B.Sc. 3rd Semester (Honours) Examination, 2019-20

CHEMISTRY

Course ID : 31412 **Course Code : SHCHE/302/C-6**

Course Title : Inorganic Chemistry II

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions: 1×5=5

(a) Which among NaCl and CsCl has higher value of Madelung constant?

(b) What type of semiconductor CuO is?

(c) Give example of a species having δ-bond.

(d) What is the hybridisation of S atom in $SOCl_2$?

(e) Which is polar among CO_2 and SO_2 and why?

(f) Find the missing element in the reaction : ${}^{27}_{13}Al + {}^{4}_{2}He = \cdots + {}^{1}_{0}n$.

(g) Why is ${}_{82}Pb^{208}$ nucleus so stable?

(h) Cite one example of a radioactive isotope used in medicine.

2. Answer *any two* questions: 5×2=10

(a) (i) The dipole moment of HF is 2·00D and bond length is 0·92Å. Calculate the percentage of ionic character in HF.

(ii) Calculate the ideal $\frac{r+}{r-}$ for an octahedral arrangement of anions around a cation. 2+3=5

(b) (i) Sketch the most likely structure of PCl_2F_3 and explain your reasoning.

(ii) Discuss the main features of nuclear binding energy curve. 2+3=5

(c) (i) Distinguish between a metallic conductor and a semiconductor on the basis of band theory.

(ii) Draw the M.O. diagram of NO molecule and give its bond order. 2+3=5

(d) (i) What are equivalent and non-equivalent hybrid orbitals?

(ii) How will you prove the non-equivalent nature of the two S atoms in $Na_2S_2O_3$ using radioactive tracer technique? 2+3=5

3. Answer *any one* question: 10×1=10

(a) (i) Why ZnO is yellow when hot and white when cold?

(ii) Compare the bond angle of H_2O with that of OF_2.

(iii) State and explain Fajans' rules.

(iv) An old piece of wood sample kept in a museum has a decay rate which is 30% of the decay shown by an equal mass of a new piece of wood. Find the age of the wood sample. Given $t_{\frac{1}{2}}$ of $C^{14} = 5740\ y$. 2+2+3+3=10

(b) (i) $KHCl_2$ is unknown but KHF_2 is known — justify.

(ii) Compare the magnetism of N_2 and O_2 molecules using MOT.

(iii) Explain nuclear spallation with example. How does it differ from nuclear fission?

(iv) What is Born Haber Cycle? Depict Born Haber Cycle for the formation of $NH_4Cl(s)$ from $NH_3(g)$ and HCl(g). 2+2+3+3=10

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