

Question Paper Comp. Delhi 2017 set 1
CBSE Class 12 CHEMISTRY

General Instructions :

- All questions are compulsory.
- Questions number 1 to 5 are very short-answer questions and carry 1 mark each.
- Questions number 6 to 10 are short answer questions and carry 2 marks each.
- Questions number 11 to 22 are also short answer questions and carry 3 marks each.
- Question number 23 is a value based question and carry 4 marks.
- Questions number 24 to 26 are long-answer questions and carry 5 marks each.
- Use log tables, if necessary. Use of calculators is not allowed.

1. A metallic element crystallises into a lattice having a pattern of AB AB..... and packing of spheres leaves out voids in the lattice. What type of structure is formed by this arrangement ?

Ans. hcp

2. Which of the following is most effective in coagulating negatively charged hydrated ferric oxide sol ?

(i) NaNO_3

(ii) MgSO_4

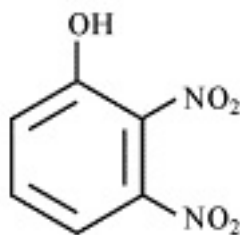
(iii) AlCl_3

Ans. $\text{AlCl}_3/\text{Al}^{3+}$

3. Why are low spin tetrahedral complexes not formed ?

Ans. Orbital splitting energies are not sufficiently large for forcing pairing

4. Write IUPAC name of the following compound :



Ans. 2,3-dinitro phenol

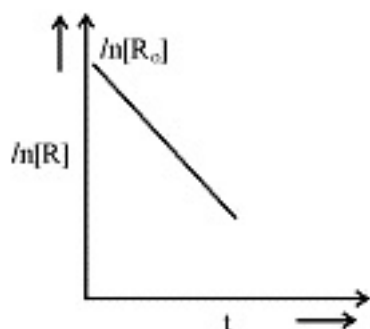
5. What type of aldehydes undergo cannizaro reaction ?

Ans. Having no α -hydrogen

6. Explain why on addition of 1 mol of glucose to 1 litre of water, the boiling point of water increases.

Ans. Vapour pressure of the solvent decreases in the presence of non – volatile solute (glucose) hence boiling point increases

7. For a chemical reaction $R \rightarrow P$, variation in $\ln [R]$ vs time (t) plot is given below :



For this reaction :

(i) Predict the order of reaction

(ii) What is the unit of rate constant (k)?

Ans. (i) First order

(ii) s^{-1} / time $^{-1}$

8. "Orthophosphoric acid (H_3PO_4) is non-reducing whereas hypophosphorus acid (H_3PO_2) is a strong reducing agent." Explain and justify the above statement with suitable example.

OR

(a) What is the covalence of nitrogen in N_2O_5 ?

(b) BiH_3 is a stronger reducing agent than SbH_3 , why?

Ans. a) 4

b) Due to lower bond dissociation enthalpy of BiH_3 as compared to SbH_3

9. Account for the following:

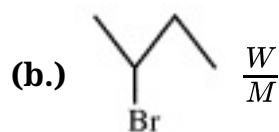
(i) The two oxygen-oxygen bond lengths in ozone molecule are identical.

(ii) Most of the reactions of fluorine are exothermic.

Ans. i. Due to resonance the two O-O bond lengths are identical.

ii. Due to strong bond formed by it with other elements

10. Which alkyl halide from the following pair is (i) Chiral and (ii) undergoes $\text{S}_\text{N}2$ reaction faster?



Ans. i) (b) is chiral

ii) (a) will undergo $\text{S}_\text{N}2$ reaction faster

11. An element crystallises in b.c.c. lattice with cell edge of 400 pm. Calculate its density if 500 g of this element contains 2.5×10^{24} atoms.

Ans. In bcc, $z=2$;

$$d = (zxM) / a^3 \times N_A \text{ (i)}$$

$$\text{No. of atoms} = \times N_A$$

$$2.5 \times 10^{24} = \frac{500g}{M} \times N_A$$

$$M = [500 \times N_A] / 2.5 \times 10^{24} \text{ (ii)}$$

Putting values of M in equation (i)

$$d = 2 \times 500 \text{ g} \times N_A / [2.5 \times 10^{24} \text{ atoms} \times (400 \times 10^{-10} \text{ cm})^3 \times N_A]$$

$$d = 6.25 \text{ g/cm}^3$$

12. The vapour pressure of pure liquids A and B at 400 K are 450 and 700 mmHg respectively. Find out the composition of liquid mixture if total vapour pressure at this temperature is 600 mmHg.

$$\text{Ans. } p_{\text{total}} = p_1^0 + (p_2^0 - p_1^0) x_2$$

$$600 = 450 + (700 - 450) x_2$$

$$x_2 = 0.6$$

$$x_2 = 1 - 0.6 = 0.4$$

13. The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume :

Experiment	Time (s)	Total pressure (atm)
1	0	0.4
2	100	0.7

Calculate the rate constant (k)

[Given : $\log 2 = 0.3010$; $\log 4 = 0.6021$]

$$\text{Ans. } P_A = 2P_0 - P_t$$

$$= (2 \times 0.4) - 0.7 = 0.1$$

$$k = \frac{2.303}{t} \log P_o/P_A$$

$$k = \frac{2.303}{100} \log 0.4/0.1$$

$$k = \frac{2.303}{100} \times 0.6021$$

$$= 1.39 \times 10^{-2} \text{ s}^{-1}$$

14. Define the following terms:

(i) Desorption

(ii) Critical micelle concentration

(iii) Shape selective catalysis

Ans. i) The process of removing an adsorbed substance from a surface on which it is adsorbed.

ii) The formation of micelles takes place only above a particular concentration called CMC.

iii) The catalytic reaction that depends upon the pore structure of the catalyst and size of the reactant and product molecules

15. (a) Write the principle involved in the ‘vapour phase refining’ of metals.

(b) Write the name of the metal refined by each of the following processes:

(i) Mond process

(ii) van Arkel method

(c) What is the role of depressant in froth floatation process ?

Ans. a) The metal is converted into its volatile compound and collected elsewhere. It is then decomposed to get the pure metal.

b) i) Ni ii) Ti/Zr

c) It is used to separate two sulphide ores by preventing one to form froth

16. (a) Arrange the hydrides of group 16 in increasing order of their acidic character.

Justify your answer. (3)

(b) Draw structure of XeOF₄.

OR

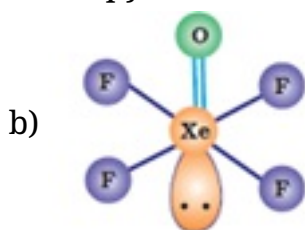
(a) Account for the following:

(i) PCl_5 is more covalent than PCl_3 .

(ii) Iron on reaction with HCl forms FeCl_2 and not FeCl_3 .

(b) Draw structure of XeO_3 .

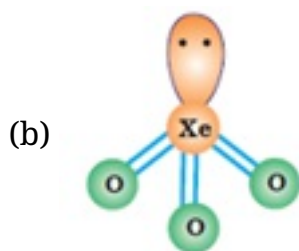
Ans. a) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$, because of decrease in bond dissociation enthalpy.



OR

a) i) Due to higher oxidation state of P in PCl_5

ii) Liberation of hydrogen prevents the formation of FeCl_3



17. For the complex ion $[\text{CoF}_6]^{3-}$ write the hybridization type, magnetic character and spin nature.

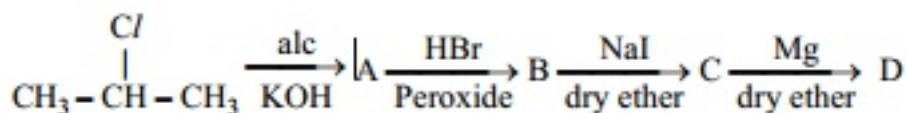
[Atomic number : Co = 27]

Ans. Hybridisation : sp^3d^2

Magnetic character : Paramagnetic

Spin nature: High spin

18. (a) Write the structural formula of A, B, C and D in the following sequence of reaction :



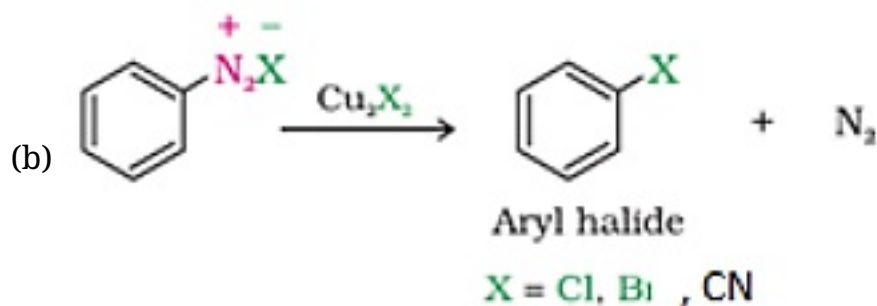
(b) Illustrate Sandmeyer's reaction with the help of a suitable example.

Ans. a) A: $\text{CH}_3 - \text{CH} = \text{CH}_2$

B: $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{Br}$

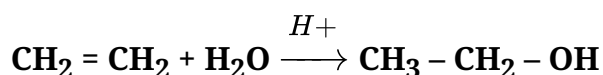
C: $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{I}$

D: $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{MgI}$



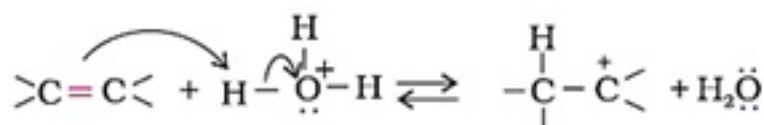
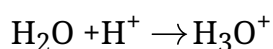
19. (a) What happens when $\text{CH}_3 - \text{O} - \text{CH}_3$ is heated with HI?

(b) Explain mechanism for hydration of acid catalyzed ethene :

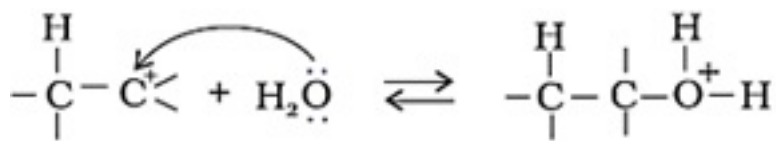


Ans. a) $\text{CH}_3 - \text{O} - \text{CH}_3 + \text{HI} \rightarrow \text{CH}_3 - \text{OH} + \text{CH}_3 - \text{I}$

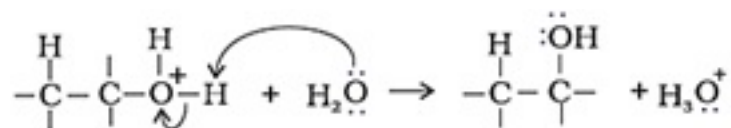
Protonation of alkene to form carbocation by electrophilic attack of H_3O^+



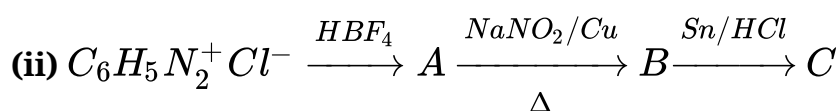
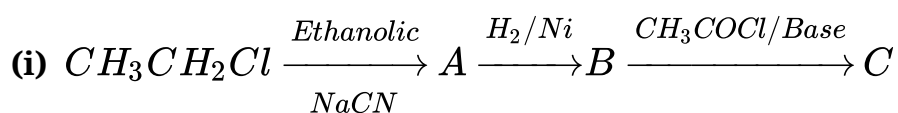
Nucleophilic attack of water on carbocation.



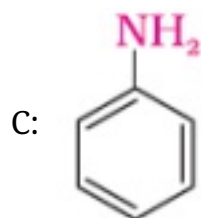
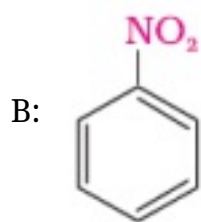
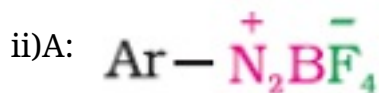
Deprotonation to form an alcohol



20. Identify A, B and C in the following reactions :



Ans. i) A: $\text{CH}_3\text{-CH}_2\text{CN}$; B: $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{NH}_2$; C: $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-NH-COCH}_3$



21. (a) What type of linkage is present in disaccharides ?

(b) Write one source and deficiency disease of vitamin B₁₂.

(c) Write the difference between DNA and RNA.

Ans. a) Glycosidic linkage

b) Source : Meat, Fish, egg, curd (any one) ; Pernicious anaemia

c) DNA is double strand while RNA is single strand molecule (or any other correct difference)

22. Write the therapeutic action of following on human body and mention the class of drugs to which each of these belong:

(i) Ranitidine

(ii) Morphine

(iii) Aspirin

Ans. i) Treatment of hyperacidity

Class : Antacids

ii) Relieve pain and produce sleep

Class: Narcotic analgesics

iii) Relieve pain and reduce fever

Class: Non- Narcotic analgesics / Analgesics

23. Once there was a heavy downpour for about three hours in the early morning. Irfan and his family were finding it difficult to carry out their morning chores as the sewer water was flowing back into the toilets, the road outside was flooded with water and they could not move out. On this serious problem, Irfan called a meeting of the residents and said that we are using too much polythene bags and other plastic items which we throw here and there, which finally move into the drains and sewer lines which get choked. As these are non-biodegradable, they remain as such for long time. So we should use bags made up of cloth and jute who are biodegradable.

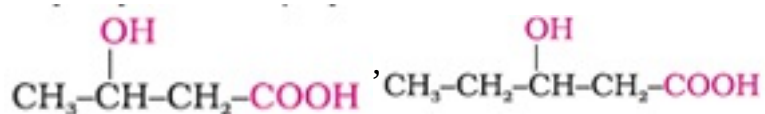
After reading the above passage, answer the following questions:

(i) Name a polymer which is biodegradable. Write the structures of its monomers and the repeating unit.

(ii) Write two uses of this polymer.

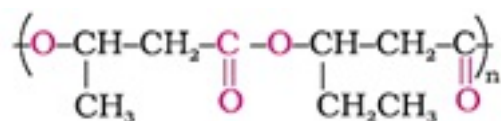
(iii) Write any two values shown by Irfan

Ans. a) Poly β -hydroxybutyrate – co- β -hydroxy valerate / (PHBV)



Monomers:

Repeating unit:

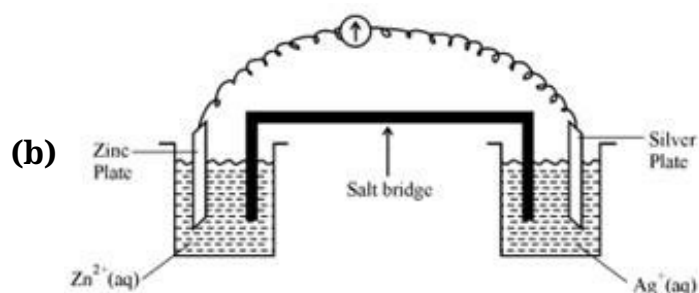


b) PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs.(any two)

c) Concern for environment , caring (or any other)

24. (a) When a bright silver object is placed in the solution of gold chloride, it acquires a golden tinge but nothing happens when it is placed in a solution of copper chloride. Explain this behavior of silver.

[Given : $E_{\text{Cu}^{2+}/\text{Cu}}^O = + 0.34 \text{ V}$; $E_{\text{Ag}^+/\text{Ag}}^O = + 0.80 \text{ V}$, $E_{\text{Au}^{3+}/\text{Au}}^O = + 1.40 \text{ V}$]



Consider the figure given above and answer the following questions :

(i) What is the direction of flow of electrons?

(ii) Which is anode and which is cathode?

(iii) What will happen if the salt bridge is removed?

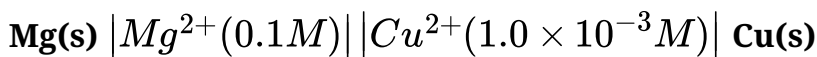
(iv) How will concentration of Zn^{2+} and Ag^+ ions be affected when the cell functions ?

(v) How will concentration of these ions be affected when the cell becomes dead ?

OR

(a) What is limiting molar conductivity ? Why there is steep rise in the molar conductivity of weak electrolyte on dilution?

(b) Calculate the emf of the following cell at 298 K :



[Given = $E_{\text{cell}}^{\circ} = 2.71 \text{ V}$]

Ans. a) E° value of silver is lower than that of gold, hence silver displaces gold which gets deposited on the silver object.

E° value of copper is lower than that of silver, hence silver cannot displace copper from its solution.

b) i) Electrons flow from Zn to Ag plate.

ii) Zn as anode and Ag acts as cathode

iii) Cell will stop functioning

iv) Concentration of Zn^{2+} ions will increase and that of Ag^{+} ions will decrease.

v) No change

OR

a) When concentration approaches zero, the molar conductivity is known as limiting molar conductivity

The change in Λ_m with dilution is due to the increase in the degree of dissociation and consequently the number of ions in the total volume of the solution that contains 1 mol of electrolyte, hence Λ_m increases steeply.

$$\begin{aligned} \text{b) } E_{\text{cell}} &= E_{\text{cell}}^{\circ} - \frac{0.059}{n} \log \log \frac{[\text{Mg}^{2+}]}{[\text{Cu}^{2+}]} \\ &= 2.71 \text{ V} - \frac{0.059}{2} \log \frac{0.1}{0.001} = 2.71 \text{ V} - \frac{0.059}{2} \log \frac{0.1}{0.001} \\ &= 2.71 \text{ V} - \frac{0.059}{2} \log 10^2 \end{aligned}$$

= 2.651 V

25. When chromite ore is fused with sodium carbonate in free excess of air and the product is dissolved in water, a yellow solution of compound (A) is obtained. On acidifying the yellow solution with sulphuric acid, compound (B) is crystallised out. When compound (B) is treated with KCl, orange crystals of compound (C) crystallise out. Identify (A), (B) and (C) and write the reactions involved.

OR

(a) (i) Which transition element in 3d series has positive $E_{M^{2+}/M}^o$ value and why ?

(ii) Name a member of lanthanoid series which is well known to exhibit +4 oxidation state and why?

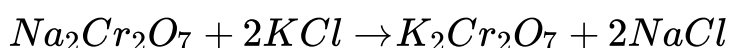
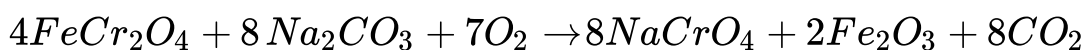
(b) Account for the following:

(i) The highest oxidation state is exhibited in oxoanions of transition metals.

(ii) HCl is not used to acidify KMnO_4 solution.

(iii) Transition metals have high enthalpy of atomisation.

Ans. a) A: Na_2CrO_4 ; B: $\text{Na}_2\text{Cr}_2\text{O}_7$; C : $\text{K}_2\text{Cr}_2\text{O}_7$



OR

a) i) Copper; It has a high energy of atomization and low hydration energy. Hence, the $E_0(\text{M}^{2+}/\text{M})$ value for copper is positive.

ii) Cerium ; Due to stable $4f^0$ configuration / Tb ; Due to stable $4f^7$ configuration

b) i) Due to ability of oxygen to form multiple bonds to metal

ii) HCl is oxidized to chlorine

iii) Due to strong interatomic metallic bonding.

26.(a) How will you convert:

(i) Benzene to acetophenone

(ii) Propanone to 2-Methylpropan-2-ol

(b) Give reasons :

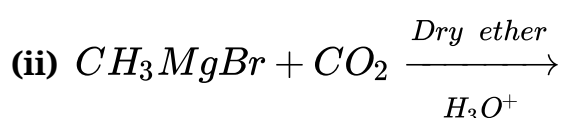
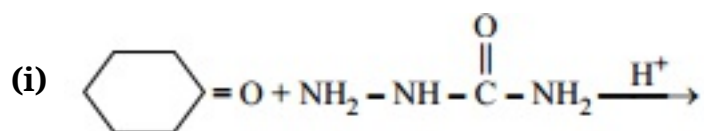
(i) Electrophilic substitution in benzoic acid takes place at meta position.

(ii) Carboxylic acids are higher boiling liquids than aldehydes, ketones and alcohols of comparable molecular masses.

(iii) Propanal is more reactive than propanone in nucleophilic addition reactions.

OR

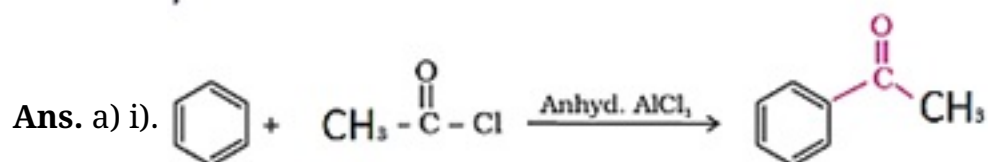
(a) Write the products of the following reactions:



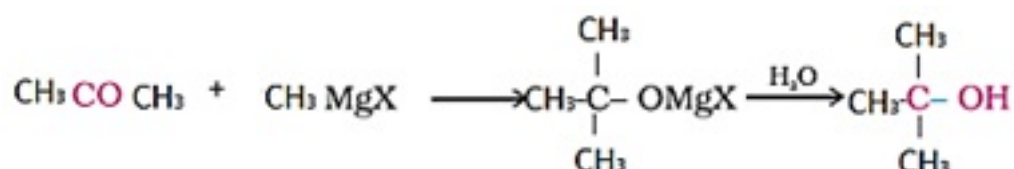
(b) Write simple chemical tests to distinguish between the following pairs of compounds.

(i) Propanal and propanone

(ii) Benzaldehyde and Benzoic acid



ii)

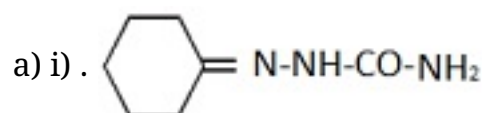


b) i) Because it is a deactivating group / Due to electron withdrawing carboxylic group resulting in decreased electron density at o- and p- position.

ii) Due to extensive association of carboxylic acid molecules through intermolecular hydrogen bonding.

iii) Due to steric and + I effect of two methyl groups in propanone

OR



ii) CH_3COOH

iii) $\text{CH}_3\text{-CH(Br)-COOH}$

b) i) Add ammoniacal solution of silver nitrate / Tollen's reagent to both the compounds, propanal will give silver mirror while propanone does not.

ii) Add NaHCO_3 solution to both the compounds, benzoic acid will give effervescence and liberate CO_2 while benzaldehyde will not. (Or any other suitable test)