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6241/01

Edexcel GCE

Chemistry

Advanced Subsidiary

Unit Test 1

Thursday 10 June 2004 – Morning

Time: 1 hour

Materials required for examination	Items included with question papers
Nil	Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.

Answer ALL the questions in the spaces provided in this question paper.

You may use a calculator. Show all the steps in any calculations and state the units.

Information for Candidates

A Periodic Table is printed on the back cover of this booklet.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.



Answer ALL questions in the spaces provided.

1. (a) A sample of an element can be analysed using a mass spectrometer. State how the following are achieved in this instrument:

(i) ionisation

(2)

(ii) deflection

(1)

- (b) The following data were obtained from the mass spectrum of a sample of gallium.

Peak at m/e	%
69.0	60.4
71.0	39.6

Calculate the relative atomic mass of this sample of gallium, to 3 significant figures.

(2)

- (c) An atom contains five protons and five neutrons.

(i) Give the symbol for this atom, including the mass number.



(2)

(ii) Complete the electronic configuration of this atom.

1s²

(1)

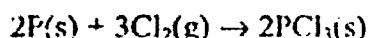
(iii) Give the formula of the compound formed between this element and chlorine.

(1)

Q1

(Total 9 marks)

2. Phosphorus(III) chloride, PCl_3 , can be formed by the reaction of phosphorus and chlorine.



- (a) (i) Calculate the maximum mass of phosphorus(III) chloride, PCl_3 , which could be obtained from 93.0 g of phosphorus.

(3)

- (ii) Calculate the minimum volume of chlorine required to react completely with 93.0 g of phosphorus.

[One mole of gas occupies a volume of 24.0 cm^3 under the conditions of the experiment].

(2)

- (iii) Identify the oxidising agent in the above reaction and explain your answer.

(2)

(b) (i) Draw a dot and cross diagram for a molecule of PCl_3 .

(2)

(ii) Draw the predicted shape of a PCl_3 molecule and mark on the diagram a value for the bond angle.

(2)

(c) Suggest the name for the shape of the PCl_4^+ ion.

(1)

(Total 12 marks)

Q2

3. (a) State the type of bonding in the following substances and draw diagrams to illustrate their 3-dimensional structures.

(i) Diamond

Bonding

Diagram

(3)

(ii) Sodium chloride

Bonding

Diagram

(3)

(b) Explain why both diamond and sodium chloride have high melting temperatures.

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(3)

(c) Explain why sodium chloride conducts electricity when molten but not when solid.

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(2)

(Total 11 marks)

Q3

4. (a) (i) Define the term first ionisation energy.

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(3)

- (ii) State and explain the general trend in the first ionisation energy across the period sodium to argon of the Periodic Table.

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(3)

- (b) (i) Write an equation to illustrate the process occurring when the second electron affinity of nitrogen is measured.

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(2)

- (ii) Explain why the second electron affinity of any element is endothermic.

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(2)

Q4

(Total 10 marks)

5. (a) (i) Write the ionic half-equation to show the oxidation of calcium, Ca, to calcium ions, Ca^{2+} .

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(1)

- (ii) Write the ionic half-equation to show the reduction of water to hydrogen, H_2 , and hydroxide ions, OH^- .

.....
(1)

- (iii) Combine the two ionic half-equations above to produce an equation which shows the effect of adding calcium to water.

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(1)

- (iv) State what you would expect to see when calcium is added to water.

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.....
(2)

- (b) State the trend in solubility of the hydroxides of the Group 2 elements as the atomic number increases.

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(1)

- (c) Write an equation to show the reaction between sodium and chlorine, to produce sodium chloride.

.....
(2)

(Total 8 marks)

Q5

6. (a) Identify a halogen which, at room temperature, is:

a solid

a liquid

a gas

(3)

(b) Explain why the hydrogen halides, such as hydrogen chloride, HCl, are:

(i) water soluble

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.....
.....

(2)

(ii) acidic in aqueous solution

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.....
.....

(1)

(c) By consideration of intermolecular forces, explain why the boiling temperature of hydrogen fluoride, HF, is higher than that of hydrogen iodide, HI.

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(2)

(d) Deduce the oxidation number of chlorine in the following:

ClO^-

ClO_3^-

(2)

Q6

(Total 10 marks)

TOTAL FOR PAPER: 60 MARKS

END