B.Sc



# 2024

## CHEMISTRY — HONOURS

### Paper : DSE-B-1 and DSE-B-2

*The figures in the margin indicate full marks.*

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

### Paper : DSE-B-1

### (Inorganic Materials of Industrial Importance)

### Full Marks : 50

Answer ***question no.*** **1** (compulsory) and ***any eight*** questions from the rest (***question nos.*** **2** to **13**).

**1.** Answer the following questions (***any ten***) : 1×10

(a) What is the main difference between hydraulic and non-hydraulic cements?

(b) What is the role of feldspar in ceramics?

(c) Name two emulsifying agents used in paints.

(d) Name any one photochromic material that can be used to make photosensitive glass.

(e) What is the composition of single superphosphate fertilizer?

(f) Mention an advantage and a disadvantage of electrolytic metallic coatings.

(g) State one use of carbon fibre.

(h) What is a solid state electrolyte battery?

(i) Give an example of mixed fertilizer.

(j) Mention one application of zeolites as catalysts.

(k) Give an example of secondary battery.

(l) Give an example of homogeneous catalyst in industry.

**2.** (a) What is annealing of glass? What is its importance?

(b) Mention any method of your choice for regeneration of a catalyst. 3+2

**3.** (a) What is triple superphosphate? Write down the name of the chemicals required for its manufacture. What is the justification of use of the term 'triple'?

(b) Give the composition of any one important non-ferrous alloy, and mention its use. 3+2

4. (a) Mention the differences between soda-lime glass and borosilicate glass.
   (b) What is wax polishing and what are its benefits? 3+2

5. (a) Outline the steps for the manufacturing of urea with reactions.
   (b) State two disadvantages of Pb-acid battery. 3+2

6. (a) What are enamels and what are their uses?
   (b) What major oils are used as vehicles in commercial paints? 3+2

7. (a) What are the main components of a Lithium-ion battery?
   (b) What is vitrification? 3+2

8. (a) What is decarbonisation of steel and why is it important?
   (b) What are fullerenes? Write one structural difference between fullerenes and carbon nanotubes. 3+2

9. (a) Differentiate between complete and incomplete fertilizers. Give an example for each.
   (b) Explain briefly how catalysts can get deactivated. 3+2

10. (a) Discuss the composition of carbon steel and its properties.
    (b) What are the differences in constituents of oil paint and water paint? 3+2

11. (a) Write the reactions for the preparation of RDX and its detonation.
    (b) What is 'nitriding'? Why is it required in the steel manufacturing process? 3+2

12. (a) Why does normal glass appear greenish? Which chemical is used to make it colourless? Mention the chemistry behind the decolourisation process.
    (b) What are the basic criteria of a compound to act as an explosive? 3+2

13. (a) What are rocket propellants? Name one solid and one liquid rocket propellant.
    (b) What is the role of a thinner in the composition of a paint? 3+2

## Paper : DSE-B-2
## (Novel Inorganic Solids)
## Full Marks : 50

Answer ***question no.*** **1** and ***any eight*** questions from the rest (***question nos.*** **2** to **13**).

**1.** Answer ***any ten*** questions : 1×10

(a) Write any application of bioinorganic nanomaterials.

(b) Cite an example of white inorganic pigment.

(c) Mention any one important property of molecular magnets.

(d) Write one difference between oxide and non-oxide ceramics.

(e) Write one application of carbon nanotube.

(f) Give an example of super conducting ceramic.

(g) Give one example each of acidic and basic refractory material.

(h) Write one application of grey cast iron.

(i) Give an example of single phase Al-bronze.

(j) Name the material which is used as matrix in fibre-reinforced composites.

(k) Cite an example of a solid electrolyte.

(l) Mention any application of cation exchange resin.

**2.** (a) What is co-precipitation method of synthesis of inorganic solids? Give one limitation and one example.

(b) Differentiate between intercalation and clathrate compounds with one example of each type. 3+2

**3.** (a) Describe Turkevich-Frens method for synthesis of gold nanoparticles.

(b) What is the general composition of polymer matrix composites? 3+2

**4.** (a) Differentiate between grey and white cast iron.

(b) What are molecular magnets? 3+2

**5.** (a) How inorganic liquid crystals are prepared?

(b) Mention two biological uses and two limitations of carbon nanotubes. 3+2

**6.** (a) What is self-assembly of nanoparticles? Explain whether self-assembly of nanoparticles depends upon temperature.

(b) Mention the properties which are required for cutting tool material. 3+2

**7.** (a) Distinguish between thermosetting and thermoplastics.

(b) Write the importance of bionanocomposites. 3+2

**8.** (a) Why composite materials are considered superior to traditional materials?

(b) Mention two uses of thermosetting plastics. 3+2

**9.** (a) Discuss the formation of polyacetylene polymer using Ziegler-Natta catalyst along with catalytic loop. Why is polyacetylene not used commercially?

(b) What is hydrothermal method of synthesis? 3+2

**10.** (a) What are metal matrix composites? What is the secondary phase of metal matrix composites made of ? Give two applications of them.

(b) How can one convert polyparaphenylene from non-conducting to semi-conducting material? Where it is used? 3+2

**11.** (a) Write down the role of reinforcement in composite materials.

(b) Write any two applications of conducting polymers. 3+2

**12.** (a) Describe a method for manufacturing of ceramics.

(b) What are mixed inorganic pigments? Give examples. 3+2

**13.** (a) How do temperature, moisture and ultraviolet radiation affect composite material?

(b) What are the characteristics of a good pigment? 3+2

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