PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: CHE 1004

Course Name: SMART MATERIALS FOR IOT

Program   : B.TECH

Date: 25-JAN-2023

Time: 01:00 PM – 04:00 PM

Max Marks: 100

Weightage: 50 %

Instructions:

(i)   Read the all questions carefully and answer accordingly.
(ii) Complete the test within the time give.
(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries ONE marks.   (20Qx 1M= 20M)

1. Which of the following is a biodegradable polymer   (1 Marks, CO1, Knowledge)
   a) Polyethylene
   b) Polyaniline
   c) Polypropylene
   d) Polylactic acid

2. Which of the following is a conducting polymer?   (1 Marks, CO1, Knowledge)
   a) Poly(p-phenylene)
   b) Polythiophene
   c) Polyaniline
   d) All the above

3. Who coined the term "Internet of Things"?   (1 Marks, CO1, Knowledge)
   a) John Wright
   b) Edward Jameson
   c) Kevin Aston
   d) George Garton

4. What is RFID?   (1 Marks, CO1, Knowledge)
   a) Relevant frequency identification
   b) Radio identification
   c) Radar frequency identification
   d) Radio frequency identification

5. IIoTs is,   (1 Marks, CO1, Knowledge)
   a) Industrial Internet of Things
   b) Internet of things
   c) Internet of Everything
   d) Infrastructure Internet of Things

6. Smart materials are also called _____ materials.
   a) Intelligent
   b) Metal oxides
   c) Responsive
   d) Both a & c   (1 Marks, CO1, Knowledge)

7. _____ sensors are commonly used in wearable technology like fitness trackers and smartwatches.

   a) Acoustic
   b) Proximity
   c) Biometric
   d) Electrical   (1 Marks, CO1, Knowledge)

8. Which of the following is a fundamental component of an IoT system?
   a) Sensors
   b) Connectivity and data processing
   c) Transformer
   d) Both a & b   (1 Marks, CO1, Knowledge)

9. M2M is,
   a) Machine to Man
   b) Machine to machine
   c) Machine to mangement
   d) None of the above   (1 Marks, CO1, Knowledge)

10. Monomer used in the synthesis of PVC is------------
    a) Methyl methacrylate
    b) Vinyl chloride
    c) Ethylene
    d) Styrene   (1 Marks, CO1, Knowledge)

11. Cellulose is _____ in water
    a) Insoluble
    b) Highly Soluble
    c) Sparingly soluble
    d) Moderately soluble   (1 Marks, CO1, Knowledge)

12. _____ and _____ are the monomers of PET.
    a) Di-isocyanate, polyol
    b) Di-isocyanate, citric acid
    c) Terephthalic acid and ethylene glycol
    d) Mono-isocyanate, adipic acid   (1 Marks, CO1, Knowledge)

13. Which of the following is inorganic polymer?
    a) Polyaniline
    b) Polydimethylsiloxane
    c) Polyethylene terephthalate
    d) Polypyrrole   (1 Marks, CO1, Knowledge)

14. Full form of ASTM is
    a) American Scientist for Testing Machines
    b) American Society for Testing Machines
    c) American Society for Testing and Materials
    d) American Science for Testing and Materials   (1 Marks, CO1, Knowledge)

15. In a voltammetry method the electrode that provides a means of applying input potential and completes the circuit and allow charge to flow is called,
    a) Standard electrode
    b) Working electrode
    c) Counter electrode
    d) Reference electrode   (1 Marks, CO1, Knowledge)

16. _____are collections of physical and computer components that are integrated with each other to operate a process safely and efficiently.
    a) Physical computer systems
    b) Cyber-Physical Systems
    c) Physical Systems
    d) Cyber systems   (1 Marks, CO1, Knowledge)

17. CPS include industrial control systems,
    a) Industrial control systems
    b) Robotics systems
    c) Smart grid
    d) All of the above   (1 Marks, CO1, Knowledge)

18. Which of the following is used in electron microscopy?
    a) Electron beams
    b) Magnetic fields
    c) Light waves
    d) UV-rays   (1 Marks, CO1, Knowledge)

19. What is monomer of Teflon?
    a) Ethylene
    b) Difluoroethylene
    c) Trifluoroethylene
    d) Tetrafluoroethylene   (1 Marks, CO1, Knowledge)

20. Which among the following polymer is a water-soluble and biodegradable synthetic polymer,
    a) Cellulose
    b) Polyvinyl alcohol
    c) Polyurethane
    d) Poly(dimethylsiloxane)   (1 Marks, CO1, Knowledge)

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.   **(5Qx10M=50M)**

21. Find out the name of the materials which contain a metal cation and an oxide anion in their structure. Identify any 2 suitable IOT applications for the following materials,
    - (i) ZnO
    - (ii) TiO_2
    - (iii) $BaTiO_3$
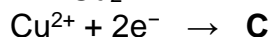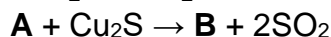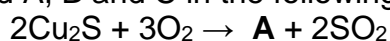   - (iv) Au-coated ZnO   (10 Marks, CO2, Comprehension)

22. What is the name of the biodegradable polymer used as piezoelectric materials of merit? Explain its scheme of synthesis.   (10 Marks, CO3, Application)

23. a) Find A, B and C in the following equations,   (6 Marks, CO3, Application)
    $$2Cu_2S + 3O_2 \rightarrow \textbf{A} + 2SO_2$$
    $$\textbf{A} + Cu_2S \rightarrow \textbf{B} + 2SO_2$$
    $$Cu^{2+} + 2e^- \rightarrow \textbf{C}$$

    b) Mention the name of the molecule which carries genetic instructions in all living organisms. Write their importance in IoT applications.   (4 Marks, CO2, Comprehension)

24. Match the following,   (10 Marks, CO2, Comprehension)
    - i. $BaTiO_3$ – Silver nitrate
    - ii. Gold – Titanium tetra isopropoxide
    - iii. Silver – Barium acetate
    - iv. Platinum – Chloroauric acid
    - v. TiO_2 – Hexachloroplatinate
    - vi. Polyhydroxybutyrate – Biopolymer
    - vii. Polypeptide – Conducting polymer
    - viii. Tin(IV)sulfide – High density polyethylene
    - ix. HDPE – Inorganic sulfide
    - x. PEDOT – Biodegradable polymer

25. What is the role of universal testing machine for analyzing the materials for IOT applications?   (10 Marks, CO3, Application)

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries FIFTEEN marks.   **(2Qx15M=30M)**

26. Find the analytical techniques that use a measurement of potential, charge, or current to determine an analyte's concentration. Explain the working principle and applications.

          (15 Marks, CO3, Application)

27. What are the different steps involved in fabricating floor mat for smart home using polyvinyl chloride (PVC) as a substrate material? Explain in detail.

          (15 Marks, CO4, Comprehension)