বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2020

(Under CBCS Pattern)

Semester - III

Subject: CHEMISTRY

Paper : C 6-T & C 6-P

(Inorganic Chemistry)

Full Marks : 60 (Theory-40 + Practical-20)

Time : 3 Hours

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

[THEORY]

Answer any ***two*** questions : $2 \times 20 = 40$

1. (a) What is lattice energy ? What does the –ve sign of lattice energy mean ?

   (b) The bond angle of NH_3 is 107°48| but that of PH_3 is 93.8° – Why ?

   (c) Define specific activity of radioactive elements.

   (d) Draw the structures of XeF_3^+ and ICl_2^- using VBT.

   (e) What is spallation reaction ?

   (f) Apply Bent's rule to explain the structure of OSF_4.

   (g) How does the even and odd numbers of protons and neutrons effect the nuclear stability of an atom ?

   (h) What is meant by artificial radioactivity ? **2½×8=20**

2. (i) (a) Define bonding and antibonding molecular orbital.

(b) With the help of Born Haber cycle discuss various steps to obtain a relation for lattice energy of MgO. **4 + 5**

(ii) (a) ^{24}Na has $t_{1/2}$ =15 hrs. If there are 800 gm of ^{24}Na initially, how long will it take for 750 gm of ^{24}Na to decay ? **5**

(b) Explain the magnetic property and ligating behaviour of CO molecule with the help of MO theory. **6**

3. (i) (a) What is the origin of the solar energy ?

(b) Dipole moment of HF molecule is 1.91D and value of H-F bond distance is 0.92 Å. Calculate the percentage of ionic character of H-F bond.

(c) Define packing fraction. **1½ + 2 + 1½**

(ii) (a) $MgCO_3$ is thermally less stable than $CaCO_3$– explain.

(b) Write down a short not on radiocarbon dating. **2 + 3**

(iii) (a) The tri-iodide ion, I_3^- is linear, but I_3^+ is bent – explain.

(b) Complex forming ability of group IIA metal changes as $Be^{2+} > Mg^{2+} > Ca^{2+} > Sr^{2+} > Ba^{2+} >$ – why ?

(c) What is mirror nuclei ? Give an example. **2 + 2 + 1**

(iv) (a) Write a short not on 'Ion Dipole Interaction'.

(b) Which molecule shows both Frenkel and Schottky defect ?

(c) Explain why $SnCl_4$ is volatile liquid, but $SnCl_2$ is solid. **2 + 1 + 1**

4. (i) (a) complete the following reaction.

i) $^{14}_{7}N + ^{1}_{0}n \longrightarrow ^{11}_{5}B + ?$

ii) $^{63}_{29}Cu + ^{2}_{1}H \longrightarrow ?$

(b) Compare the relative sability of N_2, N_2^+, N_2^- and N_2^{2-} based on MO theory.

(c) How does Aluminium change its hybridization in the following reaction ?

$$AICI_{3+}Cl^- \rightarrow AICI_4^-$$

(d) Calculate the binding energy per nucleon (in units of MeV) for ^9Be for which the atomic mass is 9.01219 amu.

Particles mass in amu is–

Proton = 1.007277

Neutron = 1.008665

Electron = 0.0005486 **2 + 3 + 2 + 3**

(ii) (a) Density of water is more than that of ice – explain.

(b) AgCl is white, but Agl is yellow – why ?

(c) Write the significance of average binding energy.

(d) What is cause of defect in a crystal ? **3 + 2 + 3 + 2**

Paper - C-6-P

(Inorganic Chemistry)

(Practical)

Discuss any ***one*** of the follwing in details : $1 \times 20 = 20$

1. Estimation of the amount of Fe and Fe_2O_3 present in Portland Cement. **20**

2. Estimation of Vitamin C. **20**

3. Estimation of available chlorine in bleaching powder. **20**