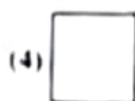
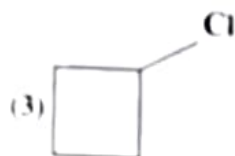
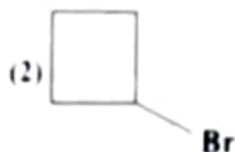
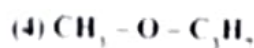
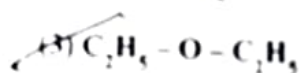
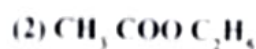
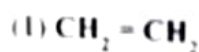


1. The major product formed when 1 - Bromo - 3 - Chlorocyclobutane reacts with metallic sodium in dry ether is



2. Ethyl alcohol is heated with concentrated sulphuric acid at 413 K. The major product formed is



3. Phenol can be distinguished from propanol by using the reagent

(1) Iodine in alcohol

(2) Sodium metal

(3) Bromine water

(4) Iron metal

4. Match the following with their pKa values

Acid	pKa
(I) Phenol	(a) 16
(II) p-Nitrophenol	(b) 0.78
(III) Ethyl alcohol	(c) 10
(IV) Picric acid	(d) 7.1

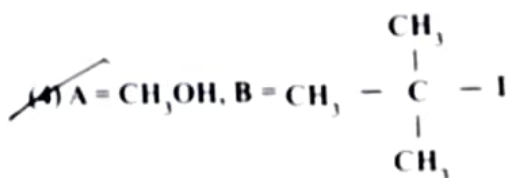
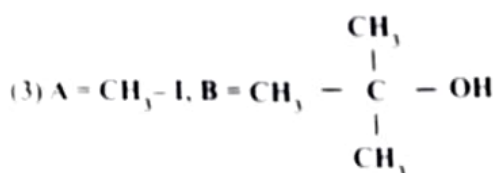
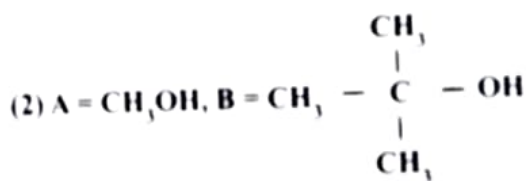
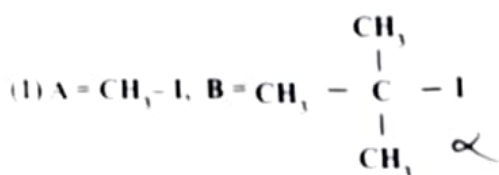
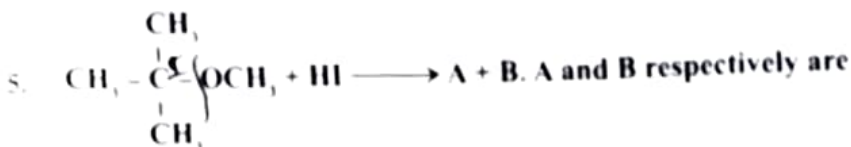
(1) I - a, II - b, III - c, IV - d

(2) I - b, II - a, III - d, IV - c

(3) I - c, II - d, III - a, IV - b

(4) I - a, II - d, III - c, IV - b

SPACE FOR ROUGH WORK



6. Oxidation of Toluene with chromyl chloride followed by hydrolysis gives Benzaldehyde. This reaction is known as _____

(1) Stephen reaction

(2) Cannizzaro Reaction

~~(3) Etard Reaction~~

~~(4) Kolbe reaction~~

7. Statement-I: Reduction of ester by DIBAL-H followed by hydrolysis gives aldehyde. α

Statement-II: Oxidation of benzyl alcohol with aqueous KMnO_4 leads to the formation of Benzaldehyde. α

Among the above statements, identify the correct statement.

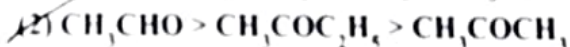
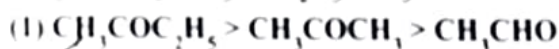
(1) Statement-I is false but statement-II is true

(2) Both statements-I and II are true

~~(3) Both statements-I and II are false~~

(4) Statement-I is true but statement-II is false

8. Arrange the following compounds in their decreasing order of reactivity towards Nucleophilic addition reaction.



SPACE FOR ROUGH WORK

9. Which of the following has most acidic Hydrogen?

~~(1) Trichloroacetic acid~~

(2) Chloroacetic acid

(3) Propanoic acid $\text{CH}_3\text{CH}_2\text{COOH}$

(4) Dichloroacetic acid

10. Which of the following reagents are suitable to differentiate Aniline and N-methylaniline chemically?

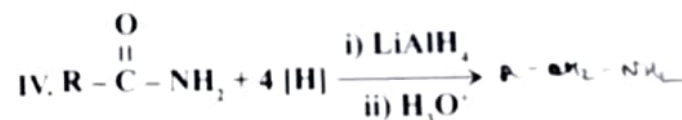
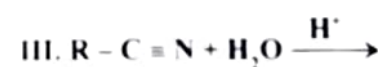
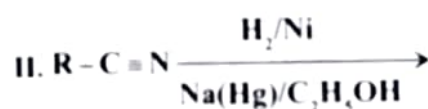
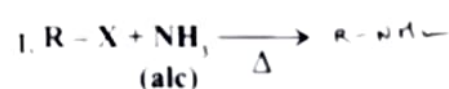
(1) Conc. Hydrochloric acid and anhydrous zinc chloride

(2) Chloroform and Alcoholic potassium hydroxide

~~(3) Acetic anhydride~~

(4) Br_2 water

11. Which of the following reaction/s does not yield an amine?



~~(1) Only III~~

~~(2) Both II and IV~~

(3) Both I and III

(4) Only II

12. Match the compounds given in List-I with the items given in List-II

List-I

List-II

(I) Benzenesulphonyl Chloride

(a) Zwitterion

(II) Sulphanilic acid

(b) Hinsberg reagent

(III) Alkyl Diazonium salts

(c) Dyes

(IV) Aryl Diazonium salts

(d) Conversion to alcohols

(1) I - c, II - a, III - d, IV - b

(2) I - b, II - a, III - d, IV - c

(3) I - c, II - b, III - a, IV - d

~~(4) I - a, II - c, III - b, IV - d~~

SPACE FOR ROUGH WORK

13. The number of orbitals associated with 'N' shell of an atom is
- (1) 3 (2) 4
~~(3) 16~~ (4) 32
14. According to the Heisenberg's Uncertainty principle, the value of $\Delta v \cdot \Delta x$ for an object whose mass is 10^{-6} kg is ($h = 6.626 \times 10^{-34} \text{ Js}$)
- (1) $3.5 \times 10^{-25} \text{ m}^2 \text{ s}^{-1}$
~~(2) $5.2 \times 10^{-29} \text{ m}^2 \text{ s}^{-1}$~~
 (3) $3.0 \times 10^{-24} \text{ m}^2 \text{ s}^{-1}$
 (4) $4.0 \times 10^{-26} \text{ m}^2 \text{ s}^{-1}$
15. Given below are two statements.
- Statement-I: Adiabatic work done is positive when work is done on the system and internal energy of the system increases ✓
- Statement-II: No work is done during free expansion of an ideal gas ✓
- In the light of the above statements, choose the correct answer from the options given below.
- ~~(1) Statement-I is false but Statement-II is true~~
 (2) Both Statement-I and Statement-II are true
 (3) Both Statement-I and Statement-II are false
 (4) Statement-I is true but Statement-II is false
16. Which one of the following reactions has $\Delta H = \Delta U$?
- ~~(1) $2\text{HI(g)} \rightleftharpoons \text{H}_2\text{(g)} + \text{I}_2\text{(g)}$~~
 (2) $\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \rightleftharpoons 2\text{NH}_3\text{(g)}$
 (3) $\text{CaCO}_3\text{(s)} \xrightarrow{\Delta} \text{CaO(s)} + \text{CO}_2\text{(g)}$
 (4) $\text{C}_6\text{H}_6\text{(l)} + \frac{15}{2} \text{O}_2\text{(g)} \longrightarrow 6\text{CO}_2\text{(g)} + 3\text{H}_2\text{O(l)}$

SPACE FOR ROUGH WORK

17. Identify the incorrect statements among the following:

- (a) All enthalpies of fusion are positive. ✓
- (b) The magnitude of enthalpy change does not depend on the strength of the intermolecular interactions in the substance undergoing phase transformations.
- (c) When a chemical reaction is reversed, the value of $\Delta_r H^\circ$ is reversed in sign.
- (d) The change in enthalpy is dependent of path between initial state (reactants) and final state (products) ✓
- (e) For most of the ionic compounds, $\Delta_{\text{sol}} H^\circ$ is negative. ✓

~~(1) a, d and e~~

(2) a and c only

~~(3) a, b and d~~

(4) b, d and e

18. Which of the following statements is/are true about equilibrium?

- (a) Equilibrium is possible only in a closed system at a given temperature ✓
- (b) All the measurable properties of the system remain constant at equilibrium ✓
- (c) Equilibrium constant for the reverse reaction is the inverse of the equilibrium constant for the reaction in the forward direction. ✓

~~(1) a, b and c~~

(2) Only a

(3) Only b

(4) Only c

19. According to Le Chatelier's principle, in the reaction $\text{CO(g)} + 3\text{H}_2\text{(g)} \rightleftharpoons \text{CH}_4\text{(g)} + \text{H}_2\text{O(g)}$, the formation of methane is favoured by

- (a) increasing the concentration of CO ✓
- (b) increasing the concentration of H_2O
- (c) decreasing the concentration of CH_4 ✓
- (d) decreasing the concentration of H_2

(1) a and d

(2) a and b

~~(3) a and c~~

✓ (4) b and d

20. The equilibrium constant at 298K for the reaction $\text{A} + \text{B} \rightleftharpoons \text{C} + \text{D}$ is 100. If the initial concentrations of all the four species were 1M each, then equilibrium concentration of D (in mol L^{-1}) will be

(1) 1.182

✓ (2) 0.818

(3) 0.182 ✓

~~(4) 1.818~~

SPACE FOR ROUGH WORK

Among the following 0.1 m aqueous solutions, which one will exhibit the lowest boiling point elevation, assuming complete ionization of the compounds in solution?

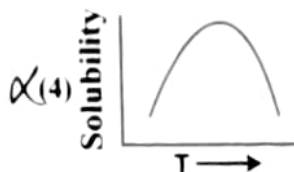
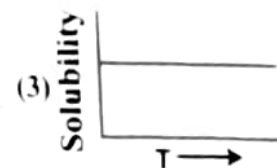
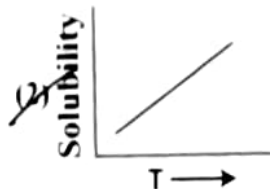
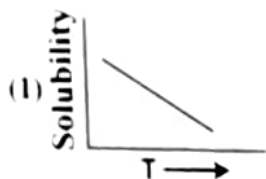
(1) Potassium sulphate

~~(2) Sodium chloride~~

(3) Aluminium chloride

(4) Aluminium sulphate

Variation of solubility with temperature T for a gas in liquid is shown by the following graphs. The correct representation is



3. 180g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a vessel. The temperature at which water boils at 1.013 bar is _____ (given, K_b for water is $0.52 K \text{ kg mol}^{-1}$. Boiling point for pure water is 373.15 K)

(1) 373.0 K

(2) 373.202 K

~~(3) 373.67 K~~

(4) 373.15 K

24. If N_2 gas is bubbled through water at 293 K, how many moles of N_2 gas would dissolve in 1 litre water? Assume that N_2 exerts a partial pressure of 0.987 bar.

[Given K_H for N_2 at 293 K is 76.48 K bar]

(1) 7.16×10^{-4}

(2) ~~7.16×10^{-3}~~

(3) 0.716×10^{-3}

~~(4) 7.16×10^{-5}~~

25. The correct statement/s about Galvanic cell is/are

(a) Current flows from cathode to anode

(b) Anode is positive terminal

(c) If $E_{\text{cell}} < 0$, then it is spontaneous reaction

(d) Cathode is positive terminal

(1) a and d only

(2) b only

(3) a and b only

~~(4) a, b and c~~

SPACE FOR ROUGH WORK

26. The electronic conductance depends on

- ~~(1) Concentration of the electrolyte~~
- (2) Size of the ions
- (3) Nature of electrolyte added
- (4) The number of valence electrons per atom

27. For a given half cell, $\text{Al}^{3+} + 3e^- \longrightarrow \text{Al}$ on increasing the concentration of aluminium ion, the electrode potential will

- ~~(1) First increase then decrease~~
- (2) Increase
- (3) Decrease
- (4) No change

28. Match the following and select the correct option for the quantity of electricity, in Cmol^{-1} , required to deposit various metals at cathode.

List-I

- (a) Ag^+
- (b) Mg^{2+}
- (c) Al^{3+}
- (d) Ti^{4+}

List-II

- i. 386000 Cmol^{-1}
- ii. 289500 Cmol^{-1}
- iii. 96500 Cmol^{-1}
- iv. 193000 Cmol^{-1}

(1) a - iv, b - iii, c - i, d - ii

(2) a - i, b - ii, c - iii, d - iv

(3) a - ii, b - i, c - iv, d - iii

~~(4) a - iii, b - iv, c - ii, d - i~~

29. Catalysts are used to increase the rate of a chemical reaction. Because it

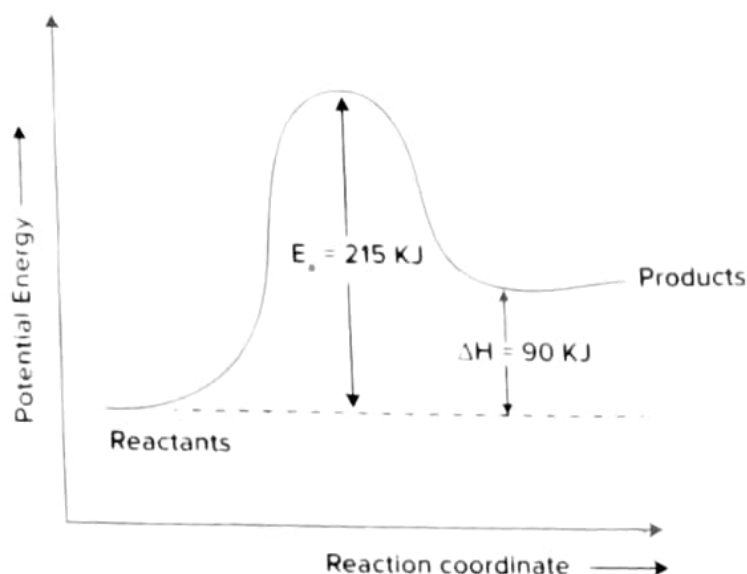
- (1) Brings about improper orientation of reactant molecules
- (2) Increases the potential energy barrier
- ~~(3) Increases the activation energy of the reaction~~
- (4) Decreases the activation energy of the reaction

30. Half-life of a first order reaction is 20 seconds and initial concentration of reactant is 0.2M. The concentration of reactant left after 80 seconds is

- (1) 0.0125 M
- (2) 0.2 M
- (3) 0.1 M
- ~~(4) 0.05 M~~

SPACE FOR ROUGH WORK

31. In the given graph, E_a for the reverse reaction will be



(1) 90 KJ

(2) 305 KJ

~~(3) 125 KJ~~

(4) 215 KJ

32. For the reaction $2\text{N}_2\text{O}_5(\text{g}) \longrightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$ initial concentration of N_2O_5 is 2.0 mol L^{-1} and after 300 min, it is reduced to 1.4 mol L^{-1} . The rate of production of NO_2 (in $\text{mol L}^{-1} \text{ min}^{-1}$) is

(1) 2.5×10^{-3}

~~(2) 2.5×10^{-3}~~

(3) 2.5×10^{-4}

(4) 4×10^{-4}

33. Which of the following methods of expressing concentration are unitless?

(1) Mass percent (W/W) and Molality

(2) Molality and Molarity

~~(3) Mole fraction and Mass percent (W/W)~~

(4) Molality and Mole fraction

34. Select the INCORRECT statement/s from the following:

(a) 22 books have infinite significant figures. ✗

(b) In the answer of calculation 2.5×1.25 has four significant figures. ✗

(c) Zero's preceding to first non-zero digit are significant. ✓

(d) In the answer of calculation $12.11 + 18.0 + 1.012$ has three significant figures ✓

(1) (b) and (d) only ✗

~~(2) (a) and (b) only~~

~~(3) (b), (c) and (d)~~

(4) (b) and (c) only ✓

SPACE FOR ROUGH WORK

Given below are the atomic masses of the elements:

Element:	Li	Na	Cl	K	Ca	Br	Sr	I	Ba
Atomic Mass (g mol ⁻¹):	7	23	35.5	39	40	80	88	127	137

Which of the following doesn't form triad?

- (1) ~~Cl, K, Ca~~
- (2) Li, Na, K
- (3) Ba, Sr, Ca
- (4) Cl, Br, I

The change in hybridisation (if any) of the 'Al' atom in the following reaction is



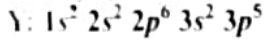
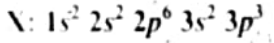
- (1) sp^3 to $sp^3 d$
- (2) sp^3 to sp^2
- (3) No change in the hybridisation state
- (4) ~~sp^2 to sp^3~~

Match List-I with List-II and select the correct option:

List-I (Molecule / ion)		List-II (Bond order)	
(a)	NO	(i)	1.5
(b)	CO	ii)	2.0
(c)	O_2^-	iii)	2.5
(d)	O_2	iv)	3.0

- (1) a - ii, b - iii, c - iv, d - i
- (2) a - iv, b - iii, c - ii, d - i
- (3) ~~a - iii, b - iv, c - i, d - ii~~
- (4) a - i, b - iv, c - iii, d - ii

88. The electronic configuration of X and Y are given below:



Which of the following is the correct molecular formula and type of bond formed between X and Y?

- (1) XY_3 , covalent bond
- (2) ~~X_2Y , covalent bond~~
- (3) ~~X_2Y , ionic bond~~
- (4) ~~X_2Y_3 , coordinate bond~~

SPACE FOR ROUGH WORK

Match List - I with List - II

List-I (Types of redox reactions)		List-II (Examples)	
(a)	Combination reaction	(i)	$\text{Cl}_{2(g)} + 2\text{Br}_{(aq)} \rightarrow 2\text{Cl}_{(aq)}^- + \text{Br}_{2(l)}$
(b)	Decomposition reaction	(ii)	$2\text{H}_2\text{O}_{2(aq)} \rightarrow 2\text{H}_2\text{O}_{(l)} + \text{O}_{2(g)}$
(c)	Displacement reaction	(iii)	$\text{CH}_{4(g)} + 2\text{O}_{2(g)} \xrightarrow{\Delta} \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$
(d)	Disproportionation reaction	(iv)	$2\text{H}_2\text{O}_{(l)} \xrightarrow{\Delta} 2\text{H}_{2(g)} + \text{O}_{2(g)}$

Choose the correct answer from the options given below.

(1) a - iii, b - iv, c - i, d - ii

(2) a - iii, b - ii, c - i, d - iv

(3) a - iv, b - iii, c - i, d - ii

(4) a - ii, b - i, c - iv, d - iii

1. In the following pairs, the one in which both transition metal ions are colourless is

(1) Zn^{2+} , Mn^{2+}

(2) Ti^{4+} , Cu^{2+}

(3) Sc^{3+} , Zn^{2+}

(4) V^{2+} , Ti^{3+}

2. In the reaction between hydrogen sulphide and acidified permanganate solution,

(1) H_2S is reduced to SO_2 , MnO_4^- is oxidised to Mn^{2+}

(2) H_2S is oxidised to S, MnO_4^- is reduced to Mn^{2+}

(3) H_2S is reduced to S, MnO_4^- is oxidised to Mn^{2+}

(4) H_2S is oxidised to SO_2 , MnO_4^- is reduced to MnO_2

3. A member of the Lanthanoid series which is well known to exhibit +4 oxidation state is

(1) Erbium

(2) Cerium

(3) Samarium

(4) Europium

4. In which of the following pairs, both the elements do not have $(n-1)d^{10}ns^2$ configuration?

(1) Cd, Hg

(2) Ag, Cu

(3) Cu, Zn

(4) Zn, Cd

SPACE FOR ROUGH WORK

44. A ligand which has two different donor atoms and either of the two ligates with the central metal atom/ion in the complex is called _____

(1) Polydentate ligand

~~(2) Ambidentate ligand~~

(3) Chelate ligand

(4) Unidentate ligand

45. Which of the following statements are true about $[\text{NiCl}_4]^{2-}$?

(a) The complex has tetrahedral geometry. ✓

(b) Co-ordination number of Ni is 2 and oxidation state is +4.

(c) The complex is sp^3 hybridised ✓

(d) It is a high spin complex.

(e) The complex is paramagnetic. ✓

(1) b, c, d and e

✓ (2) a, b, c and d

~~(3) a, c, d and e~~

✓ (4) a, b, d and e

46. Which formula and its name combination is incorrect?

~~(1) $[\text{Co}(\text{NH}_3)_5(\text{CO}_3)]\text{Cl}$, Pentaamine carbonylcobalt (III) chloride~~

(2) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$ Diamine chloridonitrito - N - platinum (II)

(3) $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$, Potassium trioxalatochromate (III)

(4) $[\text{CoCl}_2(\text{en})_2]\text{Cl}$, Dichloridobis (ethane - 1, 2 - diamine) cobalt (III) chloride

47. In the complex ion $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$, the Co-ordination number of Fe is

(1) 6

~~(2) 3~~

(3) 4

(4) 5

SPACE FOR ROUGH WORK

48. Match List - I with List - II for the following reaction pattern

Glucose $\xrightarrow{\text{Reagent}}$ Product $\longrightarrow$ Structural prediction.

List - I (Reagents)		List - II (Structural prediction)	
(a)	Acetic anhydride	(i)	Glucose has an aldehyde group
(b)	Bromine water	(ii)	Glucose has a straight chain of six carbon atoms
(c)	Hydroiodic acid	(iii)	Glucose has five hydroxyl groups
(d)	Hydrogen cyanide	(iv)	Glucose has a carbonyl group

Choose the correct answer from the options given below.

(1) a - i, b - ii, c - iii, d - iv

(2) a - iii, b - ii, c - i, d - iv

(3) a - iv, b - iii, c - ii, d - i

(4) a - iii, b - i, c - ii, d - iv

49. The correct sequence of α - amino acid, hormone, vitamin, carbohydrates respectively is

(1) Arginine, Testosterone, Glutamic acid, Maltose

(2) Aspartic acid, Insulin, Ascorbic acid, rhamnose

(3) Thiamine, Thyroxine, Vitamin A, Glucose

(4) Glutamine, Insulin, Aspartic acid, Fructose

50. Which examples of carbohydrates exhibit α - link (α - glycosidic link) in their structure?

(1) Cellulose and Glycogen

(2) Glucose and Fructose

(3) Maltose and Lactose

(4) Amylose and Amylopectin

51. In the titration of potassium permanganate (KMnO_4) against Ferrous ammonium sulphate (F solution, dilute sulphuric acid but not nitric acid is used to maintain acidic medium, because

(1) Nitric acid itself is an oxidising agent

(2) Nitric acid is a weak acid than sulphuric acid

(3) It is difficult to identify the end point

(4) Nitric acid doesn't act as an indicator

SPACE FOR ROUGH WORK

52. The group reagent $\text{NH}_4\text{Cl(s)}$ and aqueous NH_3 will precipitate which of the following ion?

(1) Ba^{2+}

(2) Ca^{2+}

~~(3) NH_4^+~~

(4) Al^{3+}

53. In the preparation of sodium fusion extract, the purpose of fusing organic compound with a piece of sodium metal is to

(1) Convert the elements of the compound from ionic form to covalent form

(2) Decrease the melting point of the compound

(3) Convert the organic compound into vapour state

~~(4) Convert the elements of the compound from covalent form to ionic form~~

54. The sodium fusion extract is boiled with concentrated nitric acid while testing for halogens. By doing so, it

(1) increases the concentration of NO_3^- ion

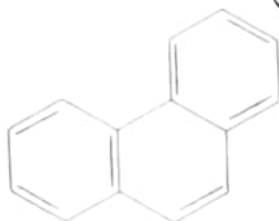
(2) decomposes Na_2S and NaCN , if formed

~~(3) helps in precipitation of AgCl~~

(4) increases the solubility of AgCl

55. Which of the following is not an aromatic compound?

(1)



~~(2)~~



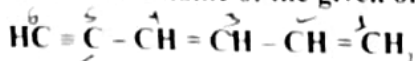
~~(3)~~



(4)



56. The IUPAC name of the given organic compound is



~~(1) Hexa - 1, 3 - dien - 5 - yne~~

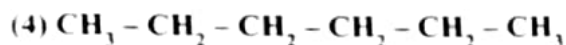
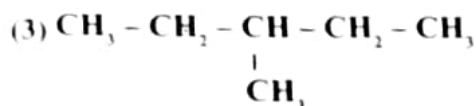
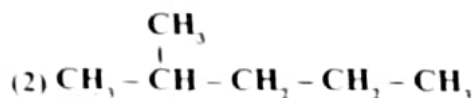
(2) Hexa - 3, 5 - dien - 1 - yne

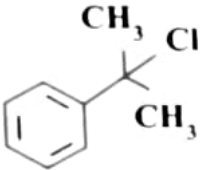
(3) Hexa - 1 - yn - 3, 5 - diene

(4) Hexa - 5 - yn - 1, 3 - diene

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57. Among the following, identify the compound that is not an isomer of hexane



58. The organic compound  can be classified as _____

~~(1) Aryl halide~~

~~(2) Alkyl halide~~

(3) Allylic halide

(4) Benzyl halide

59. Chlorobenzene reacts with bromine gas in the presence of Anhyd AlBr_3 to yield p-Bromochlorobenzene. This reaction is classified as _____

~~(1) Electrophilic substitution reaction~~

(2) Addition reaction

(3) Elimination reaction

(4) Nucleophilic substitution reaction

60. The organometallic compound $(\text{CH}_3)_3\text{CMgBr}$ on reaction with D_2O produces _____

(1) $(\text{CD}_3)_3\text{COD}$

~~(2) $(\text{CH}_3)_3\text{CD}$~~

(3) $(\text{CH}_3)_3\text{COD}$

(4) $(\text{CD}_3)_3\text{CD}$

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