



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

**COMBINED SCIENCE**

**0653/03**

Paper 3

October/November 2003

**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.  
You may use a soft pencil for any diagrams, graphs or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

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

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>TOTAL</b>	

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

- 1 (a) Fig. 1.1 shows some information about three enzymes which act in the human digestive system.

enzyme	substance which the enzyme digests	substance which is produced	place where the enzyme works
	starch	sugar (maltose)	mouth and small intestine
lipase		fatty acids and glycerol	small intestine
protease	proteins		

Fig. 1.1

Complete the table by writing the appropriate word or words in each of the four spaces. [4]

- (b) Seeds and fruits are important sources of nutrients for many animals, including humans. Many seeds and fruits contain sugar, starch and protein.

- (i) Explain how the presence of these nutrients can help the seeds or fruits to be dispersed to new areas.

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

- (ii) Describe how you would test a seed for the presence of protein, and state what you would see if the test was positive.

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

2 (a) Fig. 2.1 shows an observer's eye looking at a lamp in a mirror.

(i) On Fig. 2.1, draw a ray of light to show how the observer is able to see the lamp in the mirror.

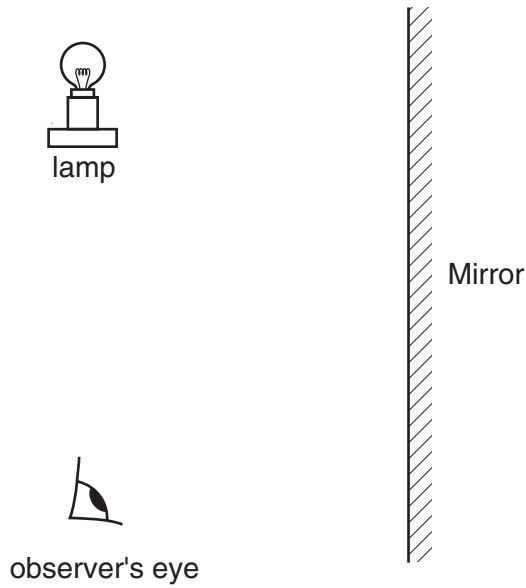


Fig. 2.1

[3]

(ii) On Fig. 2.1 show the position of the image.

[2]

(b) Light waves and radio waves are both parts of the electromagnetic spectrum.

(i) State **one** property that is the same for both of these waves.

.....[1]

(ii) State **one** property that is different for each of these waves.

.....[1]

3 Fig. 3.1 shows a blast furnace which is used to extract iron from iron ore. Iron ore is containing iron(III) oxide.

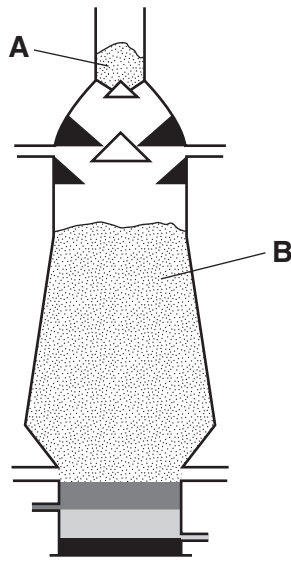


Fig. 3.1

(a) (i) Iron ore and coke are added to the furnace at **A**. Name the other raw material that is added at **A**.

.....[1]

(ii) Iron(III) oxide is reduced to iron at **B**.

Write a **word** equation for the reaction at **B**.

.....[2]

(iii) Explain why iron(III) oxide is said to be *reduced* in this reaction.

.....[1]

(b) (i) The chemical formula of iron(III) oxide is Fe<sub>2</sub>O<sub>3</sub>.  
The formula of the oxide ion is O<sup>2-</sup>.  
Deduce the formula of the iron ion.  
Show how you obtained your answer.

.....[2]

5

- (ii) Calculate the relative formula mass of iron(III) oxide.  
Show your working.

.....[2]

4 A student investigated the effect of temperature on the transpiration rate of potted plants. She took three similar plants growing in pots, and added the same volume of water to the soil in each pot. Then she fastened a transparent polythene bag around each one. For plants **A** and **B**, the bag covered the pot only. For plant **C**, the bag covered the pot and also the plant, as shown in Fig. 4.1.

Plants **A** and **C** were left in a room kept at 20°C. Plant **B** was left in a room kept at 10°C.

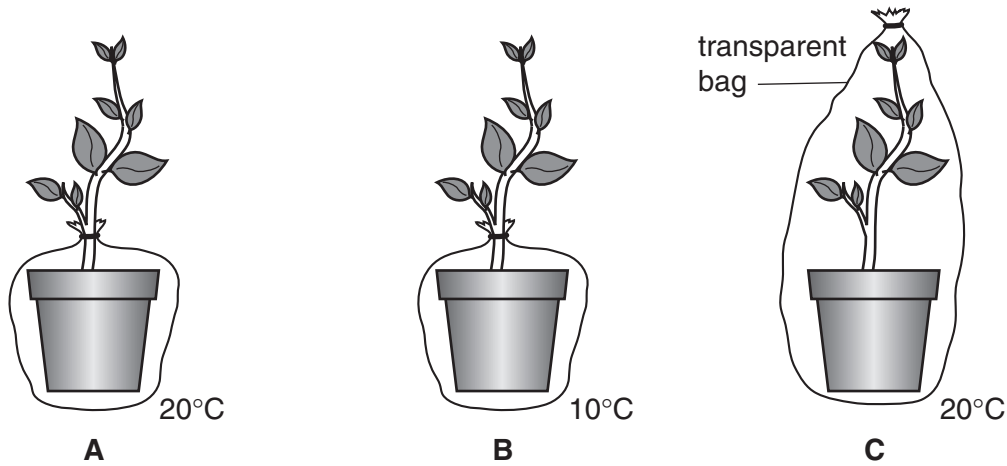
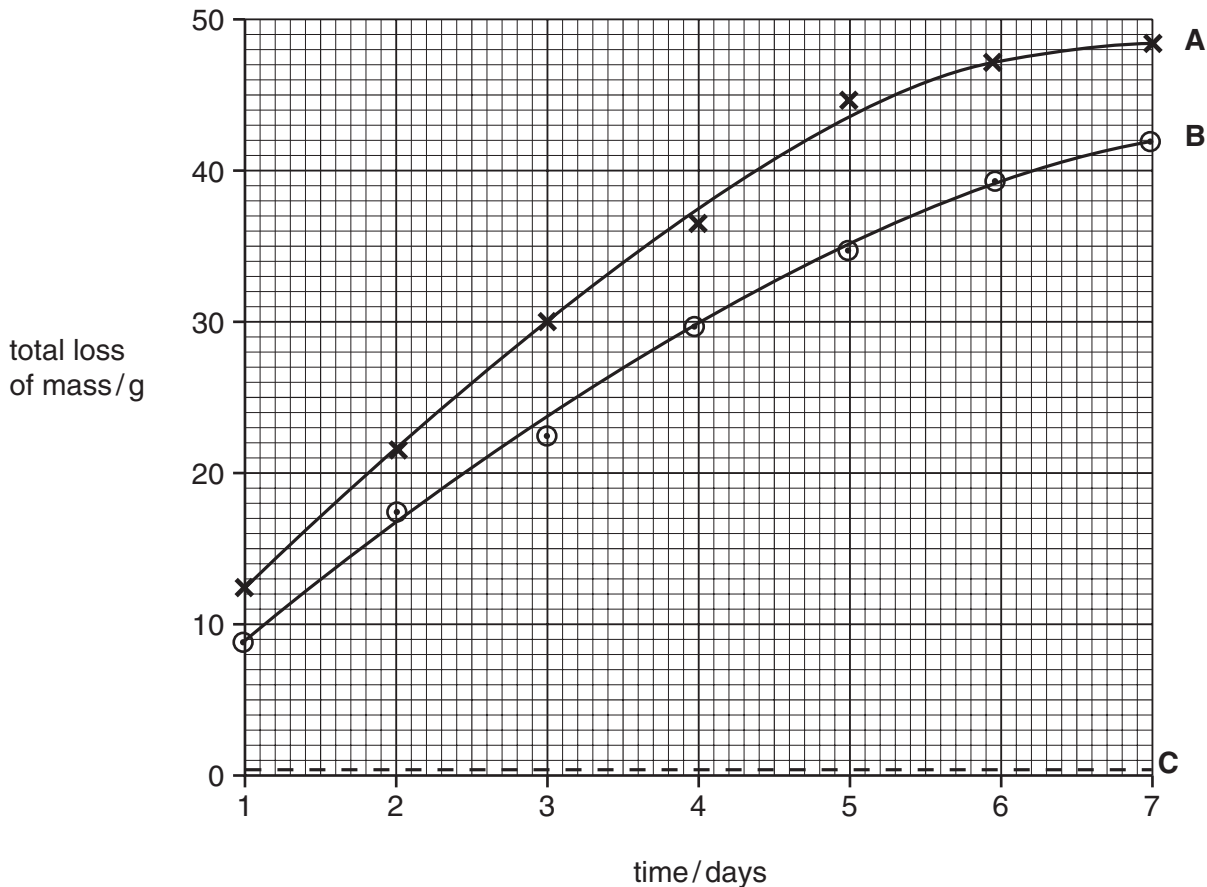


Fig. 4.1

Each plant was placed on a balance and its mass was recorded at the same time each day for one week. The loss of mass was then calculated. The results are shown in Fig. 4.2.



(a) (i) Suggest **one** factor which should have been the same in the two rooms, to ensure that the student's results were valid.

.....[1]

(ii) Explain why the polythene bags needed to be transparent.

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

(b) (i) Explain why plants **A** and **B** lost mass, but plant **C** did not.

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

(ii) Explain why plant **A** lost more mass than plant **B**.

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

(iii) The conditions in the two rooms were kept constant throughout the experiment. Suggest why plant **A** lost mass more slowly towards the end of the week.

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





6 Most of the compounds in petroleum (crude oil) are hydrocarbons but some compounds are also present.

(a) (i) Write a **word** equation for the complete combustion of the hydrocarbon, methane.

[2]

(ii) Explain how sulphur compounds may cause damage to the environment if they are not removed from petroleum.

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

(b) Some hydrocarbons are cracked to form smaller molecules such as ethene which contains a double bond.

Describe how a hydrocarbon is tested to find out whether it contains a double bond.

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

(c) Fig. 6.1 shows the displayed formula of a small part of a molecule of poly(ethene).

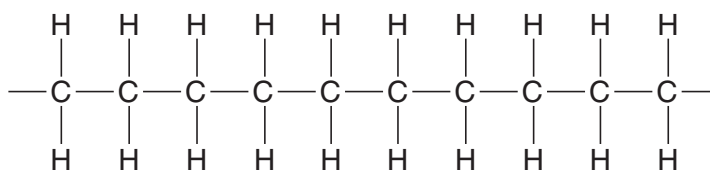


Fig. 6.1

(i) State the number of ethene monomers which have joined to form this section of the poly(ethene) molecule.

.....[1]

(ii) Explain your answer to (i).

.....

7 Fig. 7.1 shows two beakers **A** and **B**, both full of water.

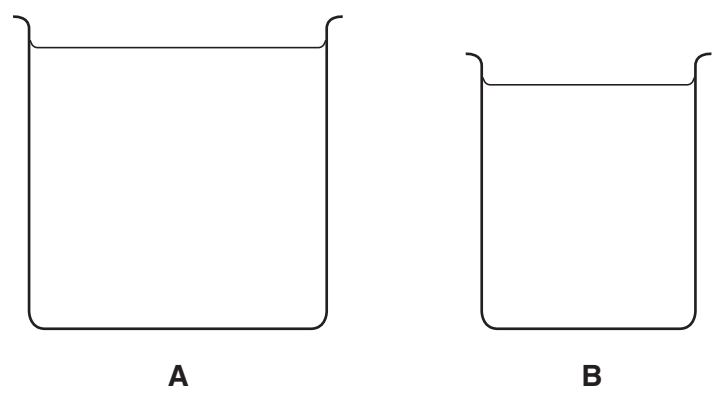


Fig. 7.1

(a) (i) When both beakers are full of water, beaker **A** has twice the weight of beaker **B**. What can be said about the masses of the two beakers when they are full of water?

Explain your answer.

.....

.....

..... [2]

(ii) Fig. 7.2 shows the two beakers balanced on a thin beam.

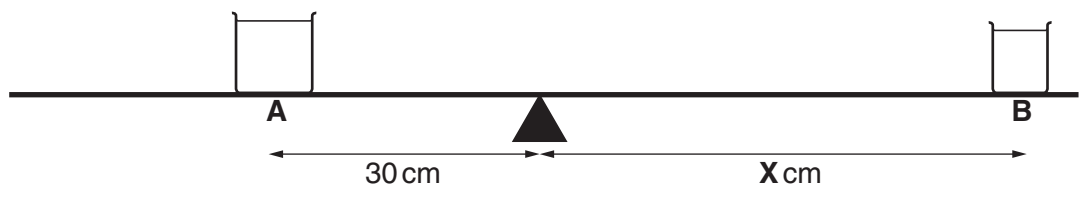


Fig. 7.2

What is the value of **X**?

Explain your answer.

.....

.....

..... [2]

(b) Fig. 7.3 shows a conical flask and a drinking glass, both full of water.

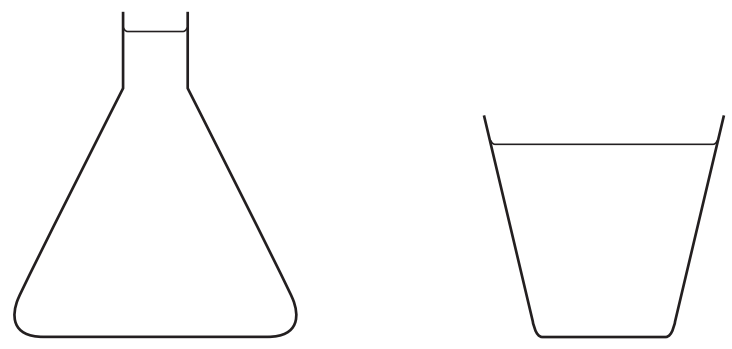


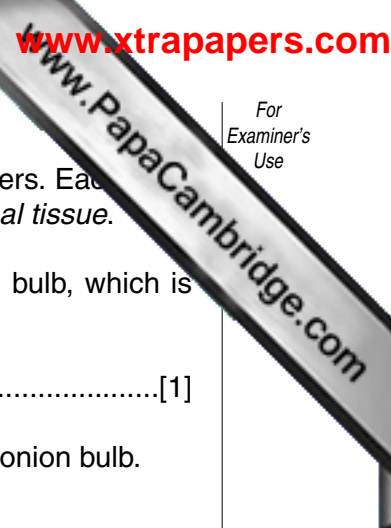
Fig. 7.3

- (i) Label each container with a **C** to show the approximate centre of mass in each one. [2]
- (ii) Explain why it is more difficult to tip over the conical flask than the drinking glass. You may draw diagrams if it helps your answer.

.....

.....

..... [2]



8 If an onion bulb is cut open, it can be seen to be made of several different layers. Each layer has a very thin 'skin' covering its inner surface. This skin is called an *epidermal tissue*.

(a) What is the term that is used to describe a structure such as an onion bulb, which is made of several tissues grouped together?

.....[1]

(b) The outline shows the shape of a plant cell in the epidermal tissue of an onion bulb.



(i) In the space below, draw a diagram to show how at least six of these cells are grouped together to form the epidermal tissue.

[3]

(ii) State **one** way in which a cell in onion epidermal tissue differs from a cell in the palisade mesophyll of a leaf. Explain the reason for this difference.

difference .....

.....

reason for this difference .....

.....

.....[3]



10 Radon is a gas that emits alpha radiation.

(a) Explain why alpha radiation is dangerous to human beings.

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

(b) Explain why alpha radiation is affected by an electric field.

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

(c) Describe the differences in the structure of the nucleus of a radon-220 atom before and after the emission of an alpha particle.

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

15  
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**DATA SHEET**  
**The Periodic Table of the Elements**

		Group															
I	II	III	IV	V	VI	VII	O										
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10									
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulphur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18										
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Tc</b> Technetium 43	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	186 <b>Re</b> Rhenium 75	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86
87 <b>Fr</b> Francium	88 <b>Ra</b> Radium	89 <b>Ac</b> Actinium															
				140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71		
				232 <b>Th</b> Thorium 90	238 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103

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

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

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