

系所組別： 生物醫學工程學系丁組

考試科目： 普通化學

考試日期： 0225，節次： 1

- (10%) Name the following compounds in **English**.
(a) HBr, (b) HClO₄, (c) Na₂HPO₄, (d) Mn(OH)₃, (e) CuSO₃.
- (20%) Give the formulas for the following compounds.
(a) 1,2,3-propanetriol, (b) manganous hydroxide, (c) acetonitrile, (d) poly(lactic acid), (e) decanedioic acid, (f) calcium oxalate, (g) copper(II) sulfate, (h) chromium(II) borate, (i) potassium chloride, (j) strontium carbonate.
- (10%) A sample of chromium weighing 0.1600 g is heated with an excess of sulfur in a covered crucible. After the reaction is complete, the unused sulfur is vaporized by heating and allowed to burn away. The cooled residue remaining in the crucible weighs 0.3082 g. Find the empirical formula of the chromium-sulfur compound that formed. Note that the atomic weight of chromium is 52 g/mol and that of sulfur is 32 g/mol.
- (10%) The Ostwald process of making HNO₃ involves the air oxidation of NH₃ over a catalyst. The first two steps in this process are
$$4\text{NH}_3 + 5\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 4\text{NO}$$
$$2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$$
 - How many cubic feet of air (21% O₂ by volume) at 27°C and 1.00 atm are needed for the conversion of 50.0 tons of NH₃ to NO₂ by this process?
 - Balance the reaction: NO₂ + H₂O → 2 HNO₃ + NO.
- (15%) Consider the unbalanced reaction:
$$\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$$
 - Balance the reaction.
 - What is the oxidation number of Mn in MnO₄⁻?
 - In the standardization of a KMnO₄ solution, a 0.2814 g sample of pure Na₂C₂O₄ requires 40.45 ml of the KMnO₄ solution. Calculate the normality and molarity of the KMnO₄ solution. Note that the atomic weight of sodium is 23 g/mol.
- (10%) The Dead Sea scrolls were found by radioactive carbon-dating techniques to have 11.9 cpm per gram of carbon. Living material similar to that from which they were made has 15.3 cpm per gram of carbon. How old must the scrolls be? Note that the half-life of ¹⁴C is 5730 years.
- (10%) The Edison cell (essentially a nickel-iron battery) is a rugged storage battery that may receive

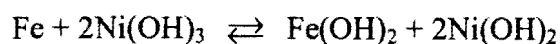
(背面仍有題目,請繼續作答)

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hard treatment and yet give good service for years. It may even be left uncharged indefinitely and still be recharged. It gives 1.3 volts. Its electrolyte is a 21.0% KOH solution to which a small amount of LiOH is added. The chemical reaction that occurs on discharge is



Write the half-cell reactions for the electrodes. Which reaction takes place in the negative pole?

8. (10%) Using a current of 5.50 amp, how long will it take to produce 47.0 liters of O_2 (measured over water at 735 torr and 35.0°C) by the electrolysis of a CuSO_4 solution?
9. (5%) A particular linear hydrocarbon molecule has five carbons and ten hydrogens. Is it saturated or unsaturated? Draw the possible line drawings.