



বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2020

(Under CBCS Pattern)

Semester - V

Subject: CHEMISTRY

Paper: C11T & C11P

(Inorganic Chemistry - IV)

Full Marks : 60

Time : 3 Hours

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

The figures in the margin indicate full marks.

Group - A

THEORY (Marks : 40)

Answer any *two* from the following questions :

2×20

- (a) $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic—explain.
- (b) Simple Cu (I) salts are not stable in aqueous solutions—why?
- (c) What is meant by lanthanide contraction?

- (d) Chromium (II) acetate monohydrate is diamagnetic though it possesses d^4 electronic configuration — explain.
- (e) The spectrum of $[Ti(H_2O)_6]^{3+}$ is broad with a shoulder — why?
- (f) Draw a plot of $1/\chi_m$ vs Temperature (K) for materials which obey (i) Curie law (ii) Curie-Weiss law. χ_m = Magnetic susceptibility.
- (g) What do you mean by normal and inverse spinel? 3+3+3+3+3+3+2
2. (a) Write a short note on Nephelauxetic effect? 2
- (b) Electronic spectrum of $[V(H_2O)_6]^{3+}$ shows two peaks — explain using Orgel diagram. 3
- (c) Predict whether Co_3O_4 normal or inverse spinel. 5
- (d) Acidified $K_2Cr_2O_7$ solution turns green when sodium sulphite solution is added to it — explain. 2
- (e) The position of the halide ions in spectrochemical series is $I^- > Br^- > Cl^- > F^-$ — explain with the help of MO theory. 3
- (f) Fe^{3+}/Fe^{2+} redox couple has less positive electrode potential than Mn^{3+}/Mn^{2+} — give the reason. 5
3. (a) Give an example of antiferromagnetic substance. 2
- (b) Discuss about the Laporte selection rule and spin selection rule for electronic spectral transition. 3
- (c) Blue colour of turns bulls blue is less intense than that of Prussian blue — why? 3
- (d) What is spin state equilibrium? 3
- (e) Discuss the nature of John-Teller distortion for an octahedral $Mn(III)$ complex ion. 2
- (f) The second and third row transition elements have almost similar radii — explain. 4
- (g) Write down an example of reaction where $KMnO_4$ acts as an oxidising agent. 3

4. (a) Mn^{2+} (*aq.*) is faintly coloured whereas aqueous solution of MnO_4^- is highly coloured—explain.
- (b) Give two limitations of *CFT*.
- (c) $K_2Cr_2O_7$ is an oxidant in acidic medium but $KMnO_4$ is an oxidant in both acidic and alkaline medium—explain.
- (d) An octahedral Ni(II) complex or a tetrahedral Co(II) complex show magnetic moment higher than $\mu_{s.o}$ value—give the reason.
- (e) Write down main differences between lanthanides and actinides.
- (f) Mention the condition for orbital contribution to spin only magnetic moment value.
- (g) Briefly explain the principle of separation of lanthanides by ion exchange method.
- (h) Explain the formation of square planar complexes by showing crystal field splitting diagram.
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Group - B

PRACTICAL (Marks : 20)

Answer any **one** from the following questions : 1×20

1. Describe the method of estimation of Al(III) by precipitating with oxine and weighing as Al(oxine)₃ (aluminium oxinate).
 2. Discuss the separation procedure of Ni (II) and Co (II) applying paper chromatography.
 3. Discuss the measurement of 10 Dq by spectrophotometric method.
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