Cambridge International **AS Level**

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

2934527865

PHYSICAL SCIENCE **8780/02**

Paper 2 Short Response **October/November 2016**

40 minutes

Candidates answer on the Question Paper.

Additional Materials: Data Booklet

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

A Data Booklet is provided.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
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Total	

This document consists of **8** printed pages.

CAMBRIDGE International Examinations

Answer **all** the questions in the spaces provided.

Relevant data, formulae and the Periodic Table are provided in the Data Booklet.

1 Fig. 1.1 shows a micrometer screw gauge with its jaws fully closed.

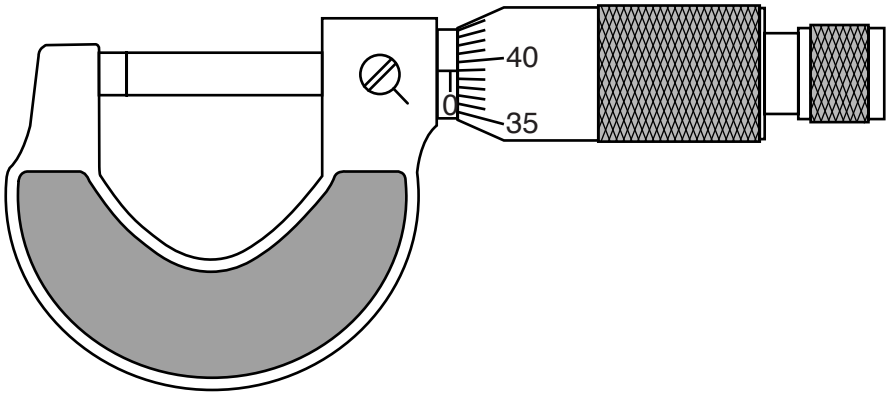

Fig 1.1

Fig. 1.2 shows the same micrometer screw gauge being used to measure the diameter of a metal ball.

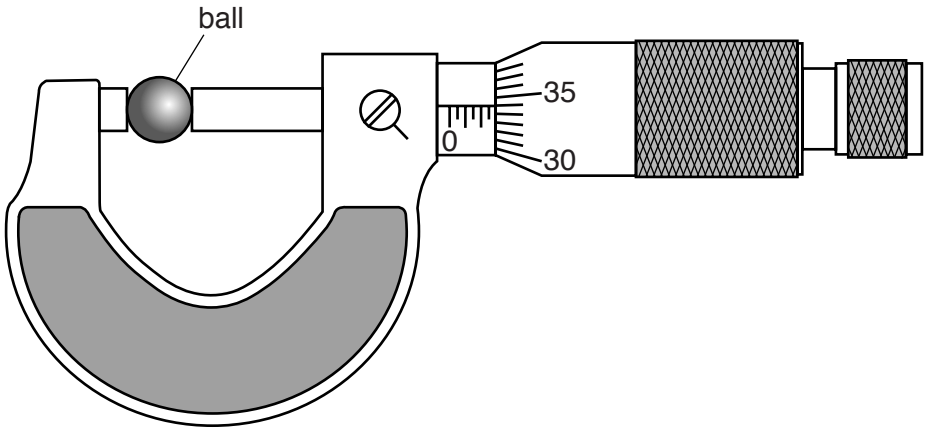

Fig 1.2

Use the micrometer screw gauge readings in Fig. 1.1 and Fig. 1.2 to determine the diameter of the metal ball. Show your working.

diameter = ... mm [2]

2 Iron ore (hematite) contains impurities such as sand, SiO_2.

Iron metal is obtained by reducing the iron oxide present in iron ore in a blast furnace.

Iron ore, coke and limestone are added to a blast furnace.

(a) Write two equations to show the reactions occurring as limestone removes the sand to form slag, $CaSiO_3$.

equation 1 .....

equation 2 .....
[2]

(b) One of the equations you have written represents an acid-base reaction.

Identify this equation and explain your answer.

equation .....

.....

.....
[1]

3 A satellite orbits the Moon in a circular orbit at constant speed.

(a) State the name of the force acting on the satellite.

..... [1]

(b) **(i)** State the meaning of the term *work*.

.....

..... [1]

(ii) Explain why no work is done by the force in **(a)** acting on the satellite.

.....

.....

..... [1]

4 Hydrochloric acid and sodium hydroxide solution react together in a neutralisation reaction.

$$HCl(aq) + NaOH(aq) \longrightarrow NaCl(aq) + H_2O(l)$$

In an experiment, 25.0 cm^3 of 1.00 $mol\,dm^{-3}$ hydrochloric acid and 25.0 cm^3 of 1.50 $mol\,dm^{-3}$ sodium hydroxide solution are mixed together.

The initial temperature of both solutions is the same.

The temperature of the reaction mixture **rises** by 6.7 °C.

(a) Calculate the thermal energy change q for the reaction in this experiment.

Assume that the final solution has a density of 1.00 $g\,cm^{-3}$ and a specific heat capacity of 4.2 $J\,g^{-1}\,K^{-1}$.

q = ... J [1]

(b) Use your answer to **(a)** to determine the enthalpy change of neutralisation ΔH_n for the reaction represented by the equation below.

$$H^+(aq) + OH^-(aq) \longrightarrow H_2O(l)$$

ΔH_n = ... $kJ\,mol^{-1}$ [2]

5 Define the term *electric field strength*.

.....

.....

..... [2]

6 Solution **X** contains either sodium bromide, NaBr, or sodium fluoride, NaF.

In order to determine which salt is present, a student adds a small amount of chlorine water, Cl_2(aq), to a sample of solution **X**.

(a) Describe the observations the student could make if solution **X** contained NaBr or NaF.

NaBr .....

.....

NaF .....

.....
[1]

(b) Choose **one** of the observations described in **(a)**.

Explain this observation in terms of the chemistry involved.

.....

.....

..... [2]

7 Fig. 7.1 shows a non-uniform post of mass 175 kg and length 6.00 m. The post is carried by two men.

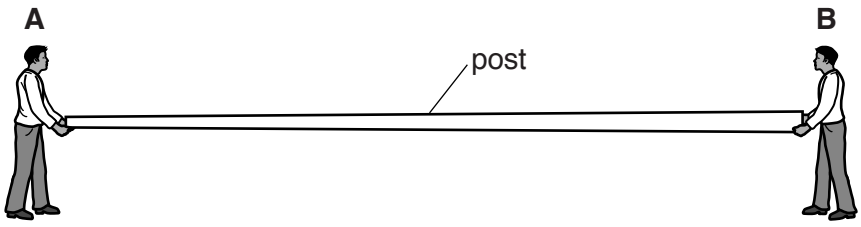

Fig. 7.1

The post is held horizontally. The vertical force man **A** applies to the post is 686 N.

(a) Calculate the vertical force applied by man **B**.

force = ... N [1]

(b) Use the principle of moments to find the distance of the centre of gravity of the post from man **A**.

distance = ... m [2]

8 There is a trend in the reactions with water of the Group II elements magnesium to barium, down the group.

(a) Describe how the **minimum** conditions necessary for magnesium and barium to react rapidly with water are different.

.....

..... [1]

(b) Write equations for the reactions that occur when magnesium and barium react rapidly with water.

(i) equation for magnesium

..... [1]

(ii) equation for barium

..... [1]

9 **(a)** Fig. 9.1 shows a liquid of density ρ in a container.

Point **X** is at the surface and point **Y** is at a depth h.

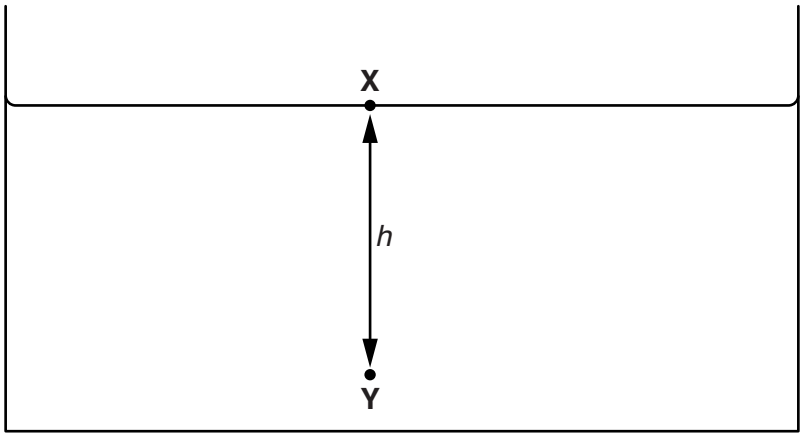

Fig. 9.1

Pressure is force per unit area and density is mass per unit volume.

Use this information to show that the pressure difference between points **X** and **Y** is given by ρgh.

[2]

(b) The pressure change in the liquid is proportional to the change in depth.

Suggest why the pressure change in the **atmosphere** is **not** proportional to the change in height.

.....

..... [1]

10 (a) Explain why the first ionisation energy of argon, Ar, is higher than the first ionisation energy of potassium, K.

.....

..... [1]

(b) The equation below represents an ionisation process.

$$K^+(g) \longrightarrow K^{2+}(g) + e^-$$

The enthalpy change for this process is the **second** ionisation energy of potassium.

Explain why the **second** ionisation energy of potassium is higher than the **first** ionisation energy of argon.

.....

.....

..... [2]

11 Fig. 11.1 shows a battery with negligible internal resistance connected to a potential divider. A high resistance voltmeter is connected across the output. The reading on the voltmeter is *V*.

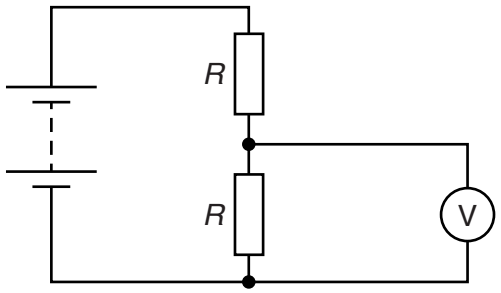

Fig. 11.1

Another resistor of resistance *R* is connected in parallel with the voltmeter.

Describe and explain the effect this additional resistor has on the voltmeter reading.

.....

.....

..... [2]