

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? 3+2
- (b) Mention any method of your choice for regeneration of a catalyst.
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'? 3+2
- (b) Give the composition of any one important non-ferrous alloy, and mention its use.

Please Turn Over

(0415+0453)

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. 3+2
- (b) Differentiate between intercalation and clathrate compounds with one example of each type.
3. (a) Describe Turkevich-Frens method for synthesis of gold nanoparticles. 3+2
- (b) What is the general composition of polymer matrix composites? 3+2
4. (a) Differentiate between grey and white cast iron. 3+2
- (b) What are molecular magnets? 3+2
5. (a) How inorganic liquid crystals are prepared? 3+2
- (b) Mention two biological uses and two limitations of carbon nanotubes. 3+2

Please Turn Over

(0415+0453)

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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