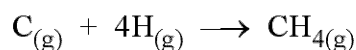


(2)

Define bond enthalpy. How bond enthalpy of C—H in methane can be determined? The main reaction is



[when heat of formation of CH_4 , heat of dissociation of H_2 all amount to 398 kcal/mole] 10+10

2. What are the main conditions essential for the formation of a covalent bond ?

To form molecular orbital, what are the rules for linear combinations of atomic orbitals ?

Draw a diagram for ψ_g and ψ_u molecular orbitals showing curves among energy, distance and atoms.

Mention the importance of ionisation potential and electron affinity in the formation of a covalent bond. 5+5+5+5

3. Explain any **four** of the following : 4×5

(a) Solvent effects from the curve-crossing model

(b) Acidity functions and their applications

(c) Ambivalent nucleophiles

(d) Marcus theory of electron transfer

(e) Hammond's postulate

(3)

4. (a) What are free radicals? Discuss their stability. Explain regioselectivity in radical reactions. 12
- (b) Give an account of reactivity related specificity and periselectivity in pericyclic reactions. 8
5. (a) Discuss qualitative understanding of solvent solute effects on reactivity. 10
- (b) Mention and discuss examples of solvent sensitive reaction rates. 10

OR

Write brief notes on any **three** of the following : 20

- (a) Frontier molecular orbital theory
- (b) Arrhenius equation
- (c) Bell-Evans-Polanyi principle used in steric and solvent effects in reaction mechanism
- (d) Structural and electronic effects on SN_1 reactions
- (e) Kinetics of S_E^{2-Ar} reaction.

Section-B

6. Give an account of six membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interaction. 20

(4)

7. Give synthesis and reactions including medicinal applications of Benzopyrroles, Benzothiophenes and Benzofurans (any **two**). 20
8. Explain any **two** of the following : 20
- (a) Empirical resonance energy, delocalisation energy and Dewar resonance energy.
 - (b) Hantzsch-Widman system of nomenclature for monocyclic and fused heterocycles.
 - (c) Hetero-aromatic reactivity and tautomerism in aromatic heterocycles.
9. Give an account of the synthesis and reactions of Coumarins, Benzopyrylium and Quinolizinium salts (any **two**). 20
10. (a) Give an account of principles of heterocyclic synthesis involving cyclisation reactions and cycloaddition reactions. 10
- (b) Give syntheses of any **two** of the following : 10
- (i) Oxiranes
 - (ii) Oxetanes
 - (iii) Aziridines
 - (iv) Azetidines
- _____