CBSE 12th Chemistry 2017 Unsolved Paper Outside Delhi Board All India

SECTION – A

Q.1. Write the formula of the compound of phosphorus which is obtained when conc. HNO_3 oxidises P_4.

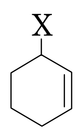
Q.2. Write the IUPAC name of the following compound:

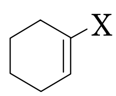
$$\begin{array}{l} H_3C-\underset{\displaystyle CH_3}{\underset{|}{C}}=\underset{\displaystyle Br}{\underset{|}{C}}-CH_2-OH \end{array}$$

Q.3. What is the effect of adding a catalyst on

(a) Activation energy (**Ea**), and

(b) Gibbs energy (ΔG) of a reaction?

Q.4. Out of the 

and 

which is an example of allylic halide?

Q.5. What type of colloid is formed when a liquid is dispersed in a solid? Give an example.

SECTION – B

Q.6. (a) Arrange the following compounds in the increasing order of their acid strength: P-cresol, p-nitrophenol, phenol 2.

(b) Write the mechanism (using curved arrow notation) of the following reaction:

$$CH_2=CH_2 \xrightarrow{H_3O^+} CH_3-CH_2^+ + H_2O$$

OR

Write the structures of the products when Butan-2-ol reacts with the following:

(a) CrO_3

(b) $SOCl_3$

Q.7. Calculate the number of unit cells in 8.1 g of aluminum if it crystallizes in a face- centered cubic (f.c.c.) structure. (Atomic mass of Al = 27 g mol^{-1}).

Q.8. Draw the structures of the following:

(a) H_2SO_3

(b) $HClO_3$

Q.9. Write the name of the cell which is generally used in hearing aids. Write the reactions taking place at the anode and the cathode of this cell.

Q.10. Using IUPAC norms write the formulae for the following:

(a) Sodium dicyanidoaurate (I)

(b) Tetraamminechloridonitrito-N-plantinum (IV) sulphate

SECTION – C

Q.11. (a) Based on the nature of intermolecular forces, classify the following solids: Silicon carbide, Argon

(b) ZnO turns yellow on heating. Why?

(c) What is meant by groups 12-16 compounds? Give an example.

Q.12. (a) The cell in which the following reaction occurs:

$$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(s)$$

has E^o_{Cell} = 0.236 V at 298 K. Calculate the standard Gibbs energy of the cell reaction.

(Given: 1F = 96,500 C mol^{-1})

(b) How many electrons flow through a metallic wire if a current of 0.5 A is passed for 2 hours?

(Given 1 F = 96,500 C mol^{-1})

Q.13. (a) What type of isomerism is shown by the complex $[Co(NH_3)_5(SCN)]^{2+}$?

(b) Why is $[NiCl_4]^{2-}$ paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic ?

(Atomic number of Ni = 28).

(c) Whey are low spin tetrahedral complexes rarely observed?

Q.14. Write one difference in each of the following :

(a) Multimolecular colloid and Associated colloid

(b) Coagulation and Peptization

(c) Homogeneous catalysis and Heterogeneous catalysis.

OR

(a) Write the dispersed phase and dispersion medium of milk.

(b) Write one similarity between physisorption and chemisorption.

(c) Write the chemical method by which $Fe(OH)_3$ sol is prepared from $FeCl_3$.

Q.15. A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed.

(Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

Q.16. The following compounds are given to you:

2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane

(a) Write the compound which is most reactive towards S_N2 reaction.

(b) Write the compound which is optically active.

(c) Write the compound which is most reactive towards β-elimination reaction.

Q.17. Write the principle of the following:

(a) Zone refining

(b) Froth floatation process

(c) Chromatography

Q.18. Write the structures of compounds A, B and C in the following reactions:

(a) $CH_3-COOH \xrightarrow{NH_3/\Delta} A \xrightarrow{Br_2/KOH(aq)} B \xrightarrow{CHCl_3+alc.\,KOH} C$

(b) $C_6H_5N_2^+BF_4^-\ A \xrightarrow[\Delta]{NaNO_2} B \xrightarrow{Br_2/KOH(aq)} B \xrightarrow{CHCl_3+alc.KOH} C$

Q.19. Write the structures of the monomers used for getting the following polymers:

(a) Nylon-6, 6

(b) Melamine-formaldehyde polymer

(c) Buna-S

Q.20. Define the following:

(a) Anionic detergents

(b) Limited spectrum antibiotics

(c) Antiseptics

Q.21. Give reasons for the following:

(a) Red phosphorus is less reactive than white phosphorus.

(b) Electron gain enthalpies of halogens are largely negative.

(c) N_2O_5 is more acidic than N_2O_3.

Q.22. Give reasons for the following:

(a) Acetylation of aniline reduces its activation effect.

(b) CH_3NH_2 is more basic than $C_6H_5NH_2$.

(c) Although $-NH_2$ is o/p directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

SECTION – D

Q.23. After watching a programme on TV about the presence of carcinogens (cancer causing agents) Potassium bromate and Potassium iodate in bread and other bakery products, Rupali a Class XII student decided to make others aware about the adverse effects of these carcinogens in foods. She consulted the school principal and requested him to instruct the canteen contractor to stop selling sandwiches, pizzas, burgers and other bakery products to the students. The principal took an immediate action and instructed the canteen contractor to replace the bakery products with some protein and vitamin rich food like fruits, salads, sprouts, etc. The decision was welcomed by the parents and the students.

After reading the above passage, answer the following questions:

(a) What are the values (at least two) displayed by Rupali?

(b) Which polysaccharide component of carbohydrates is commonly present in bread?

(c) Write the two types of secondary structures of proteins.

(d) Give two examples of water soluble vitamins.

SECTION – E

Q.24. (a) Account for the following:

(i) Transition metals show variable oxidation states.

(ii) Zn, Cd and Hg are soft metals.

(iii) E^o value for the Mn^{3+}/Mn^{2+} couple is highly positive (+1.57 V) as compared to Cr^{3+}/Cr^{2+}.

(b) Write one similarity and one difference between the chemistry of lanthanoid and

actinoid elements.

OR

(a) following are the transition metal ions of 3d series:

Ti^{4+}, V^{2+} Mn^{3+} Cr^{2+}

(Atomic numbers: Ti = 22, V = 23, Mn = 25, Cr = 24)

Answer the following:

(i) Which ion is most stable in an aqueous solution and why?

(ii) Which ion is a strong oxidising agent and why?

(iii) Which ion is colourless and why?

(b) Complete the following equations:

(i) $2MNO^{-}_4 + 16H^+ + 5S^{2+}$

(ii) $KMnO_4 \xrightarrow{heat}$

Q.25. (a) A 10% solution (by mass) of sucrose in water has a freezing point of 269.15 K.

Calculate the freezing point of 10% glucose in water if the freezing point of pure water

is 273.15 K.

Given:

(Molar mass of sucrose = 342 g mol^{-1})

(Molar mass of glucose = 180 g mol^{-1})

(b) Define the following terms:

(i) Molality (m)

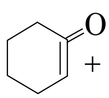
(ii) Abnormal molar mass

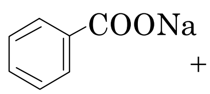
OR

(a) 30 g of urea (M = 60 g mol^{-1}) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.

(b) Write two differences between ideal solutions and non-ideal solutions.

Q.26. (a) Write the product(s) in the following reactions:

(i)  + HCN $\longrightarrow$?

(ii)  + NaOH $\xrightarrow[\Delta]{CaO}$?

(iii) $CH_3 - CH = CH - CH \xrightarrow[(b)\ H_2O]{(a)\ DIBAL-H}$?

(b) Give simple chemical tests to distinguish between the following pairs of compounds:

(i) Butanal and Butan-2-one

(ii) Benzoic acid and Phenol

OR

(a) Write the reactions involved in the following:

(i) Etard reaction

(ii) Stephen reduction

(b) How will you convert the following in not more than two steps:

(i) Benzoic acid to Benzaldehyde

(ii) Acetophenone to Benzoic acid

(iii) Ethanoic acid to 2-Hydroxyethanoic acid.

SOLUTIONS

1. $P_4 + \underset{\text{(conc.)}}{20HNO_3} \rightarrow 4H_3PO_4 + 20NO_2 + 4H_2O$

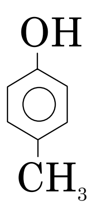
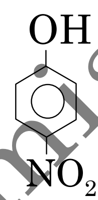
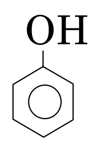
2. 2-Bromo 3-methyl But-2-ene-1-ol

3. (a) E_a of reaction decreases with catalyst.

   (b) ΔG remain unchanged with catalyst.

4.

5. Liquid dispersed in a solid result into Gel. Example : Jams, Jelly

6. (a) p-cresol  p-nitro phenol  phenol 

   Acidity order : p-nitrophenol > phenol > p-cresol

   (b) $CH_2 = CH_2 + H_3O^+ \rightarrow CH_3\overset{+}{C}H_2 + H_2O$

   Mechanism :

   $$CH_2 = CH_2 + H - \overset{+}{O}(H) - H \rightleftharpoons CH_3 - \overset{+}{C}H_2 + H_2O$$

Or

(a) $CH_3CH_2 - \underset{OH}{CH} - CH_3 + CrO_3 \rightarrow CH_3CH_2 - \underset{\underset{O}{\|}}{C} - CH_3$

(b) $CH_3CH_2\underset{OH}{CH} - CH_3 + SOCl_2 \rightarrow CH_3CH_2 - \underset{Cl}{CH} - CH_3 + SO_2 + HCl$

7. Moles of Al $= \frac{8.1}{27} = 0.3$

For fcc, 1 unit cell involves 4 Al atoms.

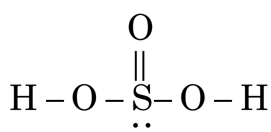
$\therefore$ Moles of unit cells $= \frac{0.3}{4}$

$\therefore$ Number of unit cells $= \frac{0.3}{4} \times N_A$

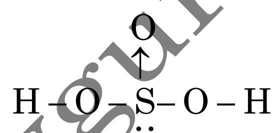
$$= \frac{0.3}{4} \times 6.022 \times 10^{23}$$

$$= 4.5 \times 10^{22}$$

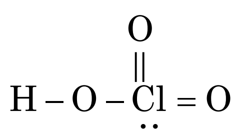
8. (a) H_2SO_3



or



(b) $HClO_3$



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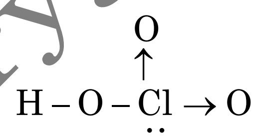


9. Button cell (or mercury cell) in used in hearing acids.

Cell reaction :

Anode : Zn (Hg) + $2OH^- \rightarrow$ ZnO(s) + H_2O + $2e^-$

Cathode : HgO (s) + H_2O + $2e^- \rightarrow$ Hg(l) + $2OH^-$

Net cell reaction : Zn(Hg) + HgO $\rightarrow$ ZnO(s) + Hg(l)

10. (a) Na [Al $(CN)_2$]

(b) [Pt $(NH_3)_4$ Cl (NO_2)]

11. (a) Silicon carbide – Network solid.

Argon – Molecular solid

(b) $ZnO \longrightarrow Zn^{2+} + \underset{\text{F - centre}}{2e^-} + {}^1/_2 O_2(g)$

On heating F-Centres are generated, which turns ZnO yellow.

(C) Compounds formed between group 12 elements and group 16 elements are called group 12-16 compounds.

Example : ZnS, ZnO, CdSe

12. (a) $\Delta G^o = -nFE^o_{Cell}$

$= -2 \times 96500 \times 0.236$ J

$= --455485 = -45.548$ kJ

(c) $Q = 0.5 \times 2 \times 3600$ C [using Q =It]

Q = 3600 C

$$\text{Number of electrons} = \frac{Q}{\text{Charge of } 1e^-}$$

$= 2.25\ 10^{22}$

13. (a) $[Co(NH_3)_5(SCN)]^{2+}$ shows linkage isomerism.

i.e., $[Co(NH_3)_5(NCS)]^{2+}$

(b) $[NiCl_4]^{2-}$: Due to weak ligand –Cl, 2 unpaired electrons are present,

hence paramagnetic

$[Ni[CN)_4]^{2-}$: Due to strong ligand –CN ; No unpaired electron present ; hence diamagnetic.

(c) In tetrahedral complex, sp^3 hybridization should present with 4 ligand. For low spin complex ligands should be strong, which cause pairing of electrons and geometry in general change to square planar [due to dsp^2 hybridization].

14. (a) Multimolecular colloid : Many molecule join together to form a cluster of colloidal particle range.

Associated colloid : Upto a certain concentration it is true solution ; above this concentration it is colloidal solution.

(b)

Coagulation. Precipitation of dispersed phase paticles from dispersion medium is coagulation.	**Peptization.** Conversion of freshly precipitated solid into colloidal solution by adding an electrolyte in peptization.

(c)

Homogeneous catalyst	**Hetrogeneous Catalyst**
The catalyst and reactants are in some phase. $H_2SO_{2(g)} + O_{2(g)} \xrightarrow{NO(g)} SO_{3(g)}$	The catalyst and reactants are in different phase $CH_2 = CH_{2(g)} + H_{2(g)} \xrightarrow{Ni(s)} CH_3CH_3$

Or

(a) Milk : Dispersed phase = oil

Dispersion medium = water

(b)

(c) By peptization,

$$Fe(OH)_3 + Fe^{3+}_{(aq)} \rightleftharpoons \underset{\text{collidal solution}}{[Fe(OH)_3]Fe^{3+}}$$

15. For I order :

$$k = \frac{2.303}{t}\log\frac{[A_o]}{[A]}$$

$$k = \frac{2.303}{20}\log\left(\frac{100}{75}\right) \quad [25\% \text{ completed}]$$

$$k = \frac{2.303}{t}\log\frac{100}{25} \quad [75\% \text{ completed}]$$

$$\frac{1}{20}\log {}^4/_3 = \frac{1}{t}\log {}^4/_1$$

$$t = 20\frac{\log 4}{\log({}^4/_3)} = 92.3 \text{ min}$$

16. (a) Most reactive for S_N2 : 1 Bromopentane

$$CH_3CH_2CH_2CH_2CH_2Br$$

[Due to minimum steric hindrance]

(b) optically active : 2-Bromo pentane

$$CH_3CH_3CH_2(Br)\ CH_3$$

(c) Most reactive for β elimination : 2 bromo 2 methyl butane

$$CH_3CH_2CH_2-\underset{\underset{CH_3}{|}}{C(Br)}-CH_3$$

[Due to bulkyness or 3^o alkyl halide].

17. **(a) Zone Refinig :** this method is based upon difference in solubilities of impurities in molten and solid state. Impurities are more soluble in molten state.

(b) Froth Floatation process : It is based upon difference in wetting tendencies of ore and gauge particles.

The ore which are concentrated in this method, are hydrophobic while gaunge particles hydrophilic.

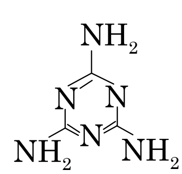
(c) Chromatography : The basic principle is different compounds of a mixture travel at different speeds through the stationary phase.

18. (a) $CH_3COOH + NH_3 + \Delta \rightarrow \underset{(A)}{CH_3CONH_2}$

$$CH_3CONH_2 + Br_2 + KOH_{(aq)} \rightarrow \underset{(B)}{CH_3NH_2} \xrightarrow{CHCl_3/KOH\ alc.} \underset{(C)}{CH_3NC}$$

(b) $\underset{A}{C_6H_5N_2^+\ BF_4^-} \xrightarrow[\Delta]{NaNO_2} \underset{B}{C_6H_5NO_2}$

19. (a) Nylon 6, 6 : Monomer = Hexamethylene diamine & Adipic Acid

(b) Melamine – formaldehyde = Melamine and HCHO 

(c) Buna-S : 1, 3 butadiene and Styrene

20.

21. (a) Red phosphorus has polymeric chain structure.

For chemical reaction ; this chain structure has to be broken, which requires more energy.

Hence, Red phosphorus is less reactive.

(b) Halegens are small size atoms with high effective nuclear charge.

Therefore their electron gain enthalpy is largely negative.

(c) N_2O_5 has higher oxygen content than N_2O_3. This more oxygen of N_2O_5 increases it oxidation number as well as its acidity.

22. (a) $C_6H_5NH_2$: $-NH_2$ is strong activity group for EAS reactions.

$C_6H_5NH_2 + (CH_3CO)_2O \rightarrow C_6H_5NHCOCH_3 + CH_3COOH$

$C_6H_5NHCOCH_3$: $-NHCOCH_3$ is weak activity group for EAS.

It can be explained with delocalization of N lone pair of electron is shared with benzene ring and $-\overset{\overset{O}{\|}}{C}-CH_3$

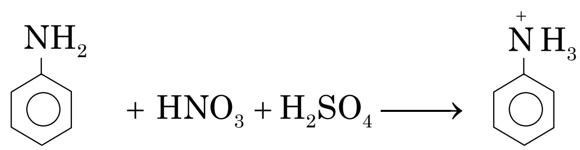
$$C_6H_5-\ddot{N}H-\overset{\overset{O}{\|}}{C}-CH_3 \leftrightarrow C_6H_5-\overset{+}{N}H=\overset{\overset{O^-}{|}}{C}-CH_3$$

(b) $CH_3\ddot{N}H_2$: electron density over $-N$ atom is increased due to + I effect of $-CH_3$

$C_6H_5-\ddot{N}H_2$: electron density over N atom is decreased due to delocalization is benzene ring.

Hence, $CH_3\,NH_2$ more basic than $C_6H_5NH_2$.

(c) In strong acidic medium, aniline is protonated.



$-\overset{+}{N}H_3$ is deactivating, –R group which forms m-nitro aniline on nitration.

23. (a) (i) Rupali shows concern for health of not only her self but also of other students.

(ii) She took courage to discuss to discuss the same health issues with right authority.

(b) Starch

(c) (i) β-sheet structure (ii) α -helex structure

(d) water soluble vitamins : C and B-complex.

24. (a) (i) Transitions metals have electrons in s-orbital and d-orbitals both. Therefore they can show variable oxidation state due to different combination of electrons [eithers or both] in chemical bond formation.

(ii) Zn, Cd, Hg have d^{10} configuration. Due to this metallic bonds are weaker.

(iii) $Mn^{3+} + e^- \rightarrow Mn^{2+}$ $E^o = 1.57$ V

Mn^{3+} = [Ag] $3d^4$

Mn^{2+} = [Ag] $3d^5$ Holf filled sub-shell hence more stable.

Therefore, $E^o_{Mn^{3+}/Mn^{2+}}$ is highly positive.

$Cr^{3+} + e^- \rightarrow Cr^{2+}$

Cr^{3+} = [Ar] $3d^3$

Cr^{2+} = [Ar] $3d^4$

Cr^{2+} = [Ar] $3d^4$

Name of Cr^{3+} or Cr^{2+} is stable electronic configuration. Therefore $E^o_{Cr^{3+}/Cr^{2+}}$ is so positive.

(b)

Lanthanides	**Actinides**
Similarity : Both show variable oxidation state, but +3 is most common oxidation state Disimilarity : Not Radioactive	Radioactive elements

Or

(a) Ti^{4+} = [Ar]

V^{2+} = [Ar] $3d^3$

Mn^{3+} = [Ar] $3d^4$

Cr^{3+} = [Ar] $3d^3$

(i) Ti^{4+} is most stable in aqueous solution due to high hydration energy.

(ii) Mn^{3+} is strong oxidizing agent.

(iii) Ti^{4+} is colourless ; no unpaired electron

(b) (i) $2MnO_4^- + 5S^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 5S + 8H_2O$

(ii) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

25. (a) For sucrose solution

$$\Delta T_f = i\ k_f\ m = i\ k_f \frac{w_B \times 1000}{m_B \times w_A}$$

$$\Delta T_f = 273.15 - 269.15 = 4k$$

$$i = 1$$

$$4 = 1 \times k_f \frac{10 \times 1000}{342 \times 90} \qquad \text{(i)}$$

for 10% solution, $w_B = 10$ gm, $w_A = 90$ g,

For glucose solution,

$$\Delta T_f = 1 \times k_f \times \frac{10 \times 1000}{180 \times 90} \qquad \text{(ii)}$$

Eq (ii) and (i)

$$\frac{\Delta T_f}{4} = \frac{342}{180} \Rightarrow \Delta T_f = 7.6\,k$$

Freezing point = 265.55 k

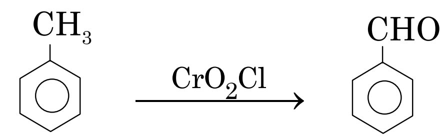
(b) (i) Molality (m) = moles of solute dissolved per kg of solvent.

(ii) Abnormal Molecular Mass : It is molecular mass calculate using colligative property but solute undergoes either association or dissociation.

Or

Or

26. (a) (i) Etard Reaction

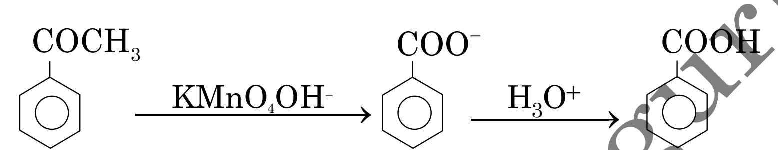


(ii) Stephen reduction.

$$RCN \xrightarrow[\text{(ii) } H_2O/H^+]{\text{(i) } SnCl_2 \text{ anhy} + HCl \text{ conc.}} RCHO$$

(b) (i)

(ii)



(iii)

$$CH_3COOH \xrightarrow{P_4/Cl_2} \underset{\displaystyle |\atop Cl}{CH_2} - COOH \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) aq.KOH}} \underset{\displaystyle |\atop OH}{CH_2} - COOH$$