

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**COMBINED SCIENCE**

**5129/02**

Paper 2

October/November 2004

**2 hours 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, tables or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.  
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.

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.

For Examiner's Use	
<b>Total</b>	

- 1 Fig. 1.1 shows a ball floating on the surface of a pond. A wave travels across the surface of the pond. This makes the ball move.



Fig. 1.1

- (a) Which of the following describes how the ball moves?

left and right      left only      up and down      right only

..... [1]

- (b) Waves on the surface of water are transverse waves.

What is meant by *transverse*?

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

- (c) Give **one** example of a *longitudinal* wave. .... [1]

- 2 An object has a mass of 2.5 kg. On Earth the gravitational field strength,  $g = 10 \text{ N/kg}$ .

- (a) How much does the object weigh on Earth?

[1]

- (b) The object has a volume of  $1000 \text{ cm}^3$ .

Calculate its density.

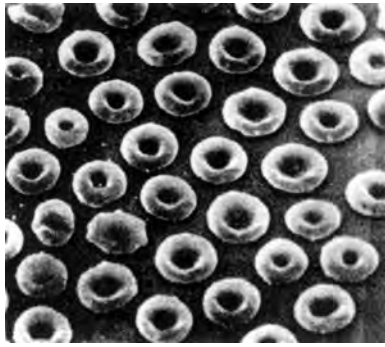
[3]

- (c) The object is taken to the moon.

Will the density increase, decrease or stay the same?

..... [1]

3 Fig. 3.1 shows red blood cells.



magnification =  $\times 900$

Fig. 3.1

(a) State **one** way in which these cells differ from typical animal cells.

..... [1]

(b) When red blood cells are placed in distilled water they swell and burst. When plant cells are placed in distilled water they swell, but do not burst.

(i) Name the process that causes the cells to swell.

..... [1]

(ii) Explain why the cells swell.

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

(iii) Explain why plant cells do not burst when placed in distilled water.

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

4 Copper reacts with silver nitrate to produce a solid and a blue solution.

(a) Name the products of the reaction.

products ..... and ..... [2]

(b) Iron reacts with copper(II) sulphate. Place the elements copper, iron and silver in order of reactivity, with the most reactive first.

most reactive ..... least reactive ..... [1]

(c) Aluminium is more reactive than iron. Explain why aluminium does not corrode as easily as iron.

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

5 All electromagnetic waves travel at the same speed in a vacuum.

(a) State this speed.

..... m/s [1]

(b) X-rays have higher frequencies than visible light.

Define *frequency*.

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

(c) Name the component of the electromagnetic spectrum that has the longest wavelength.

..... [1]

6 Fig. 6.1 shows information about some fuels.

fuel	formula of a hydrocarbon present in the fuel	boiling point of the hydrocarbon / °C
petrol	$C_8H_{18}$	126
kerosene	$C_{11}H_{24}$	196
diesel	$C_{17}H_{36}$	303

Fig. 6.1

(a) (i) Name the raw material from which the fuels are obtained.

.....

(ii) Name the process used to separate the fuels from the raw material.

.....

(iii) What difference in physical property allows this separation to take place?

.....

..... [3]

(b) The hydrocarbons shown in Fig. 6.1 belong to the same homologous series of compounds.

(i) Deduce the general formula of this homologous series.

.....

(ii) Name this homologous series.

..... [2]

(c) (i) Complete the word equation for the **complete** combustion of octane,  $C_8H_{18}$ .

octane + oxygen  $\longrightarrow$  ..... + .....

(ii) Name the gas produced by the **incomplete** combustion of octane in a car engine.

..... [3]

7 (a) The cells of a bean seed contain an *amylase*.

(i) What type of substance is this?

.....

(ii) What change does it cause?

.....

[2]

(b) Two cubes of side 5 mm are cut from the cotyledons of the same bean seed. One cube is placed in 10 cm<sup>3</sup> of a 1% solution of starch in beaker **A** as shown in Fig. 7.1. The other cube is chopped up and made into a paste using distilled water. The paste is added to 10 cm<sup>3</sup> of a 1% solution of starch in beaker **B** and then stirred.

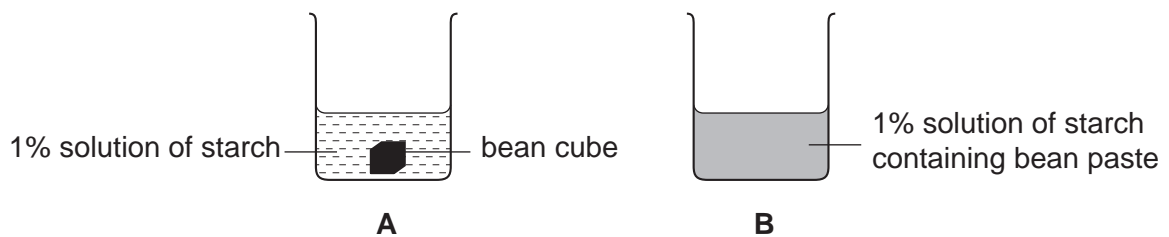


Fig. 7.1

Drops of solution from beakers **A** and **B** are tested every minute for the amount of starch. The results are plotted on Fig. 7.2.

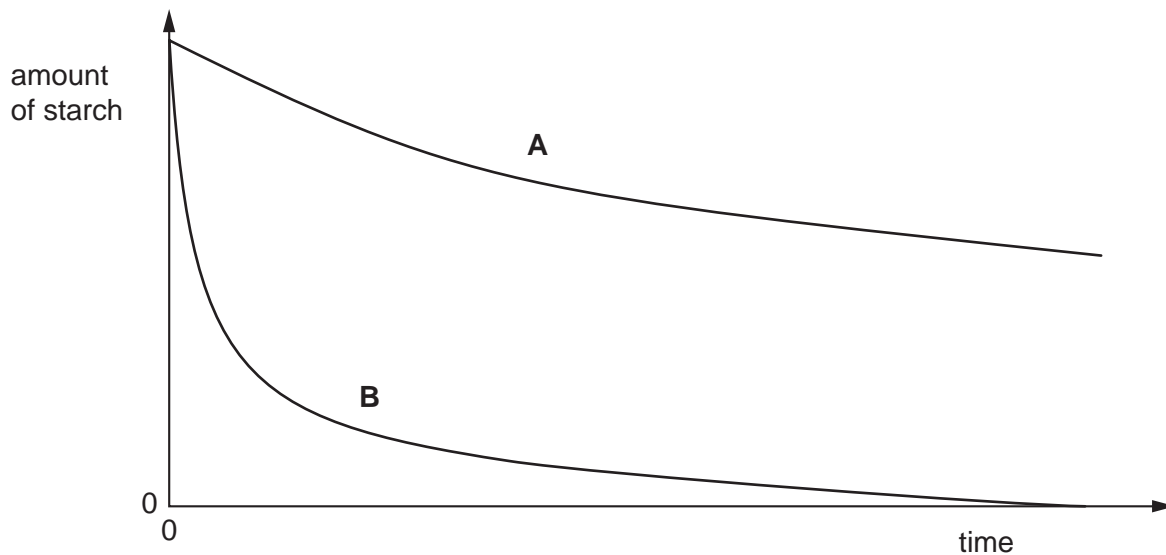
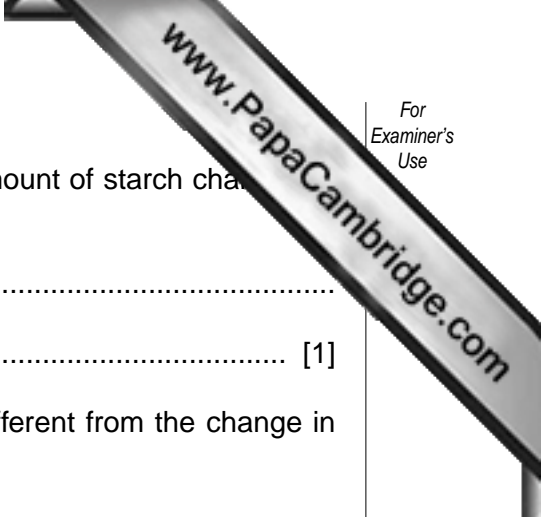


Fig. 7.2



(i) What does the graph in Fig. 7.2 show about how the amount of starch changes in both beakers?

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

(ii) Describe and explain why the change in beaker **A** is different from the change in beaker **B**.

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

(iii) Explain why no starch remains in beaker **B** at the end of the experiment.

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

(iv) Suggest what substance is now found in this beaker.

..... [1]

(c) What is the importance of amylase during the germination of bean seeds?

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

8 A 10 N weight falls 0.6 m on to the floor.

(a) Calculate the work done on the weight by the force of gravity.

[2]

(b) State the type of energy lost as the weight falls. .... [1]

(c) State the gain in kinetic energy of the weight. .... [1]

- 9 (a) Name the unit of electric charge. ....
- (b) In a lightning strike, there is a current of 100 000 A for a time of 0.0002 s.  
Calculate the charge that passes in the strike.

[2]

- 10 Fig. 10.1 shows the arrangement of electrons in the atoms of six different elements, A – F. The letters are not the chemical symbols of these elements.

atom	A	B	C	D	E	F
electron arrangement	2,5	2,8	2,8,2	2	2,8,7	2,8,4

Fig. 10.1

Use the letters to answer the following questions.

- (a) Which **two** elements are in the same group of the Periodic Table?  
..... and .....
- (b) Which element is a noble gas? .....
- (c) Which element has proton number 17? .....
- (d) Which element is a metal? .....
- (e) Which **two** elements will combine together to form an ionic compound?  
..... and ..... [5]



11 (a) The human diet sometimes includes butter.

(i) Name the main food substance (nutrient) in butter.

..... [1]

(ii) State two uses of this nutrient in the body.

1. ....

.....

2. ....

..... [2]

(b) Many people eat too much of this nutrient.

(i) What form of malnutrition does this cause?

..... [1]

(ii) State which blood vessels are especially affected by too much of this nutrient in the diet.

..... [1]

(iii) Explain how too much of this nutrient in the diet may lead to death.

.....

..... [2]

12 Fig. 12.1 shows a vernier scale and a micrometer scale.

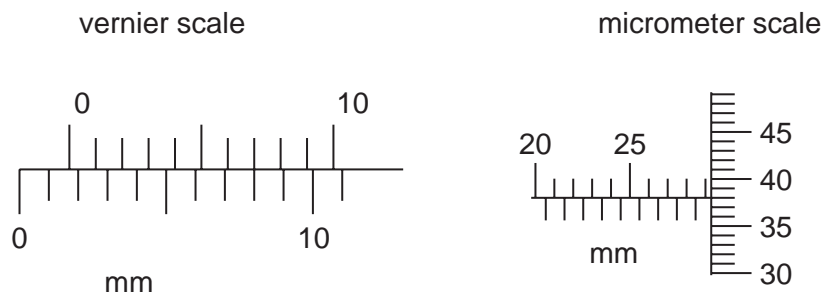


Fig. 12.1

(a) The vernier scale reads ..... mm. [1]

(b) The micrometer scale reads ..... mm. [1]

13 Ammonia is an alkaline gas. It reacts with sulphuric acid to give ammonium sulphate.

(a) (i) What type of reaction occurs between ammonia and sulphuric acid?

.....

(ii) What is the colour of Universal Indicator in aqueous ammonia?

.....

(iii) State the formula of the ion present in ammonia solution that causes the solution to be alkaline.

.....

[3]

(b) The formula of ammonium sulphate is  $(\text{NH}_4)_2\text{SO}_4$ .

How many different elements are present in ammonium sulphate? ..... [1]

(c) Explain why ammonium sulphate is used as a fertiliser.

.....

.....

..... [2]

14 (a) (i) Define *asexual reproduction*.

.....

(ii) How can asexual reproduction be an advantage to an organism?

.....

..... [2]

(b) (i) How do the offspring of sexual reproduction differ from those produced by asexual reproduction?

.....

.....

(ii) Suggest how sexual reproduction can be an advantage to a species.

.....

.....

..... [2]

(c) (i) How is a human zygote formed?

.....

(ii) What does a zygote become?

..... [2]

15 A boy runs along a road. Fig. 15.1 shows how his speed varies with time.

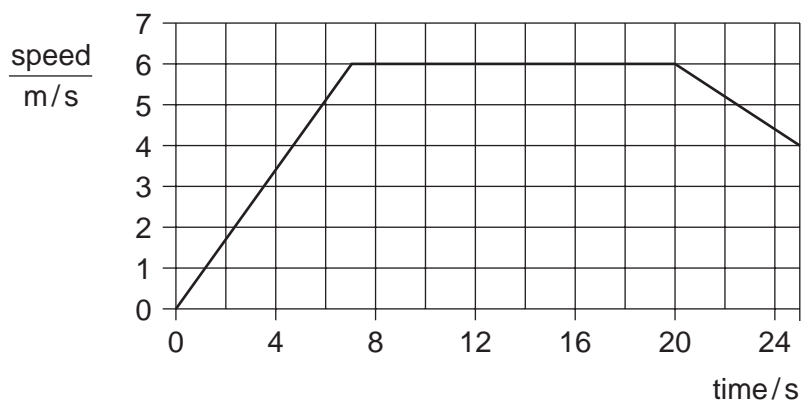


Fig. 15.1

(a) At what time does the boy stop accelerating? ..... [1]

(b) Calculate the distance travelled between the times 10 s and 15 s.

[2]

(c) The road is not straight and the boy cannot run in a straight line.

Explain why it is not possible to run along the road at constant velocity.

.....

..... [1]

16 Both laboratory and clinical thermometers contain liquid. The volume of the liquid changes with temperature.

(a) Name **one** physical property of matter, other than volume, that also changes with temperature.

..... [1]

(b) Clinical thermometers contain a constriction, as shown in Fig. 16.1.

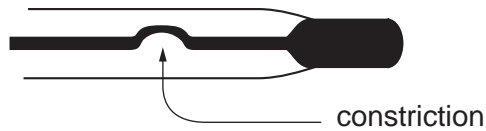


Fig. 16.1

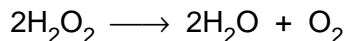
Explain the purpose of the constriction.

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

(c) A clinical thermometer is usually more sensitive than a laboratory thermometer. Explain what is meant by *sensitivity*.

..... [1]

17 The equation for the decomposition of hydrogen peroxide is shown below.



Manganese(IV) oxide acts as a catalyst.

(a) What is a *catalyst*?

..... [1]

(b) Describe a test to show that the gas given off is oxygen.

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

(c) (i) What are the relative molecular masses of hydrogen peroxide and oxygen?  
[ $A_r$ : H, 1; O, 16.]

hydrogen peroxide .....  
oxygen ..... [2]

(ii) What mass of oxygen is produced when 17 g of hydrogen peroxide decomposes?

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

18 From this list, select words to fill in the gaps in the sentences below.

You may use the words once, more than once, or not at all.

- antibiotics    bacterium    condoms    contraceptive pills**  
**cure    HIV/AIDS    sexual intercourse    virus**

The condition known as HIV/AIDS is caused by a ..... that is passed on by ..... There is no known ..... for this condition.

Gonorrhoea is a disease caused by a ....., so it can be treated and cured by using .....

Both diseases can be prevented from being passed on by using .....

It is possible to catch ..... by using needles that have been used by an

19 Fig. 19.1 shows some parts of an electrical plug. The neutral wire and the fuse have been labelled.

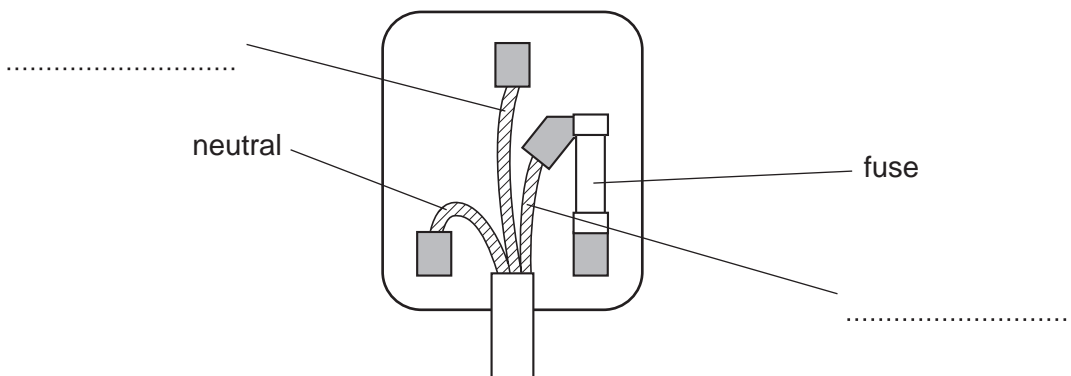


Fig. 19.1

(a) Label the two other wires shown on Fig. 19.1. [1]

(b) State the colour of the neutral wire. .... [1]

(c) The fuse has a rating of 3 A.

Explain what this means.

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

20 Lithium, sodium and potassium are elements in Group I of the Periodic Table.

(a) How many electrons are in the outermost shell of the atoms of these elements?  
 ..... [1]

(b) Describe the trend in the melting points of these elements.  
 .....  
 ..... [1]

(c) All three elements react with cold water.

State two ways in which all three reactions are similar.

1. ....  
 .....  
 2. ....  
 ..... [2]

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

		Group																																	
I	II	III	IV	V	VI	VII	0																												
7 <b>Li</b> Lithium 4	9 <b>Be</b> Beryllium 4	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>1 <b>H</b> Hydrogen 1</td> <td colspan="10"></td> </tr> <tr> <td>11 <b>B</b> Boron 5</td> <td>12 <b>C</b> Carbon 6</td> <td>13 <b>Al</b> Aluminium 13</td> <td>14 <b>Si</b> Silicon 14</td> <td>15 <b>P</b> Phosphorus 15</td> <td>16 <b>S</b> Sulphur 16</td> <td>17 <b>Cl</b> Chlorine 17</td> <td>18 <b>Ar</b> Argon 18</td> <td colspan="4"></td> </tr> </table>										1 <b>H</b> Hydrogen 1											11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	13 <b>Al</b> Aluminium 13	14 <b>Si</b> Silicon 14	15 <b>P</b> Phosphorus 15	16 <b>S</b> Sulphur 16	17 <b>Cl</b> Chlorine 17	18 <b>Ar</b> Argon 18					20 <b>Ne</b> Neon 10
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23 <b>Na</b> Sodium 12	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 20	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 38	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 56	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	222 <b>Rn</b> Radon 86																		
226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89																																		

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

3-71 Lanthanoid series  
80-103 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.).