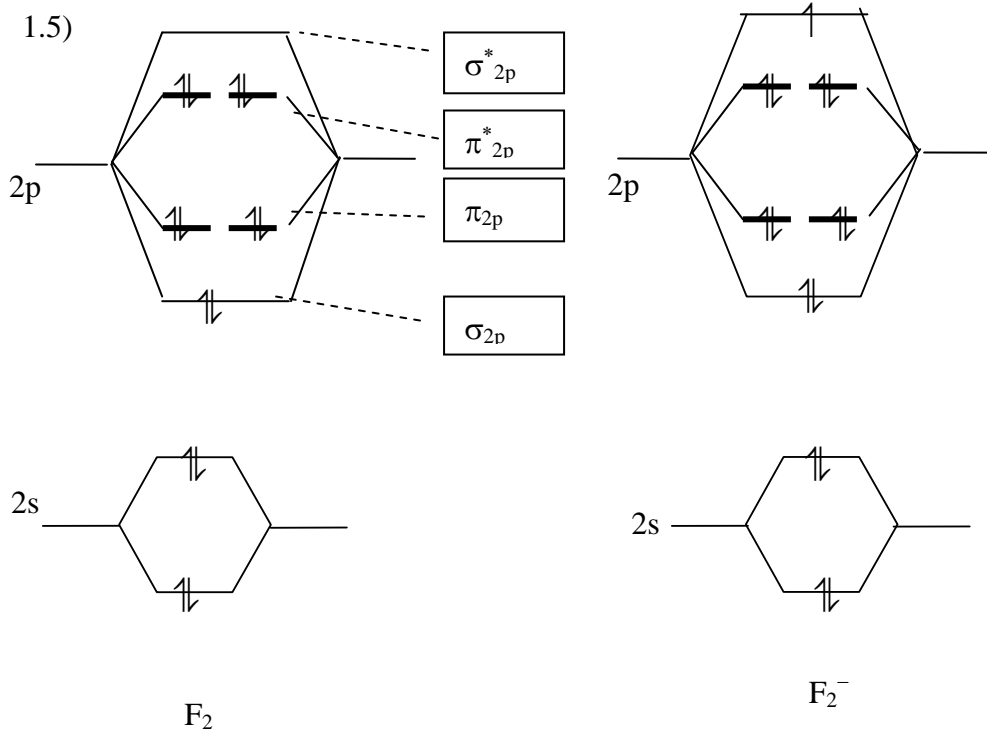


Answers to INChO-2008 problems

Question No. 1

Subdivisions

- 1.1) F_2 -1.6, F_2^- - 1.1,1.3
 1.2) F atom -3.4, F_2 molecule - 3.0,3.2
 1.3) F_2 : -1.4 F_2^- : -1.9
 1.4) 4.15

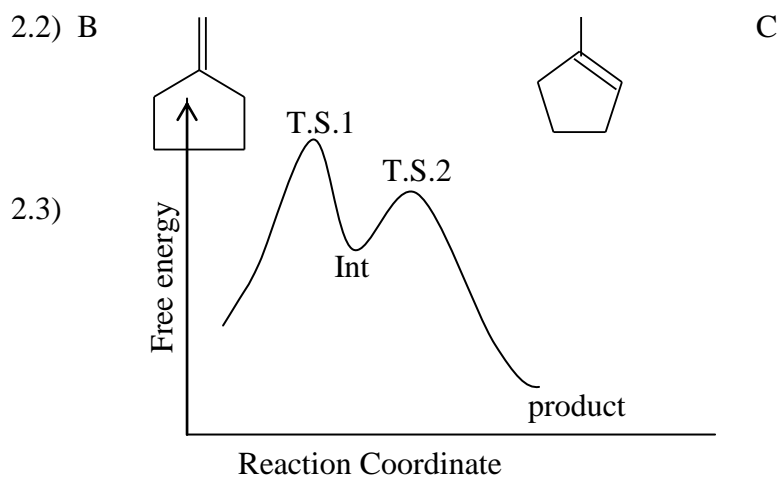


- 1.6) F_2 - 1.0 F_2^- - 0.5
 1.7) F_2^-
 1.8) $I_1 = 18.9 \text{ eV}$ $I_2 = 15.6 \text{ eV}$
 1.9) $I_1 = \pi_{2p}^*$ $I_2 = \pi_{2p}$

Question No. 2

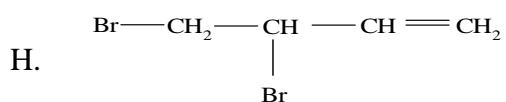
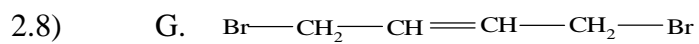
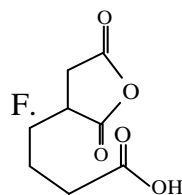
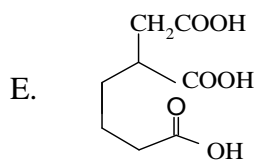
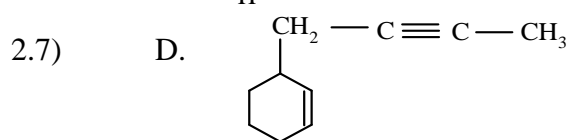
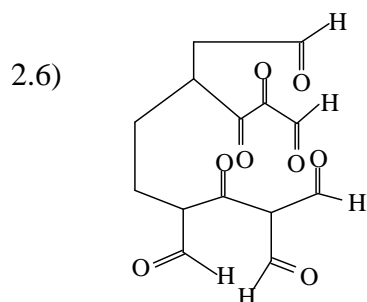
Subdivisions

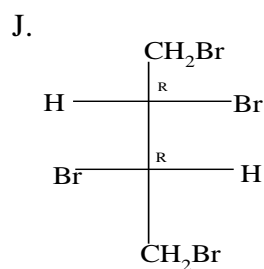
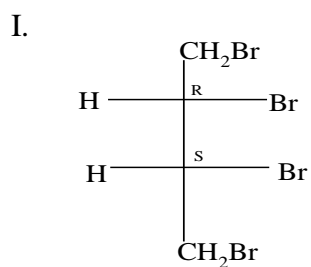
- 2.1) a) Z-5-methyl hex-2-en-1-al
 b) Z-2-methyl-1-phenyl hept-1-en-6-yne



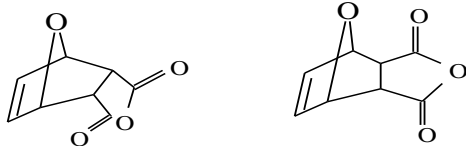
- 2.4) i) E
 ii) D
 iii) E

- 2.5) a) iv b) iii c) ii d) v e) i



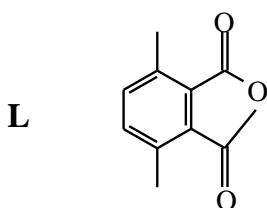


2.9)



K

2.10)



Question No. 3

Subdivisions

3.1)

i) aromatic

iv) yes

ii) aromatic

v) acidic

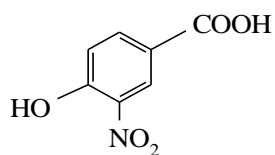


vi) a)

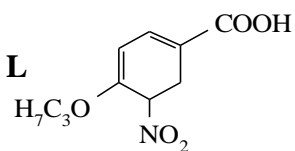
3.2) I < III < II

3.3)

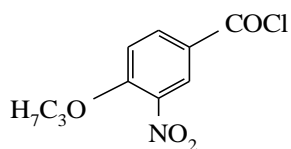
K



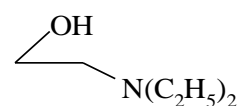
L



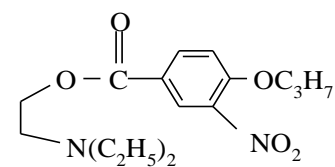
M



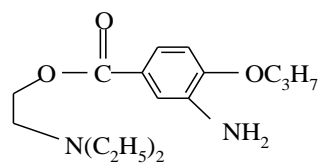
N

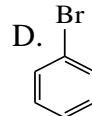
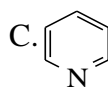
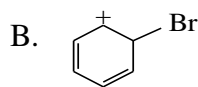
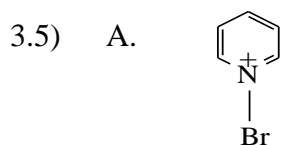
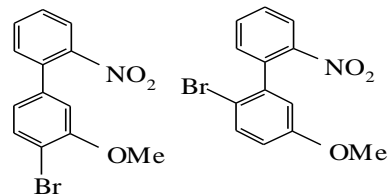
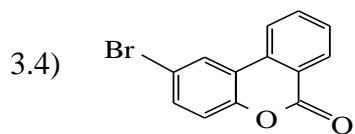


O



P





3.6) iv.

Question No. 4

Subdivisions

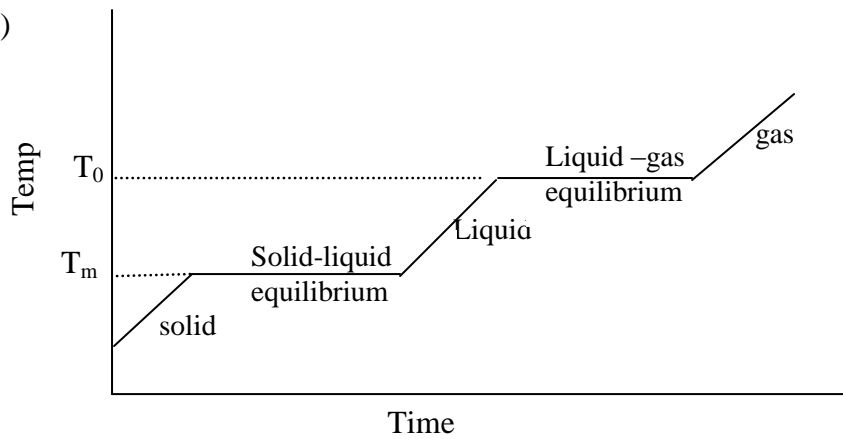
- 4.1) 8.17×10^{-8} bar
 4.2) 304 K
 4.3) 641.02 K
 4.4) Yes the reaction will proceed towards NOCl
 4.5) Rate = $k [\text{NO}]^2 [\text{Cl}_2]$
 4.6) $E_a = 98.82$ kJ / mol
 4.7) Mechanism I and II both are possible.
 4.8) Extent of the reaction = 0.1
 4.9) Extent of the reaction at completion = 0.195

Question No. 5

Subdivisions

- 5.1) a.
 5.2) b.
 5.3) $X_1 \rightarrow$ Solid phase
 $X_2 \rightarrow$ Solid –Liquid equilibrium phase
 $X_3 \rightarrow$ Liquid – Gas equilibrium phase
 $X_4 \rightarrow$ Gas Phase

5.4)



5.5) b

5.6) Volume will increase on melting

5.7) Single Phase system called Supercritical Fluid

5.8) c

$$5.9) p_1 = \chi_1 \cdot p_1^\circ = (1 - \chi_2) p_1^\circ$$

$$\Rightarrow p_1^\circ - p_1 = \chi_2 \cdot p_1^\circ \text{ or}$$

$$\Delta p_1 = \chi_2 p_1^\circ$$

$$\Rightarrow \Delta p_1 / p_1^\circ = \chi_2$$

5.10) 56

5.11) a. $nA = A_n$

$$[A] = \sqrt[n]{KC_2}$$

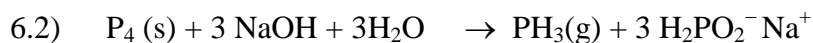
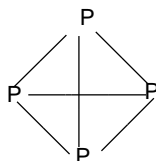
b.

$$K_D = \frac{C_1}{\sqrt[n]{C_2}}$$

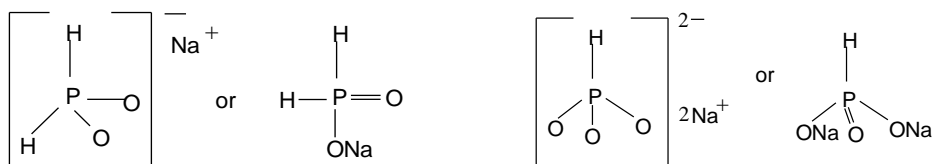
Question No. 6

Subdivisions

6.1)



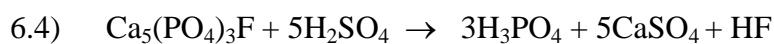
6.3) a.



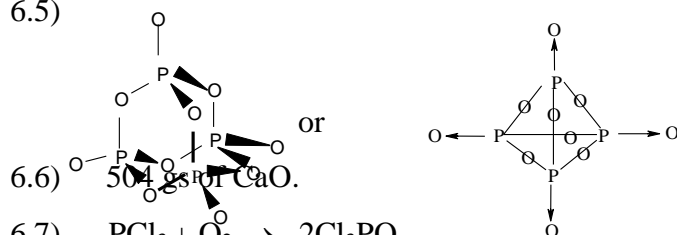
b. hypophosphite-reducing agent

phosphate-reducing agent

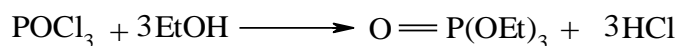
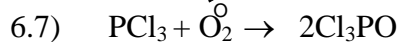
c. They are reducing agents due to presence of P-H bond and lower oxidation state of P



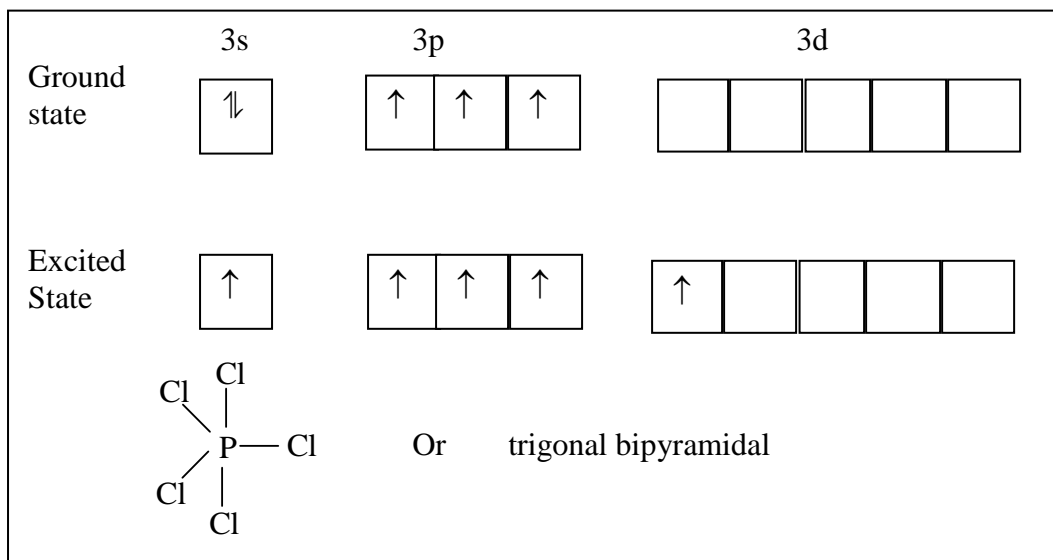
6.5)

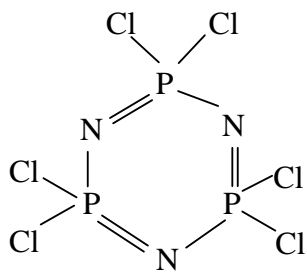
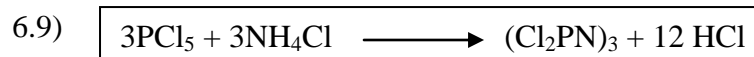


6.6) $504 g P_4 + 504 g CaO$



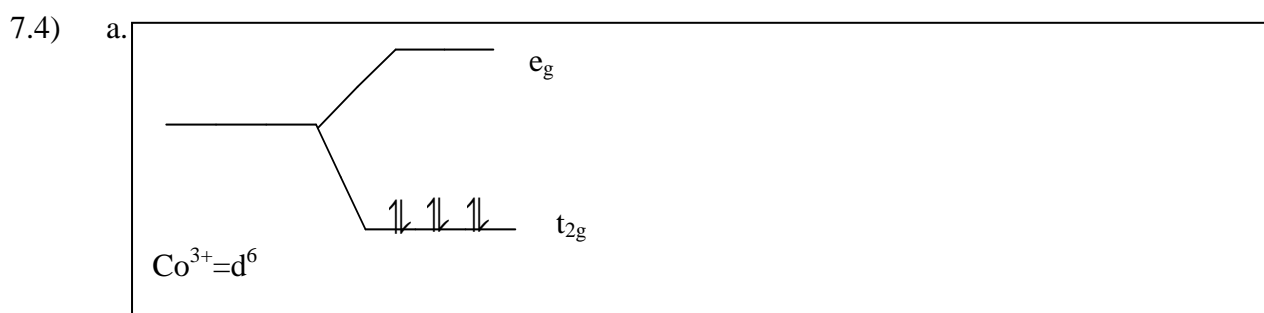
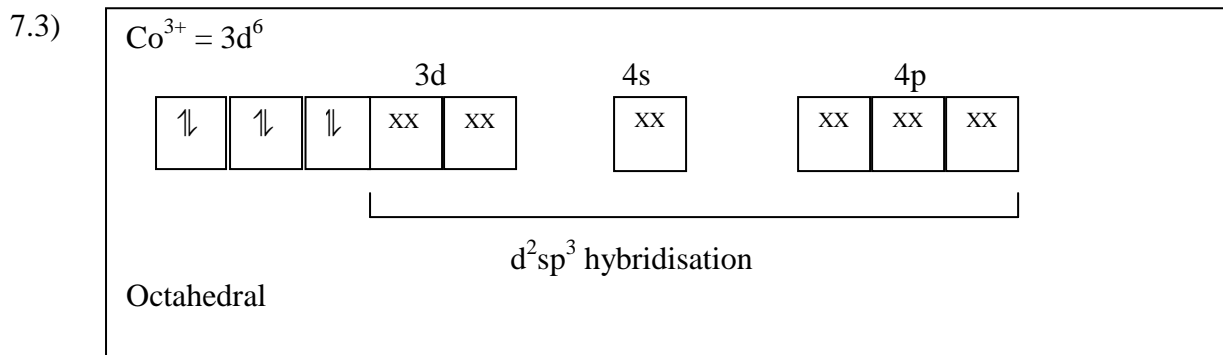
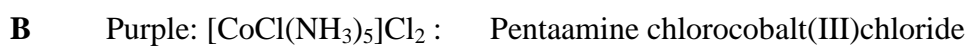
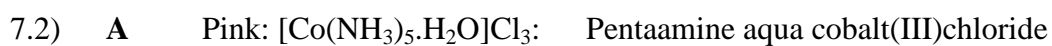
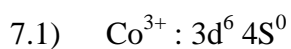
6.8)



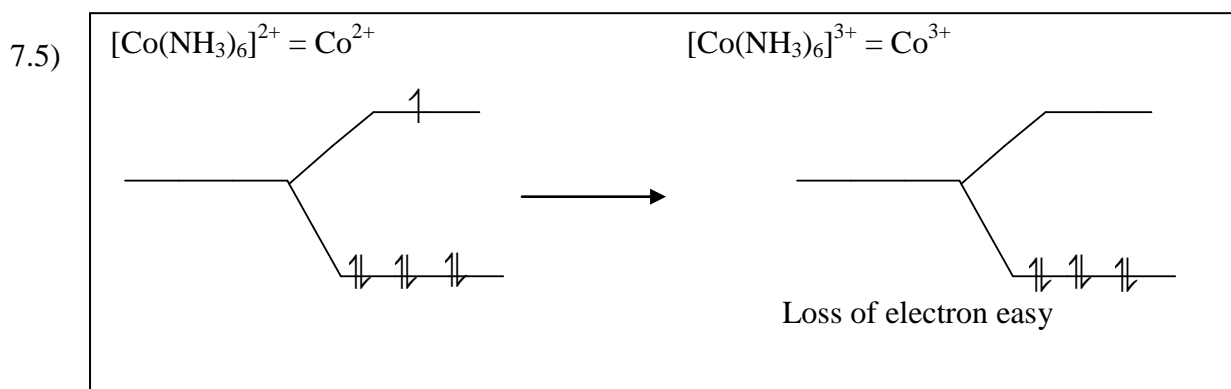


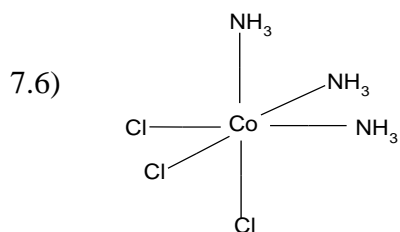
Question No. 7

Subdivisions

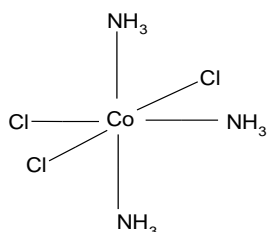


b. diamagnetic.





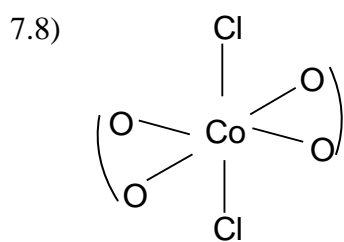
Facial



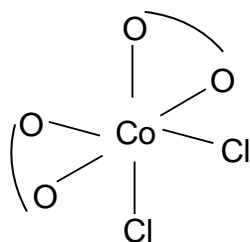
Meridional

7.7) Facial isomer - one peak due to ammonia (with all similar environments)

Meridional isomer – two peaks



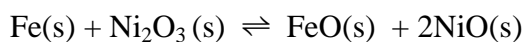
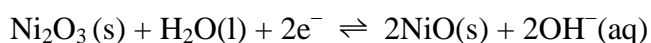
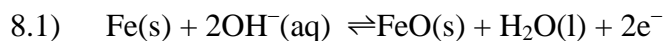
Inactive plane of symmetry



Chiral

Question No. 8

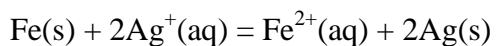
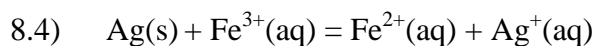
Subdivisions



8.2) iii.

8.3) $E^{\text{0}}_{\text{cell}} = 0.83633 \text{ V}$

$E_{\text{cell}} = 0.80283 \text{ V}$

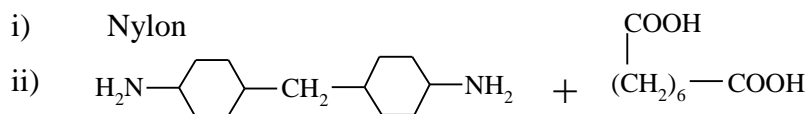


8.5) $K = 2.97$

$[\text{Fe}^{\text{3+}}] = 0.01$

Question No. 9

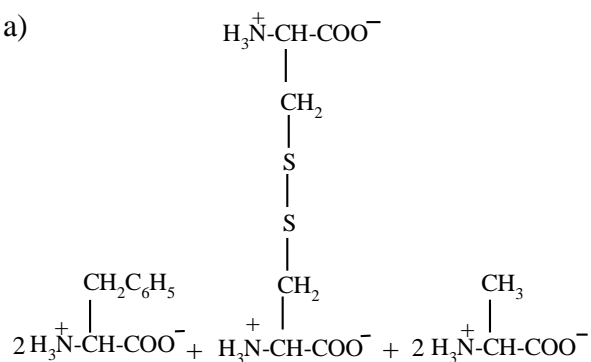
Subdivisions



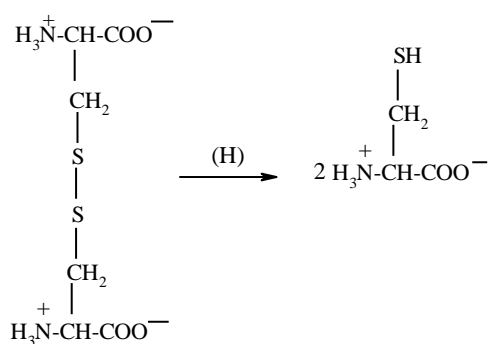
9.3)

Peptide	Nature			Charge		
	Acidic	Basic	Neutral	Positive	Negative	Zero
Gly-Leu-Val			X			X
Leu-Trp-Lys-Gly-Lys		X		X		
Arg-Ser-Val		X		X		

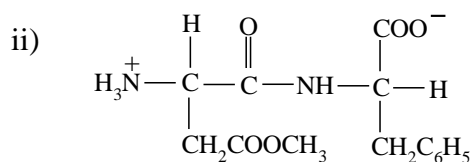
9.4) a)



b)



9.5) i) 4



- 9.6) **A** – aspartic acid
B – alanine
C - arginine