2022

CHEMISTRY — HONOURS

Paper : DSE-B-1

(Inorganic Materials of Industrial Importance)

Full Marks : 50

The figures in the margin indicate full marks.

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

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 are the components used in the manufacture of soda lime glass?

(b) Write the full form of PVCN with respect to paints.

(c) A fertilizer is labelled as 15-15-10. What does this designation mean?

(d) What is the cathode component in a lithium-ion battery?

(e) What is an complete fertilizer?

(f) Mention one application of high technology ceramics.

(g) Name one catalyst promoter for a catalytic reaction.

(h) Which compound is responsible for setting of Portland cement?

(i) How do you prepare lead azide? Show chemical reactions only.

(j) Which components are necessary for the manufacture of heat retardant paint?

(k) What is the role of a 'depolarizer' in a dry cell battery?

(l) How a ZSM-5 catalyst regenerated for olefin oligomerization?

2. (a) What do you mean by superphosphate of lime? State the reactions occurring during the production of superphosphate.

(b) Write briefly how triple superphosphate is manufactured. 3+2

3. (a) Mention the major steps of porcelain manufacturing.

(b) What do you mean by vitrification and devitrification of glass? 3+2

4. (a) What is heterogeneous catalysis? Elucidate with an example.

(b) How is PETN prepared? 3+2

5. (a) State three characteristics to choose a battery.
   (b) What is meant by 'turn-over number'? 3+2

6. (a) Show the elementary catalytic steps for homogeneous catalysis using an example of a reaction of your choice.
   (b) What are zeolites? 3+2

7. (a) Discuss with a flowchart diagram the steps involved in the manufacture of steel.
   (b) Name the two most common heat treatment practices used for surface hardening of manufactured steel components. 3+2

8. (a) State the important properties of optical glass. Write the chemical reactions involved in the photochromatic action.
   (b) Write two uses of carbon fibre. 3+2

9. (a) Draw the flowchart diagram for the manufacture of urea indicating the major unit operations.
   (b) What do you mean by slag cement mentioning its use? 3+2

10. (a) Explain the following terms related to the compositions of paint :
    (i) pigment
    (ii) binder
    (iii) plasticizer.
    (b) What do you mean by oil-length? Mention one use of varnish. 3+2

11. (a) How does a solar cell work?
    (b) What is Alkaline Fuel Cell (AFC)? 3+2

12. (a) Mention the steps in the production of glazed porcelain. State the raw materials involved.
    (b) What is the difference between High Strength Low Alloy steel (HSLA) and Plain Carbon steel? 3+2

13. (a) State the components of a lithium-ion polymer battery. Write the anodic and cathodic reactions involved in a lithium-ion battery.
    (b) What are enamels? 3+2