

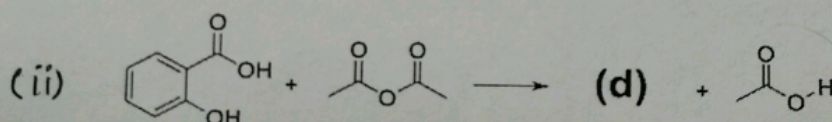
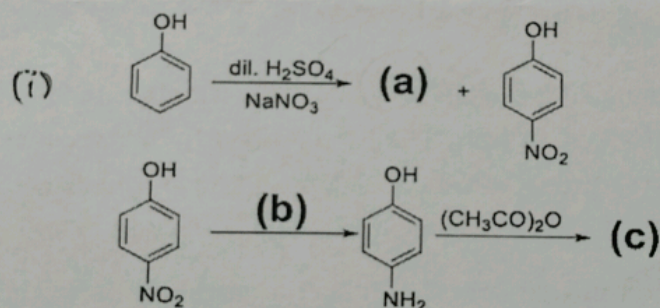


KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE

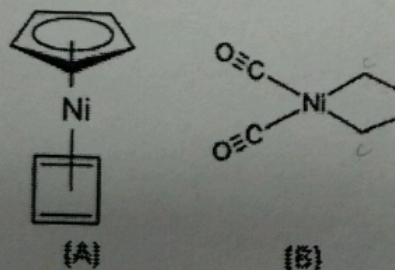
Answer any **TEN** Questions

(10 X 10 = 100 Marks)

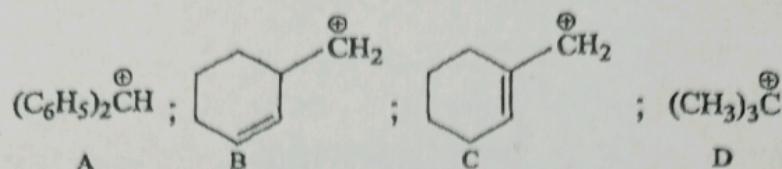
1. (a) 5 moles of an ideal gas expands reversibly and isothermally from a pressure of 12 atm to 3 atm at 300 K. Calculate the work done. [5]
(b) Substance 'A' of 6.0 grams decomposes for 30 minutes and the mass of unreacted 'A' remaining is found to be 0.452 g. What is the half-life of this reaction if it follows first-order kinetics? [5]
2. How to calculate the efficiency of a heat engine using the four stages of Carnot cycle? Illustrate with suitable sketch.
3. Apply valence bond theory to deduce the hybridization, structure, magnetic character and spin only magnetic moment of the following complexes:
(i) $[\text{Co}(\text{CN})_6]^{3-}$
(ii) $[\text{Cu}(\text{NH}_3)_6]^{2+}$
4. Identify the structure of missing species in the following reaction schemes. What are the names of (a), (b), (c) and (d)? Explain the significance of (c) and (d).



5. (a) Find the stability of the following organometallic complexes based on 18 electron rule. [5]



(b) Discuss the stability order of the following carbocations and arrange them in the decreasing order with suitable justification. [5]



6. Elucidate the mechanism of working of a fuel cell that can be operated at very high temperature of 1000 °C. Also, highlight the merits and demerits of this fuel cell.
7. Explain the principle, construction and working mechanism of Gratzel cell with suitable diagram.
8. Elaborate the synthetic procedure for the preparation of nanomaterials using bottom up approach along with its merits and demerits.
9. Elucidate how doped conducting polymers are prepared with appropriate examples. Also, describe the conductivity mechanism involved.
10. How Beer-Lambert's law is applied towards working of UV-Vis absorption spectroscopy? Further, discuss the principle and applications of UV-Vis absorption spectroscopy.
11. Describe the de-ionization process of softening hard water using ion-exchange resins with suitable diagram.
12. (a) 0.72 gram of a fuel containing 80 % carbon, when burnt in a bomb calorimeter, increased the temperature of water from 27.3 °C to 29.1 °C. If the calorimeter contains 250 grams of water and its water equivalents is 150 grams, calculate the Higher Calorific Value. [5]
 (b) Zinc materials are attached to the steel ship hulls for corrosion prevention. [5]
 Explain the chemistry involved in this process.

