

<b>R-3047</b>
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<b>Sub. Code</b>
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<b>540201</b>
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**M.Sc. DEGREE EXAMINATION, APRIL 2019**

**Second Semester**

**Energy Science**

**ENVIRONMENTAL SCIENCE**

**(CBCS – 2016 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

All questions carry equal marks.

1. Define environmental pollution. State some examples.
2. What are non-point sources?
3. What is meant by sedimentation?
4. Write a short note on coagulation.
5. How to prevent hazardous product from the chemical synthesis?
6. Write a short note on selection of renewable starting materials.
7. Define bio-catalysis.
8. What is green synthesis?
9. Define the term sustainability.
10. Write a brief note on carbon capture.

**Part B****(5 × 5 = 25)**

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

11. (a) Draw the diagram and explain Carbon cycle.

Or

- (b) Illustrate causes and effect of Ozone depletion.

12. (a) Explain water treatment by ion exchange method.

Or

- (b) How do you treat the Water by trickling filtration techniques?

13. (a) Write a comparative statement on green chemistry and synthetic chemistry.

Or

- (b) How to prevent chemical accidents? What are the precautions taken?

14. (a) Illustrate polymer supported catalysts for green synthesis.

Or

- (b) How to select starting materials in green synthesis?

15. (a) Enumerate solvent free organic synthesis by microwave assisted technique.

Or

- (b) List out the advantages of green technologies.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe causes, effect and control measure of water pollution.
  17. What is disinfection and describe disinfection techniques for water treatment.
  18. Describe the principles of sustainability of green chemistry.
  19. Discuss the recovery of renewable chemicals from its biomass.
  20. Describe the significance of carbon footprint and carbon trading.
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<b>R-3048</b>
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<b>Sub. Code</b>
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<b>540202</b>
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**M.Sc. DEGREE EXAMINATION, APRIL 2019**

**Second Semester**

**Energy Science**

**ADVANCED NANOMATERIALS AND THEIR  
APPLICATIONS**

**(CBCS – 2016 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

All questions carry equal marks.

1. Define nanoclusters.
2. Write a short note on electrospinning.
3. Define nanofibers.
4. Write a brief note on composites.
5. What is known as biopolymers?
6. What are bioactive molecules?
7. Write a short note on paramagnetic materials. State some examples.
8. Define magnetic hysteresis.
9. What is hybrid capacitor?
10. Write any two uses of nanomaterials in water purification.

**Part B**

(5 × 5 = 25)

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

11. (a) Explain various preparation techniques for polymeric nanoparticles.

Or

- (b) Discuss the synthesis of nanoparticles by microwave irradiation method.

12. (a) Explain the various potential applications of CNT.

Or

- (b) What is natural fiber composite? Mention some industrial applications.

13. (a) Enumerate the preparation of synthetic biodegradable polymer. State few examples.

Or

- (b) Explain the design strategies and applications of biomaterials.

14. (a) What is the difference between paramagnetism and ferromagnetism?

Or

- (b) Discuss the various applications of anti-ferromagnetic material.

15. (a) How do sensors work? Discuss the principle of sensor.

Or

- (b) How to build and use dye sensitized solar cells?

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Give the detailed account on synthesis of nanowires.
  17. Explain the fabrication and applications of metal-metal oxide composites.
  18. Enumerate the classification and behavior of different type of biomaterials.
  19. Describe the types and applications of magnetic materials.
  20. What is perovskite solar cell? How do perovskite solar cells work?
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<b>540203</b>
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**M.Sc. DEGREE EXAMINATION, APRIL 2019**

**Second Semester**

**Energy Science**

**ADVANCED INSTRUMENTAL METHODS OF ANALYSIS**

**(CBCS – 2016 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

All questions carry equal marks.

1. What are the different types of optical instruments?
2. What is the detection limit in AAS?
3. Define absorption spectroscopy.
4. Define Rayleigh scattering.
5. Write down the principle of potentiometry.
6. Write the principles of potentiometric and coulometric titration.
7. What is the principle of scanning electron microscopy?
8. Define Bragg's equation.
9. What structural difference exists between a DTA and DSC thermogram?
10. Why is the atmospheric control a critical factor in TG than in DTA analysis?

**Part B****(5 × 5 = 25)**

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

11. (a) Write a short note on Zeeman effect and uncertainty effect.

Or

- (b) Explain the instrumentation of X-ray fluorescence spectroscopy.

12. (a) Briefly write a note on IR sources and Transducers.

Or

- (b) Write about the working principle and instrumentation of Raman spectroscopy.

13. (a) Explain the principles of various types of electro analytical methods.

Or

- (b) Explain the voltammetric instrumentation.

14. (a) What's the difference between AFM and SPM?

Or

- (b) Write the working principle of EDAX.

15. (a) Explain the various types of curves obtained from thermogravimetric (TG) experiments.

Or

- (b) Explain the micro thermal analysis.



**Part C** $(3 \times 10 = 30)$ 

Answer any **three** questions.

16. Discuss the principle and instrumentation of atomic fluorescence spectroscopy.
  17. Explain principle and instrumentation of FTIR.
  18. Explain stripping voltammetry method.
  19. Describe the principle and applications of transmission electron microscopy (TEM).
  20. Compare the techniques of differential thermal analysis (DTA) and differential scanning calorimetry (DSC) and discuss the relative advantages and disadvantages of the techniques.
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<b>R-3050</b>
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<b>540401</b>
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**M.Sc. DEGREE EXAMINATION, APRIL 2019**

**Fourth Semester**

**Energy Science**

**HYDROGEN ENERGY SYSTEM**

**(CBCS – 2016 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is meant fossil fuel? How is hydrogen produced from fossil fuel?
2. Mention any two applications of hydrogen fuels.
3. What are the characteristics of Biomass Energy?
4. Define sulfidogenesis process.
5. How is water molecule split in photosynthesis?
6. What are the product of electrolysis of water?
7. Mention the types of fuel cells at different temperature.
8. What are the two most significant challenges to fuel cell commercialization?
9. How can hydrogen be stored safely?
10. Mention some hydrogen storage complex materials.

**Part B****(5 × 5 = 25)**

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

11. (a) What are the characteristics of steam reforming process?

Or

- (b) Explain the production of hydrogen from hydrocarbon by oxidation.

12. (a) Explain the production of hydrogen by biochemical pathway.

Or

- (b) Write a note on Batch fermentation.

13. (a) Explain the method of generating hydrogen by thermo-chemical water splitting.

Or

- (b) Discuss the working of Tandem cells.

14. (a) Explain the history and operation of fuel cell.

Or

- (b) Write a note on Borohydride fuel cell.

15. (a) Demonstrate the use of metal hydride in hydrogen storage.

Or

- (b) Write a note on Underground hydrogen storage.

**Part C** $(3 \times 10 = 30)$ Answer any **three** questions.

16. Discuss in detail the production of hydrogen from solid electrolyte membrane reactors.
17. Describe the production of hydrogen by :
- (a) Fermentation and
  - (b) Agricultural residues. (5+5)
18. (a) How is solar energy used in the production of hydrogen?
- (b) Write a note on Photo-biochemical cell. (5+5)
19. Explain the working of the following with neat diagram:
- (a) Miniature fuel cell
  - (b) Portable power
  - (c) Acid fuel cell. (4+3+3)
20. Discuss the storage of hydrogen by
- (a) By Chemical storage
  - (b) Physical Hydrogen storage. (5+5)
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<b>540504</b>
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**M.Sc. DEGREE EXAMINATION, APRIL 2019**

**Fourth Semester**

**Energy Sciences**

**ENERGY AUDIT AND MANAGEMENT**

**(CBCS – 2016 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. What is an energy audit?
2. How many types of energy audit are there?
3. How do I know which energy audits is right for me?
4. What is the methodology for Energy Management?
5. What is the meaning of energy planning?
6. Give any three measures used to produce an energy policy.
7. Define First law of efficiency of energy balance.
8. What are the roles of management information system?
9. Name any two energy audit instruments and mention their purpose.
10. What is the scope of energy audit?

**Part B** $(5 \times 5 = 25)$ Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the general principles of energy management.

Or

- (b) Write a note on Energy management Skills.

12. (a) Discuss the different stages of an energy audit.

Or

- (b) Explain the Bench Marking Energy audit.

13. (a) What are the roles and responsibilities of Energy manager?

Or

- (b) Describe the Challenges faced during implementation of energy policy.

14. (a) Draw the energy balance diagram and explain its importance.

Or

- (b) Distinguish between First law of efficiency and second law of efficiency.

15. (a) Write a note on Energy savings.

Or

- (b) Summarize of the energy audits general procedure.

**Part C** $(3 \times 10 = 30)$ Answer any **three** questions.

16. Explain the Ten Steps Methodology for Detailed Energy Audit.

17. Discuss the following (a) Maximizing system efficiency  
(b) Optimizing the energy requirement. (5 + 5)
  18. How are the following implemented? (a) Marketing  
(b) Communicating training (c) Motivation of employees.  
(4 + 3 + 3)
  19. Describe energy balance sheet and MIS.
  20. Explain the different types of Energy Audit Instruments.
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