UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

7894890047

PHYSICAL SCIENCE **0652/02**

Paper 2 (Core) **October/November 2007**

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.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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

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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13	
Total	

This document consists of **15** printed pages and **1** blank page.

1 Fig. 1.1 shows the speed of a car as it moves along a straight, level track.

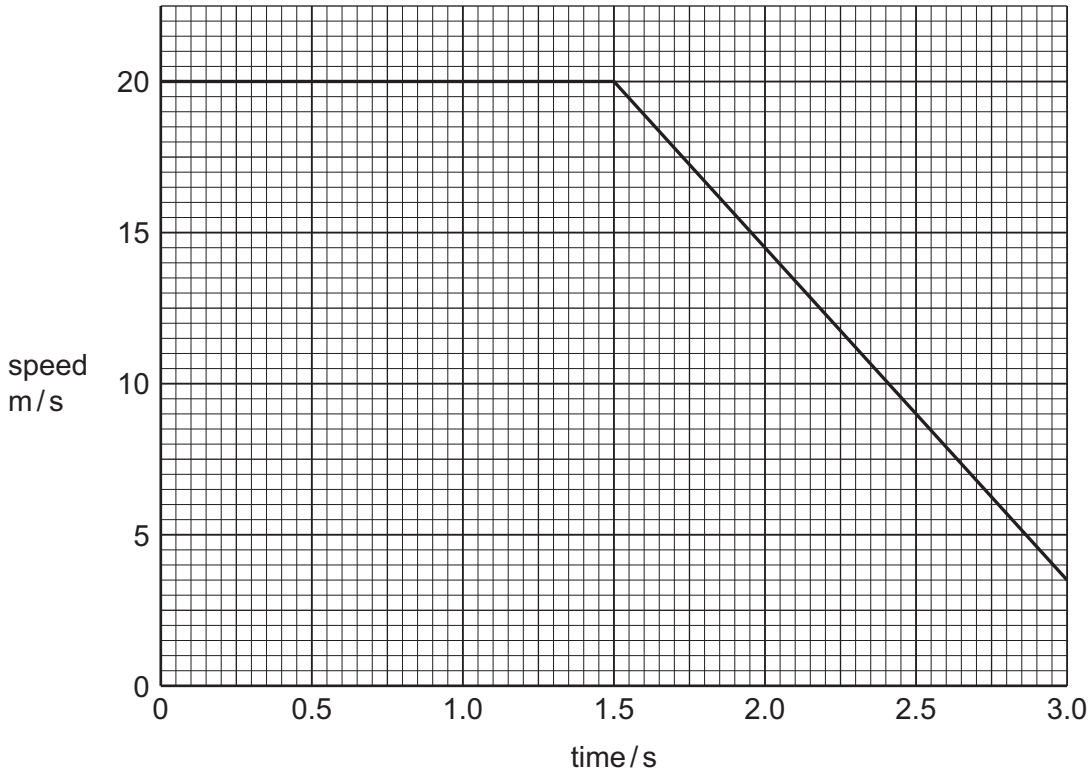

Fig. 1.1

(a) What was the initial speed of the car? ..... m / s [1]

(b) Describe the motion of the car during

(i) the first 1.5 s, ...

.....

(ii) from 1.5 s to 3.0 s. .....

..... [3]

(c) Calculate the distance the car travelled in the first 1.5 s.
Show your working.

distance = ... unit ..... [3]

2 **(a)** Balance this equation for the burning of methane in a limited supply of air.

$$.....CH_4 + ...O_2 \longrightarrow .....H_2O + ...CO$$ [1]

(b) Explain why it is dangerous to release carbon monoxide into the air.

.....

.....

..... [2]

(c) Name the compound of carbon formed when methane burns in a plentiful supply of air.

..... [1]

3 Complete Table 3.1 by giving the formula of each of these pollutants, naming a source of each, and a problem caused by releasing each into the atmosphere.

Table 3.1

pollutant	formula	source	problem
sulphur dioxide			
nitrogen dioxide			

[6]

4 Fig. 4.1 shows a view from above as a set of ripples move out from a point when a stone is thrown into a pond.

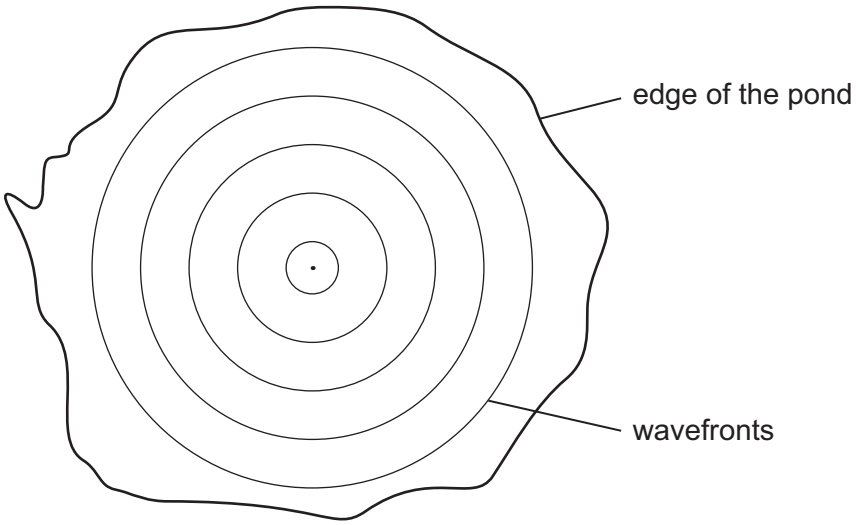

Fig. 4.1

(a) (i) Mark on Fig. 4.1 one wavelength and label it λ.

(ii) A boy counts 12 waves hitting the bank in 5.0 s.
Calculate the frequency of the waves.
Show your working.

frequency = ... unit ..... [4]

(b) The water is shallower near the bank and the waves slow down.
Suggest what effect that this will have on

(i) the wavelength of the waves, ...

.....

(ii) the frequency of the waves. .....

..... [2]

5 Fig. 5.1 shows three test-tubes with pieces of different metal foil added to solutions containing metal ions.

The observations seen in each test-tube are also given.

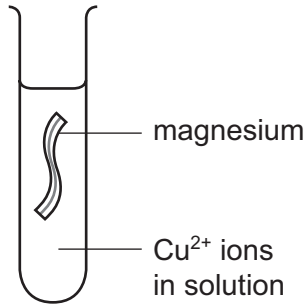	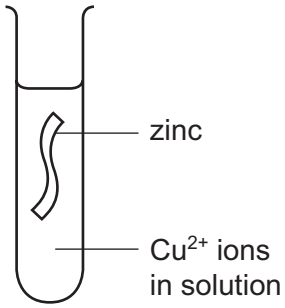	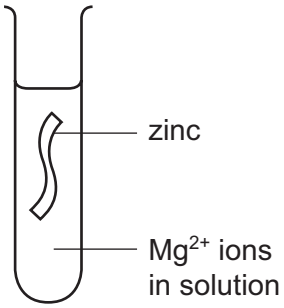
magnesium disappears copper-coloured solid formed	zinc becomes copper-coloured	no reaction

Fig. 5.1

(a) Use the results to work out the order of reactivity of the three metals.

most reactive .....

.....

least reactive ..... [2]

(b) Complete this equation for the reaction when magnesium is added to aqueous copper(II) sulphate.

$$Mg + CuSO_4 \longrightarrow \text{.....} + \text{.....}$$ [1]

(c) What happens when a piece of copper foil is put into a solution containing magnesium ions?

..... [1]

[Turn over

6 A student has a cell, three identical resistors, and an ammeter.
He builds the circuits shown in Fig. 6.1.

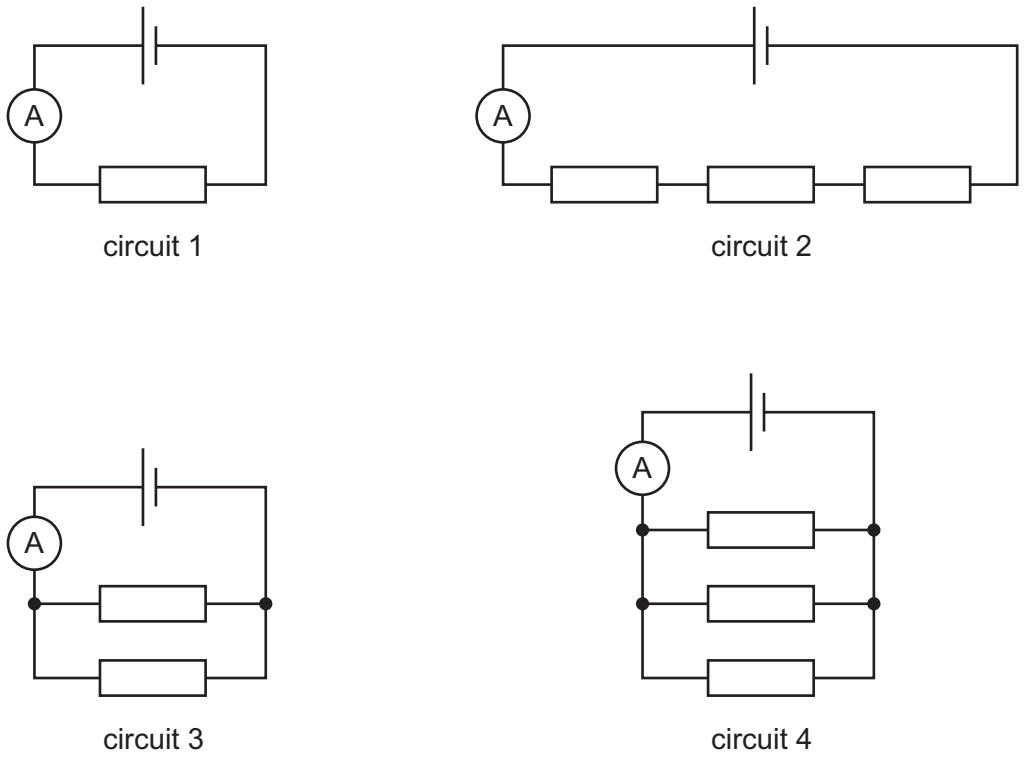

Fig. 6.1

(a) (i) In which circuit is the ammeter reading the highest?

circuit .....

(ii) Explain your answer.

.....

.....

..... [3]

(b) The student now rebuilds circuit 2 as shown in Fig. 6.2.

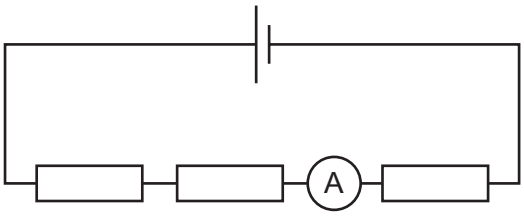

Fig. 6.2

Explain, giving a reason, how the ammeter reading compares with the reading in the original circuit 2.

.....

..... [2]

(c) He now rebuilds circuit 3, as shown in Fig. 6.3.

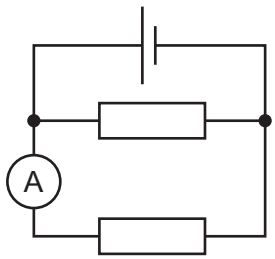

Fig. 6.3

Explain, giving a reason, how the ammeter reading compares with the reading in the original circuit 3.

.....

..... [2]

7 Sodium is an element in Group I of the Periodic Table.

(a) Complete Table 7.1 for an atom of sodium by reference to the Periodic Table shown on page 16.

Table 7.1

proton (atomic) number	
relative atomic mass	
number of neutrons in the nucleus	
arrangement of electrons in shells	

[4]

(b) Write down the name and symbol of a Group I element which is less reactive than sodium.

name .....

symbol ..... [2]

8 Fig. 8.1 shows the apparatus used to compare the penetration of different radioactive emissions.

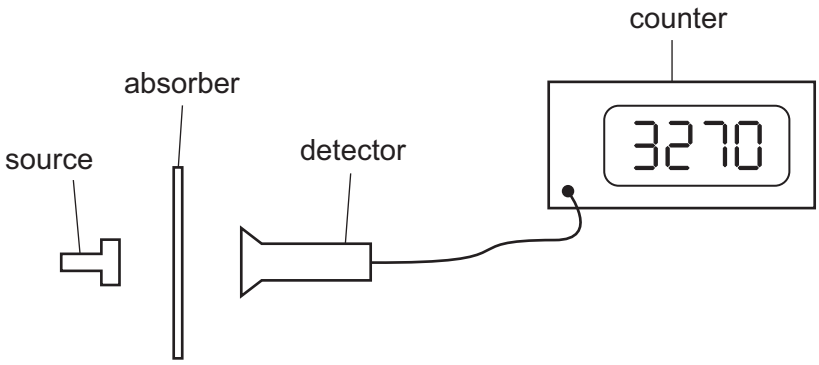

Fig. 8.1

Table 8.1 shows the count obtained in 2 minutes using different sources, with different absorbers.

Table 8.1

source	count with no absorber	count with paper absorber	count with aluminium absorber	count with lead absorber
krypton-85	3270	3268	14	12
americium-240	5854	1649	1644	103

(a) (i) State, with reasons, the type or types of radiation emitted by the krypton-85 source.

.....

.....

.....

(ii) State, with reasons, the type or types of radiation emitted by the americium-240 source.

.....

.....

.....

..... [6]

(b) Care must be taken when handling or storing radioactive materials.

(i) State **one** precaution which must be used when handling radioactive materials.

.....

.....

(ii) State **one** precaution which must be used when storing radioactive materials.

.....

..... [2]

9 Ethane and ethene are gases which can be obtained from crude oil.

(a) State the formula of ethene.

.....

[1]

(b) Describe the difference in the structures of ethane and ethene.

.....

.....

..... [2]

(c) Describe a test to distinguish between ethane and ethene.

test .....

.....

result with ethene .....

.....

result with ethane .....

..... [3]

(d) What do we call the process of making poly(ethene) from ethene?

..... [1]

10 Fig. 10.1 shows the structure of a cathode ray tube.

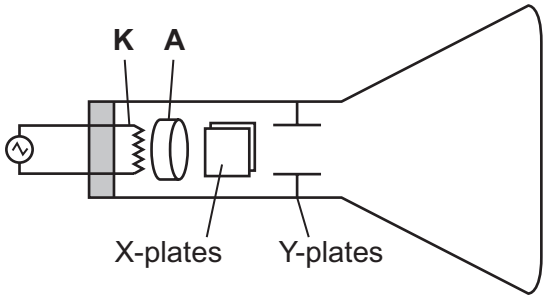

Fig. 10.1

(a) Explain how parts **K** and **A** produce cathode rays.

.....

.....

.....

.....

..... [4]

(b) Fig. 10.2a and Fig. 10.2b show two waveforms displayed on the cathode ray oscilloscope.
The settings of the oscilloscope are the same in each case.

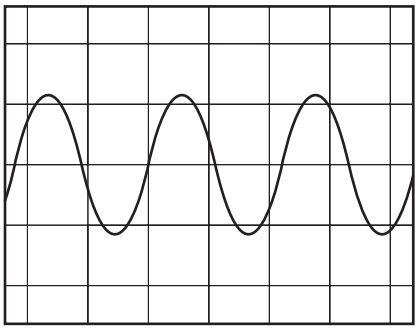

Fig. 10.2a

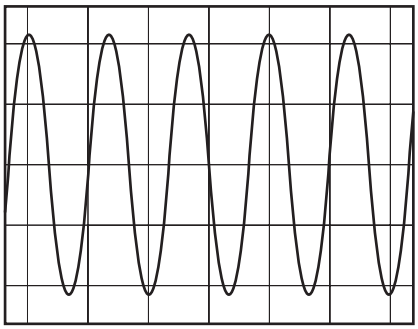

Fig. 10.2b

(i) State, giving a reason, which of the waves has the greater amplitude.

.....

.....

(ii) State, giving a reason, which of the waves has the greater frequency.

.....

.....

..... [3]

11 Limestone is an important raw material.

(a) Give the name and formula of the main calcium compound present in limestone.

name .....

formula ..... [2]

(b) (i) How can calcium oxide (lime) be made from limestone?

..... [1]

(ii) What needs to be added to calcium oxide to make calcium hydroxide (slaked lime)?

..... [1]

(iii) The reaction to make calcium hydroxide is exothermic.
What does *exothermic* mean?

..... [1]

(c) Why do farmers sometimes spread calcium hydroxide on the soil in their fields?

..... [1]

12 Fig. 12.1 shows a ray of light incident on a parallel sided glass block.

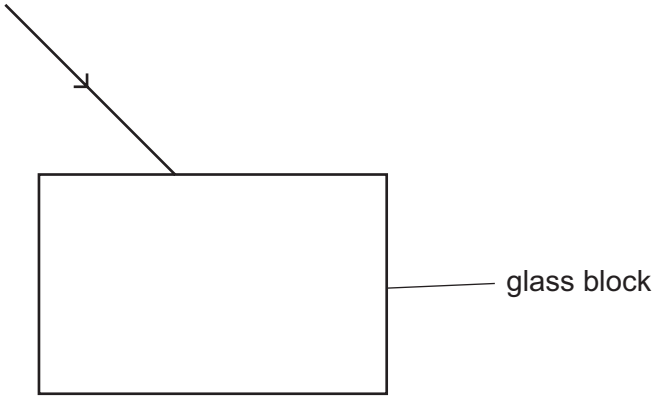

Fig. 12.1

(a) Complete the path of the light as it passes through and leaves the block. [3]

(b) Mark on Fig. 12.1

(i) the angle of incidence and label it *i*,

(ii) the angle of refraction and label it *r*. [2]

[Turn over

13 Chlorine is a reactive element in Group VII of the Periodic Table.

(a) Why is chlorine often added to drinking water supplies?

.....

[1]

(b) Complete Table 13.1 by naming the type of bonding present in each of these substances.

Table 13.1

substance	type of bonding present
chlorine	
hydrogen chloride	
sodium chloride	

[2]

(c) **(i)** What is the symbol for a chloride ion?

.....

[1]

(ii) How many electrons are in the outer shell of a chloride ion?

.....

[1]

(iii) How is the electron structure of Group 0 elements such as neon similar to that of ions such as a chloride ion?

.....

.....

.....

[2]

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 **H** Hydrogen 1										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 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulphur 16	35.5 **Cl** 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 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**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	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

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

Key: a above **X** above b

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

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