臺北醫學大學 92 學年度第 一 學期 ~~期中~~ 期末 考試 命(試)題紙

系級	科目	授課教師	考試日期	學號	姓名
保一	普通化學	鄭惠華教授	93年1月8日第1節		

※①請注意本試題共 3 張。如發現頁數不足及空白頁或缺印，應當場請求補齊，否則缺少部份概以零分計。
②每張試題卷務必填寫(學號)、(姓名)。

保一普化 鄭惠華教授

1. For which of the following reactions at 25°C would the enthalpy change represent a standard enthalpy of formation? For those where it does not, what changes would need to be made in the reaction conditions? (9 %)

(a) $2Na(s) + 1/2O_2(g) \rightarrow Na_2O(s)$

(b) $2K(l) + Cl_2(g) \rightarrow 2KCl(s)$

(c) $C_6H_{12}O_6(s) \rightarrow 6C(diamond) + 6H_2(g) + 3O_2(g)$

2. Which will experience the greater effective nuclear charge, the electrons in the n = 3 shell in Ar or the n = 3 shell in Kr? Which will be closer to the nucleus? Explain. (9 %)

3. The cyanate ion $(NCO)^-$ has three possible Lewis structures. (a) Draw these three Lewis structures and assign formal charges to the atoms in each structure. (b) Which Lewis structure should be the preferred one? (10 %)

4. Which of the following molecules or ions will exhibit delocalized bonding? SO_3, SO_3^{2-}, H_2CO, O_3, NH_4^+. (10%)

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保一	普通化學	鄭隆華教授	___年___月___日第___節		

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5. Predict whether the following molecules are polar or nonpolar: (a)BF_3; (b) CO ; (c) CF_4; (d) NCl_3; (e) SF_2. (10%)

6. If we assume that the energy-level diagrams for homonuclear diatomic molecules can be applied to heteronuclear diatomic molecules and ions, predict the bond order and magnetic behavior of the following: (a) CO (b) NO^- (c) OF^+. (12 %)

7. Consider what happens when a sample of the explosive TNT is detonated. (a) Is the detonation a spontaneous process? (b) What is the sign of q for this process? (c) Can you determine whether w is positive, negative, or zero for the process? Explain. (d) Can you determine the sign of $\triangle E$ for the process? Explain. (10 %)

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系級	科目	授課教師	考試日期	學號	姓名
保一	普通化學	鄭德華教授	____年____月____日第____節		

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8. Cyclohexane (C_6H_{12}) is a liquid hydrocarbon at room temperature. (a) Write a balanced equation for the combustion of C_6H_{12} (l) to form CO_2(g) and H_2O(l). (b) Without using thermodynamical data, predict whether $\triangle G^\circ$ for this reaction is more negative or less negative than $\triangle H^\circ$. (10 %)

9. Calculate $\triangle G$ at 298 K for the reaction of hydrazine and nitrogen dioxide to form nitrogen and water if the reaction mixture consists of 5.0 X 10^{-2} atm N_2H_4, 5.0 X 10^{-2} atm NO_2, 0.5atm N_2 and 0.3atm H_2O. (10 %)
($\triangle G^\circ_f N_2H_4(g) = 159.54$ kJ/mol, $\triangle G^\circ_f NO_2(g) = 51.84$ kJ/mol, $\triangle G^\circ_f H_2O(g) = -228.57$ kJ/mol)

10. From the values given for $\triangle H^\circ$ and $\triangle S^\circ$, calculate $\triangle G^\circ$ for each of the following reactions at 298 K. If the reaction is not spontaneous under standard conditions at 298 K, at what temperature (if any) would the reaction become spontaneous? (10%)

(a) $2PbS(s) + 3O_2(g) \rightarrow 2PbO(s) + 2SO_2(g)$
$\triangle H^\circ = -844$ kJ ; $\triangle S^\circ = -165$ J/K

(b) $2POCl_3(g) \rightarrow 2PCl_3(g) + O_2(g)$
$\triangle H^\circ = 572$ kJ ; $\triangle S^\circ = 179$ J/K