Maharashtra State Eligibility Test (SET) 2010

Sample Questions:

Chemical Sciences (Paper II and Paper III)

1. The total number of permitted electrons in a 4f orbital is
(A) 10, (B) 6,
(C) 14, (D) 2.
Ans. C

2. Which one of the following is a molecular solid ?
(A) NaCl, (B) Phosphorus,
(C) Diamond, (D) Iron.
Ans. B

3. Thr chiral molecules among the following are
(i) 1, 1-Dimethylcyclopropane.
(ii) cis-1, 2-dimethylcyclopropane.
(iii) trans-1, 2-dimethylcyclopropane.
(A) All three, (B) (ii) and (iii), (C) only (ii), (D) only (iii).
Ans. D

1. The standard heat of hydrogenation of propane in the reaction
$CH_2 = CHCH_3\ (g) + H_2(g) = C_3\ H_8(g)$ is - 124 kJ/mol.

The standard heat of combustion of propane in the reaction
$C_3\ H_8(g) + 5O_2(g) = 3CO_2(g) + 4H_2O\ (1)$ is - 2220 kJ/mol.

Calculate the standard heat of combustion of propane.
Given : $\{H_2(g) + 0.5O_2(g) = H_2O(l), AH^o = -285.8kJ/mol\}$

2. Match the following Hammet σ values :

(a) m - Me	(i) + 0.78
(b) p - Me	(ii) – 0.27
(c) p - NO_2	(iii) + 0.12
(d) p - $COCH_3$	(iv) – 0.07
(e) m - OMe	(v) + 0.50
(f) p - OMe	(vi) – 0.17

3. (a) Predict whether the following reactions will proceed via inner, sphere or outer sphere mechanism. Give the products also.
(i) $[Fe\ (CN)_6]4 + [Ir\ Cl_6]^{2-}$ -->
(ii) $[Co\ (NH_3)_5\ NCS]^{2+} + [Cr\ (H_2O)_6]^{2+}$ -->

(b) Name the factors that determine the magnitude of crystal field splitting.