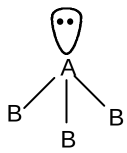
24. Among the following, the compound that

Ans: NH_4Cl

Sol: 

25. A covalent molecule AB_3 has pyramidal structure.

Ans: 1 and 3

Sol: 

26. Excess of carbon dioxide is passed through 50 ml of 0.5 M calcium hydroxide solution.

Ans: 500 cm^3

Sol: No. of millmoles of $Ca(OH)_2 = 50 \times 0.5 = 25$
No. of millmoles of $CaCO_3 = 25$
No. of milliequivalence of $CaCO_3 = 50$
$\therefore$ Volume of 0.1 N HCl $= \frac{50}{0.1} = 500\ cm^3$

27. A bivalent metal has an equivalent mass of 32.

Ans: 188

Sol: Atomic mass of the metal $= 32 \times 2 = 64$
Formula of metal nitrate is $M(NO_3)_2$
$\therefore$ Molecular mass $= 64 + 28 + 96 = 188$

28. The r.m.s. velocity of molecules of a gas

Ans: 300 ms^{-1}

Sol: $\mu_{rms} = \sqrt{\frac{3P}{d}} = \sqrt{\frac{3 \times 1.2 \times 10^5}{4}}$

$= 300\ ms^{-1}$

29. 0.5 mole of each of H_2, SO_2 and CH_4 are kept in a container.

Ans: $P_{SO_2} > P_{CH_4} > P_{H_2}$

Sol: Rate of diffusion $\alpha \frac{1}{\sqrt{\text{Molecular mass}}}$
Order of diffusion : $H_2 > CH_4 > SO_2$
Amount left is in the order $SO_2 > CH_4 > H_2$
$\therefore$ Order of partial pressure is
$SO_2 > CH_4 > H_2$

30. The enthalpy of formation of NH_3 is –46 kJ mol^{-1}.

Ans: 92 kJ

Sol: For the reaction, $2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$
$\Delta H = -(2 \times \text{Enthalpy of formation of } NH_3)$
$= -2 \times -46 = 92$ kJ

31. 5 moles of SO_2 and 5 moles of O_2 are allowed to react.

Ans: 0.41 atm

Sol: $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$

Initial	5	5	0 moles
Eqm.	2	3.5	3 moles

$\therefore P_{O_2} = \frac{3.5 \times 1}{8.5} = 0.41$ atm

32. $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

The equilibrium constant of the above reaction is 6.4 at 300K.

Ans: 6.4

Sol: Equilibrium constant remains as a constant for a given reaction at constant temperature.

33. Rate of physical adsorption

Ans: Decrease in temperature

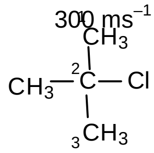
Sol: With the increase of temperature physical adsorption decreases.

34. IUPAC name of

Ans: 2–Chloro–2–methyl propane

Sol:

300 ms^{-1}



: 2-Chloro-2-methylpropane

35. Lucas test is associated

Ans: Alcohols

Sol: Lucas test is used to distinguish 1°, 2° and 3° alcohols.

36. An organic compound on heating with CuO produces CO_2 but no water.

Ans: Carbon tetrachloride

Sol: Since the compound on heating with CuO produced CO_2, it contains carbon. Since it does not produce water, it does not contain hydrogen. So the compound is CCl_4 (carbon tetrachloride)

37. The condensation polymer

Ans: Protein

Sol: Proteins are the condensation polymers of α–amino acids.

38. The order of stability of metal

Ans: $Fe_2O_3 < Cr_2O_3 < Al_2O_3 < MgO$

Sol:

39. The temperature of the slag zone in the metallurgy

Ans: 800 – 1000°C

Sol: 800 – 1000°C is slag zone

40. The function of $Fe(OH)_3$ in the

Ans: to remove arsenic impurity

Sol: $Fe(OH)_3$ a positive sol removes Arsenic impurity which is a negative sol.

41. In which of the following, NH_3

Ans: Nessler's reagent

Sol: Nessler's reagent is used for detecting ammonia.

42. Argon is

Ans: In high temperature welding

Sol: For creating an inert atmosphere.

43. The incorrect statement in respect of

Ans: Liberation of Chlorine

Sol: No Cl_2 is liberated, it is a test for Cl^- ions.

44. The magnetic moment of a transition metal ion is $\sqrt{15}$ B.M.

Ans: 3

Sol: n = 3 $\therefore \mu = \sqrt{3(3+2)} = \sqrt{15}$

45. The IUPAC name of $[Co(NH_3)_5ONO]^{2+}$

Ans: Pentaamine nitrito cobalt (III) ion

Sol: ONO^- is called nitrito.

46. The oxidation state of Fe in the brown ring

Ans: +2

Sol: NO is neutral ligand

47. The correct statement with regard to

Ans: H_2^+ is more stable than H_2^-

$\frac{3}{4}\frac{\mu_o i}{2R} \quad \frac{1}{2}\frac{\mu_o i}{2\pi R}$

Sol: There is one electron in the antibonding molecular orbital in H_2^-

48. Arrange the following in the increasing order

Ans: O_2^{--}, O_2^-, O_2, O_2^+

Sol:

	O_2^{--}	O_2^-	O_2	O_2^+
BO	1	1.5	2	2.5

49. 2 gm of a radioactive sample having half life of 15 days

Ans: 0.125 gm

Sol: 1st Jan 2009 to 1st March 2009 $\rightarrow$ 60 days

$2 \text{ gm} \xrightarrow{15 \text{ days}} 1 \text{ gm} \xrightarrow{15 \text{ days}} 0.5 \text{ gm} \xrightarrow{15 \text{ days}} 0.25 \text{ gm} \xrightarrow{15 \text{ days}} 0.125 \text{ gm}$

50. For a chemical reaction A$\rightarrow$ B, the rate of the reaction is 2×10^{-3} mol dm^{-3} s^{-1}, when the initial concentration is 0.05 mol dm^{-3}.

Ans: 3

Sol: Concentration — Rate

$\frac{0.1}{0.05} = 2$ times $\qquad \frac{1.6 \times 10^{-2}}{2 \times 10^{-3}} = 8$ times

$2^3 = 8$

$\therefore$ Order = 3

51. For the decomposition of a compound AB at 600K,

Ans: 2

Sol: Concentration — Rate

$\frac{0.4}{0.2} = 2$ times $\qquad \frac{11 \times 10^{-8}}{2.75 \times 10^{-8}} = 4$ times

$\frac{0.6}{0.2}$ = 3 times $\frac{24.75 \times 10^{-8}}{2.75 \times 10^{-8}}$ = 9 times

$2^2 = 4$

$\therefore$ Order = 2

52. The rate equation for a reaction: $A \rightarrow B$ is $r = K[A]^{\circ}$.

Ans: $\frac{a}{2K}$

Sol: It is given that the reaction is of zero order

$\therefore t_{1/2} = \frac{a}{2K}$

53. 30 cc of $\frac{M}{3}$ HCl, 20 cc of $\frac{M}{2}$ HNO_3 and 40 cc of $\frac{M}{4}$ NaOH

Ans: 2

Sol: Total milli equivalence of $H^+ = 30 \times \frac{1}{3} + 20 \times \frac{1}{2} = 20$

Total milli equivalence of $OH^- = 40 \times \frac{1}{4} = 10$

Milli equivalence of H^+ left = 20 – 10 = 10

$\therefore [H^+] = \frac{10}{1000}$ g– ions/dm^3 = 10^{-2}

$\therefore$pH = 2

54. An aqueous solution containing 6.5 gm of NaCl of 90% purity was subjected to

Ans: 100 cm^3

Sol: Wt. of NaCl = $6.5 \times 0.9 = 5.85$ gm

No. of equivalence of NaCl = $\frac{5.85}{58.5} = 0.1$

No. of equivalence of NaOH obtained = 0.1

Volume of 1M acetic acid required for the neutralisation of NaOH = $\frac{0.1 \times 1000}{1}$ = 100 cm^3

55. The standard electrode potential for the half cell reactions are:

$Zn^{++} + 2e^- \rightarrow Zn$ E° = –0.76 V

$Fe^{++} + 2e^- \rightarrow Fe$ E° = –0.44 V

Ans: +0.32 V

Sol: Cell reaction is $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$

$E_{cell} = Eel_{(oxidation)} + Eel_{(reduction)}$

= 0.76 – 0.44 = 0.32 V

56. 10^{-6} M NaOH is diluted 100 times.

Ans: Between 7 and 8

Sol: $[OH^-]$ in the diluted base = $\frac{10^{-6}}{10^2} = 10^{-8}$

Total $[OH^-] = 10^{-8} + [OH^-]$ obtainable from water.

PH of an alkaline solution is always greater than 7.

57. In the electrolysis of acidulated water, it is desired to obtain 1.12 cc of hydrogen

Ans: 9.65 amp

Sol: No. of moles of $H_2 = \frac{1.12}{22400}$

No. of equivalence of hydrogen

$= \frac{1.12 \times 2}{22400} = 10^{-4}$

No. of Faradays required = 10^{-4}

$\therefore$ Current to be passed in one second

$= 96500 \times 10^{-4}$ Amp

= 9.65 Amp

58. The one which decreases

Ans: Specific conductance

Sol: Number of ions/cc decreases with dilution and hence specific conductance decreases with dilution.

59. Vapour pressure of pure 'A' is 70 mm of Hg at 25°C.

Ans: 140 mm

Sol: $0.8 \times 70 + 0.2 \times P_B^0 = 84$

$P_B^0 = \frac{28}{0.2} = 140$ mm

60. A 6% solution of urea is isotonic

Ans: 1 M solution of glucose

Sol: $\frac{6}{60} = \frac{x}{180}$

x = 18 g

i.e., 18 g of glucose in 100 mL solution is isotonic with 6% urea solution.

18 g of glucose in 100 mL is 1 M