2019

PG Even Semester (CBCS) Exam., May—2019

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)* What are meant by 'nanomaterials'? Account, in brief, the classification of nanostructured materials according to their dimensionality. Elucidate the quantum confinement in nano-structures. 1+3+1=5

(b) Illustrate various factors that affect the properties of nanostructured materials. Show various properties of gold (Au) in bulk and nanoscale dimension. 3+2=5

(c) Point out the fundamental differences between hydrothermal and solvothermal synthetic strategies of nanoscale materials. 4

2. *(a)* What is meant by 'localized surface plasmon resonance' (LSPR)? Discuss the origin of creation of surface plasmon oscillation in spherical metal nano-particles. 2+5=7

(b) Elucidate the plausible application of gold nanoshell in plasmonic photo-thermal therapy of cancerous cells. 7

UNIT—II

3. *(a)* Bring out the essence of third generation photosensitizers by describing their expected features and properties. Highlight the advantages of using tetrapyrrolic macrocycles as photosensitizers. 4+2=6

(b) Mention the reasons why cancer cells or tissues in their initial stages allow entry of macrocyclic photosensitizers whereas healthy cells or tissues prevent that from happening. Provide at least four significant reasons. 4

(c) Device means and suggest options for the conversion of a photosensitizer capable of PDT to perform PTT. Provide befitting reasons to justify your choice. 4

4. (a) Mention eight different advantages of producing nanohybrids of tetrapyrrolic macrocycles with super paramagnetic nanoparticles for developing cancer photodynamic therapy. 8

(b) Delineate the significance of light dosiometry in PDT with respect to both the photosensitizers as well as external sources. 3

(c) Explain how PDT can be manipulated once hypoxia sets into the advanced cancer tissues. Provide at least two different and significant options. 3

UNIT—III

5. (a) What is order parameter? Discuss the order parameter of smectic phase. 2+3=5

(b) Write a short note on fluid mosaic model. 5

(c) Discuss two biological applications of lyotropic liquid crystals. 4

6. (a) What are MRI contrast agents? Write down the most commonly used compounds for contrast enhancement. Explain the working principle of MRI contrast agent. 1+1+2=4

(b) "Molecular AND and XOR logic devices can be used for simple mathematics." Explain by taking suitable examples. 5

(c) Schematically represent and discuss the following : 3+2=5

(i) Energy and electron transfer processes in a supramolecular system A L B, where A is the light absorbing molecular unit, B is the other molecular unit and L is a connecting unit.

(ii) Strategy for photochemical water splitting in homogeneous system.

UNIT—IV

7. (a) What is 'Lipinki's rule of five'? 2

(b) What is combinatorial synthesis? Explain the benefits of this approach in drug design. 2+2=4

(c) What do you mean by QSAR? Explain the utility of log P in drug design. 1+2=3

(d) Discuss the chemical nature of binding of ligands to receptors (targets). 3

(e) Explain the 'lock and key' mechanism of enzyme action. 2

8. *(a)* What is the 'binding site' of a receptor? How the nature of binding differs in case of 'competitive' and 'non-competitive' drugs for a target receptor? 2+2=4

(b) What is 'pharmacophore'? Explain with an example. 1+1=2

(c) Discuss the ADMET properties related to drug action. 3

(d) What are pro-drugs? 1

(e) Write brief notes on the following : 2×2=4

(i) Cyclodextrins

(ii) Drug delivery systems

UNIT—V

9. *(a)* Define weapon of mass destruction. What are the important classes of WMD? 1+1=2

(b) Define, with example, crooking agent of chemical weapon. 2

(c) What is nuclear weapon? Discuss the principles of atomic weapons. 1+3=4

(d) Which agents or chemicals are most likely to be used as biological weapons to create a deliberate outbreak? 2

(e) What is chemical weapons convention (CWC)? What are the declaration requirements of CWC? 1+3=4

10. *(a)* Write short notes on the following : 2½×2=5

(i) Agent orange

(ii) Sulfur mustard

(b) Define blood agent of mass destruction. How CN affects on human body? Discuss the symptoms and treatment of victims affected by blood agent. 1+2+4=7

(c) Distinguish between V-agent and C-agent. Give at least one example of each type of agents. 1+1=2

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