

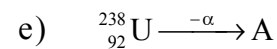
2020
CHEMISTRY
[HONOURS]
Paper : V

Full Marks : 50

Time : 2 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **five** questions: 2×5=10
- a) "Hydrogen molecules remain in two forms"
— Explain with evidence.
- b) Calculate the average life of ${}^{99}_{\text{Tc}}$ whose half life is 6h.
- c) Borax is converted into B by steps:
- $$\text{Borax} \xrightarrow{\text{I}} \text{H}_3\text{BO}_3 \xrightarrow{\Delta} \text{B}_2\text{O}_3 \xrightarrow{\text{II}} \text{B}$$
- Identify I & II and write down the reaction occurred in the third step.
- d) Aluminium forms $[\text{AlF}_6]^{3-}$ whereas $[\text{BF}_6]^{3-}$ is not known. Why?

[Turn over]

— identify A and mention in which group 'A' will be placed.

(Given: ${}_{92}^{238}\text{U}$ – III B)

- f) What happens when a mixture of KCl and $\text{K}_2\text{Cr}_2\text{O}_7$ is heated with conc. H_2SO_4 ?
- g) Ge(II) compounds are reducing agents while Pb(IV) compounds are oxidizing agents.
— Clarify.
- h) Oxides of alkaline earth metals are more stable than carbonate salts— Explain why.
2. Answer any **four** questions: 5×4=20
- a) i) Predict and explain the colour and conductance of the dilute solutions of alkali metals in liquid ammonia.
- ii) Give evidence in favour of in-equivalency of S-atoms in $\text{S}_2\text{O}_3^{2-}$ ion. 3+2
- b) i) Define magic number and mention them.
- ii) The amount of ${}^{14}_6\text{C}$ isotope in a piece of aged wood is found to be one-sixth

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of that present in a fresh piece of wood. Calculate the age of the wood.
[Half life of $^{14}_6\text{C} = 5577$ yr.] 2+3

c) i) SnCl_2 is reducing but PbCl_2 is neither reducing nor oxidising— Explain.

ii) Arrange in order of increasing Lewis acidity with reasons:



iii) What is CFC? 2+2+1

d) i) Discuss the effect of H-bonding on the structure of ice.

ii) Aqueous solution of BaCl_2 is acidic while that of CaCl_2 is neutral. Explain. 3+2

e) i) Why interhalogen compounds contain even number of halogen atoms?

ii) Why is bond angle in OF_2 smaller than in OCl_2 ? $2\frac{1}{2}+2\frac{1}{2}$

f) i) Why iodine shows more basic property among the halogens?

ii) SO_2 can act as a reducing agent or oxidising agent while SO_3 can act only as an oxidising agent. Why? 2+3

g) i) An aqueous solution of borax is alkaline in nature. Explain with reaction.

ii) Which of the following is not hydrolyzed and why?

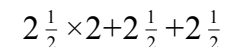


3. Answer any **two** questions: $10 \times 2 = 20$

a) i) Arrive the shapes of XeO_2F_2 and BrF_4^- using USEPR method. Show the details of electron count and hybridization.

ii) Arrange the halogens in order of their increasing oxidising power with explanation.

iii) Give a brief explanatory note on polythiazyl compounds.

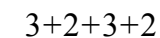


b) i) Write a short note on oxo-acids of phosphorus.

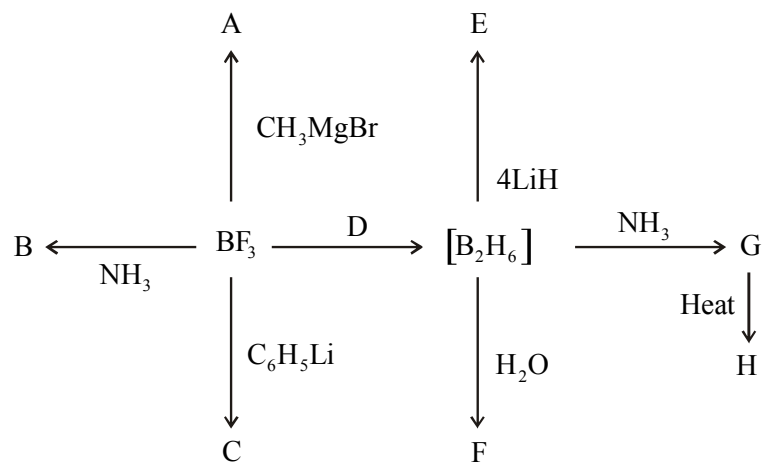
ii) Iodine is less soluble in water but solubility increases in presence of KI.

iii) Why are interhalogen compounds more reactive than halogens? Explain with examples.

iv) How will you prepare I_2O_5 ?



- c) i) State the radioactive decay law and discuss the physical significance of "decay constant". Derive the expression for half life of a radioelement from the decay law.
- ii) Mass of ${}^7_3\text{Li}$, ${}^6_3\text{Li}$ and ${}^1_0\text{n}$ are 7.016, 6.0151 and 1.0087 a.m.u. respectively. Calculate the binding energy per nucleon of ${}^7_3\text{Li}$ in MeV.
(1 amu = 931 MeV)
- iii) Calculate the number of α - and β -particles emitted when ${}^{238}_{92}\text{U}$ changes into ${}^{206}_{82}\text{Pb}$.
- iv) Define Nuclear Fission. 4+2+2+2
- d) i) Identify A, B, C, D, E, F, G & H.



- ii) What are fullerenes? Are they aromatic?
8+2
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