

AQA A2 CHEMISTRY

TOPIC 5.2

PERIODICITY

BOOKLET OF PAST EXAMINATION QUESTIONS

1. Write balanced equations to show the reaction of water with:

(i) sodium

.....

(1)

(ii) sodium oxide.

.....

(1)

(Total 1 marks)

2. Write equations for the reactions of phosphorus(V) oxide and sulphur dioxide with water. In each case predict the approximate pH of a 1M aqueous solution of the product.

Phosphorus(V) oxide.....

Approximate pH.....

Sulphur dioxide.....

Approximate pH

(Total 4 marks)

3. Apart from argon, the Period 3 elements all form oxides.

(i) Write an equation to represent the reaction of aluminium with oxygen.

.....

(1)

(ii) The reaction in (b)(i) occurs very readily. Suggest why aluminium saucepans can be safely heated on a gas cooker.

.....

.....

(1)

(iii) Complete the following table to show information about Period 3 oxides.

	Sodium oxide	Silicon dioxide	Phosphorus(V) oxide	Sulphur dioxide
Physical state at room temperature				
Type of bonding present				

(4)

(iv) Write an equation for the reaction of sodium oxide with water.

..... (1)

(v) Write an equation for the reaction of sulphur dioxide with water.

..... (1)

(vi) Samples of silicon dioxide and phosphorus(V) oxide are added to separate samples of pure water and each mixture is stirred. State the approximate pH value of each sample after the stirring.

pH value with silicon dioxide

pH value with phosphorus(V) oxide

(2)

(Total 10 marks)

4.

(a) Explain, with reference to the bonding in sodium oxide, why this compound reacts with water to form a solution with a pH of 14.

.....
.....
.....

(3)

(b) What general type of oxide forms acidic solutions in water? Give the formula of one such oxide.

General type.....

Formula.....

(2)

(Total 5 marks)

5. The following two-stage method was used to analyse a mixture containing the solids magnesium, magnesium oxide and sodium chloride.

Stage 1

A weighed sample of the mixture was treated with an excess of dilute hydrochloric acid. The sodium chloride dissolved in the acid. The magnesium oxide reacted to form a solution of magnesium chloride. The magnesium also reacted to form hydrogen gas and a solution of magnesium chloride. The hydrogen produced was collected.

- (a) Write equations for the two reactions involving hydrochloric acid.
- (b) State how you would collect the hydrogen. State the measurements that you would make in order to calculate the number of moles of hydrogen produced. Explain how your results could be used to determine the number of moles of magnesium metal in the sample.

(8)

Stage 2

Sodium hydroxide solution was added to the solution formed in **Stage 1** until no further precipitation of magnesium hydroxide occurred. This precipitate was filtered off, collected, dried and heated strongly until it had decomposed completely into magnesium oxide. The oxide was weighed.

- (c) Write equations for the formation of magnesium hydroxide and for its decomposition into magnesium oxide.
- (d) When a 6.25 g sample of the mixture of the three solids was analysed as described above, the following results were obtained.

Hydrogen obtained in **Stage 1** 0.0528 mol

Mass of magnesium oxide obtained in **Stage 2** 6.41 g

Use these results to calculate the number of moles of original magnesium oxide in 100 g of the mixture.

(7)

(Total 15 marks)

6. Describe the trend in pH of the solutions formed when the oxides of the Period 3 elements, sodium to sulphur, are added separately to water. Explain this trend by reference to the structure and bonding in the oxides and by writing equations for the reactions with water.

(19)

(Total 19 marks)