

B.Sc. Semester - 5 (CBCS) Examination
Oct/Nov - 2021 (NEW COURSE)
Inorganic and Industrial Chemistry (Core)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q. 1 (A) Answer the following question. (04)

- (1) Find out the degeneracy of a particle moving in a cubic box length at the energy level $E = 9h^2/8ma^2$.

Q.1 (B) Answer the following questions. (Any two) (10)

- (1) Discuss structure of $\text{Fe}_2(\text{CO})_9$.
- (2) Derive the normalized wave function for a particle moving in one dimensional box.
- (3) Discuss different types of CO groups in metal carbonyl.

Q. 2 (A) Answer the following question. (04)

- (1) Give classification of Fertilizers.

Q. 2 (B) Answer the following questions. (Any two) (10)

- (1) Explain Prilling method for the production of ammonium nitrate with process flow diagram.
- (2) Discuss different types of cement (any ten).
- (3) Discuss ISI specification of cement.

Q. 3 (A) Answer the following question. (04)

- (1) CFSE value of $[\text{Co}(\text{CN})_6]^{-3}$ is -26520 cm^{-1} and d orbital splitting energy is 34800 cm^{-1} . Find out pairing energy (P).

Q. 3 (B) Answer the following questions. (Any two) (10)

- (1) Prove that splitting of d-orbitals is approximately half and inverse in tetrahedral complexes as compared to octahedral complexes.
- (2) Discuss different types of glass (any ten).
- (3) Discuss dry process for hydrogenation of oils.

Q. 4 (A) Answer the following question. (04)

- (1) Draw the structure and write number of bridged and terminal CO group in $\text{Ru}_2(\text{CO})_9$ & $\text{Co}_4(\text{CO})_{12}$.

Q. 4 (B) Answer the following questions. (Any two) (10)

- (1) If $\text{Ir}_4(\text{CO})_{12}$ & $\text{Os}_4(\text{CO})_{16}$ follow 18 electron rule then find out number of M-M bonds.
- (2) Explain Sindri method for the production of Urea.
- (3) Discuss factors affecting the crystal field splitting energy.

Q. 5 (A) Answer the following question. (04)

- (1) Prove that $[\text{NiCl}_4]^{-2}$ is tetrahedral while $[\text{Ni}(\text{CN})_4]^{-2}$ is square planar.

Q. 5 (B) Answer the following questions. (Any two) (10)

- (1) Explain normalization & orthogonality of wave function of the particle in one dimensional box.
- (2) Discuss properties of cement.
- (3) Explain Saponification value.
