R1048	Sub. Code
	540201

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Energy Science

ENVIRONMENTAL SCIENCE

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** following objective questions by choosing the correct option.

1. Pesticides and fertilizers are responsible for (CO1, K4)

   (a) Soil pollution

   (b) Air pollution

   (c) Water pollution

   (d) All the above

2. Where we can find water soluble radioactive isotopes? (CO1, K4)

   (a) In radioactive waste

   (b) In radioactive reactor

   (c) In radioactive coolant

   (d) In radioactive shield

3. Which of the following is not a unit of hardness?(CO2, K2)

(a) Degree centigrade

(b) Parts per million

(c) Degree French

(d) Degree Clarke

4. Which of the following is not used for semi-permeable membrane? (CO2, K2)

(a) Cellulose acetate

(b) Polymethylsulphate

(c) Polymethyl acrylate

(d) Polyamide polymer

5. The green synthesis methods should have ————————. (CO3, K6)

(a) Low efficiency

(b) High harmful products

(c) Low energy requirements

(d) Low atom efficiency

6. Identify the non-toxic and green solvent. (CO3, K6)

(a) Liquefied carbon dioxide

(b) Benzene

(c) Carbon tetrachloride

(d) Toluene

7. _____ is the fundamental advantage of the sono chemistry in organic synthesis without solvents.(CO4, K2)

(a) High yields

(b) High energy requirements

(c) Use of solvents

(d) High wastes

8. The atom economy obtained for green synthesis is in the range of ————————. (CO4, K2)

(a) 62-70%

(b) 72-82%

(c) 40-50%

(d) 90-100%

9. _____ are greener than the conventional methods. (CO5, K4)

(a) Radio waves

(b) Electromagnetic waves

(c) Micro waves

(d) Ultra-Violet waves

10. What is the starting material for nylon 6-6 ————————. (CO5, K4)

(a) Adipic acid

(b) Nitric acid

(c) 2-methyl propyl benzene

(d) Acetic anhydride

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Write a note on air pollutants. (CO1, K4)

Or

(b) Explain the Noise pollution with suitable examples. (CO1, K4)

12. (a) Explain the BOD and COD of water. (CO2, K2)

Or

(b) Describe the working principle of Reverse Osmosis process. (CO2, K2)

13. (a) Difference between the green chemistry and environmental chemistry. (CO3, K6)

Or

(b) What are the safety measurements being followed to prevent the chemical accidents? (CO3, K6)

14. (a) Explain the importants of starting materials in green synthesis? (CO4, K2)

Or

(b) Describe the ultra-sound assisted synthesis of nanoparticles. (CO4, K2)

15. (a) How can we use the green synthesis in biomedical applications? (CO5, K4)

Or

(b) What are the green materials used in the agriculture application? (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Explain the sources of environmental pollution. (CO1, K4)

Or

(b) Describe the controlling methods of water pollution and soil pollution. (CO1, K4)

17. (a) Discuss about the water quality parameters. (CO2, K2)

Or

(b) Describe the secondary water treatment methods. (CO2, K2)

18. (a) Explain the recent development of green chemistry. (CO3, K6)

Or

(b) Explain any two principle green chemistry with suitable example. (CO3, K6)

19. (a) Discuss about polymer supported catalysts for green synthesis. (CO4, K2)

Or

(b) Explain the role and important of catalyst in the green synthesis. (CO4, K2)

20. (a) Describe the role of green synthesis material in environmental applications. (CO5, K4)

Or

(b) Explain in detail about the applications of green technology in energy sector. (CO5, K4)

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R1051

Sub. Code
540503

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Energy Science

Elective — ADVANCED NANOMATERIALS AND THEIR APPLICATIONS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. The bulk materials come under ———— dimensional nanomaterials. (CO1, K1)

   (a) Zero (b) One

   (c) Two (d) Three

2. What is the standard form CNFs? (CO3, K2)

   (a) Carbon Nanofibers

   (b) Carbon Nanographene

   (c) Carbide Nanographene

   (d) None of the above

3. Nanostructures have sizes in between (CO1. K1)

   (a) 1 and 100 Å (b) 1 and 100 nm

   (c) 100 and 1000 nm (d) None of the above

4. Quantum dots can be used for (CO1, K2)

   (a) Optoelectronics (b) Mechanics

   (c) Crystallography (d) Quantum physics

5. Which one of the following is an example for top-down approach? (CO2, K1)

(a) Ball milling technique

(b) Sol gel process

(c) Both (a) and (b)

(d) None of the above

6. The substances which are attracted by the magnetic field are (CO3, K2)

(a) Diamagnetic (b) Paramagnetic

(c) Ferromagnetic (d) Ferrimagnetic

7. The polymeric materials come under _____ dimensional nanomaterial. (CO4, K2)

(a) Diamagnetic (b) Paramagnetic

(c) Ferromagnetic (d) Ferrimagnetic

8. The advantage of ultra-capacitors are (CO5, K1)

(a) Long life

(b) Transient response is fast

(c) Efficiency is high

(d) All of the above

9. The conducting polymers and metal oxides are _____ capacitors. (CO5, K1)

(a) Hybrid (b) Double layer

(c) Pseudo (d) All of the those

10. The conducting polymers and metal oxides are _____ capacitors. (CO4, K2)

(a) Coulomb's law (b) Ohm's law

(c) Kirchhoff's law (d) All of the above

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain the surface area and quantum confinement effect. (CO1, K2)

Or

(b) Summaries the significance of nanoscale. (CO1, K2)

12. (a) Discuss the nanomaterial preparation method of RF/DC magnetron sputtering. (CO2, K6)

Or

(b) Write a short note on Phyto synthesis and Mycosynthesis? (CO2, K6)

13. (a) Classify the properties of metal-metal oxide composite materials properties. (CO3, K4)

Or

(b) Examine the applications of single walled carbon nanotubes. (CO3, K4)

14. (a) Explain the design factors of biomaterials. (CO4, K2)

Or

(b) Summaries the classification of magnetic materials. (CO4, K4)

15. (a) Discuss the applications of Dye sensitized solar cells. (CO5, K6)

Or

(b) Estimate the various applications of nanomaterials in electric devices. (CO5, K6)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1,000 words each.

16. (a) Classify the types of nanocrystals. (CO1, K2)

Or

(b) Illustrate a uniqueness in mechanical and chemical properties of bulk and microscopic materials. (CO1, K2)

17. (a) Elaborate the electrospinning method for the synthesis of nano materials. (CO2, K6)

Or

(b) Discuss about hydrothermal and solvothermal methods of synthesis. (CO2, K6)

18. (a) Examine the polymer nanocomposites and its applications. (CO3, K6)

Or

(b) Categories the various kinds of carbon nanotubes and its properties. (CO3, K6)

19. (a) Outline the classification of biomaterials. (CO4, K2)

Or

(b) Explain about the super paramagnetism and Magnetic phenomena at nanoscale. (CO4,K2)

20. (a) Formulate the applications of Batteries and supercapacitors. (CO5, K6)

Or

(b) Elaborate the biological applications of nanomaterials in cancer detection. (CO5, K6)

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R1049	Sub. Code
	540202

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Energy Science

SOLAR THERMAL ENERGY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Section A $(10 \times 1 = 10)$

Answer **all** the following objective questions by choosing the correct option.

1. The value of solar constant is ———— (CO1, K2)

   (a) 1367 W/m^2 (b) 1247 W/m^2

   (c) 1357 W/m^2 (d) 1377 W/m^2

2. Which type of device is used to measure beam radiation? (CO1, K2)

   (a) Net radiometer (b) Pyranometer

   (c) Pyrheliometer (d) Gardon gauge

3. Why does flat plate collector gives higher efficiency than evacuated tube solar collector in terms of area? (CO2, K2)

   (a) Because flat plate collector has a large installation area

   (b) Because evacuated tube collector is compact

   (c) Because of the vacuum gap in evacuated tube collectors

   (d) Because of the vacuum gap in flat plate collectors

4. The collection efficiency of flat plate collector can be improved by (CO2, K2)

(a) Putting a selective coating on the plate

(b) Evacuating the space above the absorber plate

(c) None of the above

(d) Both (a) and (b)

5. What is carnot efficiency? (CO3, K4)

(a) Ratio of absolute temperature between source and sink and the absolute source temperature

(b) Ratio of rate of the temperature difference and the absolute source temperature

(c) Ratio of relative temperature between source and sink and the relative source temperature

(d) None of the above

6. Which of the following is a popular solar thermal power system? (CO3, K4)

(a) Photovoltaics

(b) Central receiver thermal electric power system

(c) Solar reflectors

(d) Concentrating mirrors

7. Which of the following is an example of passive solar technology? (CO4, K3)

(a) Photovoltaic

(b) Solar furnace

(c) Active solar water heating systems

(d) Solar thermo-mechanical systems

8. What kind of solar thermal technologies are used for industrial processes? (CO4, K3)

(a) Solar air collectors and solar water systems

(b) Solar air collectors and geothermal energy

(c) Geothermal and photovoltaics

(d) Photovoltaics and solar air collectors

9. Solar heating systems is applicable for ———— (CO5, K2)

(a) Wetting

(b) Pasteurisation and drying

(c) Residential applications

(d) Liquid adsorption

10. A module in a solar panels means (CO5, K2)

(a) Series arrangements of solar cells

(b) Parallel arrangements of solar cells

(c) Series and parallel arrangements of solar cells

(d) None of these above

Section B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) Write about the spectral energy distribution of solar radiation. (CO1, K2)

Or

(b) Write a note on global radiation. (CO1, K2)

12. (a) How does a solar thermal collector work? (CO2, K2)

Or

(b) Discuss about the evacuated tube collector. (CO2, K2)

13. (a) Discuss in detail about the medium temperature solar power plant with a schematic diagram. (CO3, K4)

Or

(b) Explain the hybrid solar power plants. (CO3, K4)

14. (a) What is solar water heating system? Explain with an example. (CO4, K3)

Or

(b) Write the difference between the active and passive solar heating system. (CO4, K3)

15. (a) Discuss the solar panel technologies. (CO5, K2)

Or

(b) Discuss on solar thermal economics in India. (CO5, K2)

Section C ($5 \times 8 = 40$)

Answer **all** the questions not more than 1000 words each.

16. (a) Discuss about the terrestrial and extra-terrestrial radiation. (CO1, K2)

Or

(b) Discuss in detail about The pyranometer and pytheliometer. (CO1, K2)

17. (a) Explain the working principle of non-concentrating type collector. (CO2, K2)

Or

(b) Explain the swimming pool absorber with diagram. (CO2, K2)

18. (a) Discuss about the Carnot cycle and Stirling cycle. (CO3, K4)

Or

(b) Describe the working principle of solar pond based electric power plants. (CO3, K4)

19. (a) Explain with neat diagram about the active solar furnace system. (CO4, K3)

Or

(b) What is solar refrigeration system? Explain the working principle with neat diagram. (CO4, K3)

20. (a) Discuss about the components of solar panels. (CO5, K2)

Or

(b) Write the outlook an development potential of solar thermal energy. (CO5, K2)

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R1050

Sub. Code
540203

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Energy Science

HYDROGEN ENERGY SYSTEMS

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** the following objective type questions by choosing the correct option.

1. Which of the following pair of substance will not evolve H_2 Gas? (CO1, K2)

   (a) Iron and aqueous H_2SO_4

   (b) Copper and HCl (aq)

   (c) Sodium and Ethanol

   (d) Iron and Steam

2. The Number of electron hydrogen contains in its K shell is (CO1, K1)

   (a) 1 (b) 2

   (c) 3 (d) 4

3. Hydrogen has isotopes (CO2, K1)

   (a) 2 (b) 3

   (c) 4 (d) 5

4. Which of the following is continuously replaced in a fuel cell? (CO2, K2)

(a) Oxidizer

(b) Fuel

(c) Both fuel and oxidizer

(d) None of the above

5. Chemical energy is converted to ———————— energy by a fuel cell. (CO3, K2)

(a) solar

(b) electrical

(c) potential

(d) mechanical

6. Which of the following is not a fuel cell? (CO3, K2)

(a) Hexanone-oxygen cell

(b) Methyl-oxygen-alcohol cell

(c) Hydrogen-oxygen cell

(d) Propane-oxygen cell

7. The structure of H_2O is (CO4, K1)

(a) Planar

(b) Non-planar

(c) Spherical

(d) Linear

8. Fossil fuels are ————————. (CO4, K1)

(a) Renewable source of energy

(b) Non-renewable source of energy

(c) Both (a) and (b)

(d) None of these

9. Which one of the following is the colour of hydrogen gas? (CO5, K2)

(a) Light Yellow

(b) Orange

(c) Black

(d) Colourless

10. Very pure hydrogen (99.9%) can be made by which of the following processes (CO5, K1)

(a) Reaction of salt-like hydrides with water

(b) Reaction of methane with steam

(c) Mixing natural hydrocarbons of high molecular weight

(d) Electrolysis of water

Part B ($5 \times 5 = 25$)

Answer **all** the questions not more than 500 words each.

11. (a) Explain the principle of water electrolysis. (CO1, K2)

Or

(b) Illustrate the properties of hydrogen storage as a thel cell. (CO1, K2)

12. (a) Classify the membrane types of gas separation. (CO2, K4)

Or

(b) Examine the present and projected the uses of Hydrogen. (CO2, K4)

13. (a) Identify the hydrogen production by other bacteria. (CO3, K3)

Or

(b) Explain the co-product formation of hydrogen from biomass. (CO3, K3)

14. (a) Outline the list of merits and demerits of fuel cells. (CO4, K2)

Or

(b) Summarize the fuel cell efficiency and its applications. (CO4, K2)

15. (a) Compare about stationary hydrogen storage and underground hydrogen storage. (CO5, K2)

Or

(b) Illustrate the cryo-compressed hydrogen storage techniques. (CO5, K2)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Summaries the thermochemical water splitting method for the preparation of hydrogen. (CO1, K2)

Or

(b) Express a detailed account of the general introduction to infrastructure requirements for hydrogen production and storage. (CO1, K2)

17. (a) Illustrate the photobiological hydrogen production potential. (CO2, K4)

Or

(b) Examine the reforming natural gas and gas separation of hydrogen from fossil fuels. (CO2, K4)

18. (a) Discuss the process and culture parameters of hydrogen production from biomass. (CO3, K3)

Or

(b) Explain the role of Sulphur and sulfidogenesisin hydrogen production from biomass. (CO3, K3)

19. (a) Relate the aspects of comparison for battery vs fuel cells. (CO4, K2)

Or

(b) Explain the principle, construction and working of molten carbonate fuel cells. (CO4, K2)

20. (a) Express the physical storage of hydrogen materials and technology. (CO5, K2)

Or

(b) Illustrate the advantage and disadvantage of hydrogen as a transport Fuel. (CO5, K2)

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