



**PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF ENGINEERING**

MAKEUP EXAMINATION – JAN 2023

Course Code: CHE 1013

Course Name: Chemistry for Engineers

Program: B.Tech

Date: 25-JAN-2023

Time: 01:00 PM to 04:00 PM

Max Marks: 100

Weightage: 50%

Instructions:

- (i) Read the question properly and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO marks. (10Qx2M=20M)

1. Which of the following is NOT a component of conventional batteries,
a) anode b) cathode c) electrolyte d) fuel (C.O.NO.1) [Knowledge Level]
2. Reduction involves gaining of
a) electrons b) protons c) neutrons d) ions (C.O.NO.1) [Knowledge Level]
3. Which of the following is reserve battery
a) Sodium ion battery b) Lithium ion battery c) Magnesium water activated battery
d) Potassium ion battery (C.O.NO.1) [Knowledge Level]
4. A quantitative relationship between electrode potential and concentration of substance involved is called _____
a) Standard electrode potential b) Nernst equation c) Reduction potential
d) Ideal gas law constant (C.O.NO.1) [Knowledge Level]
5. Charge transport in an electrolyte occurs via the motion of
a) ions b) electrons c) protons d) neutrons (C.O.NO.1) [Knowledge Level]
6. Which of the following components of battery take part in the oxidation reactions,
a) Anode b) Cathode c) Electrolyte d) Separator (C.O.NO.1) [Knowledge Level]
7. Which of the following is TRUE with fuel cells, (C.O.NO.2) [Knowledge Level]
a) They are ecofriendly b) They are less expensive
c) Reactants and products are stored inside the system d) They are rechargeable.

8. Which of the following statement is NOT TRUE for the properties of silicon
(C.O.NO.2) [Knowledge Level]

- a) It is a semiconductor
- b) It can be doped with boron and phosphorous atoms
- c) It has a band gap of 1.12 eV between valence and conduction band
- d) All the above

9. Which of the following is a non-renewable energy? (C.O.NO.2) [Knowledge Level]

- a) Solar energy
- b) Nuclear energy
- c) Hydro-electric energy
- d) Geothermal energy

10. $1 \text{ nm} = \underline{\hspace{2cm}} \text{ m}$ (C.O.NO.3) [Knowledge Level]

- a) 10^{-6}
- b) 10^{-9}
- c) 10^{-12}
- d) 10^{-15}

Part B [Thought Provoking Questions]

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

11) Methanol fuel cells are a subcategory of proton-exchange fuel cells in which methanol is used as the fuel. Write the construction and working of the methanol-oxygen fuel cell. Illustrate with a neat labelled diagram. (C.O.NO.2) [Comprehension Level]

12) Single/mono crystalline silicon solar panels are more efficient than polycrystalline silicon solar panels. Describe '*Czochralski crystal pulling technique*' for production of single crystalline silicon with a suitable labeled diagram. (C.O.NO.2) [Comprehension Level]

13) Explain and give reasons for the following statements:

- (a) The melting point of bulk CdSe is 1600 K but melting point of nano CdSe is 700 K.
- (b) Bulk gold is practically inert but nano sized gold particles are highly catalytically active materials. (C.O.NO.3) [Comprehension Level]

14) Nanomaterials can be synthesized from gaseous reactants by chemical vapour deposition (CVD) technique. Explain the steps involved in CVD technique with suitable diagram. (C.O.NO.3) [Comprehension Level]

15) The nanomaterials can be synthesized by top-down and bottom-up approaches.

- (a) Differentiate top-down and bottom-up approaches for synthesizing nanomaterials
- (b) What are carbon nano tubes (CNTs)? Write the applications of CNTs. (C.O.NO.3) [Comprehension Level]

Part C [Problem Solving Questions]

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

16) Solar grade silicon (99.99% purity) is produced from quartz (SiO_2) in four steps: i) production of metallurgical grade Si, ii) silane formation, iii) pyrolysis and iv) zone refining. (a) Explain the method for producing '*metallurgical grade Si*'. (b) Give detail description of '*zone refining process*' with suitable diagram. (C.O.NO.2) [Application Level]

17) The sol-gel process is a bottom-up approach, wet-chemical technique for synthesizing nanomaterials. Explain the steps involved in sol-gel process for synthesizing nanomaterials. (C.O.NO.3) [Application Level]