

**R6756**

**Sub. Code**

**540201**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Energy Science**

**ENVIRONMENTAL SCIENCE**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is the impact of global warming?
2. Name various sources of air pollution.
3. Define reverse osmosis.
4. Explain sludge digestion.
5. List out the basic principle of green chemistry.
6. How can you improve the atom economy of a reaction?
7. Define reagents.
8. What is the role of catalyst in green chemistry? Give suitable example for the same.
9. Write a note on microwave reactions.
10. What is meant by carbon capture?

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Derive the relationship to find the amount of methane per gram of COD.

Or

- (b) Elaborate on the purpose of sampling for water quality analysis.

12. (a) Differentiate between activated sludge unit and trickling filters.

Or

- (b) Enlist and explain the advantages and disadvantages of anaerobic treatment processes.

13. (a) Write short note on prevention of waste and minimization of hazardous products.

Or

- (b) Briefly discuss about the prevention of chemical accidents.

14. (a) Give a brief account of polymer supported catalysts and solvents.

Or

- (b) Explain safer chemical design, with examples.

15. (a) Discuss the importance of environmentally benign applications.

Or

- (b) Write down the advantages of green technologies.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Define global warming and illustrate the various ill-effects on the environment and other life forms on the earth.
17. Explain the principle and applications of analytical techniques used in determination of heavy metals.
18. Explain the application of green chemistry in scientific areas for practical.
19. Explain about
  - (a) use of renewable raw materials and
  - (b) shorter synthetic methods.
20. State chief characteristic features of solvent free esters saponification.

---

**R6757**

**Sub. Code**

**540202**

**M.Sc., DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Energy Science**

**PHOTOVOLTAICS**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Define elemental semiconductor.
2. What is meant by fermi level?
3. What do you understand by the p-i-n junction?
4. Define organic solar cell.
5. Write the differences between identical and non-identical solar cells.
6. Define thin film modules.
7. Define charge controller and what is the function of charge controller.
8. List out the specific purpose photovoltaic systems.
9. Define Solar PV concentrators.
10. What are the advantages of hybrid SPV power systems?

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the temperature effect pertaining to a P-N Junction.

Or

- (b) What are anti-reflection coatings? Describe the materials and methods of coatings.

12. (a) Describe the different kinds of semiconductor junctions.

Or

- (b) Explain about the nanotech solar cells.

13. (a) Explain the term 'Solar module' with neat sketch.

Or

- (b) Discuss about the issue with solar PV modules.

14. (a) Discuss about the types of inverters.

Or

- (b) Explain about the space purpose photovoltaic system.

15. (a) Describe hybrid SPV power systems.

Or

- (b) Discuss solar photovoltaic system in economic aspect.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Write detailed notes on intrinsic, extrinsic and compound Semiconductors.
  17. Describe the plasma enhanced chemical vapour deposition (PECVD) in detail.
  18. Write an essay on different types of solar cell fabrication technologies.
  19. Explain the major components required for solar PV system.
  20. Explain with a neat diagram, the different types of concentrated solar PV system with its operation and working principle.
-

**R6758**

**Sub. Code**

**540203**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Energy Science**

**ENERGY STORAGE SYSTEMS**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. Define sealed lead acid battery.
2. Differentiate electrochemical reaction and chemical reaction.
3. Identify the cathode materials used in Lithium-ion battery.
4. Define nanomaterials.
5. Analyze how metal air batteries work.
6. What happens at the cathode of a battery?
7. Define bipolar plates.
8. What is the principle of fuel cell?
9. What is hybrid energy system?
10. Define hybrid fuel cell.

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the characteristics and properties of sulphuric acid.

Or

- (b) State the advantages and disadvantages of lead acid batteries.

12. (a) Explain the merits and demerits of lithium-ion battery.

Or

- (b) Deliberate the  $\text{LiTiO}_4$  nanostructured anode material for lithium-ion batteries.

13. (a) Write a short note on lithium-air batteries.

Or

- (b) Discuss about the merits, demerits and applications of metal-air batteries.

14. (a) Explain about fuel cell catalysts and precious and non-precious metal catalysts.

Or

- (b) Execute the fuel cells for vehicles and grid connected applications.

15. (a) Explain the concept of hybrid energy systems.

Or

- (b) Briefly explain the supercapacitor-battery hybrid systems and its applications.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the lead acid battery for PV and automotive applications with suitable examples.
  17. Describe the carbon nanotubes and TiO<sub>2</sub> nanostructured anode materials for lithium- ion batteries.
  18. Explain the reaction formula, storage density, cell types and applications of Zinc-air batteries.
  19. Discuss about the nanomaterials for low temperature and reversible fuel cells.
  20. Explain the concept of hybrid fuel cell-battery systems with examples and its applications.
-

**R6759**

**Sub. Code**

**540502**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Second Semester**

**Energy Science**

**ADVANCED NANOMATERIALS AND THEIR  
APPLICATIONS**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

All question carry equal marks.

1. What are the factor which causes the properties of nanomaterials to differ significantly from other materials?
2. What are the compounds prepared from iron and palladium nano particles?
3. Why are nanocomposites better than composites?
4. Distinguish between nano composite and natural composites.
5. How natural systems do produce biomaterials.
6. What are Implant materials? Give examples.
7. What are diamagnetic materials?

8. Name the metals used in the production of magnetic nanomaterials.
9. Mention four major areas of technology where nanotechnology can play important roles.
10. What makes the fusion of nanotechnology and biology possible?

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss Bottom up approach in the synthesis of Nanomaterial.

Or

- (b) Write a note on polymeric nanoparticles.

12. (a) Explain the process for synthesis of metal — metal oxide composites with a neat sketch.

Or

- (b) Discuss the preparation and chemical structure of CNT-metal oxide composites”

13. (a) Discuss the historical development of bio-nanomaterials.

Or

- (b) Write a note on Bioplastics.

14. (a) Explain the classification of magnetic nanomaterials.

Or

- (b) Write the magnetic properties of ‘nanomaterials’.

15. (a) Mention the applications of nanomaterials in solar cells.

Or

- (b) How are the magnetic nanomaterials used in sensors?

**Part C** (3 × 10 = 30)

Answer any **three** questions.

16. Discuss the preparation, properties and applications of nano composite.
17. Describe the properties and applications of hybrid materials.
18. How are biomaterials classified? Explain their applications.
19. Discuss the preparation and applications of ferrites nano materials.
20. Describe the applications of nanomaterials in (a) fuel cell (b) battery (c) water purification. (3+4+3)

**R6760**

**Sub. Code**

**540401**

**M.Sc., DEGREE EXAMINATION, APRIL – 2022**

**Fourth Semester**

**Energy Science**

**ENERGY AUDIT AND MANAGEMENT**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is energy management?
2. What are the objectives of energy management?
3. What is Bench Marking?
4. Differentiate fuel costs and power costs.
5. Define energy policy.
6. What are the requirements of energy audit planning?
7. Define energy balance.
8. What do you mean by second law of efficiency?
9. Write about energy saving method.
10. Give the scope of energy audit.

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss about energy management skills.

Or

- (b) Write about energy management strategy.

12. (a) Discuss the energy management approach.

Or

- (b) How did you calculate energy performance?

13. (a) What is the role and responsibilities of energy manager?

Or

- (b) What are the importance and perspective of energy policy?

14. (a) Explain the methods for preparing process flow.

Or

- (b) Write a note on energy balance sheet.

15. (a) Discuss about the methods of energy savings and its consequence.

Or

- (b) Explain the general procedure of energy audit.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. What is energy audit? Explain the general principles of Energy audit and management.

17. Explain in detail about the methodology of detailed energy audit.

18. Write in detail about Designing, marketing, training and planning of energy audit.
  19. Discuss in detail about energy management information system (MIS).
  20. Explain about energy audit instruments and mention the accuracy of energy audit.
-

**R6761**

**Sub. Code**

**540507**

**M.Sc. DEGREE EXAMINATION, APRIL – 2022**

**Fourth Semester**

**Energy Science**

**CLIMATE CHANGE AND CO<sub>2</sub> EMISSION ASSESSMENT**

**(CBCS – 2019 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is known as renewable energy?
2. List out the economic problems related to energy usage.
3. What are the causes for global climate change?
4. What is green house effect?
5. Define carbon emission.
6. How to measure CO<sub>2</sub> emission?
7. How to reduce carbon foot print?
8. What is emission factor?
9. Define Carbon credit.
10. What are the future prospect of carbon trading mechanism?

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the climate change impact on energy sector.

Or

- (b) Discuss about the various renewable energy sources and their technologies in India.

12. (a) Explain the mechanism of green house gas emission.

Or

- (b) Discuss the International concern on global climate change.

13. (a) Propose the eco-friendly technology for reduction of CO<sub>2</sub> emission.

Or

- (b) Discuss the theory of CO<sub>2</sub> emission related to energy conversion.

14. (a) Discuss about the methodology for CO<sub>2</sub> assessment.

Or

- (b) Explain the evaluation of CO<sub>2</sub> emission from fossil fuel.

15. (a) Explain the concept of carbon credit.

Or

- (b) Discuss the role of individual to control CO<sub>2</sub> emission.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the social and economic implications of energy utilization.
  17. Explain the theory and practices of global climate change.
  18. Write about the role of technology and resources used for energy conversion of CO<sub>2</sub> emission.
  19. Discuss in effect CO<sub>2</sub> emission from industry and transport sectors.
  20. Enumerate the National and International policies for CO<sub>2</sub> emission.
-