CANDIDATE NAME

CENTRE NUMBER

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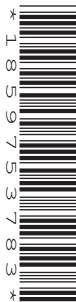
PHYSICAL SCIENCE **6888/02**

Paper 2 Core October/November 2011

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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 in the spaces provided on the Question Paper.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
A copy of the Periodic Table is printed on page 16.

You may use a calculator.

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	
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Total	

This document consists of **16** printed pages.

[Turn over

1 Fig. 1.1 shows the apparatus for fractional distillation.
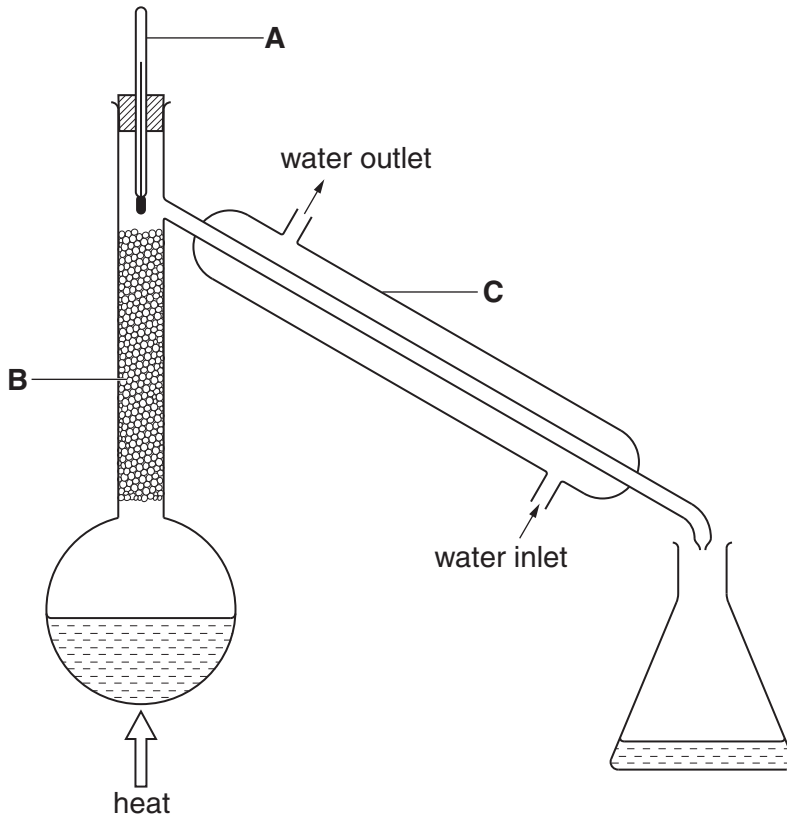
Fig. 1.1

(a) Label parts **A** and **C**.

A ....

C ....[2]

(b) Explain the function of structure **B**.

....

....

....[2]

2 A thermometer is one of the instruments used in the laboratory.

(a) State the quantity measured by a thermometer.

....[1]

(b) State the values of the **two** fixed points on the Celsius scale.

....

....[2]

(c) State the physical property that a liquid-in-glass thermometer uses to measure the quantity in **(a)**.

....[1]

(d) Give an example of another physical property that can be used to measure the quantity in **(a)**.

....[1]

3 Fig. 3.1 shows the changes of state that occur when solid lead is heated.

| solid lead | → heat → | molten lead | → heat → | gaseous lead |
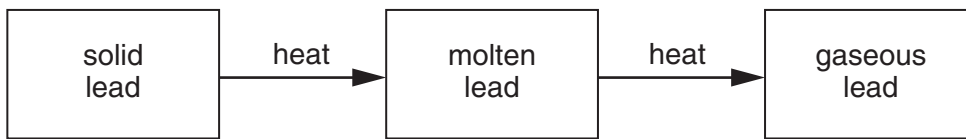
Fig. 3.1

**(a)** In the box shown in Fig. 3.2, draw a diagram to show the arrangement of the particles in gaseous lead.
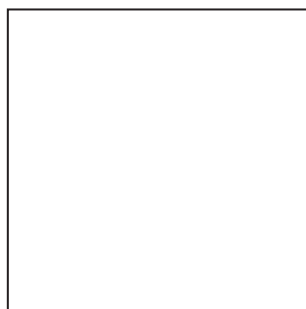
Fig. 3.2   [1]

(b) Describe how the arrangement and speed of the gaseous lead particles change as they are cooled down.

....

....

....[2]

4 A man of mass 75 kg climbs up some steps of height 4.0 m.
   Use g = 10 N/kg.

   (a) Calculate the weight of the man.

   ....[2]

   (b) Calculate the work the man does against gravity.

   .... J [2]

5 An atom of element **X** has an atomic number of 11 and a nucleon number of 23.

(a) Determine **(i)** the number of protons and **(ii)** the number of neutrons in an atom of element **X**.

(i) .... **(ii)** .... [2]

(b) The two isotopes of the element chlorine contain different nuclides, $^{35}_{17}Cl$ and $^{37}_{17}Cl$.

(i) Explain what is meant by the term *nuclides*.

....

....

....[2]

(ii) Explain why the two isotopes of chlorine have the same chemical properties.

....

....

....[2]

(c) Draw a diagram to show the arrangement of electrons in the compound formed between atom **X** and a chlorine atom. (Show only the electrons in the outermost shell.)

[2]

6 Fig. 6.1 shows two resistors connected in series with a 6V battery.

6 V
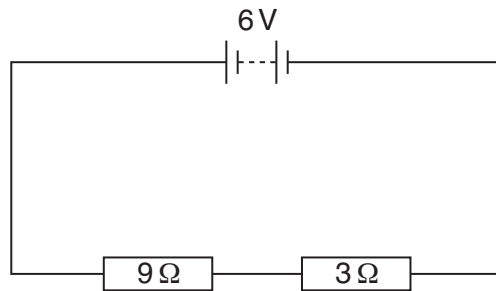
Fig. 6.1

(a) Calculate

(i) the total resistance in the circuit,

.... Ω [1]

(ii) the current in the circuit,

....[3]

(iii) the potential difference across the 9 Ω resistor.

....[1]

(b) Name an instrument used to measure potential difference.

....[1]

7 A Form 4 Chemistry teacher soaks some cotton wool with ammonia solution. He places it in a glass tube, as shown in Fig. 7.1. After a few minutes the litmus paper nearest the cotton wool changes colour to blue. As time goes on, the remaining pieces of litmus paper change, in turn, to blue.

wet cotton wool

wet red litmus paper
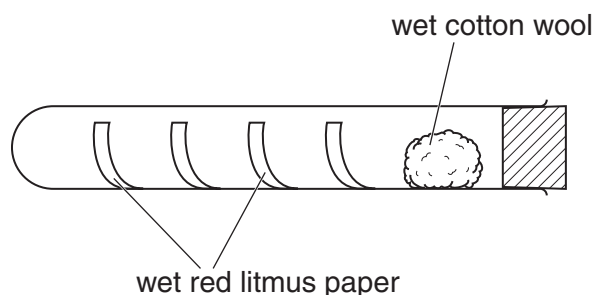
Fig. 7.1

(a) Name the process that this experiment demonstrates.

....[1]

(b) **(i)** State what information this experiment gives about the nature of ammonia gas.

....[1]

(ii) Write down the formula of ammonia.

....[1]

(iii) Calculate the molecular mass M_r of ammonia.

....[2]

(iv) Name the process that is used to manufacture ammonia.

....[1]

8 A density bottle has a mass of 15.0 g. It is filled with water and the total mass is 35.0 g.

(a) Calculate the volume of water in the density bottle, in cm^3.
(The density of water is $1 g/cm^3$.)

....[3]

(b) The density bottle is filled with another liquid **A**. The mass of the bottle plus liquid **A** is 30.0 g.

Calculate the density of liquid **A**.

....[1]

9 The element fluorine (F) is found in the Periodic Table.

(a) (i) State which group, in the Periodic Table, fluorine belongs to.

....[1]

(ii) Explain, in terms of the electron arrangement, why fluorine is in this group.

....

....[1]

(b) Fluorine is reacted with sodium iodide.

(i) State what you would observe.

....[1]

(ii) Explain your observation.

....

....[1]

6888/02/O/N/11

10 Fig. 10.1 shows a simple electromagnet with four paper clips suspended from it.

soft iron core

paper clip

switch
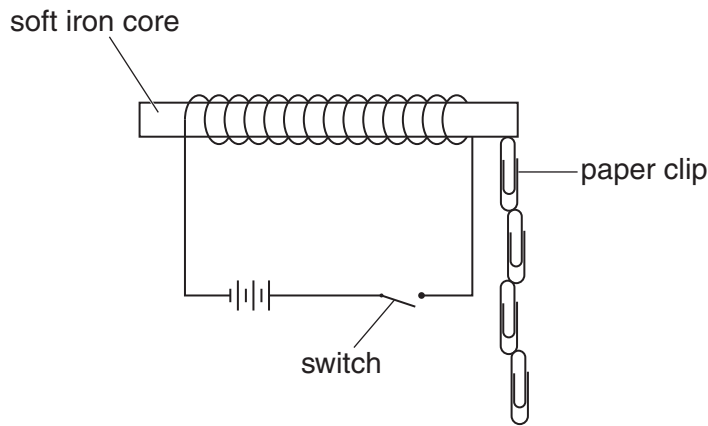
Fig. 10.1

(a) Explain why the core of the electromagnet is made from iron and not steel.

....

....

....[2]

(b) Suggest **two** changes that can be made to the electromagnet to increase the number of paper clips that can be suspended.

....

....

....[2]

11 Fig. 11.1 is a flow diagram for reactions involving sodium hydroxide and barium hydroxide.
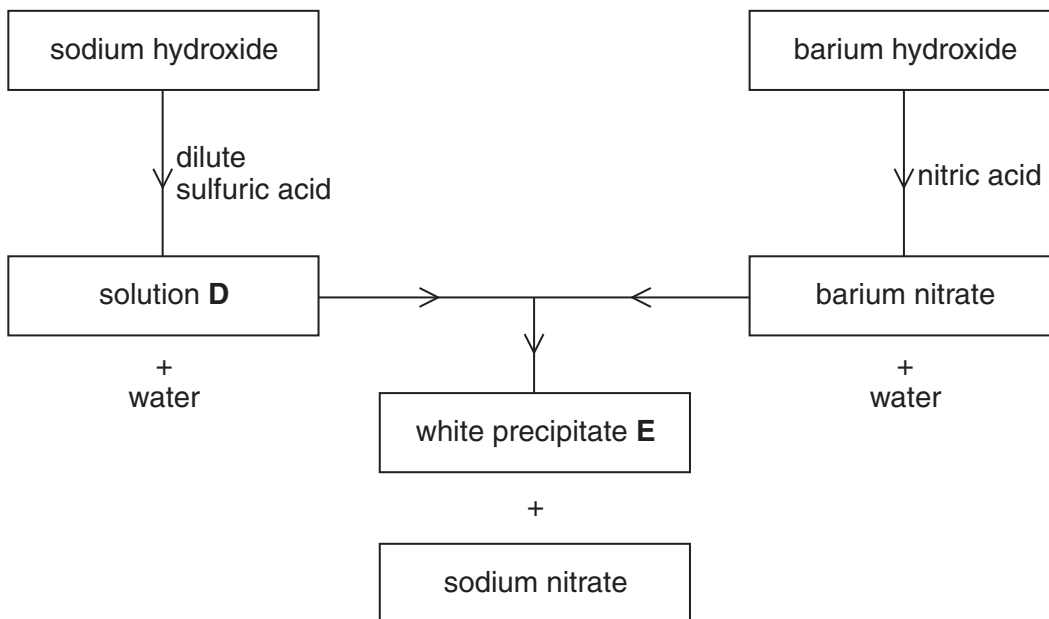
Fig. 11.1

(a) Name the substances **D** and **E**.

D ....

E ....[2]

(b) Describe a test for the presence of water.

test ....

result ....[2]

(c) Name an indicator that can be used to identify an acid.

....[1]

(d) Write a balanced chemical equation for the reaction of sodium hydroxide with sulfuric acid.

....[2]

12 Fig. 12.1 shows a gold leaf electroscope.
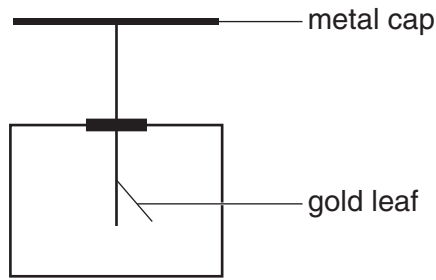
metal cap

gold leaf

Fig. 12.1

   **(a)** Explain why the gold leaf deflects when a positively charged rod is brought close to the metal cap.

   ....

   ....

   ....

   ....[3]

   (b) The positively charged rod is held close to the electroscope and then the metal cap is earthed.

   Explain why the gold leaf collapses.

   ....

   ....

   ....[2]

13 Pure water is soft. Three samples of water **F**, **G** and **H** are tested in the laboratory and the results of the tests are shown in Table 13.1.

Table 13.1

test	F	G	H
Shaken with soap solution	poor lather	good lather	poor lather
Boiled first and then shaken with soap solution	good lather	good lather	poor lather
Some bath washing soda added, shaken with soap solution after filtering	good lather	good lather	good lather

(a) Explain what is meant by 'hard water'.

....

....[2]

(b) State the letter of the sample which is pure water. Give a reason for your choice.

....

....[1]

(c) Name a method by which temporary hard water can be softened in the home.

....[1]

14 Fig. 14.1 shows a thin conductor placed between the poles of a U-shaped magnet.

conductor

north pole

south pole

S
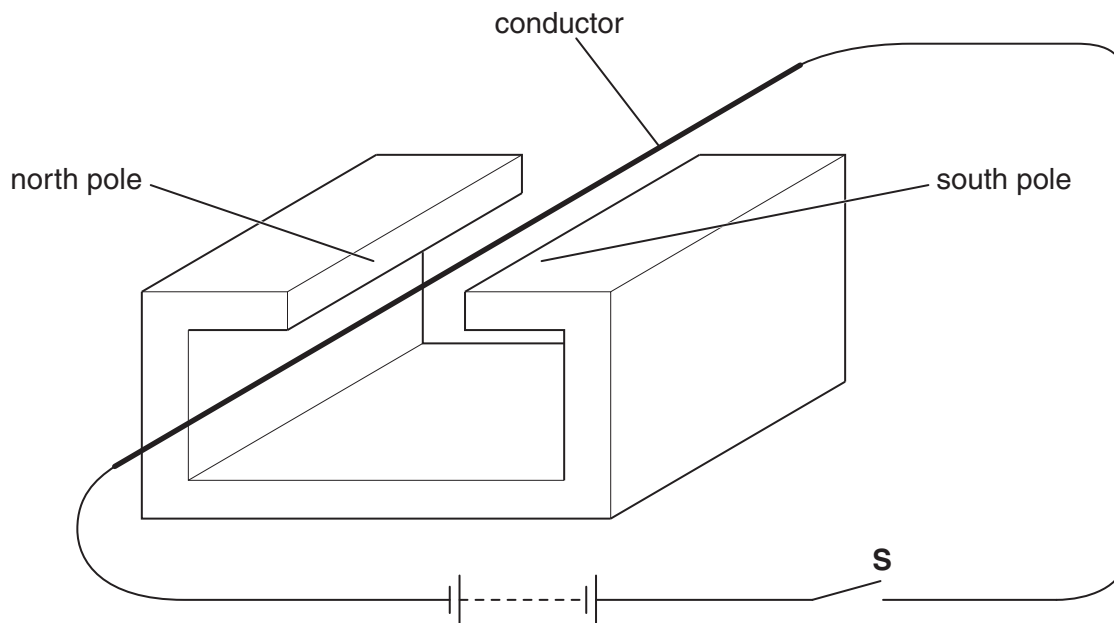
Fig. 14.1

(a) (i) Explain what happens when switch **S** is closed.

....

....

....

....[3]

(ii) Comment on the directions of the current, the magnetic field and the force on the conductor.

....

....[1]

(b) Name **one** device that is based on the effect demonstrated in this experiment.

....[1]

15 Fig. 15.1 shows the apparatus used for the fractional distillation of crude oil.
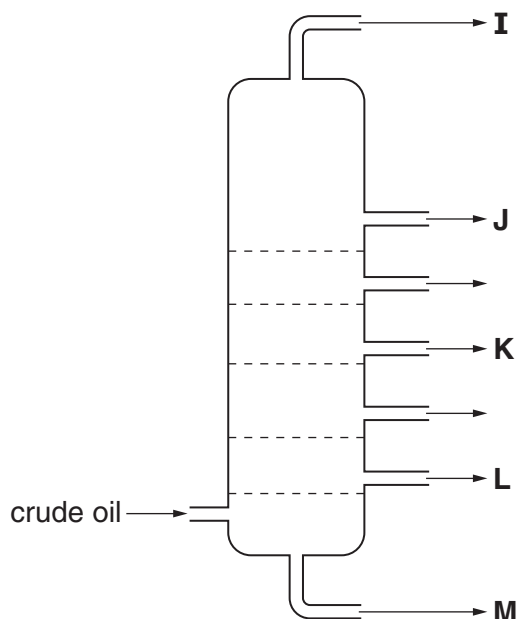
Fig. 15.1

(a) Name the fraction that is collected at **J**.

....[1]

(b) State the use of the fraction collected at **M**.

....[1]

(c) Methane can be collected from this fractional distillation apparatus.

(i) State the letter of the outlet from which methane can be collected.

....[1]

(ii) Draw the structure of methane.

[1]

16 Na-25 is a radioactive isotope of sodium. It has a half life of 1 minute.

(a) Explain what is meant by the term *radioactive*.

....

....

....

....[3]

(b) Explain what is meant by the *half-life* of a radioactive isotope.

....

....

....[2]

(c) What fraction of a sample of Na-25 remains after 3 minutes?

....[2]

DATA SHEET
The Periodic Table of the Elements

Group

I	II												III	IV	V	VI	VII	0
																		4 **He** Helium 2
7 **Li** Lithium 3	9 **Be** Beryllium 4												11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
23 **Na** Sodium 11	24 **Mg** Magnesium 12												27 **A***l* Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **C***l* Chlorine 17	40 **Ar** Argon 18
39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30		70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48		115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57 *	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80		204 **T***l* Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	209 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86
223 **Fr** Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †																

1 **H** Hydrogen 1

* 58–71 Lanthanoid series
† 90–103 Actinoid series

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	147 **Pm** Promethium 61	150 **Sm** Samarium 62	152 **Eu** Europium 63	157 **Gd** Gadolinium 64	159 **Tb** Terbium 65	162 **Dy** Dysprosium 66	165 **Ho** Holmium 67	167 **Er** Erbium 68	169 **Tm** Thulium 69	173 **Yb** Ytterbium 70	175 **Lu** Lutetium 71
232 **Th** Thorium 90	231 **Pa** Protactinium 91	238 **U** Uranium 92	237 **Np** Neptunium 93	244 **Pu** Plutonium 94	243 **Am** Americium 95	247 **Cm** Curium 96	247 **Bk** Berkelium 97	251 **Cf** Californium 98	252 **Es** Einsteinium 99	257 **Fm** Fermium 100	258 **Md** Mendelevium 101	259 **No** Nobelium 102	260 **Lr** Lawrencium 103

Key

a
X
b

a = relative atomic mass
X = atomic symbol
b = atomic (proton) number

The volume of one mole of any gas is $24\,dm^3$ at room temperature and pressure (r.t.p.).