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3 (Sem-5/CBCS) CHE HE 4/HE 5/HE 6

2021

(Held in 2022)

CHEMISTRY

(Honours Elective)

Answer the Questions from any one Option.

OPTION-A

Paper : CHE-HE-5046

(Novel Inorganic Solids)

Full Marks : 60

Time ; Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following as directed : $1 \times 7 = 7$

(a) The colour of gold nanoparticles is

(i) yellow

(ii) orange

(iii) red

(iv) variable

(Choose the correct answer)

Contd.

- (b) Carbon nanotubes are also known as _____.
(Fill in the blank)
- (c) What is the basis of classification of composite materials ?
- (d) Quartz is an acidic refractory.
(State True or False)
- (e) What are fullerides ?
- (f) Give an example of a magnetic material used in data storage devices.
- (g) What is solid electrolyte made of ?
2. Answer the following questions : $2 \times 4 = 8$
- (a) What are inorganic pigments ? How are they different from organic pigments ?
- (b) What is the amount (%) of carbon in pure iron, cast iron and steel ?
- (c) What are superalloys ? Mention two important applications of superalloy.
- (d) Distinguish between natural and artificial nanoparticles.
3. Answer **any three** questions : $5 \times 3 = 15$
- (a) What are solid-state electrolytes (SSEs) ? In which batteries SSEs are used ? $3 + 2 = 5$
- (b) Discuss a method for the synthesis of silver nanoparticles. What is the colour of silver nanoparticles ? $4 + 1 = 5$
- (c) What is the role of matrix in a composite material ? Discuss the advantages of composite materials.
 $2 + 3 = 5$
- (d) What are polymer matrix materials ? Mention their important applications. Why are polymer matrix materials better than metals ? $1 + 2 + 2 = 5$
- (e) Based on the composition, how are ceramic materials classified ? Discuss each of them. $2 + 3 = 5$
4. Answer **any three** of the following questions : $10 \times 3 = 30$
- (a) (i) Discuss the top-down and bottom-up approach in nanomaterial synthesis. $2\frac{1}{2} + 2\frac{1}{2} = 5$
- (ii) What is the molecular structure of carbon nanotubes ? What are their uses in carbon nanotechnology ? $3 + 2 = 5$
- (b) Write notes on the following : $2\frac{1}{2} \times 4 = 10$
- (i) Hydrothermal synthesis
- (ii) Thermoplastics

- (iii) Molecular magnets
- (iv) Green synthesis of nanoparticles
- (c) (i) Discuss the effects of environmental factors on composite materials. 5
- (ii) What are fibre-reinforced composites? Discuss their applications. 2+3=5
- (d) What are alloying elements? Discuss the various types of aluminium alloys and their uses. 2+8=10
- (e) What is DNA nanotechnology? Write a brief note on biological applications of DNA nanomaterials. 3+7=10
- (f) Discuss the various methods used in the synthesis of inorganic solids. 10
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