## **Stage 2 Chemistry**

## **Birdwood**

HIGH SCHOOL **Topic 1: Monitoring the Environment**

**Review Paper 6**

**DUE DATE:**

**Question 1**

Find the volume of 20.0 mol L-1 sodium oxalate, Na2C2O4 , solution needed to be *diluted* to make up

500.0 mL of concentration 0.40 mol L-1.

(3 marks)

**Question 2**

Volumetric analysis is described as a *quantitative method*.

Briefly explain the meaning of this term as it applies to volumetric analysis. (1 mark)

**Question 3**

*Credit will be given for the correct use of significant figures in calculations in answers to this question*.

Prior to checking the acetic acid, CH3COOH, concentration of some vinegar, a laboratory assistant prepared a standard solution of anhydrous sodium carbonate Na2CO3.

i Calculate the mass of anhydrous sodium carbonate required to prepare 250.0 mL of a solution with a

concentration of 0.0487 mol L-1.

ii Write a balanced equation for the reaction between acetic acid and sodium carbonate, given the

products of the reaction are carbon dioxide, water and sodium acetate, NaCH3COO.

(5 marks)

**Question 4**

The concentration of hydrogen peroxide in a commercial hydrogen peroxide solution can be determined

by titration with potassium permanganate solution.

i State the oxidation number of oxygen in hydrogen peroxide, H2O2. [*Remember hydrogen is +1*]

ii Balance the redox half-equation for the reaction of the permanganate ion.

MnO4- Mn2+

iii The half-equation for the reaction of hydrogen peroxide in this titration is:

H2O2 O2 + 2H+ + 2e-

State why hydrogen peroxide is behaving as a *reducing agent* in this reaction. (5 marks)

**Question 5**

*Credit will be given for the correct use of significant figures in calculations in answers to this question*.

The following experiment was performed to determine the concentration of a solution of sodium hydroxide.

**STEP 1**: A 0.050 mol L-1 standard solution of oxalic acid, H2C2O4 was prepared in an appropriate piece

of glassware.

**STEP 2**: 20.0 mL portions of a sodium hydroxide solution of unknown concentration were then

delivered into a suitable container.

**STEP 3**: 2 drops of phenolphthalein indicator was then added to the sample of sodium hydroxide.

**STEP 4**: A titration was then performed using these two solutions and the average titre obtained was

21.2 mL.

The equation for the reaction is:

H2C2O4 + 2NaOH 2H2O + Na2 C2O4

i State the number of significant figures that should be used for all numerical answers in this

question.

ii State the oxidation number of C (carbon), in H2C2O4.

iii Name the best apparatus used to deliver the portions of sodium hydroxide in STEP 2.

iv Name the best piece of apparatus used to prepare the standard solution of oxalic acid in STEP 1.

vi Describe the purpose of the phenolphthalein?

vii Calculate the number of moles of oxalic acid from the data given above.

viii Use the reaction mole ratio to find the number of moles of NaOH used.

ix Hence find the concentration of NaOH in mol L-1.

x Convert your answer in part ix to % w/v. (13 marks)

**Question 6**

The burette used in Question 5 was prepared carefully, to ensure that the results were accurate.

State *two* steps that should be followed in the *filling* of the burette, and state why each step

is necessary to ensure accuracy.

(4 marks)

**Question 7**

Assume the molar mass of ethanol is 46.068 g mol-1 for answers to this question.

i A particular brand of beer was found to contain ethanol, (C2H5OH), at a concentration of 0.046 g mL-1.

Convert this concentration to mol L-1.

ii A person drank a different beverage containing ethanol. The concentration of ethanol in the blood

leaving this person’s liver 30 minutes later was 10.53 μmol L-1.

Convert this concentration of ethanol into ppm.

(5 marks)

**TOTAL MARK = 36**