

Selezione per le Olimpiadi Internazionali della Chimica 2011
Fase Nazionale – Soluzioni dei problemi a risposta aperta
Frascati, 28 maggio 2011

Esercizio 1: Cinetica

1.1 $A + R \rightarrow P$

Dati i 2 valori ottenuti (valore reale e valore con l'assunzione che $[P]$ sia costante) avremo che:
 $E_{relativo} = E_{assoluto} / V_{medio}$; $E_{assoluto} = \Delta(\text{valori}) / 2$, con $\Delta(\text{valori}) > 0$.

Assumendo che $[R]$ sia costante fino al 40% avremo che $[R]_{fin} = 100 [A]_0$.

Quando $[R]$ non si considera più costante avremo che al 40% di completezza $[R] = 99.6 [A]_0$.

$$E_{relativo} = E_{assoluto} / V_{medio} = (0.2 [A]_0) / (99.8 [A]_0) = 2 \cdot 10^{-3}$$

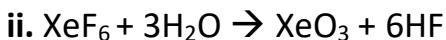
1.2 $[A] = 0,01 [A]_0 \rightarrow 0,01 = e^{-kt} \rightarrow t = 92.1 \text{ sec}$

1.3 $[R] = [R]_0 e^{-kt}$, $[R] = 5.1 \cdot 10^{-3} \text{ M}$

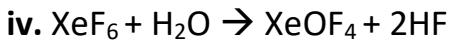
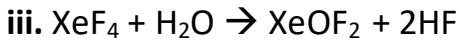
Esercizio 2: Termodinamica dei gas

	Espansione isoterma			Espansione adiabatica		
	$P_{est} = 0$	$P_{est} = k$	$P_{est} = P$	$P_{est} = 0$	$P_{est} = k$	$P_{est} = P$
Q	0	W	w	0	0	0
W	0	$+p_{est} \Delta V$	$nRT \ln V_2/V_1$	0	ΔU	ΔU
ΔU	0	0	0	0	$nC_v \Delta T$	$nC_v \Delta T$
ΔT	0	0	0	0	$\Delta U / nC_v$	$\Delta U / nC_v$
ΔS	0	$+p_{est} \Delta V / T$	$nR \ln V_2/V_1$	> 0	> 0	0

Esercizio 3: Reattività e forma delle molecole



a



i. XeF_2 ; sp^3d

ii. XeF_4 ; sp^3d^2

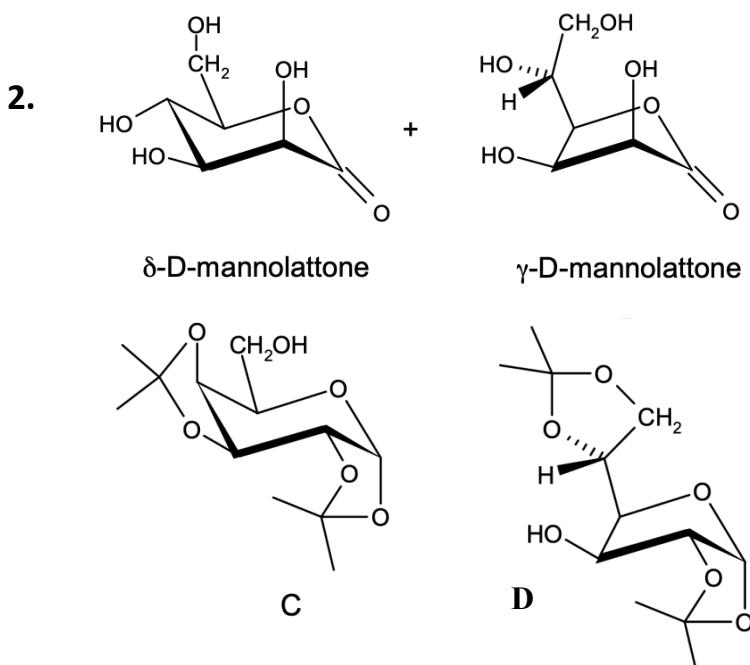
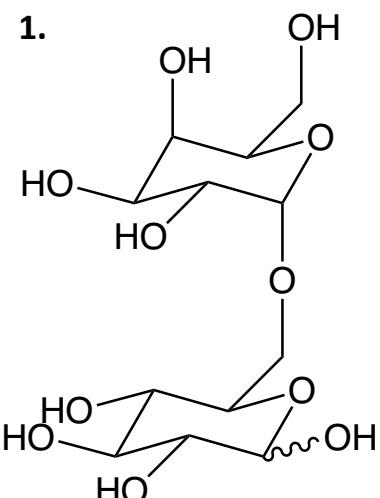
b

iii. XeO_3 ; sp^2

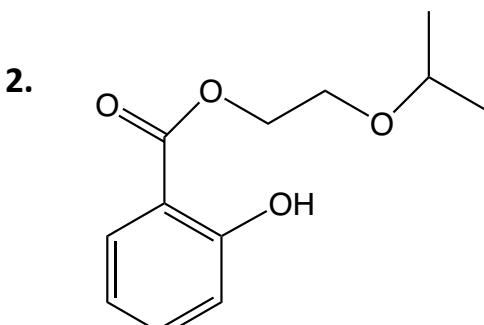
iv. XeOF_2 ; sp^3d

v. XeOF_4 ; sp^3d^2

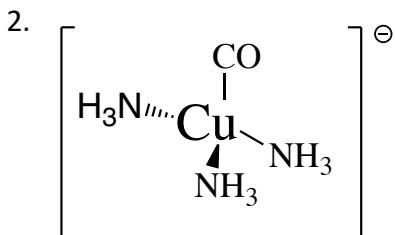
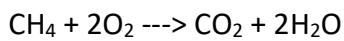
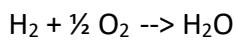
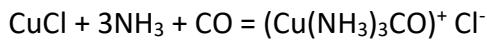
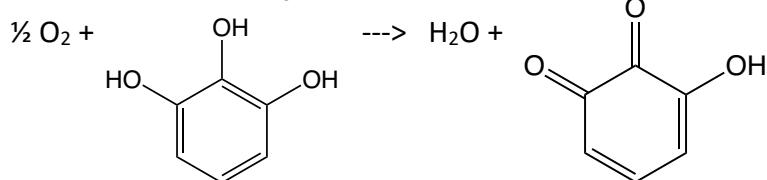
Esercizio 4: Organica



Esercizio 5: Determinazione di struttura



Esercizio 6: Analisi dei gas



$$3. \quad \% \text{ CO}_2 = (8 / 90) * 100 = 8.89 \%$$

$$\% \text{ O}_2 = (6 / 90) * 100 = 6.67 \%$$

$$\% \text{ CH}_4 = (64 * 3 / (18 * 90)) * 100 = 11.85 \%$$

$$\% \text{ H}_2 = (9*64/(18*90)) * 100 = 35.55 \%$$

$$\% \text{ CO} = (12 / 90) * 100 = 13.33 \%$$

$$\% \text{ N}_2 = 100 - (8.89 + 6.67 + 13.33 + 11.85 + 35.55) = 23.71 \%$$

Esercizio 7: Sostanze naturali, il Tassolo

Le stereochimie sono tutte relative.

