KCET PYQ 2022

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CHEMISTRY

Q1 Which among the following has highest pH ? **[KCET 2022]**

(A) 1 M NaOH (B) 1 M H_2SO_4

(C) 0.1 M NaOH (D) 1 M HCl

Q2 In which of the following compounds, an element exhibits two different oxidation states? **[KCET 2022]**

(A) NH_4NO_3 (B) N_2H_4

(C) N_3H (D) NH_2CONH_2

Q3 Which of the following hydrides is electron deficient ? **[KCET 2022]**

(A) CaH_2 (B) CH_4

(C) B_2H_6 (D) NaH

Q4 Amphoteric oxide among the following **[KCET 2022]**

(A) CO_2 (B) Ag_2O

(C) SnO_2 (D) BeO

Q5 Which property of CO_2 makes it biologically and geo-chemically important? **[KCET 2022]**

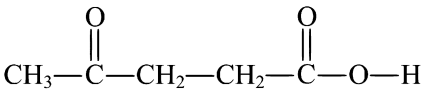
(A) Its colourless and odourless nature

(B) Its low solubility in water

(C) Its high compressibility

(D) Its acidic nature

Q6 The IUPAC name for



[KCET 2022]

(A) 1,4-dioxopentanol

(B) 1-carboxybutan-3-one

(C) 4-oxopentanoic acid

(D) 1-hydroxy pentane-1, 4-dione

Q7 1 mole of HI is heated in a closed container of capacity of 2L. At equilibrium half a mole of HI is dissociated. The equilibrium constant of the reaction is **[KCET 2022]**

(A) 0.5 (B) 0.25

(C) 0.35 (D) 1

Q8 Vacant space in body centered cubic lattice unit cell is about **[KCET 2022]**

(A) 10% (B) 23%

(C) 46% (D) 32%

Q9 How many number of atoms are there in a cube based unit cell, having one atom on each corner and 2 atoms on each body diagonal of cube? **[KCET 2022]**

(A) 6 (B) 4

(C) 9 (D) 8

Q10 Which of the following is not true about the amorphous solids? **[KCET 2022]**

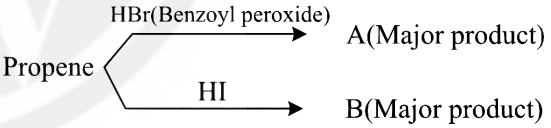
(A) They may become crystalline on keeping for long time.

(B) Amorphous solids can be moulded by heating.

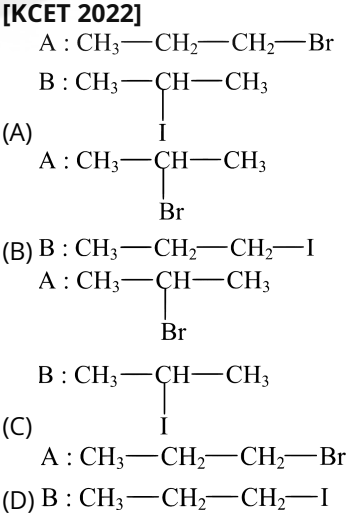
(C) They are anisotropic in nature.

(D) On heating they may become crystalline at certain temperature.

Q11 Identify, A and B in the following reaction



[KCET 2022]



(A) A : $CH_3—CH_2—CH_2—Br$; B : $CH_3—\underset{\underset{I}{|}}{CH}—CH_3$

(B) B : $CH_3—CH_2—CH_2—I$; A : $CH_3—\underset{\underset{Br}{|}}{CH}—CH_3$

(C) A : $CH_3—CH_2—CH_2—Br$; B : $CH_3—\underset{\underset{I}{|}}{CH}—CH_3$

(D) B : $CH_3—CH_2—CH_2—I$

Q12 Solubility of a gas in a liquid increases with **[KCET 2022]**
(A) decrease of p and increase of T
(B) increase of p and decrease of T
(C) decrease of p and decrease of T
(D) increase of p and increase of T

Q13 The rise in boiling point of a solution containing 1.8 g of glucose in 100 g of solvent is 0.1°C. The molal elevation constant of the liquid is **[KCET 2022]**
(A) 1 K kg/mol (B) 2 K kg/mol
(C) 10 K kg/mol (D) 0.1 K kg/mol

Q14 If 3 g of glucose (molar mass = 180 g) is dissolved in 60 g of water at 15°C, the osmotic pressure of the solution will be **[KCET 2022]**
(A) 0.65 atm (B) 6.57 atm
(C) 5.57 atm (D) 0.34 atm

Q15 Which of the following colligative properties can provide molar mass of proteins, polymers and colloids with greater precision? **[KCET 2022]**
(A) Elevation in boiling point
(B) Depression in freezing point
(C) Osmotic pressure
(D) Relative lowering of vapour pressure

Q16 In fuel cells _____ are used as catalysts. **[KCET 2022]**
(A) nickel-cadmium
(B) lead-manganese
(C) zinc-mercury
(D) platinum-palladium

Q17 The molar conductivity is maximum for the solution of concentration **[KCET 2022]**
(A) 0.002 M (B) 0.005 M
(C) 0.001 M (D) 0.004 M

Q18 Alkali halides do not show dislocation defect because **[KCET 2022]**
(A) anions cannot be accommodated in vacant spaces
(B) cations and anions have almost equal size
(C) there is large difference in size of cations and anions
(D) cations and anions have low coordination number

Q19 For spontaneity of a cell, which is correct? **[KCET 2022]**
(A) $\Delta G = -ve, \Delta E = 0$
(B) $\Delta G = +ve, \Delta E = +ve$
(C) $\Delta G = -ve$
(D) $\Delta G = 0, \Delta E = 0$

Q20 For nth order of reaction, half-life period is directly proportional to **[KCET 2022]**
(A) $\frac{1}{a^{1-n}}$ (B) a^{n-1}
(C) a^{1-n} (D) $\frac{1}{a^{n-1}}$

Q21 Half-life of a reaction is found to be inversely proportional to the fifth power of its initial concentration, the order of reaction is **[KCET 2022]**
(A) 4 (B) 5
(C) 6 (D) 3

Q22 A first order reaction is half completed in 45 min. How long does it need 99.9% of the reaction to be completed ? **[KCET 2022]**
(A) 7.5 Hours (B) 10 Hours
(C) 20 Hours (D) 5 Hours

Q23 The rate of the reaction, $CH_3COOC_2H_5$ + NaOH CH_3COONa + C_2H_5OH is given by the equation, rate = k $[CH_3COOC_2H_5]$ [NaOH]. If concentration is expressed in $molL^{-1}$, the unit of k is **[KCET 2022]**
(A) mol L^{-1} s^{-1}
(B) L mol^{-1} s^{-1}
(C) s^{-1}
(D) mol^{-2} L^2 S^{-1}

Q24 Colloidal solution commonly used in the treatment of skin disease is **[KCET 2022]**
(A) colloidal silver
(B) colloidal antimony
(C) colloidal gold
(D) colloidal sulphur

Q25 Specific conductance of 0.1 M HNO_3 is 6.3 × 10^{-2} ohm^{-1} cm^{-1}. The molar conductance of the solution is **[KCET 2022]**
(A) 315 ohm^{-1} cm^2 mol^{-1}
(B) 6.300 ohm^{-1} cm^2 mol^{-1}
(C) 63.0 ohm^{-1} cm^2 mol^{-1}
(D) 630 ohm^{-1} cm^2 mol^{-1}

Q26 The property of halogens which is not correctly matched is **[KCET 2022]**
(A) F > Cl > Br > I (Electronegativity)
(B) I > Br > Cl > F (Density)
(C) F > Cl > Br > 1 (Electron gain enthalpy)
(D) F > Cl > Br > 1 (Ionisation enthalpy)

Q27 Which noble gas has least tendency to form compounds? **[KCET 2022]**
(A) Ne (B) Ar
(C) Kr (D) He

Q28 $(NH_4)_2Cr_2O_7$ on heating liberates a gas. The same gas will be obtained by **[KCET 2022]**
(A) heating NH_4NO_2
(B) treating H_2O_2 with $NaNO_2$
(C) treating Mg_3N_2 with H_2O
(D) heating NH_4NO_3

Q29 The strong reducing property of hypophosphorus acid is due to **[KCET 2022]**
(A) the positive valency of phosphorus
(B) two P – H bonds
(C) presence of phosphorus in its highest oxidation state
(D) its concentration

Q30 A transition metal exists in its highest oxidation state. It is expected to behave as **[KCET 2022]**
(A) a central metal in a coordination compound
(B) an oxidising agent
(C) a reducing agent
(D) a chelating agent

Q31 What will be the value of x in Fe^{x+}, if the magnetic moment, $\mu = \sqrt{24}\ BM$? **[KCET 2022]**
(A) +3 (B) 0
(C) +1 (D) +2

Q32 Which can adsorb larger volume of hydrogen gas ? **[KCET 2022]**
(A) Colloidal solution of palladium
(B) Finely divided platinum
(C) Colloidal $Fe(OH)_3$
(D) Finely divided nickel

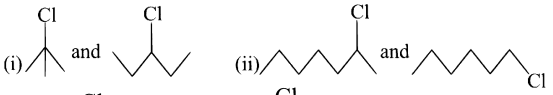
Q33 All Cu(II) halides are known, except the iodide, the reason for it is that **[KCET 2022]**
(A) Cu^{2+} oxidises iodide to iodine
(B) Cu^{2+} has much more negative hydration enthalpy
(C) Cu^{2+} ion has smaller size.
(D) iodide is bulky ion.

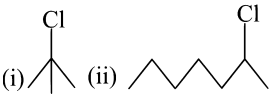
Q34 The correct IUPAC name of cis-platin is **[KCET 2022]**
(A) diamminedichloridoplatinum (IV)
(B) diamminedichloridoplatinum (0)
(C) dichloridodiammineplatinum (IV)
(D) diamminedichloridoplatinum (II)

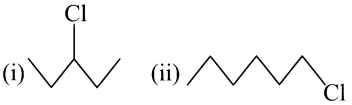
Q35 Crystal field splitting energy (CFSE) for $[CoCl_6]^{4-}$ is $18000\ cm^{-1}$. The crystal field splitting energy (CFSE) for $[CoCl_4]^{2-}$ will be **[KCET 2022]**
(A) 16000 cm^{-1}
(B) 8000 cm^{-1}
(C) 10000 cm^{-1}
(D) 18000 cm^{-1}

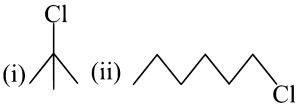
Q36 he complex hexamineplatinum(IV)chloride will give ____ number of ions on ionisation. **[KCET 2022]**
(A) 4 (B) 3
(C) 2 (D) 5

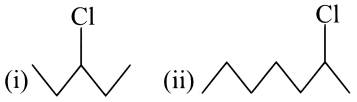
Q37 In the following pairs of halogen compounds, which compound undergoes faster S_N1 reaction? **[KCET 2022]**



(A) 

(B) 

(C) 

(D) 

Q38 The only lanthanoid which is radioactive **[KCET 2022]**
(A) cerium (B) promethium
(C) praseodymium (D) lanthanum

Q39 Identify the products A and B in the reactions :

$$R-X+AgCN \rightarrow A+AgX$$

$$R-X+KCN \rightarrow B+KX$$

[KCET 2022]

(A) A = RCN; B = RNC

(B) A = RNC; B = RCN

(C) A = RNC; B = RNC

(D) AR-CN; B = RCN

Q40 An organic compound with molecular formula C_7H_8O dissolves in NaOH and gives a characteristic colour with $FeCl_3$. On treatment with bromine, it gives a tribromo derivative $C_7H_5OBr_3$. The compound is **[KCET 2022]**

(A) o-cresol (B) m-cresol

(C) p-cresol (D) benzyl alcohol

Q41 In Kolbe's reaction the reacting substances are **[KCET 2022]**

(A) phenol and CCl_4

(B) sodium phenolate and CCl_4

(C) phenol and $CHCl_3$

(D) sodium phenolate and CO_2

Q42 The major product obtained when ethanol is heated with excess of conc. H_2SO_4 at 443 K is **[KCET 2022]**

(A) ethyne (B) ethane

(C) methane (D) ethene

Q43 Among the following, the products formed by the reaction of anisole with HI are **[KCET 2022]**

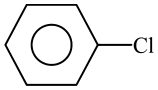
(A) sodium phenate + methanol

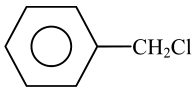
(B) benzene + methanol

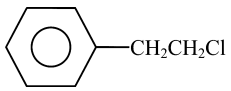
(C) phenol + methane

(D) phenol + iodomethane

Q44 Which one of the following chlorohydrocarbon readily undergoes solvolysis ? **[KCET 2022]**

(A) 

(B) 

(C) 

(D) $CH_2 = CHCl$

Q45 The general name of the compound formed by the reaction between aldehyde and alcohol is **[KCET 2022]**

(A) acetal (B) glycol

(C) acetate (D) ester

Q46 Reaction by which benzaldehyde cannot be prepared is **[KCET 2022]**

(A) $\text{Benzoic acid} \xrightarrow{\text{Zn·Hg and conc. HCl}}$

(B) $\text{Toluene} \xrightarrow[(ii)\,H_3O^+]{(i)\,CrO_2Cl_2 \text{ in } CS_2}$

(C) $\text{Benzoyl chloride} + H_2 \xrightarrow[\Delta]{Pd-BaSO_4}$

(D) $\text{Benzene} + CO + HCl \xrightarrow{\text{Anhyd. } AlCl_3}$

Q47 The test to differentiate between pentan-2-one and pentan-3-one is **[KCET 2022]**

(A) Benedict's test

(B) Fehling's test

(C) Iodoform test

(D) Baeyer's test

Q48 In carbylamine test for primary amines the resulting foul smelling product is **[KCET 2022]**

(A) CH_3CN (B) CH_3NC

(C) $COCl_2$ (D) CH_3NCl_2

Q49 Ethanoic acid undergoes Hell-Volhard Zelinsky reaction but methanoic acid does not, because of **[KCET 2022]**

(A) presence of α-H atom in ethanoic acid

(B) absence of α-H atom in ethanoic acid

(C) higher acidic strength of ethanoic acid than methanoic acid

(D) presence of α-H atom in methanoic acid

Q50 Which of the following is correctly matched? **[KCET 2022]**

(A) Teflon - Caprolactum

(B) Bakelite - Novolac

(C) Polyester - Tetrafluoroethene

(D) Nylon - Acrylonitrile

Q51 Which institute has approved the emergency use of 2-deoxy-D-glucose as additive therapy for COVID-19 patients? **[KCET 2022]**

(A) World Health Organisation

(B) Ministry of Health and Family Welfare

(C) Drug Controller General of India

(D) India Council of Medical Research

Q52 A nucleic acid, whether DNA or RNA gives on complete hydrolysis, two purine bases, two pyrimidine bases, a pentose sugar and phosphoric acid. Nucleotides which are intermediate products in the hydrolysis contain **[KCET 2022]**

(A) a purine base, pentose sugar and ortho-phosphoric acid

(B) purine or pyrimidine base and ortho-phosphoric acid

(C) purine or pyrimidine base, a pentose sugar and ortho-phosphoric acid

(D) purine or pyrimidine base and pentose sugar

Q53 A secondary amine is **[KCET 2022]**

(A) a compound with two carbon atoms and an NH_2 group

(B) a compound with an NH_2 group on the carbon atom in number 2 position

(C) a compound in which 2 of the hydrogen of NH_3 have been replaced by organic group

(D) an organic compound with two NH_2 groups

Q54 If wavelength of photon is 2.2×10^{-11} m and h = 6.6×10^{-34} J s, then momentum of photon **[KCET 2022]**

(A) $3.33 \times 10^{-22}\ \text{kg ms}^{-1}$

(B) $1.452 \times 10^{-44}\ \text{kg ms}^{-1}$

(C) $6.89 \times 10^{+43}\ \text{kg ms}^{-1}$

(D) $3 \times 10^{-23}\ \text{kg ms}^{-1}$

Q55 Elements X, Y and Z have atomic numbers 19, 37 and 55 respectively. Which of the following statements is true about them? **[KCET 2022]**

(A) Y would have an ionisation potential between those of X and Z.

(B) Z would have the highest ionisation potential.

(C) Y would have the highest ionisation potential.

(D) Their ionisation potential would increase with increasing atomic number.

Q56 In oxygen and carbon molecule the bonding is **[KCET 2022]**

(A) $O_2 : 2\sigma, 0\pi; C_2 : 0\sigma, 2\pi$

(B) $O_2 : 1\sigma, 1\pi; C_2 : 0\sigma, 2\pi$

(C) $O_2 : 0\sigma, 2\pi; C_2 : 2\sigma, 0\pi$

(D) $O_2 : 1\sigma, 1\pi; C_2 : 1\sigma, 1\pi$

Q57 Which is most VISCOUS ? **[KCET 2022]**

(A) Ethanol

(B) Ethylene glycol

(C) Glycerol

(D) Methanol

Q58 The volume of 2.8 g of CO at 27°C and 0.821 atm pressure is (R = 0.08210 L. atm K mol^{-1}) **[KCET 2022]**

(A) 1.5 litres (B) 3 litres

(C) 30 litres (D) 0.3 litres

Q59 The work done when 2 moles of an ideal gas expands rèversibly and isothermally from a volume of 1 L to 10 L at 300 K is (R = 0.0083 kJ K mol^{-1}) **[KCET 2022]**

(A) 5.8 kJ (B) 0.115 kJ

(C) 58.5 kJ (D) 11.5 kJ

Q60 An aqueous solution of alcohol contains 18 g of water and 414 g of ethyl alcohol. The mole fraction of water is **[KCET 2022]**

(A) 0.4 (B) 0.7

(C) 0.9 (D) 0.1

Answer Key

Q1	A
Q2	A
Q3	C
Q4	C, D
Q5	B
Q6	C
Q7	B
Q8	D
Q9	C
Q10	C
Q11	A
Q12	B
Q13	A
Q14	B
Q15	C
Q16	D
Q17	C
Q18	B
Q19	C
Q20	C
Q21	C
Q22	A
Q23	B
Q24	D
Q25	D
Q26	C
Q27	D
Q28	A
Q29	B
Q30	B
Q31	D
Q32	A
Q33	A
Q34	D
Q35	B
Q36	D
Q37	A
Q38	B
Q39	B
Q40	B
Q41	D
Q42	D
Q43	D
Q44	B
Q45	A
Q46	A
Q47	C
Q48	B
Q49	A
Q50	B
Q51	C
Q52	C
Q53	C
Q54	D
Q55	A
Q56	B
Q57	C
Q58	B
Q59	D
Q60	D

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

For acidic medium, we know that pH values range is between 0 – 6, 9, for neutral it is 7 and for bases it is 7.1 – 14 So, HCl is acidic and NaOH is basic. Thus, we can straight forward infer that NaOH has a higher pH value.

Now, 1 mole of sodium hydroxide produces 1 mole of Na^+ and 1 mole of OH^- ions. This means that the concentration of the hydroxide ions will be equal to $[OH^-] = [NaOH] = 1\ M$

For case A,

$$pOH = -\log[OH^-] = -\log[1] = 0$$

$$\therefore pH = 14 - pOH = 14 - 0 = 14$$

For case B,

$$[OH^-] = [NaOH] = 0.1M$$

$$pOH = -\log[0.1] = 1$$

$$\therefore pH = 14 - 1 = 13$$

So,

pH of 1 M NaOH is highest among the given solution.

Q2 Text Solution:

In NH_4NO_3, N exhibits two different oxidation states. Actually NH_4NO_3 exists as NH_4^+ and NO_3^-. Oxidation state of N in NH_4^+ is –3 and in NO_3^- is +5.

Q3 Text Solution:

An electron-deficient hydride is a compound that has fewer valence electrons than are required to completely satisfy the traditional bonding requirements based on the concept of two electrons for every single bond between atoms. To determine if a hydride is electron deficient, we must consider the valence electrons and bonding in each given molecule.

Let's examine each option:

Option A: CaH_2

Calcium hydride consists of calcium ions (Ca^{2+}) and hydride ions ((H^-). Each calcium atom provides two electrons to form two ionic bonds with two hydride ions. This compound is not electron deficient; it is an ionic hydride where the bonding requirements for both the metal and the hydrogen are fulfilled.

Option B: CH_4

Methane, CH_4, has a central carbon atom bonded to four hydrogen atoms. Carbon has four valence electrons and needs four more to complete its octet, which it gains by forming covalent bonds with the four hydrogen atoms (each hydrogen providing one electron). In methane, all atoms have full valence shells, so it is not electron deficient.

Option C: B_2H_6

Diborane (B_2H_6) is a molecule where each boron atom contributes three valence electrons, and each hydrogen atom contributes one electron. In a simple model where we would expect each pair of atoms to be connected by a single bond (two electrons per bond), the two boron atoms together with six hydrogen atoms would require 12 electrons for conventional two-electron bonds. However, diborane has only 12 valence electrons in total (6 from boron and 6 from hydrogen), which are not enough to form conventional bonds for all atoms involved. Diborane forms multiple-center bonds, where two electrons are shared by more than two atoms, specifically in the form of two three-center two-electron bonds, often referred to as banana bonds. This is indicative of electron deficiency. Therefore, B_2H_6 is electron deficient.

Option D: NaH

Sodium hydride consists of sodium ions (Na^+) and hydride ions (H^-). Sodium loses one electron to the hydride ion, and this fulfilling the octet rule (or the duet rule for hydrogen). Each resultant ion has a complete octet or duet, and thus this ionic compound is not electron deficient.

Based on the explanation above, the electron-deficient hydride among the given options is:

Option C: B_2H_6

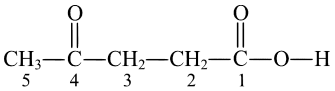
Q4 Text Solution:

$SnO_2$and BeO both are amphoteric in nature.

Q5 Text Solution:

The property of low solubility of carbon dioxide in water makes it biologically and geo-chemically important. Carbon dioxide on reaction with water form carbonic acid, which dissociates to give HCO_3^- ions . H_2CO_3 / HCO_3^- buffer system helps to maintain pH of blood between 7.29 – 7.42.

Q6 Text Solution:



IUPAC name = 4 -oxopentanoic acid

The given compound contains a carboxylic acid group (-COOH) and a ketone group (-CO-) within the carbon chain. When naming compounds according to the IUPAC system, priority is given to certain functional groups. The carboxylic acid group has higher priority than the ketone group. Thus, the compound will be named with the suffix "-oic acid" to denote the presence of the carboxylic acid.

The longest carbon chain that contains the carboxylic acid group has five carbons, so the base name will be "pentanoic acid." The carbon atoms are numbered starting from the carboxylic acid group to give the substituent, in this case, the ketone group, the lowest possible number. The ketone is on the fourth carbon, so it will be indicated with "4-oxo."

Therefore, the correct IUPAC name for the compound is "4-oxopentanoic acid," which corresponds to Option C. Options A, B, and D do not correctly prioritize the functional groups nor do they name the compound with proper numbering and suffixes based on IUPAC rules.

Q7 Text Solution:

$$2HI \rightleftharpoons H_2 + I_2$$

Initial mole :	1	x	x
Final mole :	$(1-x)$	$x/2$	$x/2$

$$K_C = \frac{x^2}{4(1-x)^2}$$

By putting the value of $x = 1/2$, we get,

$$K_C = \frac{1/4}{4(1-1/2)^2} = 0.25$$

Q8 Text Solution:

For bcc, number of atoms = 2

$$\text{Percentage packing fraction} = \frac{V_{\text{sphere}}}{V_{\text{unit cell}}} \times 100$$

$$= \frac{2 \times \frac{4}{3} \times \pi r^2}{\left(\frac{4}{\sqrt{3}} r\right)^3} \times 100 = 68\%$$

$\therefore$ Fraction of free space in bcc in $100 - 68 = 32\%$.

Q9 Text Solution:

Total atoms in a cube based unit cell $= \left[\frac{8}{8} + 2 \times 4\right] = 1 + 8 = 9$

Q10 Text Solution:

The correct answer is Option C.

Amorphous solids are characterized by the lack of a long-range ordered structure that is typical in crystalline solids. This means that in amorphous solids, the arrangement of particles does not repeat periodically over long distances. This structure (or lack thereof) leads to different properties as compared to crystalline solids.

Let's go over each option to see why Option C is not true:

Option A: They may become crystalline on keeping for long time.

This statement is true. Amorphous solids can sometimes transition into a crystalline state if they are kept at a steady temperature for a long time, a process known as devitrification. This is because many amorphous solids are actually supercooled liquids—substances that have been cooled below their melting points without crystallization occurring—and given time, they can rearrange themselves into a crystalline structure.

Option B: Amorphous solids can be moulded by heating.

This is also true. Due to their lack of a rigid, long-range order, amorphous solids like glass and plastics can soften and become mouldable when heated. This is in contrast to crystalline solids, which usually have distinct melting points at which they transition sharply from solid to liquid.

Option C: They are anisotropic in nature.

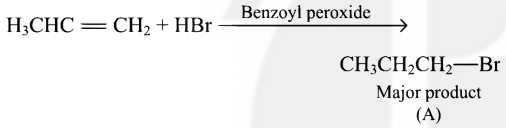
This statement is false, which makes it the correct answer to the question. Unlike crystalline solids, amorphous solids are

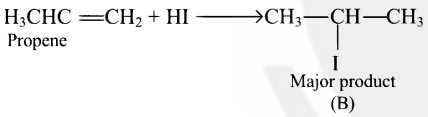
isotropic, not anisotropic. Isotropic materials have properties that are the same in all directions because their molecular arrangement is similar in all orientations. Anisotropy, on the other hand, is a characteristic of crystalline solids, where the properties can vary depending on the direction due to the ordered periodic arrangement of particles.

Option D: On heating they may become crystalline at certain temperature.

True, similar to Option A, amorphous solids can transition to a crystalline state when heated to certain temperatures where the thermal energy allows the particles to overcome any barriers to rearrangement into a more ordered structure. This is usually referred to as the glass transition temperature in materials like glass or certain polymers.

Q11 Text Solution:





Q12 Text Solution:

Solubility of a gas in a liquid increases with increase of p and decrease of T.

Q13 Text Solution:

$\text{Given, amount of glucose } (w) = 1.8 \text{ g}$

$\text{Amount of solvent } (W) = 100 \text{ g}$

$\Delta T_b = 0.1^\circ C$

$\text{Molecular mass of glucose} = 180$

$\text{Molal elevation constant of the liquid,}$

$$\Delta T_b = 0.1^\circ C$$

$$\text{We know that, } K_b = \frac{\Delta T_b \times m \times W}{1000 \times w}$$

$$= \frac{0.1 \times 180 \times 100}{1000 \times 1.8} = 1 \text{ K kg/mol}$$

Q14 Text Solution:

$\text{Given, molar mass of glucose } M_B = 180 \text{ g}$

$\text{Mass of glucose, } W_B = 3 \text{ g}$

$\text{Mass of water, } W_A = 60 \text{ g}$

$\text{Temperature} = 15^\circ C \Rightarrow 273 + 15 = 288 \text{ K}$

$\text{Osmotic pressure, } \pi = ?$

$$C = \frac{W_B \times 1000}{W_A \times M_B} = \frac{3 \times 1000}{60 \times 180} = 0.277 \text{ mol } L^{-1}$$

We know that,

$$\pi = CRT = 0.277 \times 0.0821 \times 288$$

$$= 6.549 \simeq 6.57 \text{ atm}$$

Q15 Text Solution:

Among the given colligative properties, osmotic pressure can provide molar mass of proteins, polymers and colloids with greater precision. Because for these substances, the value of other given colligative properties are too small to be measured. Secondly, this method has the advantage i.e., this use molarities instead of molalities.

Q16 Text Solution:

In fuel cells platinum-palladium are used as catalysts.

Q17 Text Solution:

We know that,

molar conductivity, $\Lambda_m = \frac{\kappa \times 1000}{M}$

That means Λ_m is inversely proportional to the molarity. The solution which is less concentrated have maximum molar conductivity: Thus, among the given option 0.001 M has the maximum molar conductivity.

Q18 Text Solution:

Generally in alkali halides, cations and anions have almost equal size, thus they do not show dislocation defect.

Q19 Text Solution:

For spontaneity of a cell, the value of ΔG should be negative.

Q20 Text Solution:

For nth order of reaction, half-life period is directly proportional to a^{1-n}

Q21 Text Solution:

The half-life period of nth order reaction is

$t_{1/2} = \frac{k}{a^{n-1}}$

a is the initial concentration of reactant $t_{1/2} \propto \frac{1}{a^5}$

$\therefore t_{1/2} = \frac{k}{a^5}$ and $\frac{k}{a^{n-1}} = \frac{k}{a^5}$

$\Rightarrow a^5 = a^{n-1}$

$n - 1 = 5 = 6$

$\therefore$ The order of the reaction is 6.

Q22 Text Solution:

$t_{1/2}$ for first order reaction is 45 min

$t_{1/2} = \frac{0.693}{k} \Rightarrow k = \frac{0.693}{t_{1/2}} = \frac{0.693}{45}$

$t = \frac{2.303}{k} \log \frac{a}{a-x} = \frac{2.303}{0.693} \times 45 \log \frac{100}{0.1}$

$= 448 \text{ min} \simeq 7.5 \text{ hrs}$

Q23 Text Solution:

Given that, rate

$= k[CH_3COOC_2H_5][NaOH]$

That means the reaction is a second order

$\therefore \frac{dx}{dt} = k[A]^2 \Rightarrow \frac{conc}{time} = k[\text{ conc. }]^2$

$\frac{\text{mol } L^{-1}}{s} = k \text{ mol } L^{-1} \times \text{mol } L^{-1}$

$k = L \text{ mol}^{-1} \text{ s}^{-1}$

Q24 Text Solution:

Among the given solution colloidal sulphur is commonly used in the treatment of skin disease.

Q25 Text Solution:

Given, specific conductance,

$k = 6.3 \times 10^{-2} \text{ ohm}^{-1} \text{ cm}^{-1}$

HNO_3 concentration, $c = 0.1$ M

Molar conductance $\Lambda_m = \frac{\kappa \times 1000}{c}$

$= 6.3 \times 10^{-2} \times \frac{1000}{01} = 630 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$

Q26 Text Solution:

Down the group, electron gain enthalpies become less and less negative with the increase in the size of the halogen. However, electron gain enthalpy of F is less negative than Cl. This is due to small size of F-atom. As a result, there are strong inter electronic repulsions in the relatively small 2p-orbitals of F and thus incoming electrons experience much less attraction. Thus, the correct order is Cl > F > Br > I.

Q27 Text Solution:

Noble gas has least tendency to form compounds with helium due to highest ionisation enthalpy.

Q28 Text Solution:

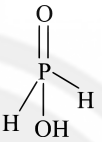
$(NH_4)_2Cr_2O_7$ and NH_4NO_2 both on heating liberate nitrogen gas. The reaction involve are as follows

$(NH_4)_2 Cr_2 O_7 \xrightarrow{\Delta} N_2 \uparrow + Cr_2O_3 + 4H_2O$

$NH_4NO_3 \rightarrow N_2O + 2H_2O$

Q29 Text Solution:

The strong reducing property of hypophosphorus acid is due to the presence of two P – H bonds. Its structure is as follows



Q30 Text Solution:

In highest oxidation state of transition metals can undergo reduction and thus act as the oxidising agent.

Q31 Text Solution:

Given that, magnetic moment, $\mu = \sqrt{24}$ and $\mu = \sqrt{n(n+2)}$

where, n = unpaired electrons

$\sqrt{24} = \sqrt{n(n+2)}$

$24 = n(n+2) = n^2 + 2n$

$n^2 + 2n - 24 = 0 \Rightarrow n^2 + 6n - 4n - 24 = 0$

$n(n+6) - 4(n+6) = 0 \Rightarrow (n-4)(n+6) = 0$

$n = 4, -6$

$\therefore$ Number of unpaired electrons = 4

If oxidation of F is $+2$ then it has 4 unpaired electrons.

Q32 Text Solution:

The ability of a substance to adsorb hydrogen gas depends on the surface area and the nature of the adsorbent material. The higher the surface area and the stronger the interaction between the adsorbate (in this case, hydrogen) and the adsorbent, the greater the volume of gas that can be adsorbed.

Among the given options:

Option A: A colloidal solution of palladium has particles dispersed in a medium, which increases the surface area available for hydrogen adsorption. Palladium is particularly effective at adsorbing hydrogen due to its electronic structure and the ability to form palladium hydride (PdH_x).

Option B: Finely divided platinum has a high surface area due to its particulate form, and platinum is also known to adsorb hydrogen effectively. However, it does not form a hydride as readily as palladium, so it may adsorb slightly less hydrogen under similar conditions.

Option C: Colloidal $Fe(OH)_3$ or ferric hydroxide is not particularly known for its ability to adsorb hydrogen. While it might have a reasonable surface area in its colloidal form, its interaction with hydrogen is not as strong as that of the noble metals.

Option D: Finely divided nickel has a decent adsorption capacity for hydrogen due to its surface area and can adsorb hydrogen to form nickel hydride. However, it is generally less effective than palladium in adsorbing hydrogen.

Considering the above factors, the most likely answer would be:

Option A: Colloidal solution of palladium

Palladium has the unique ability to adsorb large volumes of hydrogen, and when in a colloidal solution, its surface area is maximized, making it the most efficient adsorbent for hydrogen among the given options.

Q33 Text Solution:

$$2\,Cu^{2+} + 4I^{-} \rightarrow 2\,CuI_2$$

This Cu (II) iodide immediately decomposes to liberate I_2 and insoluble copper (I) iodide.

$$2\,CuI_2 \rightarrow 2CuI + I_2$$

Q34 Text Solution:

The correct IUPAC name for cis-platin, a chemotherapy drug used to treat various types of cancers, is Option D: diamminedichloridoplatinum (II).

The reason for this naming is based on IUPAC rules for naming coordination complexes, which are as follows:

First, the ligands are named in alphabetical order, regardless of charge or the number of each type of ligand present.

The prefix "diammine" indicates the presence of two ammine (NH_3) ligands.

The prefix "dichlorido" indicates the presence of two chlorido (Cl-) ligands.

Following the ligands, the metal atom is named, which in this case is platinum. The oxidation state of the metal is indicated by Roman numerals in parentheses immediately following the metal's name.

In cis-platin, the platinum has an oxidation state of +2. We know this because there are two ammonia molecules and two chloride ions as ligands, each contributing either to the neutrality or the charge balance of the complex:

$[Pt(NH_3)_2Cl_2]$}

Solving for platinum's oxidation state:

Let x be the oxidation state of platinum. The ammonia ligands do not have a charge, but each chloride ion has a charge of -1. Therefore, we have:

x + 2(charge of NH_3) + 2(-1) = 0

x + 0 – 2 = 0

x = 2

Thus, Option D, diamminedichloridoplatinum (II), is the correct IUPAC name, where (II) reflects the +2 oxidation state of the platinum in the complex.

Q35 Text Solution:

$[CoCl_6]^{4-}$ is an octahedral complex, its CFSE value, $\Delta_0 = 18000\ cm^{-1}$

$[CoCl_4]^{2-}$ is a tetrahedral complex, $\Delta_t = ?$

We know that, $\Delta_t = \frac{4}{9}\Delta_0 = \frac{4}{9} \times 18000 = 8000\ cm^{-1}$

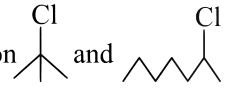
Q36 Text Solution:

The formula of hexamineplatinum (IV) chloride is $[Pt(NH_3)_6]Cl_4$.

$[Pt(NH_3)_6]Cl_4 \rightarrow [Pt(NH_3)_6]^{4+} + 4Cl^-$

Thus, five ions are produced.

Q37 Text Solution:

The reactivity of compound under S_N1 reaction is 3° > 2° > 1°. Thus, among the given option  and

undergoes faster S_N1 reaction.

Q38 Text Solution:

Promethium is a radioactive lanthanoid.

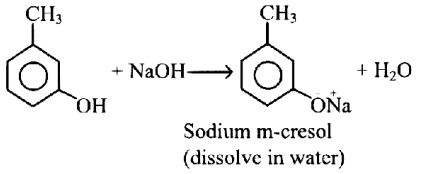
Q39 Text Solution:

R - X + AgCN → RNC + AgX

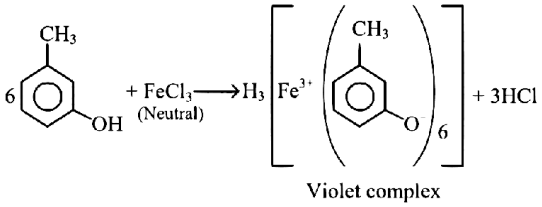
R - X + KCN → RCN + KX

KCN is predominantly ionic in nature, its C - C bond is more stable than C - N bond. Therefore, in this case attack takes place through carbon atom. On other hand, AgCN is predominantly covalent in nature, hence only nitrogen is available for bonding result in formation of RNC.

Q40 Text Solution:

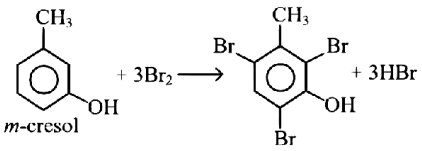


Sodium m-cresol
(dissolve in water)



Violet complex

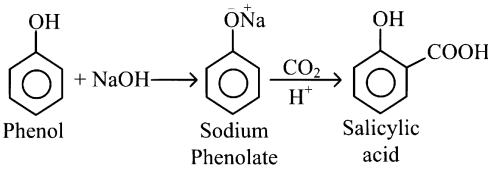
According to given information the compound is *m*-cresol.



m-cresol

Q41 Text Solution:

In the Kolbes reaction the reacting substances are sodium phenolate and CO_2. The reaction involve are as follows



Phenol — Sodium Phenolate — Salicylic acid

Q42 Text Solution:

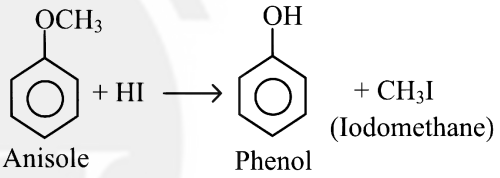
The major product obtained when ethanol is heated with excess of conc. H_2SO_4 at 443 K is ethene. The reaction involve is as follows

$$CH_3CH_2OH \xrightarrow[\text{Ethanol}]{\text{Conc. } H_2SO_4,\ 443\ K} CH_2 = CH_2 + H_2O$$

(Ethene)

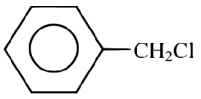
Q43 Text Solution:

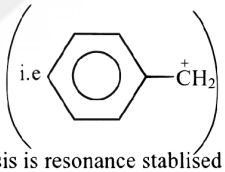
Phenol and iodomethane are formed by the reaction of anisole with HI.

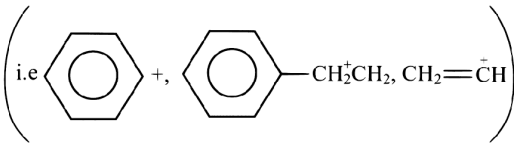


Anisole — Phenol — (Iodomethane)

Q44 Text Solution:

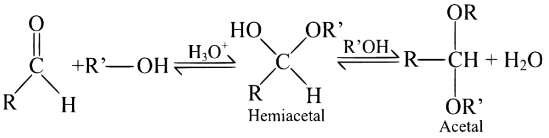
Among the given option 

will readily undergo solvolysis because its carbocation i.e  Produce after the solvolysis is resonance stablised and is stable than the other carbocation



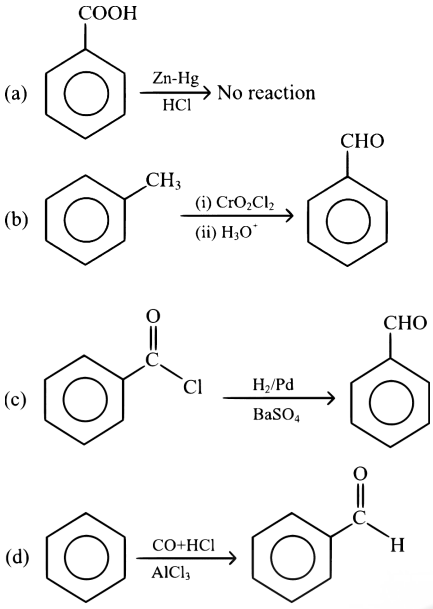
Q45 Text Solution:

The general name of the compound formed by the reaction between aldehyde and alcohol is acetal. e.g.



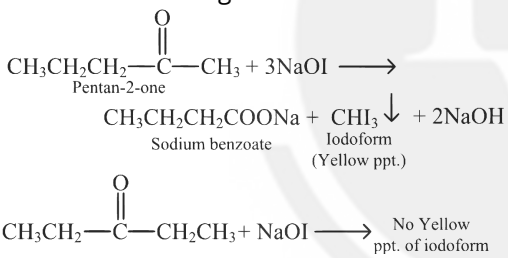
Hemiacetal — Acetal

Q46 Text Solution:



Q47 Text Solution:

Pentan-2-one gives positive iodoform test when react with NaOH and I_2 and form yellow precipitates of iodoform. While pentan-3-one does not gives positive iodoform test. The involved reactions given below :



Q48 Text Solution:

In carbylamine test for primary amines the resulting foul smelling product is CH_3NC

$$\text{e.g. } \underset{\text{Ethylamine}}{CH_3CH_2NH_2} + CHCl_3 + \underset{\text{Alcoholic}}{3KOH}$$

$$\rightarrow \underset{\text{Ethyl isocyanide}}{CH_3CH_2NC} + 3KCl + 3H_2$$

Q49 Text Solution:

Ethanoic acid has α-H atom, thus it undergoes Hell-Volhard Zelinsky reaction. Whereas methanoic acid does not has α-H atom, thus it does not give this test.

Q50 Text Solution:

The correct pair in bakelite and novalac. It is form by the polymerisation of phenol and formaldehyde monomer. While teflon is the polymer of tetrafluoroethylene, polyester is the polymer of ethyleneglycol and terephathalic acid and nylon is polymer of caprolactum.

Q51 Text Solution:

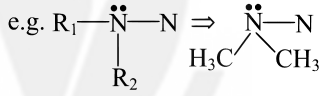
The institute that has approved the emergency use of 2-deoxy-D-glucose as an adjunct therapy for COVID-19 patients is Option C, the Drug Controller General of India (DCGI). The DCGI is responsible for the regulation of pharmaceuticals and medical devices in India, which includes the approval of drugs for use in the country based on evidence of their safety and efficacy. The DCGI gave emergency use authorization for 2-deoxy-D-glucose, which is developed by the Institute of Nuclear Medicine and Allied Sciences (INMAS), a lab of the Defence Research and Development Organisation (DRDO), in collaboration with Dr. Reddy's Laboratories in Hyderabad.

Q52 Text Solution:

Three part of nucleotide are ortho phosphoric acid, pentose sugar and nitrogenous base (purine or pyrimidine base).

Q53 Text Solution:

A secondary amine is a compound in which 2 of the hydrogen of NH_3 have been replaced by organic group.



Q54 Text Solution:

$$\text{Given, wave length of photon, } \lambda = 22 \times 10^{-11} \text{ m}$$

$$\text{Plank constant, } h = 6.6 \times 10^{-34} \text{ Js}$$

$$\text{We know that, } \lambda = \frac{h}{mc} \Rightarrow mc = \frac{h}{\lambda} \text{ and } mc = \text{momentum}$$

$$\therefore \text{ Momentum} = \frac{6.6 \times 10^{-34}}{2.2 \times 10^{-11}}$$

$$= 3 \times 10^{-23} \text{ kg ms}^{-1}$$

Q55 Text Solution:

Elements X, Y and Z with atomic number 19, 37 and 55 respectively K, Pb and Cs. These elements are belongs to group-I of periodic table. On moving down the period in group-I ionisation potential will decrease down the group. Thus, the order is X > Y > Z.

Therefore, statement (a) is correct.

Q56 Text Solution:

The bond order of C_2 consists of both pi bond because of the presence of the four electrons in two pi molecular orbitals. Whereas in most of the other molecules a double bond is made up of a sigma bond and a pi bond. Thus, option (b) is correct.

Q57 Text Solution:

We know that, higher is the extent of H-bonding higher will be the viscosity.

Among the given option glycerol has the highest viscosity as in this case 3-OH groups are involved in hydrogen bonding which is greater than other ethylene glycol has two and both ethanol and methanol has one - OH group.

Q58 Text Solution:

$\text{Given, amount of CO} = 2.8\ \text{g}$

$\text{Temperature} = 27^{\circ}\text{C}$

$\text{Pressure} = 0.821\ \text{atm}$

$R = 0.08210\ \text{L atm K mol}^{-1}$

$\text{We know that, } pV = RT$

$\therefore \quad V = \frac{RT}{p} = \frac{0.0821 \times 300}{0.821} = 30\ \text{L}$

$\therefore 28\ \text{g of CO occupy volume } 30\ \text{L}$

$\therefore 2.8\ \text{g of CO occupy volume} = \frac{30 \times 2.8}{28}$

$= 3\ \text{L}$

Q59 Text Solution:

$\text{Given, initial volume } V_1 = 1\ \text{L}$

$\text{Final volume, } V_2 = 2\ \text{L}$

$\text{Temperature} = 300\ \text{K}$

$R = 0.0083\ \text{kJ K mol}^{-1}$

$\text{Moles } (n) = 2\ \text{moles}$

We know that,

$\text{Work done, } W = 2.303\ nRT\ \log \frac{V_2}{V_1}$

$= 2.303 \times 2 \times 0.0083 \times 300 \log 10 = 11.5\ \text{kJ}$

Q60 Text Solution:

Given, amount of ethylalcohol = 414 g

Amount of water = 18 g

Molar mass of water = 18

Molar mass of ethyl alcohol = 46

$\text{Mole of } C_2H_3OH = \frac{414}{46} = 9$

$\text{Mole of } H_2O = \frac{18}{18} = 1$

$\text{Mole fraction of } H_2O = \frac{1}{10} = 0.1$