

系級	微生物學系二年級	考試時間	100 分鐘
科目	普通化學	本科總分	100 分
1.	An ethanol-water solution is prepared by dissolving 10.0 mL of ethanol ($d = 0.789 \text{ g/mL}$, M.W. 46.07), in a sufficient volume of water (M.W. 18.02) to produce 100.0 mL of a solution with a density of 0.982 g/mL. What is the concentration of ethanol in this solution expressed as (a) volume percent; (b) mass percent; (c) mole fraction; (d) mole percent; (e) molarity; (f) molality. (24 %)		
2.	Would you expect either N_2^- or N_2^{2-} to be a more stable diatomic species in the gaseous state? Explain? (4%, 4 %)		
3.	1.10 g of an unknown compound reduces the freezing point of 75.22 g benzene from 5.53 to 4.92 °C. What is the molar mass of the compound? $K_f = 5.12 \text{ }^\circ\text{C m}^{-1}$ (4 %)		
4.	For a 5.0 M H_3PO_4 solution, calculate (a) $[\text{H}_3\text{O}^+]$; (b) $[\text{H}_2\text{PO}_4^-]$; (c) $[\text{HPO}_4^{2-}]$ and $[\text{PO}_4^{3-}]$. ($K_{a1} = 7.1 \times 10^{-3}$, $K_{a2} = 6.8 \times 10^{-8}$, $K_{a3} = 4.2 \times 10^{-13}$) (12 %)		
5.	Explain how each of the following affects the amount of H_2 present in an equilibrium mixture in the reaction. (12 %)		
	$3\text{Fe}_{(s)} + 4\text{H}_2\text{O}_{(g)} \rightleftharpoons \text{Fe}_3\text{O}_{4(s)} + 4\text{H}_{2(g)} \quad \Delta H^\circ = -150\text{kJ}$		
	(a) Raising the temperature of the mixture		
	(b) Introducing more $\text{H}_2\text{O}_{(g)}$		
	(c) Doubling the volume of the container holding the mixture		
	(d) Adding an appropriate catalyst		
6.	The reaction used in the deployment of automobile airbags is the high-temperature decomposition of sodium azide, NaN_3 , to produce N_2 gas. How many liters of N_2 at 1.15 atm and 30 °C are produced by decomposition of 100g NaN_3 ? (8%)		
	$2\text{NaN}_{3(s)} \rightarrow 2\text{NaS}_{(s)} + 3\text{N}_{2(g)}$		
7.	Name these compounds (a)-(e), and write formulas for the compounds (f)-(j): (30%)		
	(a) SrO (b) ZnS (c) H_2SO_3 (d) HNO_2 (e) BrF_5		
	(f) silicon tetrafluoride (g) strontium nitrite (h) iodic acid (i) 3-pentanol (j) tetranitrogen tetrasulfide:		
8.	What is the appropriate VSEPR notation for the central atom XeF_2 ? (2%)		