

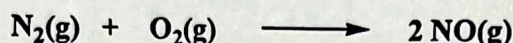


KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE

PART - A (10 X 3 = 30 Marks)

Answer ALL Questions

1. Calculate the standard free energy change for the formation of NO(g) from N₂(g) and O₂(g) at 298 K:



given that $\Delta H^\circ = 180.7 \text{ kJ}$ and $\Delta S^\circ = 24.7 \text{ J/K}$.

Is the reaction spontaneous under these conditions?

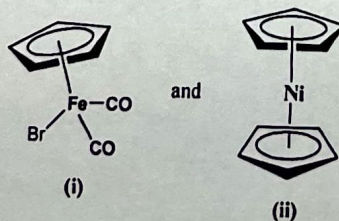
What happens to the reaction if the temperature is increased to 8000 K?

2. Highlight the function of chlorophyll in photosynthesis.
3. Evaluate the stability of secondary carbocation based on inductive and resonance effects taking a suitable example.
4. Why is silicon preferred for solar cell applications?
5. Outline the roles of individual constituents present in a composite material with an appropriate example.
6. List out any three important applications of X-Ray diffraction technique.
7. Identify and write a short description of a suitable method for decorative coating of aluminium on a plastic support.
8. Give a brief account of lock and key mechanism in enzyme catalysis.
9. Describe briefly the working principle of H₂-O₂ fuel cell.
10. Explain briefly the working of reverse osmosis process.

PART - B (7 X 10 = 70 Marks)

Answer ALL Questions

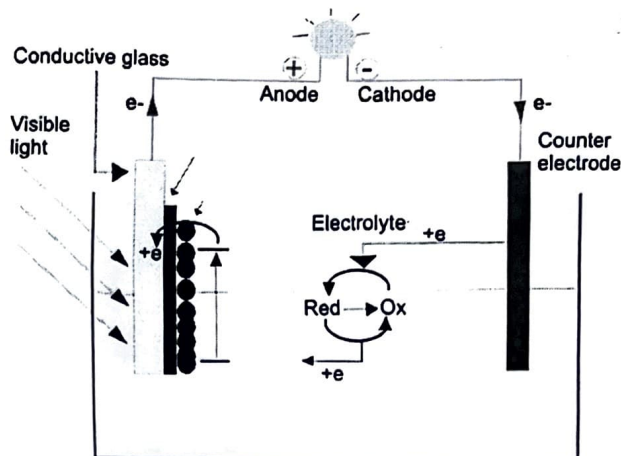
11. a) Discuss the working of a Carnot engine. [6]
- b) Identify the differences between homogeneous and heterogeneous catalysts. [4]
12. a) Interpret the hybridization and magnetic properties of [NiCl₄]²⁻ and [Ni(CN)₄]²⁻. [8]
- b) Comment on the stability of the following organometallic complexes: [2]



13. Choose appropriate examples for the following and compare their stability with a proper justification: [10]
- i) Aromatic
 - ii) Anti-aromatic and
 - iii) Non-aromatic

14. Identify the components used in the construction of a Grätzel cell given below. [10]
Highlight the significance of components and working of this cell.

What are the advantages of these cells over conventional solar cells?



15. a) How do dopants increase the conductivity of polymers? Explain the mechanistic aspects using a suitable example. [10]

OR

15. b) How are nanoparticles prepared by a top-down approach? Briefly discuss the advantages and limitations of this technique. [10]

16. a) Explain the important components and working principle of the X-ray diffraction (XRD) spectrometer with a schematic diagram. [10]

OR

16. b) Discuss the working principle, limitations and applications of UV-Visible spectrophotometry. [10]

17. a) i) Explain the working principle and regeneration of ion-exchange resins used for water softening with a neat sketch. [7]

- ii) Outline a suitable method to protect the ship hulls from corrosion. [3]

OR

17. b) Explain the working of Bomb calorimeter with a neat sketch and mention the corrections in the calculation of the calorific value of solid fuels. [10]

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