SH-III/Chemistry-302C-6(T)/19

B. Sc. Semester III (Honours) Examination, 2018-2019

CHEMISTRY

Course ID : 31412 **Course Code : SHCHE-302C-6(T)**

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) Write down the Born-Lande' equation.

(b) What is the formal charge of the central oxygen atom in O_3?

(c) Give one example of a compound where intramolecular hydrogen bond is present.

(d) State the hybridisation of sulphur atom in SF_4.

(e) I_2 forms I_3^- with I^-ion. Name the type of weak interaction involved in it.

(f) Which among NH_3 and NF_3 has higher dipole moment?

(g) Find the missing element $^{14}_{7}N + ^{4}_{2}He \rightarrow ... + ^{1}_{1}H$.

(h) Give one example of a "*n*"-type semiconductor.

2. Answer *any two* questions: 5×2=10

(a) (i) Applying radius ratio rule find out critical radius ratio for a CsCl type of lattice.

(ii) Why does metallic beryllium conduct electricity despite absence of unpaired electrons in its atom? Expalin on the basis of Band theory. 3+2=5

(b) (i) Compare Schottky defect with Frenkel defect.

(ii) The equatorial $\angle FSF$ angle is 101° in SF_4 while that in SOF_4 is 115°— Explain using Bent's rule. 2+3=5

(c) (i) Sketch a qualitative MO energy-level diagram of H_2O.

(ii) Predict the shapes of NF_3, ClF_3 and $POCl_3$ using VSEPR theory. 2+3=5

(d) (i) A helium atom is highter than the total mass of its constituent particles.-Explain.

(ii) Dissociation energy of O_2 is less than that of O_2^+ but dissociation energy of N_2 is greater than that of N_2^+— explain using MOT. 2+3=5

3. Answer *any one* question: 10×1=10

(a) (i) Which one is more covalent and why? CuCl or NaCl.

(ii) Which one has higher boiling point among $SnCl_2$ and $SnCl_4$? — Explain.

(iii) The solubility of salts in water can be rationalised by considering lattice and hydration enthalpies. Justify the statement with suitable examples.

(iv) The final product of U-238 is Pb-206. A sample of pitch blende contains 0·0453gm Pb-206 for each gram of U–238 present in it. Assuming that pitch blende is formed at the time of formation of earth and did not contain any Pb-206, calculate the age of earth. (Given that $t_{1/2}$ of U-238 is $4{\cdot}5\times10^9$ years.) 2+2+3+3=10

(b) (i) Draw the molecular orbital diagram for HF molecule. Find the number of non-bonding electrons.

(ii) 'The NaCl crystal being heated with sodium vapour becomes yellow'— Give reason.

(iii) Distinguish between nuclear fission and nuclear fusion.

(iv) Represent the Born-Haber cycle of NaI and calculate the electron affinity of iodine from the following data given in kJ mol^{-1}:

$$\Delta H_{f(NaI)} = -289, \Delta H_{sub(Na)} = 108{\cdot}8, \Delta H_{diss(I_2)} = 214{\cdot}2, \Delta H_{IE(Na)} = 497{\cdot}3, U_{NaI} = -694{\cdot}7 .$$

2+2+3+3=10

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