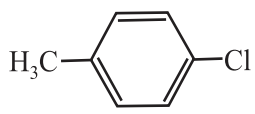


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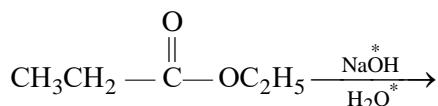
SECTION-A

1. On treating a mixture of two alkyl halides with sodium metal in dry ether, 2-Methylpropane was obtained. The alkyl halides are;
- (1) 2-Chloropropane & Chloromethane
 - (2) 2-Chloropropane & Chloroethane
 - (3) Chloromethane & Chloroethane
 - (4) Chloromethane & 1-Chloropropane
2. The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy of the molecule per atom will be;
- (1) 2.2×10^{-19} J
 - (2) 2.0×10^{-19} J
 - (3) 4.0×10^{-20} J
 - (4) 2.0×10^{-20} J
3. De-Broglie wavelength for electron is related to applied voltage as;
- (1) $\lambda = \frac{12.3}{\sqrt{h}} \text{ \AA}$
 - (2) $\lambda = \frac{12.3}{\sqrt{V}} \text{ \AA}$
 - (3) $\lambda = \frac{12.3}{\sqrt{r}} \text{ \AA}$
 - (4) $\lambda = \frac{12.3}{\sqrt{m}} \text{ \AA}$
4. The group having trigonal planar structures is;
- (1) $\text{NCl}_3, \text{BCl}_3, \text{SO}_3$
 - (2) $\text{CO}_3^{2-}, \text{NO}_3^-, \text{SO}_3$
 - (3) $\text{NH}_3, \text{SO}_3, \text{CO}_3^{2-}$
 - (4) $\text{BF}_3, \text{NF}_3, \text{CO}_3^{2-}$
5. For the reaction,
 $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
 $K_C = 66.9$ at 350°C and $K_C = 50.0$ at 448°C . The reaction has;
- (1) $\Delta H > 0$
 - (2) $\Delta H < 0$
 - (3) $\Delta H = 0$
 - (4) ΔH sign cannot be determined
6. The formation of oxide ion, $\text{O}^{2-}(\text{g})$ requires first an exothermic and then an endothermic step as shown below:
- $$\text{O}(\text{g}) + \text{e}^- \rightarrow \text{O}^-(\text{g}); \quad \Delta H^\circ = -142 \text{ kJ mol}^{-1}$$
- $$\text{O}^-(\text{g}) + \text{e}^- \rightarrow \text{O}^{2-}(\text{g}); \quad \Delta H^\circ = 844 \text{ kJ mol}^{-1}$$
- This is because;
- (1) Oxygen is more electronegative
 - (2) Oxygen has high electron affinity
 - (3) O^- ion will tend to resist the addition of another electron
 - (4) O^- has comparatively larger size than oxygen atom
7. The IUPAC name of the following compound is;
- 
- (1) 4-Methylchlorobenzene
 - (2) 4-Chlorotoluene
 - (3) 2-Chloro-4-methylbenzene
 - (4) 1-Methyl-4-chlorobenzene
8. Solution of 0.1 M NH_4OH and 0.1 M NH_4Cl has pH 9.25, The pK_b of NH_4OH is;
- (1) 9.25
 - (2) 4.75
 - (3) 3.75
 - (4) 8.25
9. The reducing character of hydrides of group 14 elements is;
- (1) Maximum for CH_4 and minimum for PbH_4
 - (2) Maximum for CH_4 and minimum for SnH_4
 - (3) Maximum for PbH_4 and minimum for SiH_4
 - (4) Maximum for PbH_4 and minimum for CH_4
10. The reaction,
- $$\text{R}_2\text{CO} + 4[\text{H}] \xrightarrow[\text{Conc. HCl}]{\text{Zn-Hg}} \text{R}_2\text{CH}_2 + \text{H}_2\text{O}$$
- is well known as;
- (1) wurtz reaction
 - (2) rosenmund reduction
 - (3) kolbe reaction
 - (4) clemmensen reduction
11. A compound (80 g) on analysis gave C = 24 g, H = 4 g, O = 32 g. Its empirical formula is;
- (1) $\text{C}_2\text{H}_2\text{O}_2$
 - (2) $\text{C}_2\text{H}_2\text{O}$
 - (3) CH_2O_2
 - (4) CH_2O
12. **Assertion (R):** Scandium and zinc are two members of first transition series which do not form coloured compounds.
Reason (R): Scandium compounds have $3d^0$ configuration in + 3 state while zinc compounds have $3d^{10}$ configuration in + 2 state due to which there is no d-d transition.
- (1) If both assertion and reason are true and reason is the correct explanation of assertion.
 - (2) If both assertion and reason are true but reason is not the correct explanation of assertion.
 - (3) If assertion is true but reason is false.
 - (4) If both assertion and reason are false.

13. Which of the following major product will be obtained when neopentyl alcohol is treated with conc. HCl in presence of $ZnCl_2$?

- (1) t-Butyl chloride
- (2) Isobutylene
- (3) t-Pentyl chloride
- (4) Neopentyl chloride

14. Product of the given reaction contains;



- (1) $CH_3 - CH_2 - \overset{\overset{O}{\parallel}}{C} - O^*$
- (2) $CH_3 - CH_2 - \overset{\overset{O^*}{\parallel}}{C} - O^-$
- (3) $CH_3 - CH_2 - O^* - H$
- (4) Both (1) and (2)

15. Denaturation of protein;

- (1) is always irreversible
- (2) disrupts the secondary and tertiary structures only
- (3) will not affect the original biological activity
- (4) none of these

16. The **incorrect** statement regarding an octahedral complex is;

- (1) central metal cation with d^6 configuration is diamagnetic in strong ligand field.
- (2) central metal cation with d^5 configuration has one unpaired electron in both weak and strong ligand field.
- (3) central metal cation with d^8 configuration has two unpaired electrons in weak, strong and also in mixed ligand field.
- (4) central metal cation with d^4 , d^5 , d^6 and d^7 configuration have different number of unpaired electrons in weak and strong ligand field.

17. The colour of light absorbed by an aqueous solution of $CuSO_4$ is;

- (1) Orange-Red
- (2) Blue-Green
- (3) Yellow
- (4) Violet

18. Which of the following material is **not** present in a dry cell?

- (1) MnO_2
- (2) NH_4Cl
- (3) $ZnCl_2$
- (4) KCl

19. If specific rotation of glucose solution is 52° and that of fructose solution is -92° then what will be the specific rotation of invert sugar?

- (1) -20°
- (2) $+20^\circ$
- (3) -72°
- (4) $+72^\circ$

20. The shape of ClO_3^- is;

- (1) Pyramidal
- (2) Tetrahedral
- (3) Triangular planar
- (4) Triangular bipyramidal

21. Match the List-I with List-II:

	List-I (Reaction)		List-II (K_p/K_c)
A	$A_2(g) + 3B_2(g) \rightleftharpoons 2AB_3(g)$	P	$(RT)^{-2}$
B	$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$	Q	$(RT)^0$
C	$A(s) + \frac{3}{2} B_2(g) \rightleftharpoons AB_3(g)$	R	$(RT)^{1/2}$
D	$AB_2(g) \rightleftharpoons AB(g) + \frac{1}{2} B_2(g)$	S	$(RT)^{-1/2}$

- (1) $A \rightarrow P, B \rightarrow Q, C \rightarrow R, D \rightarrow S$
- (2) $A \rightarrow P, B \rightarrow Q, C \rightarrow S, D \rightarrow R$
- (3) $A \rightarrow S, B \rightarrow R, C \rightarrow Q, D \rightarrow P$
- (4) $A \rightarrow Q, B \rightarrow R, C \rightarrow P, D \rightarrow S$

22. An inorganic salt is strongly heated the residue is yellow when hot and white when cold. The salt contains

- (1) Cu^{2+}
- (2) Zn^{2+}
- (3) Co^{2+}
- (4) Fe^{2+}

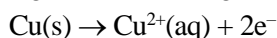
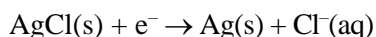
23. The number of spectral lines that are possible when electrons in 7th shell in different hydrogen atoms return to the 2nd shell is;

- (1) 12
- (2) 15
- (3) 14
- (4) 10

24. Which of the following statements is in accordance with the Arrhenius equation?

- (1) Rate of a reaction has no effect with increase in temperature.
- (2) Rate of a reaction increases with decrease in activation energy.
- (3) Rate constant decreases exponentially with increase in temperature.
- (4) Rate of reaction decreases with decrease in activation.

25. An electrochemical cell consists of two half-cell reactions:



The mass of copper (in grams) dissolved on passing 0.5 A current for 1 hour is (Given : Atomic mass of Cu is 63.6 ; $F = 96500 \text{ C mol}^{-1}$) ;

- (1) 0.88 g
- (2) 1.18 g
- (3) 0.29 g
- (4) 0.56 g

26. Solubility of AgCl in water, in 0.01M CaCl₂, in 0.01M NaCl and in 0.05M AgNO₃ are S₁, S₂, S₃ and S₄ respectively, then;

- (1) $S_1 < S_2 < S_3 < S_4$
- (2) $S_1 > S_3 > S_2 > S_4$
- (3) $S_1 > S_2 = S_3 > S_4$
- (4) $S_1 > S_3 > S_4 > S_2$

27. **Statement-1:** The reciprocal of time in which 66% of the reactant is converted to product is equal to the rate constant of first order reaction.

Statement-2: The rate constant for first order reaction depends on initial concentration of reactants.

- (1) Statement I and statement II both are correct.
- (2) Statement I and statement II both are incorrect.
- (3) Statement I is true but statement II is false.
- (4) Statement I is false but statement II is true.

28. **Statement-1:** Carbonyl compounds take part in nucleophilic addition reactions.

Statement-2: These reactions are initiated by nucleophilic attack at the electron deficient carbon atom.

- (1) Statement I and statement II both are correct.
- (2) Statement I and statement II both are incorrect.
- (3) Statement I is true but statement II is false.
- (4) Statement I is false but statement II is true.

29. The solution which maintains its pH constant even upon addition of small amounts of acid or base, is called buffer solution. Which can act as a buffer?

- (1) $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH}$
- (2) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$
- (3) 40 mL of 0.1M NaCN + 20 mL of 0.1M HCN
- (4) All of these

30. **Assertion:** The pK_a of acetic acid is lower than that of phenol.

Reason: Phenoxide ion is more resonance stabilized than acetate ion.

- (1) If both assertion and reason is true and reason is the correct explanation of assertion.
- (2) If both assertion and reason is true but reason is not the correct explanation of assertion.
- (3) If assertion is true but reason is false.
- (4) If both assertion and reason are false.

31. Basic strength of $\text{CH} \equiv \overset{\ominus}{\text{C}}$ (I); $\text{CH}_2 = \overset{\ominus}{\text{C}}\text{H}$ (II) and $\overset{\ominus}{\text{C}}\text{H}_3$ (III) will be in order:

- (1) $\text{I} < \text{II} < \text{III}$
- (2) $\text{II} < \text{III} > \text{I}$
- (3) $\text{III} < \text{II} < \text{I}$
- (4) $\text{III} < \text{I} < \text{II}$

32. Match the following lists:

List-I		List-II	
A	Ethane	P	2 sp carbons
B	Ethylene	Q	6 sp ² carbons
C	Acetylene	R	2 sp ³ carbons
D	Benzene	S	2 sp ² carbons
		T	1 sp and 1 sp ² carbons

- (1) $\text{A} \rightarrow \text{R}, \text{B} \rightarrow \text{S}, \text{C} \rightarrow \text{P}, \text{D} \rightarrow \text{Q}$
- (2) $\text{A} \rightarrow \text{S}, \text{B} \rightarrow \text{T}, \text{C} \rightarrow \text{R}, \text{D} \rightarrow \text{Q}$
- (3) $\text{A} \rightarrow \text{R}, \text{B} \rightarrow \text{P}, \text{C} \rightarrow \text{Q}, \text{D} \rightarrow \text{T}$
- (4) $\text{A} \rightarrow \text{Q}, \text{B} \rightarrow \text{R}, \text{C} \rightarrow \text{S}, \text{D} \rightarrow \text{T}$

33. **Statement-1:** Fluorine molecule has bond order one.

Statement-2: The number of electrons in antibonding molecular orbitals is two less than in bonding molecular orbitals.

- (1) Statement I and statement II both are correct.
- (2) Statement I and statement II both are incorrect.
- (3) Statement I is true but statement II is false.
- (4) Statement I is false but statement II is true.

34. At 25°C, the values of rate constant, activation energy and Arrhenius constant of a reaction are $3 \times 10^{-4} \text{ sec}^{-1}$, 129 kJ/mol and $2 \times 10^{15} \text{ sec}^{-1}$ respectively.

The value of rate constant as $T \rightarrow \infty$ is;

- (1) zero
- (2) 2×10^{15}
- (3) 3×10^{-4}
- (4) 6×10^{11}

35. Which of the following statements regarding actinides is **correct**?

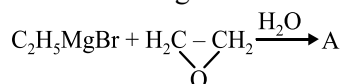
- (1) Pu^{4+} disproportionates to Pu^{3+} and PuO_2^{2+} in strongly acidic medium.
- (2) Maximum oxidation state of Np is +7.
- (3) UO_2^{2+} is stable.
- (4) All of the above statements are correct.

SECTION-B

36. The synthesis of alkyl fluorides is best accomplished by:

- (1) Swarts reaction
- (2) Free radical fluorination
- (3) Finkelstein reaction
- (4) Sandmeyer reaction

37. In the following reaction 'A' is;



- (1) $\text{C}_2\text{H}_5\text{CH}_2\text{CHO}$
- (2) $\text{C}_2\text{H}_5\text{CH}_2\text{CH}_2\text{OH}$
- (3) $\text{C}_2\text{H}_5\text{CH}_2\text{OH}$
- (4) $\text{C}_2\text{H}_5\text{CHO}$

38. The amount of Al deposited on passage of 2F charge through molten Al_2O_3 is;

[Atomic mass of Al = 27 u]

- (1) 9 g
- (2) 15 g
- (3) 18 g
- (4) 37 g

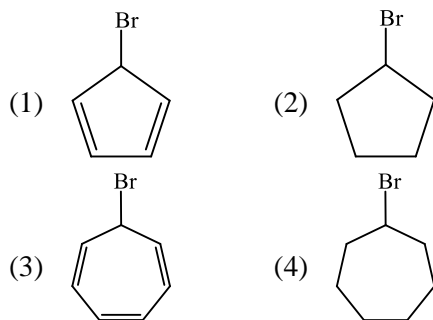
39. The oxidation state of chromium in the final product formed by the reaction between KI and acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution is;

- (1) +4
- (2) +6
- (3) +2
- (4) +3

40. Tollens' reagent is:

- (1) Alkaline mercuric chloride
- (2) Alkaline potassium permanganate
- (3) Ammoniacal silver nitrate
- (4) Ammonium citrate

41. The compound which will react fastest with AgNO_3 solution is:



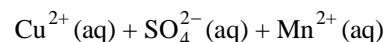
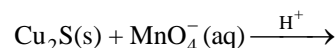
42. A mixture showing negative deviation from Raoult's law is:

- (1) Hexane + Heptane
- (2) Benzene + Toluene
- (3) Water + Ethanol
- (4) Nitric acid + Water

43. Non-reducing sugar out of the given molecules is/are:

- (1) Maltose
- (2) Lactose
- (3) Sucrose
- (4) Both (1) and (3)

44. Consider the following redox reaction:



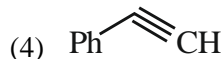
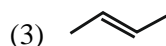
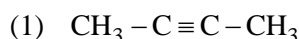
The number of moles of MnO_4^- ion that will be needed to oxidise one mole of Cu_2S completely is:

- (1) 2
- (2) 5
- (3) $\frac{2}{5}$
- (4) $\frac{5}{2}$

45. Molarity and molality of a solution of caustic soda are respectively 11.12M and 94.12m. The density of the solution is:

- (1) 0.556 g mL^{-1}
- (2) 5.56 g mL^{-1}
- (3) 55.6 g mL^{-1}
- (4) None of these

46. Which of the following will give white precipitate with ammoniacal silver nitrate solution?



47. Enthalpy of neutralisation of four acids A, B, C and D with NaOH are -10.5 , -13.7 , -5.9 and $-12.7 \text{ kcal eq}^{-1}$ respectively. Out of A, B, C and D the strongest acid is:

- (1) C
- (2) A
- (3) D
- (4) B

48. What is the pH of the resulting solution when 100 ml of 0.1M CH_3COOH is mixed with 50 ml of 0.1M NaOH solution?

[pK_a of $\text{CH}_3\text{COOH} = 4.74$]

- (1) 4.44
- (2) 4.74
- (3) 5.04
- (4) 9.37

49. 5 moles of an ideal gas at 27°C expands isothermally and reversibly from a volume of 6 L to 60 L. The work done in kJ is:
- (1) -14.7 (2) -28.72
(3) $+28.72$ (4) -56.72

50. The number of geometrical isomers of $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$ are :
- (1) 2 (2) 3
(3) 4 (4) nil

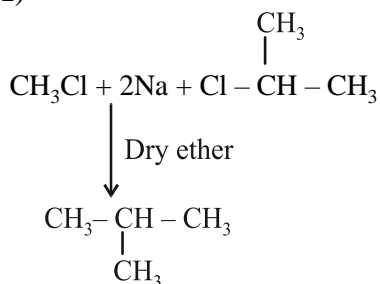
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ANSWER KEY

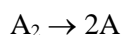
- | | |
|---------|---------|
| 1. (1) | 26. (2) |
| 2. (4) | 27. (3) |
| 3. (2) | 28. (1) |
| 4. (2) | 29. (4) |
| 5. (2) | 30. (3) |
| 6. (3) | 31. (1) |
| 7. (2) | 32. (1) |
| 8. (2) | 33. (1) |
| 9. (4) | 34. (2) |
| 10. (4) | 35. (4) |
| 11. (4) | 36. (1) |
| 12. (1) | 37. (2) |
| 13. (3) | 38. (3) |
| 14. (4) | 39. (4) |
| 15. (2) | 40. (3) |
| 16. (2) | 41. (3) |
| 17. (1) | 42. (4) |
| 18. (4) | 43. (3) |
| 19. (1) | 44. (1) |
| 20. (1) | 45. (1) |
| 21. (2) | 46. (4) |
| 22. (2) | 47. (4) |
| 23. (2) | 48. (2) |
| 24. (2) | 49. (2) |
| 25. (4) | 50. (1) |

HINTS AND SOLUTION

1. (1)



2. (4)



$$\text{K.E.} = h\nu - h\nu_0$$

$$= 4.4 \times 10^{-19} - 4.0 \times 10^{-19}$$

$$= 0.4 \times 10^{-19} \text{ J}$$

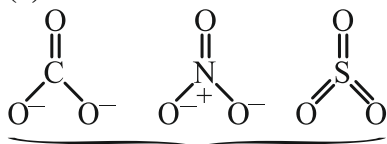
$$= 4 \times 10^{-20} \text{ J}$$

$$\text{K.E. per atom} = 2 \times 10^{-20} \text{ J}$$

3. (2)

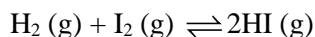
$$\lambda = \frac{12.3}{\sqrt{V}} \text{ \AA}$$

4. (2)



Trigonal planar

5. (2)

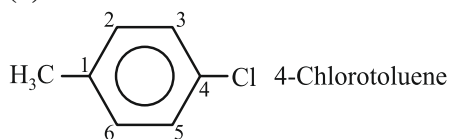


For the given reaction, on increasing temperature K_c decreases, that implies reaction is exothermic.

6. (3)

Addition of electron to O^- is endothermic as O^- will tend to resist the addition of further electron due to inter electronic repulsions.

7. (2)



8. (2)

$$\text{pOH} = \text{pK}_b + \log \frac{[\text{salt}]}{[\text{base}]}$$

$$[\text{NH}_4\text{OH}] = [\text{NH}_4\text{Cl}] = 0.1 \text{ M}$$

$$\text{pOH} = \text{pK}_b$$

$$14 - \text{pH} = \text{pK}_b$$

$$\text{pK}_b = 14 - 9.25 = 4.75$$

9. (4)



(E = C, Si, Ge, Sn, Pb)

Due to decrease in E - H bond strength down the group, reducing nature increases.

10. (4)

Clemmensen reduction

11. (4)

$$n_{\text{C}} = \frac{24}{12} = 2$$

$$n_{\text{H}} = \frac{4}{1} = 4$$

$$n_{\text{O}} = \frac{32}{16} = 2$$

Empirical formula

C:H:O

2:4:2

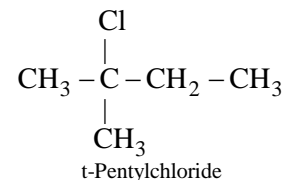
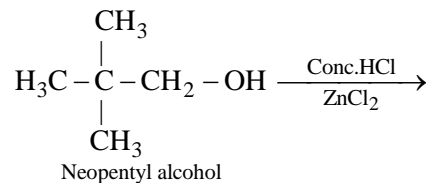
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CH_2O

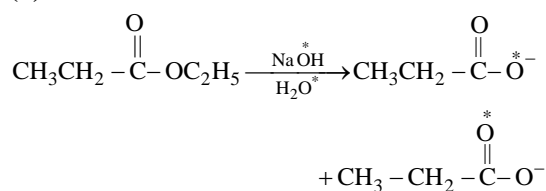
12. (1)

There is no possibility of d-d transition.

13. (3)



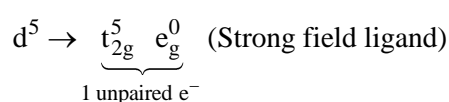
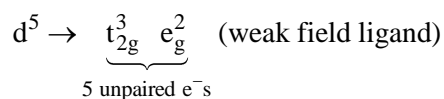
14. (4)



15. (2)

Denaturation disrupts only secondary and tertiary structures of proteins.

16. (2)



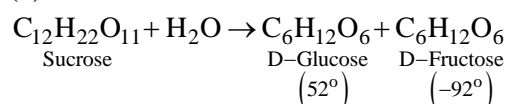
17. (1)

CuSO_4 solution absorbs orange-red colour and appears blue (complimentary to the colour absorbed).

18. (4)

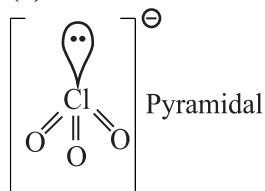
KCl is not present in dry cell.

19. (1)



$$\text{Specific rotation} = \frac{1}{2} (52^\circ + (-92^\circ)) = -20^\circ$$

20. (1)



21. (2)

$$\frac{K_P}{K_C} = RT^{\Delta n_g}$$

Where $(\Delta n_g = \text{number of gaseous mole of product} - \text{number of gaseous mole of reactant})$

22. (2)

Salt contains Zn^{2+}

23. (2)

$$\begin{aligned} \text{Number of spectral lines} &= \frac{(n_2 - n_1)(n_2 - n_1 + 1)}{2} \\ &= \frac{(7 - 2)(7 - 2 + 1)}{2} = 15 \end{aligned}$$

24. (2)

According to Arrhenius equation, rate of a reaction increases with decrease in activation energy.

25. (4)

Faraday's first law of electrolysis,

$$W = Z \times I \times t$$

where, $Z = \text{electrochemical equivalent (g/C)}$

$I = \text{current (Amps)}$

$t = \text{time (sec)}$

$$W = \frac{63.6}{2 \times 96500} \times 0.5 \times 60 \times 60$$

$$W = 0.56 \text{ g.}$$

26. (2)

$$\text{Solubility of AgCl in water} = \sqrt{K_{sp}} = S_1$$

In 0.01M CaCl_2 , it is given by,

$$K_{sp} = S_2 \times (0.01 \times 2 + S) \left(\because S_2 = \frac{K_{sp}}{0.02} \right)$$

In 0.01 M NaCl , it is given by

$$K_{sp} = S_3 \times (0.01 + S) \left(\because S_3 = \frac{K_{sp}}{0.01} \right)$$

In 0.05M AgNO_3 , it is given by

$$K_{sp} = S_4 \times (0.05 + S) \left(\because S_4 = \frac{K_{sp}}{0.05} \right)$$

The solubilities are derived by neglecting S in comparison to 0.02, 0.01 and 0.05.

So, order of solubilities:

$$S_1 > S_3 > S_2 > S_4$$

27. (3)

The rate constant for first order reaction does not depend on initial concentration of reactants.

28. (1)
A nucleophilic addition reaction is a chemical addition reaction in which a nucleophile forms a sigma bond with an electron-deficient species.

29. (4)
Buffer is a solution of weak acid and conjugate base of weak acid or a weak base and a conjugate acid of weak base, e.g. $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH}$, $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$, $\text{NaCN} + \text{HCN}$

30. (3)
Acetate ion is more resonance stabilized than phenoxide ion.

31. (1)
 $\text{CH} \equiv \text{CH}$, $\text{CH}_2 = \text{CH}_2$, $\text{CH}_3 - \text{CH}_3$
 \uparrow \uparrow \uparrow
 sp sp^2 sp^3

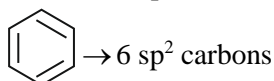
Electronegativity of carbon atom:
 $sp > sp^2 > sp^3$.

\therefore Acidic character follows the order
 $\text{CH} \equiv \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3$

Hence, order of basic strength:

$\text{CH} \equiv \overset{\ominus}{\text{C}} < \text{CH}_2 = \overset{\ominus}{\text{C}} < \text{CH}_3 \overset{\ominus}{\text{C}} \text{H}_2$
 (I) (II) (III)

32. (1)
 $\text{CH}_3 - \text{CH}_3 \rightarrow 2 sp^3$ carbons
 $\text{CH}_2 = \text{CH}_2 \rightarrow 2 sp^2$ carbons
 $\text{CH} \equiv \text{CH} \rightarrow 2 sp$ carbons



33. (1)
Molecular orbital electronic configuration-
 $(\sigma 1s^2)(\sigma^* 1s^2)(\sigma 2s^2)(\sigma^* 2s^2)(\sigma 2p_z^2)(\pi 2p_x^2)(\pi 2p_y^2)$
 $(\pi^* 2p_x^2)(\pi^* 2p_y^2)$

Number of electrons in bonding MOs = 10

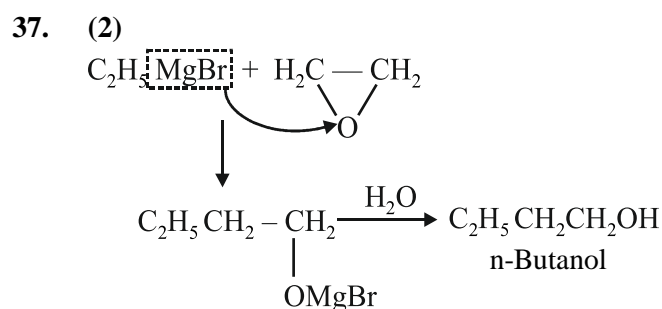
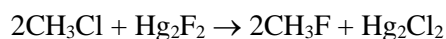
Number of electrons in anti-bonding MOs = 8

34. (2)
When $T \rightarrow \infty$
then $K = A$

35. (4)
All of the above given statements are correct.

36. (1)
Alkyl fluorides which cannot be prepared by Finkelstein reaction is best accomplished by Swarts reaction. In this reaction, the corresponding fluoride is obtained by the action of mercurous fluoride or antimony trifluoride on corresponding chlorides.

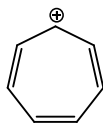
The reaction is as follows:

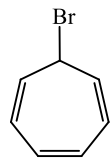


38. (3)
 $\text{Al}_2\text{O}_3 \rightarrow 2\text{Al}^{3+} + 3\text{O}^{2-}$
 $\text{Al}^{3+} + 3e^- \rightarrow \text{Al}$
 $\therefore 3F$ charge gives $\text{Al} = 27$ g
 $\therefore 2F$ charge will give $\text{Al} = \frac{27}{3} \times 2 = 18$ g
[1 mole $e^- = 1F$ charge]

39. (4)
 $\text{K}_2\text{Cr}_2\text{O}_7 + 7\text{H}_2\text{SO}_4 + 6\text{KI} \rightarrow \text{Cr}_2(\text{SO}_4)_3 + 3\text{I}_2 + 7\text{H}_2\text{O} + 4\text{K}_2\text{SO}_4$

40. (3)
Ammoniacal silver nitrate

41. (3)
Tropylium ion,  is an aromatic species.

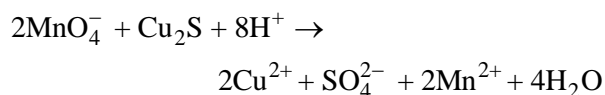
Therefore,  will react fastest with AgNO_3 solution.

42. (4)
If A–B interactions > A–A or B–B interactions then mixture shows negative deviation from Raoult's law.

Hexane + Heptane	:	No deviation
Benzene + Toluene	:	No deviation
Water + Ethanol	:	+ve deviation
Nitric acid + Water	:	–ve deviation

43. (3)
Among all monosaccharides and all disaccharides, only sucrose is a non-reducing sugar.

44. (1)
The balanced reaction is:



Thus, the number of moles of MnO_4^- ion that will be needed to oxidise one mole of Cu_2S completely = 2

45. (1)

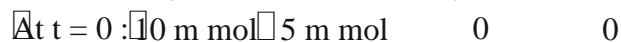
$$d = M \left(\frac{1}{m} + \frac{\text{molar mass of solute}}{1000} \right)$$

$$d = 11.12 \left(\frac{1}{94.12} + \frac{40}{1000} \right) = 0.556 \text{ g mL}^{-1}$$

46. (4)
Only Terminal alkynes gives white precipitate with ammoniacal silver nitrate solution.

47. (4)
Neutralisation reactions are exothermic in nature.
Acidic strength $\propto \Delta H_{\text{neutralisation}}$ (negative value)
Thus, acidic strength order is:
 $B > D > A > C$

48. (2)
 $\text{CH}_3\text{COOH} + \text{NaOH} \rightleftharpoons \text{CH}_3\text{COONa} + \text{H}_2\text{O}$



Thus, the given buffer is an acidic buffer.

(NaOH is the limiting reagent)

pH of an acidic buffer is given by:

$$\text{pH} = \text{pK}_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$$

$$= 4.74 + \log \frac{5}{5}$$

$$= 4.74 + \log 1$$

$$= 4.74 + 0$$

$$= 4.74$$

$$[\text{m mol} = \text{Volume} \times \text{Molarity}]$$

49. (2)
$$w = -2.303nRT \log \frac{V_2}{V_1}$$

$$= -2.303 \times 5 \times 8.314 \times 300 \log \frac{60}{6}$$

$$= -28.72 \text{ kJ}$$

50. (1)
The complex exhibits two geometrical isomers (i) facial and (ii) meridional.

