

2 0 1 8

PG Even Semester (CBCS) Exam., May—2018

CHEMISTRY

(4th Semester)

Course No. : CHMCC-402

(Chemistry of Advanced Materials)

*Full Marks : 70**Pass Marks : 28**Time : 3 hours**The figures in the margin indicate full marks
for the questions*Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) Define 'nanomaterials'. Explain the importance of nanomaterials by virtue of their unusual physical properties. 1+6=7
- (b) What is meant by 'exciton'? Draw the density of states (DOS) profile for semiconductor nanoparticles. 1+1=2
- (c) Mention different characterization techniques for nanostructured materials. 2
- (d) Account, in brief, the synthesis of TiO₂ nanoparticles using sol-gel method. 3

2. (a) Discuss the synthesis of size-selective gold nanoparticles using Frens' citrate reduction method. 4
- (b) How could nanotechnology be utilized to meet the clean energy demand in the modern world? 3
- (c) Discuss, in brief, the principle of operation of a bulk heterojunction solar cell. 7

UNIT—II

3. (a) Delineate the types of polymer-based nanomaterials employed in photo-thermal cancer therapy. 5
- (b) How is the delivery of photosensitizers fundamentally different from chemotherapeutics? Explain. 4
- (c) Mention the significant features of gold nanostructures that attribute to photo-thermal effect. 5
4. (a) Highlight four significant reasons why porphyrin derivatives are a popular choice as photosensitizers in photo-thermal cancer therapy. 4+2=6

(3)

- (b) Why is selectivity of photodynamic treatment very important? How can it be achieved? 4
- (c) What is combination therapy? Provide an example of such a therapy performed by organic dye-based nanomaterials. Support your answer with appropriate illustrations. 1+3=4

UNIT—III

5. (a) Define the following terms : 2×2=4
(i) Director
(ii) Order parameter
- (b) Discuss the effect of molecular structure on the mesophase formation by considering the ring structure on the nematic phase. 4
- (c) Write short notes on the following : 3×2=6
(i) Lamellar lyotropic liquid crystal phase
(ii) Cubic lyotropic liquid crystal phase
6. (a) Electrochemical recognition must be coupled to complexation for a redox sensor to work. Discuss by taking suitable examples. 6

8J/1680

(Turn Over)

(4)

- (b) How can citrate anion be detected using fluorescent sensor? Explain. 4
- (c) Write a short note on molecular AND logic gate. 4

UNIT—IV

7. (a) What is meant by the term 'pharmacophore'? 2
- (b) What is the 'binding site' of a receptor? How does the binding site change shape during activation? 2+3=5
- (c) What is suicide substrate? Explain by taking a suitable example. 1+2=3
- (d) What is 'Lipinski's rule of five' for drug likeness study? What is the corresponding guideline for 'lead likeness'? 2+2=4
8. (a) What are prodrugs? Provide classification of prodrugs with suitable examples. 1+3=4
- (b) What is combinatorial synthesis? What are the major benefits of this approach over conventional synthesis in drug design? 2+2=4

8J/1680

(Continued)

(5)

(c) What is QSAR? Illustrate one of the descriptors of QSAR. 2+2=4

(d) What are cyclodextrins? 2

UNIT—V

9. (a) Discuss the principle of thermonuclear weapons. Define, with example, the critical mass of fissile material. 3+1=4

(b) How does nerve agent of chemical weapon affect on human body? Write the names and structures of any three nerve agents that can be used as chemical weapons. 2+3=5

(c) Discuss the prohibitions of chemical weapons convention. 3

(d) Discuss the historical background of chemical weapons used in war. 2

10. (a) Write a short note on biological weapons of mass destruction. 3

(b) Discuss the effect of nuclear weapons. 3

(6)

(c) What are the blister agents of chemical weapon? Draw the chemical structure of BAL and write its application. 2+2=4

(d) How does phosgene affect on human body? Discuss the treatment procedure of victim of choking agent of chemical weapons. 2+2=4
