Previous Years Paper

10th June 2023 (Shift 1)

Q1. For the cell in which the following reaction occurs:
$2Au^{3+}(aq) + 6Br^{-}(aq) \rightarrow 2Au(s) + 3Br_2(1)$ has $E°_{cell} = 2.49$ V at 298 K.
The standard Gibbs energy change will be
(a) –1742 kJ
(b) −1642 kJ
(c) −1542 kJ
(d) −1442 kJ

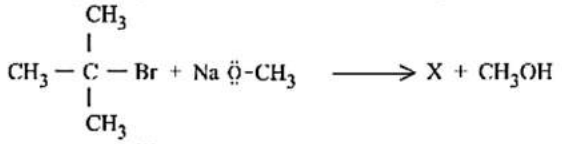
Q2. Match **List I** with **List II.**

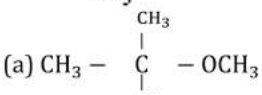
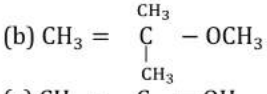
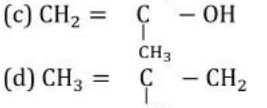
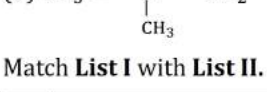
	List – I		List - II
A.	PCl_3	I.	See-saw shaped
B.	SF_4	II.	Square planar
C.	BrF_3	III.	Trigonal pyramidal
D.	XeF_4	IV.	Bent T Shape

Choose the correct answer from the options given below:
(a) A-IV, B-I, C-III, D-II
(b) A-III, B-II, C-I, D-IV
(c) A-I, B-II, C-III, D-IV
(d) A-III, B-I, C-IV, D-II

Q3. An organic compound 'X' on treatment with methyl magnesium bromide gives a compound 'Y' which on hydrolysis gives ethanol. The compound 'X' is:
(a) CH_3CHO
(b) CH_3COCH_3
(c) $HCHO$
(d) CH_3OH

Q4. **Identify the product 'X' in the following reaction.**



(a) 
(b) 
(c) 
(d) 

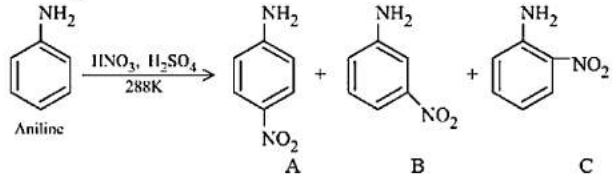
Q5. Match **List I** with **List II.**

	List – I		List - II
A.	λ_m of KCl increases on dilution	I.	is a linear graph.
B.	λ_m of CH_3COOH increases on dilution	II.	is a non-linear graph.
C.	λ_m of KCl versus $(molarity)^{1/2}$	III.	due to increased degree of ionization.
D.	λ_m of CH_3COOH versus $(molarity)^{1/2}$	IV.	Due to weakening of interionic attraction.

Choose the correct answer from the options given below:
(a) A-III, B-IV, C-I, D-II
(b) A-IV, B-III, C-II, D-I
(c) A-I, B-II, C-III, D-IV
(d) A-IV, B-III, C-I, D-II

Q6. When methyl bromide is treated with sodium *tert*-butoxide, the compound formed is:
(a) Diethyl ether
(b) *tert*-Butyl methyl ether
(c) Diethylbromide
(d) Methyl propyl ether

Q7. In the given chemical reaction:



The mixture of three compound, A, B and C is formed respectively in the what ratio?
(a) 51%, 2%, 47%
(b) 47%, 2%, 51%
(c) 51%, 47%, 2%
(d) 2%, 51%, 47%

Q8. Complete the following reaction:
$2H_2O + 5SO_2 + 2MnO_4^- \rightarrow$ _____ + _____ + _____
(a) $5SO_4^{2-}, 4H^+, 2Mn^{2+}$
(b) $5SO_3^{2-}, 4OH^-, 2Mn^{2+}$
(c) $5SO_4^{2-}, 4H^+, 2Mn^{3+}$
(d) $5S_2O_3^{2-}, 4H^+, 2MnO_2$

Q9. Which of the following transition elements of 3d series has the lowest melting point?
(a) Ti (At.No –22)
(b) V (At.No – 23)
(c) Cr (At.No –24)
(d) Mn (At.No –25)

Q10. The vapour pressure of chloroform, ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 298 K are 400 mm Hg and 615 mm Hg, respectively. What is the mole fraction of $CHCl_3$ in vapour phase in solution prepared by mixing 30 g of $CHCl_3$ and 45 g of CH_2Cl_2?
(a) 0.76
(b) 0.23
(c) 0.82
(d) 0.18

Q11. The transition element having least numberof unpaired electrons, is:
(a) Fe
(b) Cr
(c) Zn
(d) Sc

Q12. Colligative properties depend on
(a) the nature of solvent particles present in solution.
(b) the nature of solute particles present in solution.
(c) the number of solute particles in the solution.

(d) the physical properties of the solute particles present in solution.

Q13. Match **List I** with **List II.**

	List – I		List - II
A.	XeF_6	I.	sp^3d^3 – Distorted octahedral
B.	XeO_3	II.	sp^3d^2 – Square planer
C.	$XeOF_4$	III.	sp^3 – Pyramidal
D.	XeF_4	IV.	sp^3d^2 – Square pyramidal

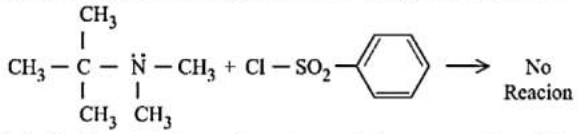
Choose the correct answer from the options given below:
(a) A-III, B-IV, C-II, D-I
(b) A-I, B-III, C-IV, D-II
(c) A-IV, B-III, C-II, D-I
(d) A-I, B-II, C-III, D-IV

Q14. Match **List I** with **List II.**

	List – I		List - II
A.	Liquation	I.	As, Mn, P
B.	Distillation	II.	Cu, Ag
C.	Oxidation	III.	Sn, Pb, Hg
D.	Bessemerisation	IV.	Hg, Cd, Zn

Choose the correct answer from the options given below:
(a) A-III, B-IV, C-I, D-II
(b) A-III, B-IV, C-II, D-I
(c) A-III, B-I, C-II, D-IV
(d) A-IV, B-I, C-II, D-III

Q15. Which of the following is true for the given reaction?



(a) Tertiary amines do not contain any replaceable 'H' on amino group.
(b) It is very bulky due to many $-CH_3$ groups
(c) Lone pair of electron on nitrogen does not allow this reaction
(d) SO_2 is eliminated and stops the reaction

Q16. Match **List I** with **List II**

	List – I		List - II
A.	Raoult's Law	I.	$\Delta T_b = k_b.m$
B.	Henry's Law	II.	$\Delta T_f = k_f.m$
C.	Elevation in boiling point	III.	$p = x_1 p^\circ_1 + x_2 p^\circ_2$
D.	Depression in freezing point	IV.	$P = K_H.x$

Choose the correct answer from the options given below:
(a) A-I, B-II, C-III, D-IV
(b) A-IV, B-III, C-II, D-I
(c) A-II, B-III, C-IV, D-I
(d) A-III, B-IV, C-I, D-II

Q17. The reaction of toulene with Cl_2 in the presence of $FeCl_3$ gives X and reaction in presence of light gives. Y Thus, X and Y are
(a) X = Benzyl chloride, Y = *m* - Chlorotoulene
(b) X = Benzal chloride, Y = *o* - Chlorotoulene
(c) X = *m* – chloroloulene, Y = *p* - Chlorotoulene
(d) X = *o* and *p* – chlorotoluene, Y= trichloromethylbenzene

Q18. Which of the following statements are correct?
A. An amino acid contains amino $(-NH_2)$ and $(-COOH)$ functional groups.
B. All amino acids are optically active
C. All amino acids are solid at room temperature.
D. In aqueous solution amino acids exist as zwitter ions.
Choose the correct answer from the options given below:
(a) A, C only
(b) A, B only
(c) A, D only
(d) A, C, D only

Q19. The number of electrons constituting 1.5 Faradays charge are:
(a) 9.03×10^{23}
(b) 9.03×10^{22}
(c) 9.03×10^{24}
(d) 9.03×10^{25}

Q20. Which of the following statement/s is/are wrong?
A. Methylamine is more basic than ammonia.
B. Amines form hydrogen bonds.
C. Ethylamine has higher boilding point than propane.
D. Dimethylamine is less basic than methylamine.
E. Amines are soluble in organic solvents like alcohol.
Choose the correct from the options given below:
(a) A only
(b) D only
(c) B & E only
(d) A & C only

Q21. Arrange the following pentaoxides in order of their increasing acidic strengths.
A. Bi_2O_5
B. Sb_2O_5
C. P_2O_5
D. As_3O_5
E. N_2O_5
Choose the correct answer from the options given below:
(a) A < B < D < C < E
(b) A < B < C < D < E
(c) E < C < D < B < A
(d) E < D < C < B < A

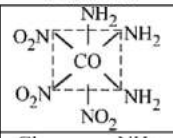
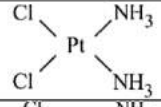
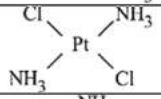
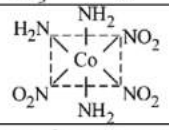
Q22. Choose the **incorrect** statement about ethylenediaminetetraacetate ion.
(a) It is a hexadentate ligand.
(b) It forms chelate when binds with metal ion.
(c) It can bind through two nitrogen and four oxygen atoms.
(d) It is an ambident ligand.

Q23. Which one of the following drugs is an antibiotic?
A. Morphine
B. Equanil
C. Chloramphenicol
D. Valium
Choose the correct answer from the options given below:

(a) A only
(b) C only
(c) D only
(d) B only

Q24. Which one of the following Lanthanoid ions is diamagnetic?
[At.no. of Ce = 58, Sm = 62, Eu = 63, Yb = 70]
(a) Yb^{2+}
(b) Ce^{2+}
(c) Sm^{2+}
(d) Eu^{2+}

Q25. Match List I with List II.

	List – I		List - II
A.	Geometrical Isomerism (*cis*)	I.	
B.	Geometrical Isomerism (*trans*)	II.	
C.	Geometrical Isomerism (*facial*)	III.	
D.	Geometrical Isomerism (*meridional*)	IV.	

Choose the correct answer from the options given below:
(a) A-II, B-III, C-I, D-IV
(b) A-I, B-II, C-III, D-IV
(c) A-IV, B-III, C-II, D-I
(d) A-III, B-II, C-I, D-IV

Q26. 2-Bromopentane is heated with alcoholic KOH. Which is the correct statement for this reaction?
A. Only pent-2-ene is formed.
B. Only pent-1-ene is formed.
C. Both pent-2-ene and pent-1-ene are formed.
D. pent-2-ene will be major product as it is more stable.
Choose the correct answer from the options given below:
(a) A only
(b) B only
(c) C only
(d) C, D only

Q27. What type of defect is shown by ZnO?
(a) Frenkel defect
(b) Metal excess defect due to the presence of extra cations at interstitial site.
(c) Schottky defect
(d) Metal excess defect due to anionic vacancies

Q28. Which one of the following ions is paramagnetic in nature?
(a) Sc^{3+}
(b) Ti^{4+}
(c) Zn^{2+}
(d) V^{2+}

Q29. Match **List I** with **List II.** Match nitrogen oxides with their oxidetion number of nitrogen

	List – I		List - II
A.	NO	I.	+4
B.	N_2O_4	II.	+2
C.	N_2O_3	III.	+5
D.	N_2O_5	IV.	+3

Choose the correct answer from the options given below:
(a) A-I, B-II, C-III, D-IV
(b) A-II, B-IV, C-III, D-I
(c) A-II, B-I, C-IV, D-III
(d) A-II, B-III, C-IV, D-I

Q30. Which of the following compounds gives iodoform test?
(a) CH_3OH
(b) CH_3CH_2OH
(c) $C_2H_5COC_2H_5$
(d) HCHO

Q31. Water soluble vitamins are excreted out of our body through urination. Identify the vitamin which is stored in our body for a number of years?
(a) Vitamin B_2
(b) Vitamin B_6
(c) Vitamin B_{12}
(d) Vitamin C

Q32. Insulin deficiency in human beings causes diabetes. Excess of which hormone causes an increase in blood pressure?
(a) Adrenal Cortex hormones
(b) Steroid hormones
(c) Thyroid hormones
(d) Corpus leuteum hormones

Q33. A first order reaction requires 6.96 months for the concentration of reactant A to be reduced to 25% of its original value. The half-life of the reaction is:
(Given log 2 = 0.3010)
(a) 6.96 months
(b) 3.48 months
(c) 1.74 months
(d) 27.8 months

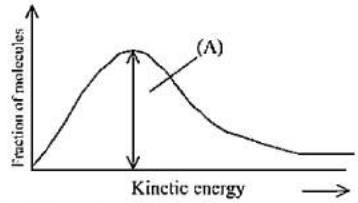
Q34. For the reaction $x + y \rightarrow z$,
rate law expression is rate = k [x] $[y]^3$.
If the volume of the vessel is reduced to $\frac{1}{3}$ of its original volume, then rate of reaction will
(a) decrease 81 times.
(b) increase 81 times.
(c) decrease 9 times.
(d) increase 27 times.

Q35. In p-type semiconductors, the conductivity is due to:
(a) negative holes.
(b) positive holes.
(c) valence electrons.
(d) mobile electron.s

Q36. Which of the following element is used for vulcanisation of rubber?
(a) S

(b) Si
(c) Se
(d) /

Q37. A in the following graph is



(a) Threshold energy
(b) Most probable kinetic energy
(c) Effective collisions
(d) Temperature coefficient

Q38. The crystal field stabilization energy for low spin d^6 octahedral complex is:
(a) $-2.0\Delta_o$
(b) $-2.4\Delta_o$
(c) $-0.4\Delta_o$
(d) $-1.6\Delta_o$

Q39. Match **List I** with **List II**

	List – I		List - II
A.	Cr^{3+}	I.	d^3 Configuration
B.	Mn^{4+}	II.	d^{10} Configuration
C.	Cu^{+}	III.	Paramagnetic
D.	V^{2+}	IV.	Diamagnetic

Choose the correct answer from the options given below:
(a) A-I, IV, B-I, III, C-II, III, D-I, III
(b) A-I, III, B-I, III, C-II, IV, D-I, III
(c) A-II, III, B-I, IV, C-II, IV, D-I, IV
(d) A-I, III, B-I, IV, C-II, III, D-I, IV

Q40. Which one of the following is most reactive towards substitution nucleophilic unimolecular (S_N1) reaction?
(a) $C_6H_5CH(C_6H_5)Br$
(b) $C_6H_5CH(Br)CH_3$
(c) $C_6H_5C(CH_3)(C_6H_5)Br$
(d) $C_6H_5CH_2Br$

Direction (Q41. to Q45) Answer the question on the basis of passage given below:

Adsorption arises due to the fact that the surface particles of the adsorbent are not in the same environment as the particles inside the bulk. The extent of adsorption increases with the increase of surface area per unit mass of the adsorbent at a given temperature and pressure. Another important factor featuring adsorption is the heat of adsorption. During adsorption, there is always a decrease in residual forces of the surface, therefore it is invariably an exothermic process of $\triangle H$ and $\triangle S$ are always negative. There are mainly two types of adsorptions of gases on solids. In physiosorption, the attractive forces are mainly Van der Waals forces while in chemisorption, actual bonding occurs between the particles of adsorbent and adsorbate. Generally, easily liquefying gases are adsorbed more easily on the surface of a solid as compared to the gases which are liquified with difficulty. Freundlich gave an empirical relationship between the quantity of gas adsorbed by unit mass of solid adsorbent and pressure, at a particular temperature.

Q41. Which two parameters from the following are plotted to give a straight line on Freundlich adsorption isotherm?
(a) $\frac{x}{m}$ Vs $\frac{1}{p}$
(b) $\log\frac{x}{m}$ Vs p
(c) $\frac{x}{m}$ Vs p
(d) $\log\frac{x}{m}$ Vs log p

Q42. Rate of physisorption increases with
(a) decrease in pressure.
(b) decrease in surface area.
(c) increase in temperature.
(d) decrease in temperature.

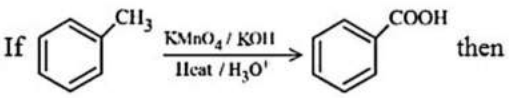
Q43. Which of following is not an example of adsorption?
(a) Retaining the colour of the ink on the surface of the chalk stick
(b) Drying of the substance using anhydrous calcium chloride
(c) Decolourisation of the crude sugar
(d) Dyring of air in the presence of silica gel

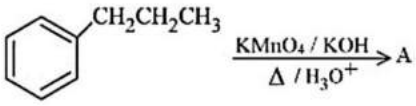
Q44. Identify the correct order of case of adsorption of the following gases on the surface of charcoal
A. CH_4
B. H_2
C. NH_3
D. CO_2
Choose the correct answer from the options given below:
(a) B > A > D > C
(b) A > D > C > B
(c) D > C > B > A
(d) C > D > A > B

Q45. Entropy during adsorption is negative because
(a) the disorderness in the system increases.
(b) the disorderness in the system decreases.
(c) bond formation results in more disorderness.
(d) disorderness remains unaffected.

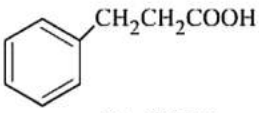
Direction (Q46. to Q50.) Answer the question on the basis of passage given below:

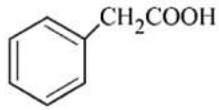
Aldehydes are generally more reactive than ketones in nucleophilic addition reactions due to steric and electronic reasons. Sterically, the presence of two relatively large substituents in ketones hinders the approach of nucleophile to carbonyl carbon than in aldehydes having only one such substituent Electronically, aldehydes are more reactive than ketones because two alkyl groups reduce the electrophilicity of the carbonyl more effectively in the former.

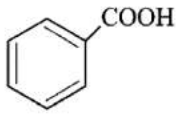


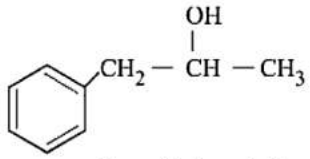


Q46. A will be:

(a) 

(b) 

(c) 

(d) 

Q47. For preparation of phenylethanoic acid from benzyl alcohol, reagents required are

A. HBr

B. CO_2

C. KCN

D. Δ/H_3O^+

E. $AgNO_3$

Choose the correct answer from the options given below:

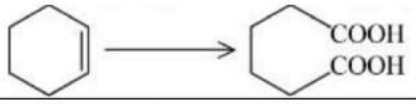
(a) A, B and C only

(b) A, C and D only

(c) A, C and E only

(d) A, B and E only

Q48. Match **List I** with **List II.**

	List – I		List - II
A.	$CH_3CH_2CH_2CHO \longrightarrow CH_3CH_2CH_2COOH$	I.	$CrO_3 - H_2SO_4$
B.		II.	H_3O^+/Δ
C.	$CH_3CH_2CH_2CH_2OH \longrightarrow CH_3CH_2CH_2COOH$	III.	Ammonical $AgNO_3$
D.	$CH_3CONH_2 \longrightarrow CH_3COOH$	IV.	$KMnO_4 - H_2SO_4/\Delta$

Choose the correct answer from the options given below:

(a) A-III, B-IV, C-II, D-I

(b) A-III, B-IV, C-I, D-II

(c) A-III, B-IV, C-I, D-II

(d) A-III, B-I, C-II, D-IV

Q49. 4-Hydroxy-4-methylpentan-2-one and 4-methylpent-3-en-2 one are the products obtained from A by aldol condensation. A is

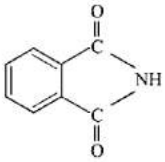
(a) CH_3COCH_3

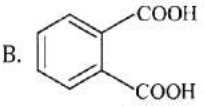
(b) CH_3CHO

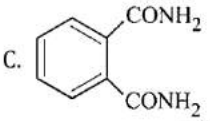
(c) $H_3C - CH_2 - CH_2 - CH_2 - CHO$

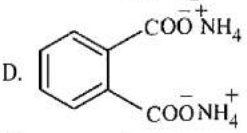
(d) $H_3C - CH_2 - CH_2 - CHO$

Q50. In the reaction of carboxylic acids with ammonia to give the imides, the reaction proceeds in the sequence of steps involving the following compounds.

A. 

B. 

C. 

D. 

The correct sequence of the compounds formed will be:

Choose the correct answer from the options given below:

(a) B, D, C, A

(b) B, C, D, A

(c) B, A, D, C

(d) B, C, A, D

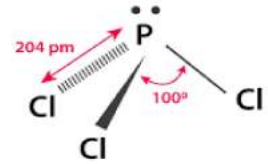
SOLUTIONS

S1. Ans. (d)

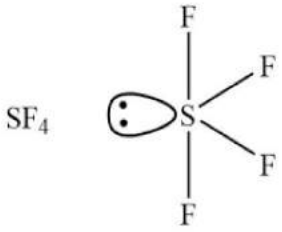
Sol. $\Delta G = -nFE^{\circ}_{cell}$
$= -6 \times 2.49 \times 96500 = 1442$ kJ

S2. Ans. (d)

Sol. PCl_3 - Trigonal Pyramidal

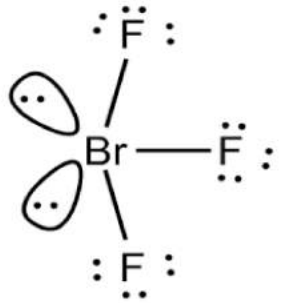


SF_4 – See-Saw Shape

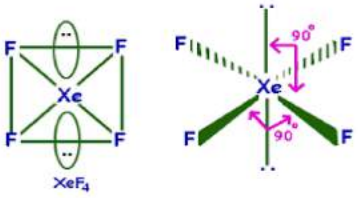


See-saw shape

BrF_3 – Bent T-shape

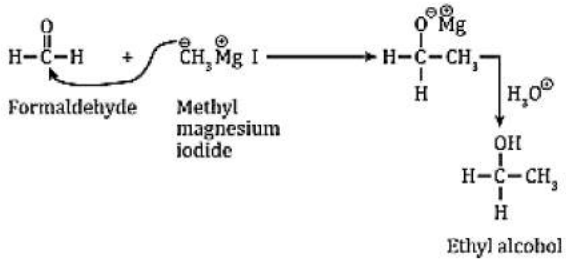


XeF_4 square planar shape.



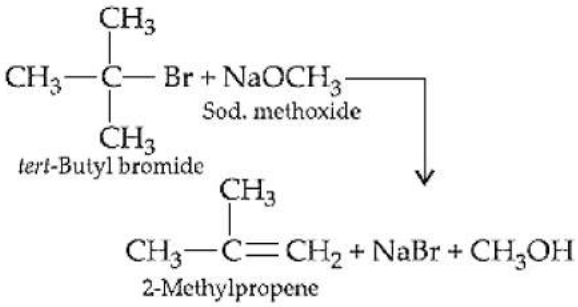
S3. Ans. (c)

Sol.



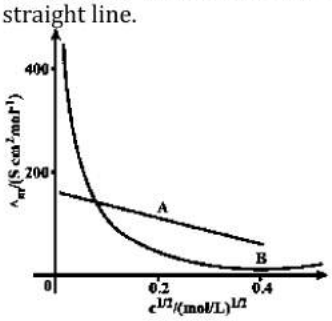
S4. Ans. (d)

Sol.



S5. Ans. (d)

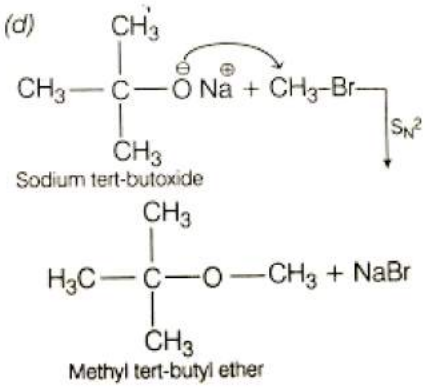
Sol. As seen from the graph, electrolyte 'A' is a strong electrolyte which is ionized almost completely almost completely in solutions. For strong electrolyte 'A' the number of ions does not increase appreciably on dilution and only mobility of ions increases due to decrease in interionic attraction. Therefore, molar conductivity increases a little as shown in graph by a straight line.



When diluted, the dissociation degree increases, and the number of ions present also increases which leads to the drastic increase of CH_3COOH and gradual increase in CH_3COONa.

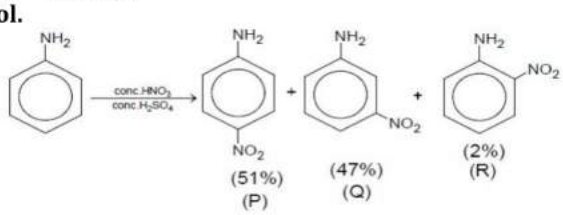
S6. Ans. (b)

Sol.



S7. Ans. (c)

Sol.



S8. Ans. (a)

Sol. $2H_2O + 5SO_2 + 2MnO_4^- \rightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$

S9. Ans. (d)

Sol. In the first transition series, Mn has abnormally low melting point. This is due to the fact that Mn has exactly half-filled d-orbitals. As a result, electronic configuration is very stable, i.e., electrons are held tightly by the nucleus so that the delocalization is less and the metallic bond is much weaker than the elements on its either side.

S10. Ans. (a)

Sol. Vapour pressure of pure chloroform = P_A^o = 400mm
Vapour pressure of pure dichloromethane P_B^o = 615mmHg
Molar mass M_A = 119.5g
Molar mass M_B = 85g
Mass of $CHCl_3$ = 30 g
Number of moles = 30/119.5 = 0.251
Mass of CH_2Cl_2 = 45 g
Number of moles = 45/85 = 0.529
x_A = 0.251/0.251 + 0.53 = 0.321
x_B = 1 – 0.321 = 0.679

S11. Ans. (b)

Sol. Fe = 4 unpaired electrons
Zn = No unpaired electrons
Cr - Electron configuration for chromium: [Ar] $4s^1$, $3d^5$. Six unpaired electrons
In Sc, there is only one unpaired electron. Therefore, the number of unpaired electrons in Sc is 1.

S12. Ans. (c)

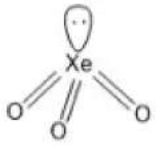
Sol. Colligative properties depend upon number of solute particles in solution irrespective of their nature. Colligative property is used to determine the molecular mass of particle.

S13. Ans. (b)

Sol.

A. Xenon hexafluoride has sp^3d^3 hybridization. Xe has 8 electrons in its valence shell, of which 6 electrons form six bonds with 6 F atoms while the remaining two electrons remain as lone pair. It's structure is distorted octahedral as the lone electron pair is located in the sp3d3 hybrid orbital.

B. According to the VSEPR theory, the hybridization of XeO_3 is sp^3 with 3 sigma bond pairs and 1 lone pair on the central atom.
Hence, its shape is 'trigonal pyramidal' as shown in the figure.



C. The xenon atom must bond with the four fluorine atoms into four single bonds and double-bonded with an oxygen atom. It has one lone pair of electrons. As per VSEPR theory, sp^3d^2 has a square pyramidal shape.

D. The shape of XeF_4 is square – planar with sp^3d^2 hybridization.

S14. Ans. (a)

Sol. A. Liquation is used for the refining of metals having low melting point and are associated with high melting impurities. For example, Pb, Sn, Sb, Bi and Hg. The impure metal is heated on the sloping hearth of a furnace.

B. Zinc, Cadmium, and Mercury can be purified using the method of distillation.

D. Bessemerisation is used in the extraction of pure copper which is also known as blister copper. The molten copper matte obtained is introduced in a small pear-shaped furnace which is made up of steel plates known as Bessemer converters.

S15. Ans. (A)

Sol. 3° amine does not react with Heinsberg's reagent.

S16. Ans. (d)

Sol.

A. Mathematically, Raoult's law equation is written as: $P_{solution} = X_{solvent} P^0_{solvent}$

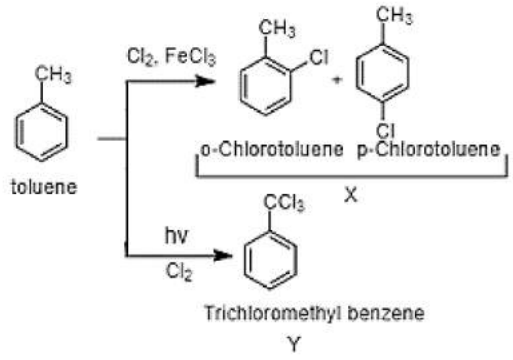
B. Henry's Law states that "the partial pressure applied by any gas on a liquid surface is directly proportional to its mole fraction present in a liquid solvent."
The Mathematical Formula of Henry's Law is as Follows –
$P \propto X$
Where P = partial pressure applied by the gas on liquid in the solution
X = Mole fraction of gas in liquid
On Removing the Proportionality –
P = kH.X

C. Elevation in boiling point: $\Delta T_b = k_b . m$

D. Depression in freezing point: $\Delta T_f = k_f . m$

S17. Ans. (d)

Sol.



S18. Ans. (c)

Sol.

A. An amino acid is an organic molecule that is made up of a basic amino group ($-NH_2$), an acidic carboxyl group (–COOH)

D. In aqueous solution, an amino acid exists as a dipolar ion, which is known as Zwitter ion.

S19. Ans. (a)

Sol. 1 F is charge carried by 1 mole of electrons so 6.023 x 10^{23} electrons are involved.
1.5 F = 6.02 x 10^{23} x 1.5 = 9.03 x 10^{23}

S20. Ans. (b)

Sol. D. As the number of electrons donating groups increases, basic character increases.

Thus, dimethylamine is more basic than methyl amine.

S21. Ans. (a)

Sol. All the oxides of nitrogen (expect NO and N_2O neutral oxides) and phosphorus are strongly acidic in nature, oxides of arsenic are weakly acidic oxides of antimony are amphoteric and those of bismuth are weakly basic. As the size of nitrogen atom is small and it has a strong positive field, so it interacts with water, more strongly pulling the electron pairs between O-H and thus helps in the release of H^+ ions. However, this tendency diminishes with the increases in size and therefore, decreases the acidic character or conversely increases the basic character.

S22. Ans. (d)

Sol. Ethylenediamine is an example of bidentate ligand. This means that ethylene diamine has two donor atoms. It means that it can bind with the central metal ion with two nitrogen atoms. The bidentate ligands are also known as chelating ligands.

S23. Ans. (b)

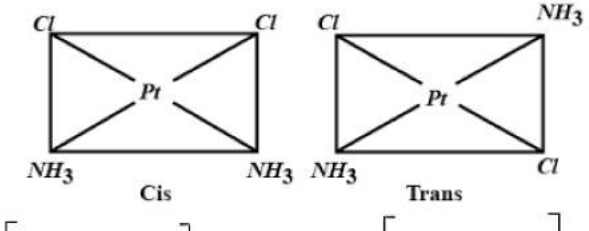
Sol. Out of Morphine, Equanil, Chloramphenicol, Aspirin, only Chloramphenicol is an antibiotic.

S24. Ans. (a)

Sol. Lanthanide ion is diamagnetic in nature, especially when there is no unpaired electron present. Hence, Yb^{2+} is diamagnetic, due to the absence of the unpaired electron.

S25. Ans. (a)

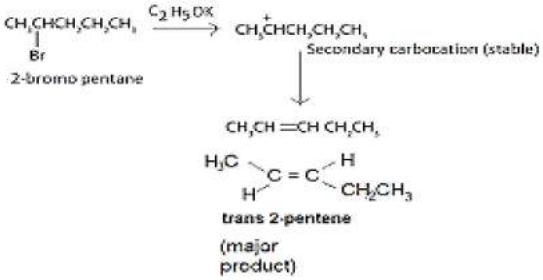
Sol.



S26. Ans. (d)

Sol. Pent-2-ene is major product known as Saytzeff's Product and it is more stable alkene.

The process is known as β– elimination as it involves elimination of β– Hydrogen.



S27. Ans.(b)

Sol. When white Zinc oxide (ZnO) is heated, it loses oxygen and becomes yellow.

$$Zn \xrightarrow{\text{heating}} Zn^{2+} + \frac{1}{2}O_2 + 2e^-$$

Now, an excess of Zinc occurs in the crystal and its formula becomes $Zn_{(1+x)}O$

S28. Ans. (d)

Sol. There are some exceptions to the paramagnetic rule; these concern some transition metals, in which the unpaired electron is not in a d-orbital. Examples of these metals include Sc3+, Ti4+, Zn2+, and Cu+. These metals are not defined as paramagnetic: they are considered diamagnetic because all d-electrons are paired.

S29. Ans. (c)

Sol.

A. The oxidation number of nitrogen in NO is +2.

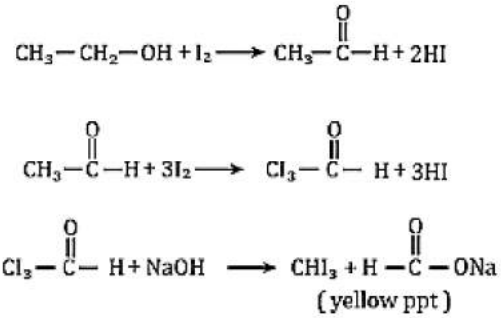
B. Let the oxidation state of N be x. Oxidation state of O is −2 as it is in oxide form.
$2x + 4(-2) = 0$
$x = 4$

C. Let the oxidation state of N be x. Oxidation state of O is −2 as it is in oxide form.
$2x + 4(-2) = 0$
$x = 3$

D. Let the oxidation state of N be x. Oxidation state of O is −2 as it is in oxide form.
$\Rightarrow 2x+5(-2)=0$
$\Rightarrow x= 10/2 =+5$

S30. Ans. (b)

Sol.



Iodoform test is used to check the presence of carbonyl compounds with the structure R–CO–CH_3 or alcohols with the structure R–CH(OH)–CH_3 in a given unknown substance.

When Iodine and sodium hydroxide are added to a compound that contains either a methyl ketone or a secondary alcohol with a methyl group in the alpha position, a pale-yellow precipitate of iodoform or triiodomethane is formed. It can be used to identify aldehydes or ketones. If an aldehyde gives a positive iodoform test, then it must be acetaldehyde since it is the only aldehyde with a $CH_3C{=}O$ group.

S31. Ans. (c)

Sol. All B group vitamins and vitamin C are water soluble. However, vitamin B_{12} is not excreted in urine and is instead stored in the body. It is involved in the metabolism of every cell in the body.

S32. Ans. (a)

Sol. Hyperaldosteronism results from overproduction of aldosterone from one or both adrenal glands. This is characterized by increase in blood pressure that often requires many medications to control. Some people can develop low potassium levels in the blood, which can cause muscle aches, weakness and spasms.

S33. Ans. (b)

Sol. $t = 2.303/k \log[a/a-x]$
$t = 2.303/k \times \log [100/25] = 0.199$
$t1/2 = 0.693/k = 0.693/1.99 = 3.48$ months

S34. Ans. (b)

Sol. When the volume is reduced to one third, the pressure is increased to three times.
Rate = $kP_xP_y^3$
Let a and b be the initial pressures of x and y2 respectively.
After volume change, the pressures of x and y2 are 3a and 3b respectively.
$r_0 = kxy^3$ .....(1)
$r = k(3x)(3y)^3$ ....(2)
Dividing,
$r/r_0 = 81/1$

S35. Ans. (b)

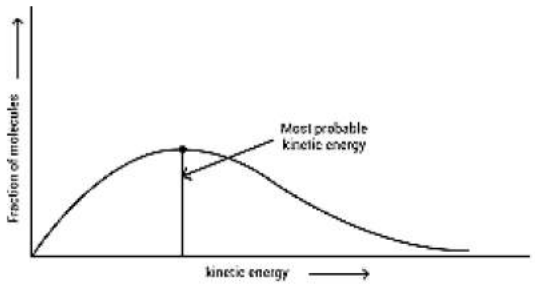
Sol. In P-type semiconductors, the conductivity is due to the presence of holes. The conductivity in the N-type semiconductor is due to the presence of electrons. In a P-type semiconductor, the fermi level lies between the acceptor energy level and the valance band.

S36. Ans. (a)

Sol. Sulphur is used in the vulcanization of rubber.

S37. Ans. (b)

Sol.



S38. Ans. (b)

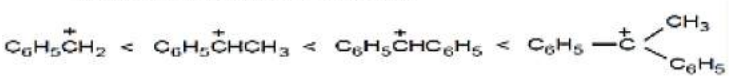
Sol. CFSE = $[-2/5 \times 6 \times \Delta_0 + 3/5 \times 0 \times \Delta_0] + 3P$
$-12/5\ \Delta_0 + 3P = -2.4\ \Delta_0$

S39. Ans. (b)

Sol.
A. The electronic configuration of chromium is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$
B. Mn4+: $1s^2,2s^2,2p^6,3s^23p^63d^3,4s^0$
C. Cu^+: $[Ar]3d^{10}4s^0$. Cu^+ is diamagnetic because it has no unpaired electrons in its core.
D. For the V^{2+}, called the Vanadium ion, we remove two electrons from 4s2 and leaving us with: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$. So it is paramagnetic

S40. Ans. (c)

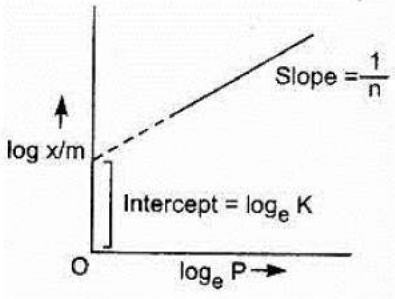
Sol. Reactivity in reactions depends upon the stability of the carbocation intermediate. Since the stability of the carbocations increases in order:



Therefore, the alkyl halide $C_6H_5C(CH_3)(C_6H_5)$ is the most reactive.

S41. Ans. (d)

Sol. For Freundlich adsorption isotherm, a plot of log (x / m) (y - a x i s) and log p (x - axis) gives a straight line.



S42. Ans. (d)

Sol. The rate of physisorption is inversely proportional to temperature. The rate of physisorption increases with the decrease in temperature as it is an exothermic process.

S43. Ans.(b)

Sol. Water vapours are absorbed by anhydrous calcium chloride but adsorbed by silica gel.

S44. Ans. (d)

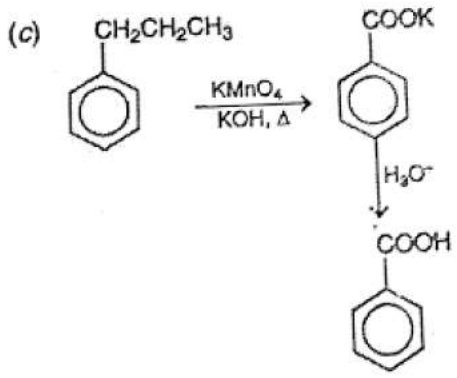
Sol. NH3 has higher critical temperature than CO_2, i.e., NH_3 is more liquefiable than CO_2. Hence, NH_3 has greater intermolecular forces of attraction and hence will be adsorbed more readily.
The adsorption affinity of CO_2 is higher than CH4
Increasing order of adsorption of the following gases on the same mass of charcoal at the same T and P is $H_2 < CH_4 < CO_2$.
Here, lesser the critical temperature of gases lesser will be the extent of adsorption.

S45. Ans. (b)

Sol. Entropy is a measure of the disorder or randomness in a system. In adsorption, when molecules or ions are adsorbed onto a surface, they become more ordered and organized, leading to a decrease in entropy.

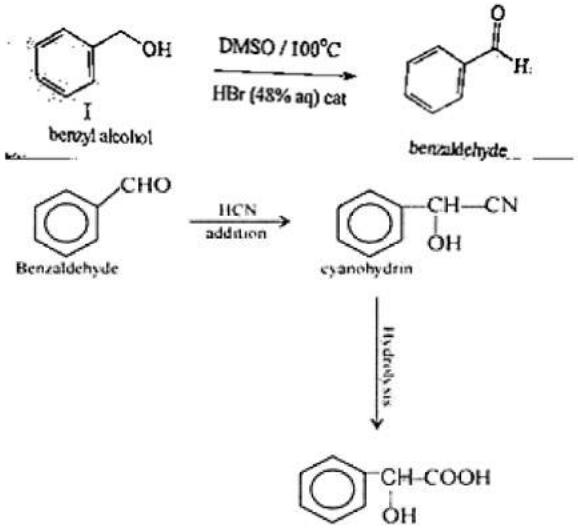
S46. Ans. (c)

Sol.

(c) 

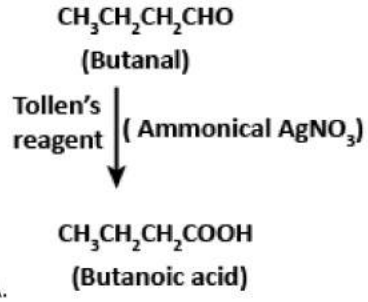
S47. Ans. (b)

Sol.

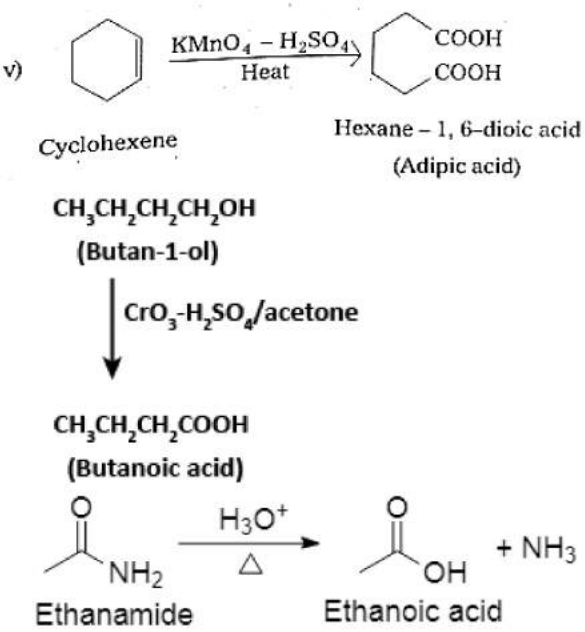


S48. Ans. (b)

Sol.

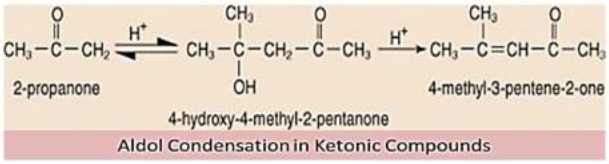


A.

v) 

S49. Ans. (a)

Sol.



S50. Ans. (b)

Sol.