

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE

0653/02

Paper 2 Core

May/June 2006

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.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
You may use a pencil for any diagrams, graphs, tables or rough working.
A copy of the Periodic Table is printed on page 20.
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.

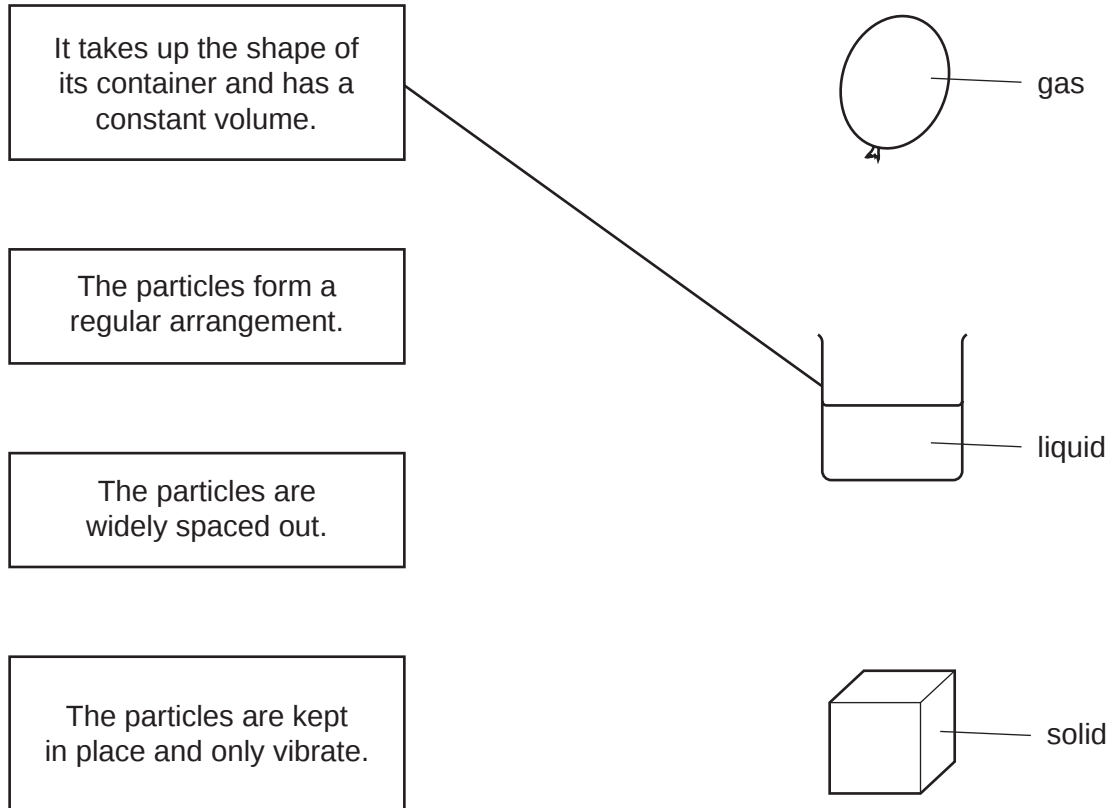
For Examiner's Use	
1	
2	
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6	
7	
8	
9	
Total	

This document consists of **17** printed pages and **3** blank pages.



- 1 (a) Each box below contains a description of a solid, a liquid or a gas.

Join each box to the correct diagram. One has been done for you.



[2]

- (b) A student sets up the apparatus shown in Fig. 1.1.
He wants to use this apparatus to detect thermal radiation.

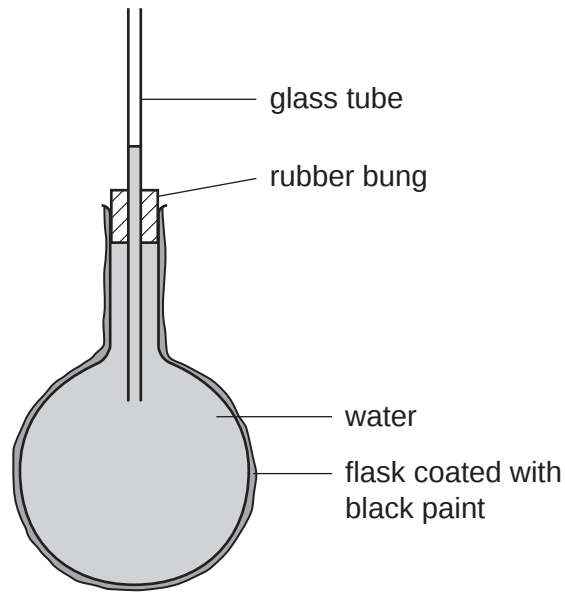


Fig. 1.1

- (i) Describe what the student would observe when the flask coated with black paint is exposed to a source of thermal radiation.

.....
 [1]

- (ii) Explain the observation in (i) in terms of water particles.

.....

 [3]

- (iii) Suggest why the flask is coated with black paint.

..... [1]

- 2 Fig. 2.1 shows a fetus developing in the uterus.

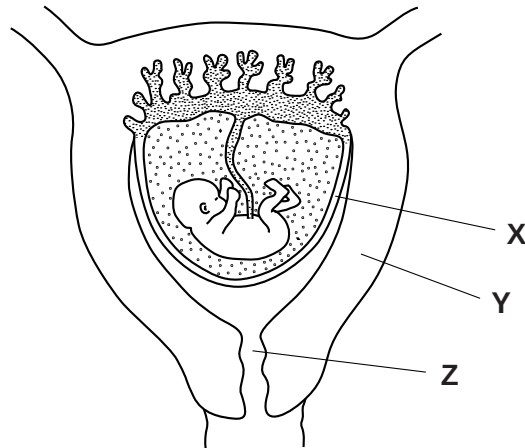


Fig. 2.1

- (a) Name the parts labelled **X**, **Y** and **Z**.

X

Y

Z

[3]

- (b) Describe how the fetus obtains oxygen.

.....

 [3]

- (c) Anna is planning to start a family. She smokes 6 cigarettes a day.
 Explain why Anna should give up smoking before she becomes pregnant.

.....

 [2]

- 3 (a) Table 3.1 shows some information about the elements in Group VII of the Periodic Table. Use the Periodic Table on page 20 to help you with this question.

(i) Complete the table.

Table 3.1

Period in which the element is found	symbol	physical state at 25 °C
	Cl	
	Br	
	I	

[2]

- (ii) Fluorine is the Group VII element in Period 2.
Suggest the physical state of fluorine at 25 °C.

..... [1]

- (b) Bromine exists as diatomic molecules, Br₂. Bromine molecules react with magnesium atoms to form magnesium bromide.

(i) State the type of chemical bonding in bromine molecules.

..... [1]

- (ii) The formula of magnesium bromide is MgBr₂.
Explain what is meant by this formula.

.....
.....
..... [1]

- (c) (i) State **one** element which is often added to water intended for drinking.

..... [1]

- (ii) Suggest and explain what might happen if the element you have named in (i) was **not** added to water intended for drinking.

.....
.....
..... [2]

- 4 (a) A radioactive tracer can be used to detect leaks in water pipes. The tracer is placed in the water flowing through the pipe and a radiation detector is used to check for radiation coming from water leaking out of the pipe.



- (i) Suggest a suitable instrument for detecting the radiation.

..... [1]

- (ii) State two precautions which should be taken when handling and storing the radioactive tracer.

1.

2. [2]

- (b) Beta-radiation is one form of ionising radiation.

- (i) Explain why beta-radiation is said to be *ionising*.

.....

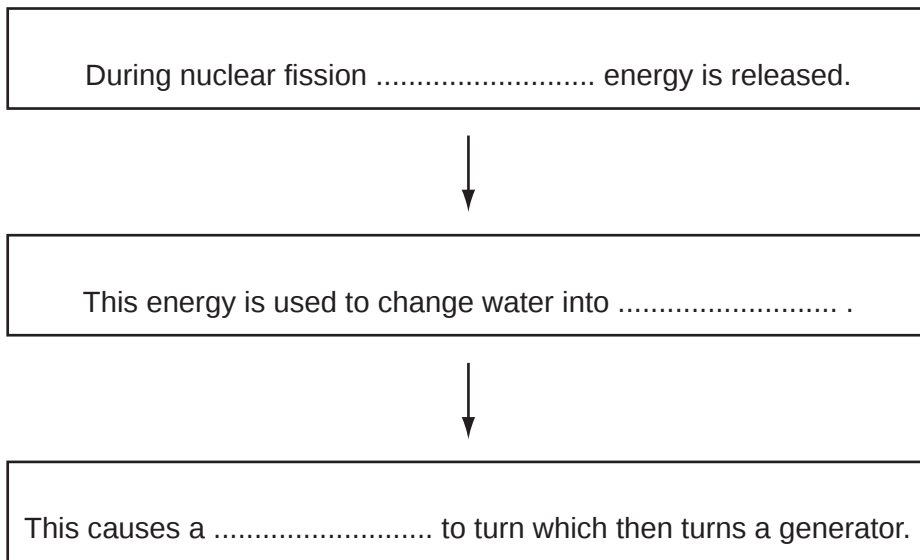
 [2]

- (ii) Explain why ionising radiation can be harmful to humans.

.....

 [2]

- (c) The flow chart shows how electricity is produced in a nuclear power station. Complete the flow chart by filling in the missing words.



[3]

- (d) (i) The voltage of the electricity generated is increased using transformers for transmission through power lines to the users.

Explain why this is done.

.....

.....

..... [2]

- (ii) The electrical supply to a house is at a voltage of 220 V.
An electric kettle is plugged into the supply.
The current flowing through the heating element of the kettle is 10 A.

Calculate the resistance of the heating element.

Show your working and state the formula that you use.

formula used

working

.....ohms [2]

5 (a) The list below contains descriptions of some different parts of cells.

- A contains genes made of DNA
- B controls what enters and leaves the cell
- C is fully permeable

Write the **letter** or **letters** of the descriptions that fit each of these parts of cells.
Each part may have one letter, two letters or no letters at all.

nucleus

cell wall

chloroplast

cell surface membrane

[3]

(b) Fig. 5.1 shows a cell from a plant root.

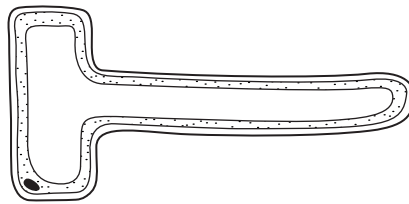


Fig. 5.1

This cell takes up water from the soil.
The water is then carried up to the leaves in the xylem vessels.

(i) Name the type of cell in Fig. 5.1.

.....

[1]

(ii) Explain how this cell is adapted for its function.

.....

[1]

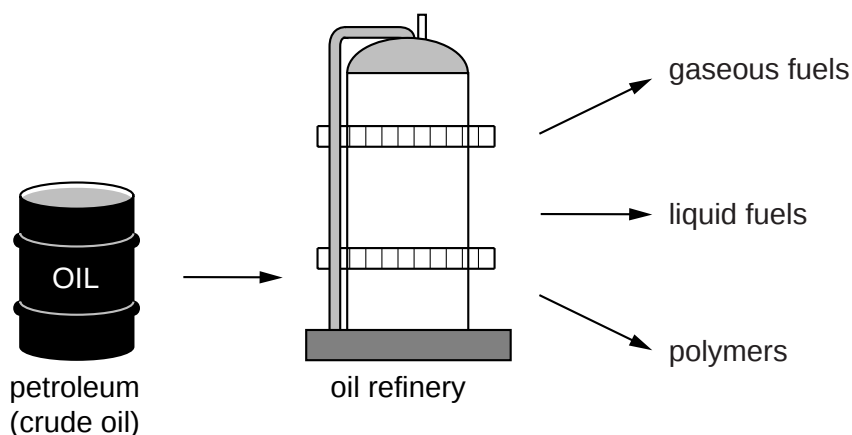
- (iii) In the leaves, a small amount of the water is used for photosynthesis.
Write the word equation for photosynthesis.

..... [2]

- (iv) What happens to most of the water after it has travelled into the leaves?

..... [1]

- 6 Petroleum (crude oil) provides many important products including fuels and polymers.



- (a) Name the **two** main elements which are always found combined together in fuels obtained from petroleum.

..... [2]

- (b) Butane is a gaseous fuel obtained from petroleum.

- (i) State **one** form of energy that is transferred to the surroundings when butane is oxidised.

..... [1]

- (ii) Name **one** product that is formed when butane is completely oxidised.

..... [1]

- (c) Table 6.1 shows the total number of atoms which are combined in molecules of three compounds **A**, **B** and **C**.

Table 6.1

compound	A	B	C
number of atoms in one molecule	60 000	11	26

Suggest and explain which one of these compounds is a polymer.

.....

 [2]

(d) Compounds containing the element sulphur are usually removed from fuels obtained from petroleum. The sulphur is collected and used to make sulphuric acid.

(i) State the number of sulphur atoms in one molecule of sulphuric acid.

..... [1]

(ii) Explain why the removal of sulphur compounds from fuel reduces environmental damage.

.....
.....
.....
..... [3]

7 Fig. 7.1 shows sugar cane growing in Fiji.



Fig. 7.1

(a) In Fiji, much of the land is hilly. It often rains very hard.

With reference to Fig. 7.1, explain how the fields of sugar cane can help to reduce soil erosion.

.....

.....

..... [2]

(b) Would a field of sugar cane have a low species diversity or a high species diversity? Explain your answer.

.....

.....

..... [2]

- (c) Sugar cane is used to produce sugar, which can be used in cooking.
A man eats a cake containing sugar.

(i) Describe how the sugar is absorbed into his blood.

.....

.....

.....

..... [2]

(ii) Explain how his blood sugar level will be prevented from rising too high after he has eaten the cake.

.....

.....

.....

..... [3]

(iii) Explain why he would feel tired and ill if his blood sugar level dropped very low.

.....

.....

..... [2]

8 The element iron is extracted from iron ore, which is a rock found in the Earth's crust.

- (a) The main iron compound in iron ore is iron oxide. When iron oxide reacts with carbon monoxide, iron is produced. The word equation for this reaction is shown below.

iron oxide + carbon monoxide $\longrightarrow$ iron + carbon dioxide

- (i) State **one** difference between an element such as iron and a compound such as iron oxide.

.....

 [1]

- (ii) The reaction shown in (a) is an example of oxidation and reduction.

State and explain briefly which substance has been reduced in this reaction.

.....

 [2]

- (b) Fig. 8.1 shows a diagram of a car.

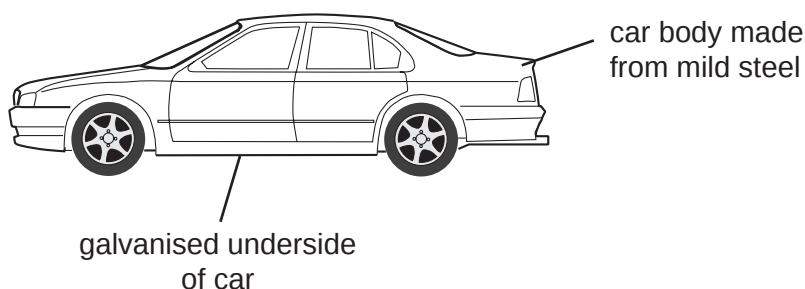


Fig. 8.1

Mild steel is an alloy containing a large amount of iron.

- (i) Name an element, other than iron, which is present in mild steel.

..... [1]

- (ii) The steel on the underside of the car is galvanised by coating it with a layer of zinc. This protects the steel from rusting.

Suggest how this prevents the steel from rusting.

.....

.....

.....

..... [3]

- (c) Fig. 8.2 shows a test-tube containing a small piece of galvanised steel reacting in sulphuric acid.

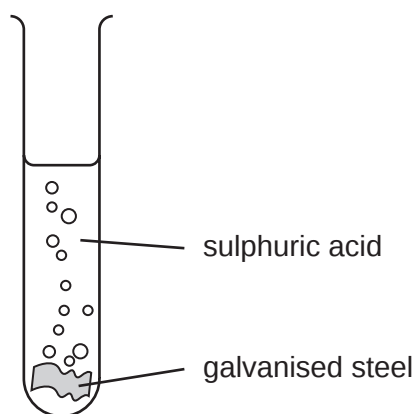


Fig. 8.2

Suggest the names of two salts which will remain in the solution in the test-tube when all of the galvanised steel has reacted.

1.
2. [2]

- 9 (a) An athlete takes part in a race. His performance is shown on the speed–time graph in Fig. 9.1.

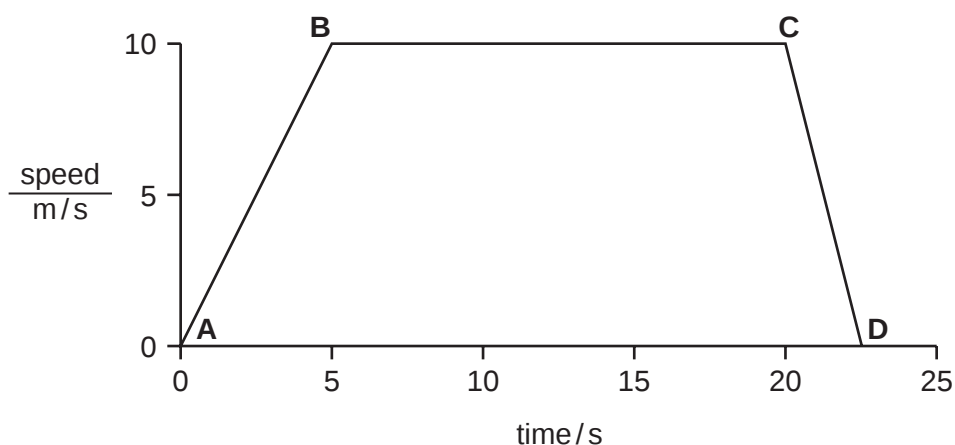


Fig. 9.1

Use the graph to describe the motion of the athlete between

- (i) **A** and **B**,
- (ii) **B** and **C**,
- (iii) **C** and **D**.

[3]

- (b) Calculate the distance travelled between 5 seconds and 20 seconds.

Show your working and state the formula that you use.

formula used

working

..... m [2]

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Question 7

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DATA SHEET

The Periodic Table of the Elements

Group																														
I	II											III	IV	V	VI	VII	0													
		1HHydrogen1																												
7LiLithium3	9BeBeryllium4																	11BBoron5	12CCarbon6	14NNitrogen7	16OOxygen8	19FFluorine9	20NeNeon10							
23NaSodium11	24MgMagnesium12																	27AlAluminium13	28SiSilicon14	31PPhosphorus15	32SSulphur16	35.5ClChlorine17	40ArArgon18							
39KPotassium19	40CaCalcium20	45ScScandium21	48TiTitanium22	51VVanadium23	52CrChromium24	55MnManganese25	56FeIron26	59CoCobalt27	59NiNickel28	64CuCopper29	65ZnZinc30	70GaGallium31	73GeGermanium32	75AsArsenic33	79SeSelenium34	80BrBromine35	84KrKrypton36													
85RbRubidium37	88SrStrontium38	89YYttrium39	91ZrZirconium40	93NbNiobium41	96MoMolybdenum42	99TcTechnetium43	101RuRuthenium44	103RhRhodium45	106PdPalladium46	108AgSilver47	112CdCadmium48	115InIndium49	119SnTin50	122SbAntimony51	128TeTellurium52	127Iiodine53	131XeXenon54													
133CsCaesium55	137BaBarium56	139LaLanthanum57	178HfHafnium72	181TaTantalum73	184WTungsten74	186ReRhenium75	190OsOsmium76	192IrIridium77	195PtPlatinum78	197AuGold79	201HgMercury80	204TlThallium81	207PbLead82	209BiBismuth83	212PoPolonium84	210AtAstatine85	222RnRadon86													
87FrFrancium87	226RaRadium88	227AcActinium89																												
*58-71 Lanthanoid series 90-103 Actinoid series																														
140CeCerium58																		141PrPraseodymium59	144NdNeodymium60	150SmSamarium62	152EuEuropium63	157GdGadolinium64	159TbTerbium65	162DyDysprosium66	165HoHolmium67	167ErErbium68	169TmThulium69	173YbYtterbium70	175LuLutetium71	
232ThThorium90																		238PaProtactinium91	238UUranium92	93NpNeptunium93	94PuPlutonium94	95AmAmericium95	96CmCurium96	97BkBerkelium97	98CfCalifornium98	99EsEinsteinium99	100FmFermium100	101MdMendelevium101	102NoNobelium102	103LrLawrencium103

a

X

b

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

Key

Key

a	X	b
---	---	---

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).