

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	
Total	

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



- 1 Fig. 1.1 shows a ball floating on the surface of a pond. A wave travels across the surface and 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 cm^3 .

Calculate its density.

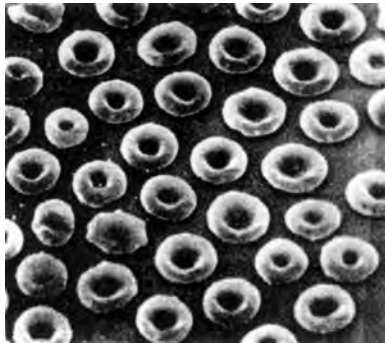
[3]

- (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 * $\uparrow$ +

(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 cm³ 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 cm³ of a 1% solution of starch in beaker **B** and then stirred.

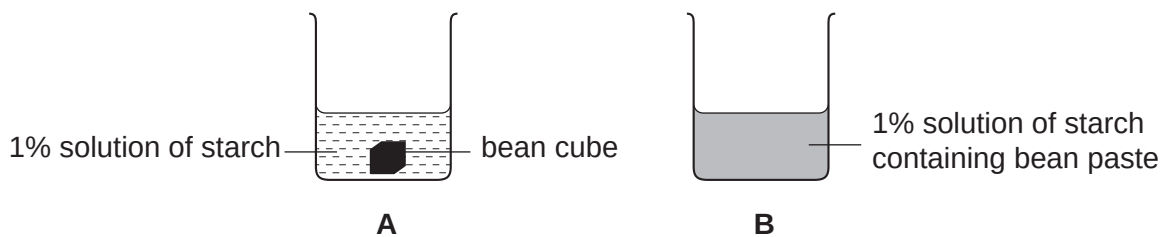


Fig. 7.1

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.

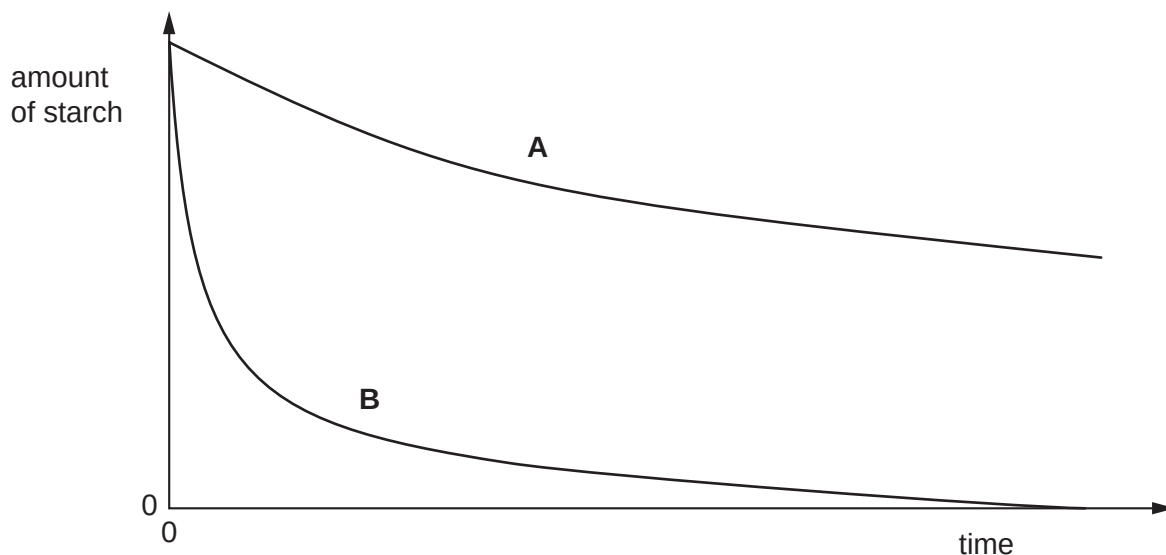


Fig. 7.2

- (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. [1]

(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.

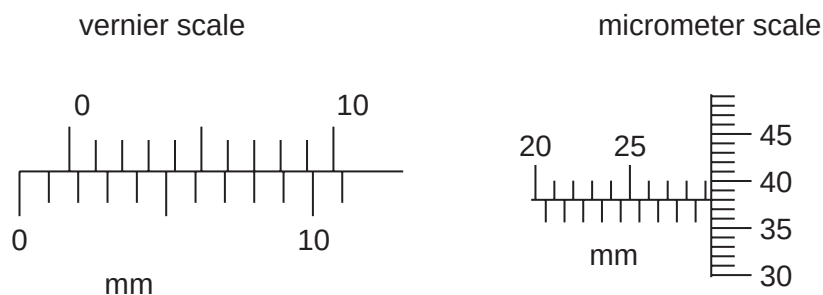


Fig. 12.1

(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.

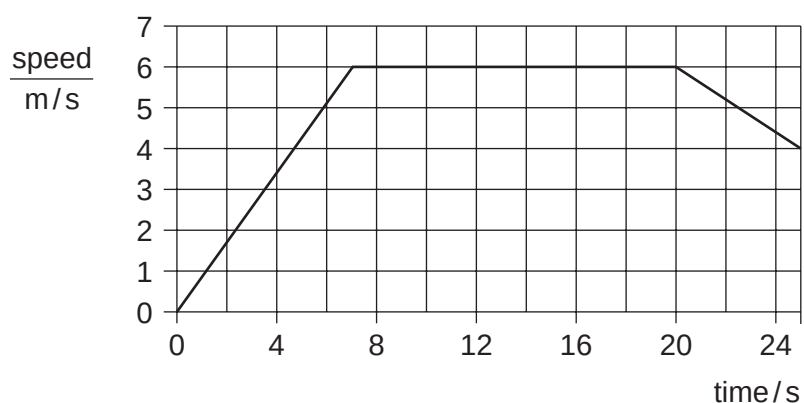


Fig. 15.1

- (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.

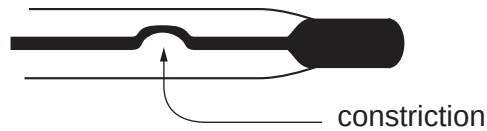


Fig. 16.1

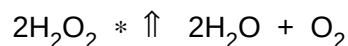
Explain the purpose of the constriction.

.....
 [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 infected person.

[7]

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

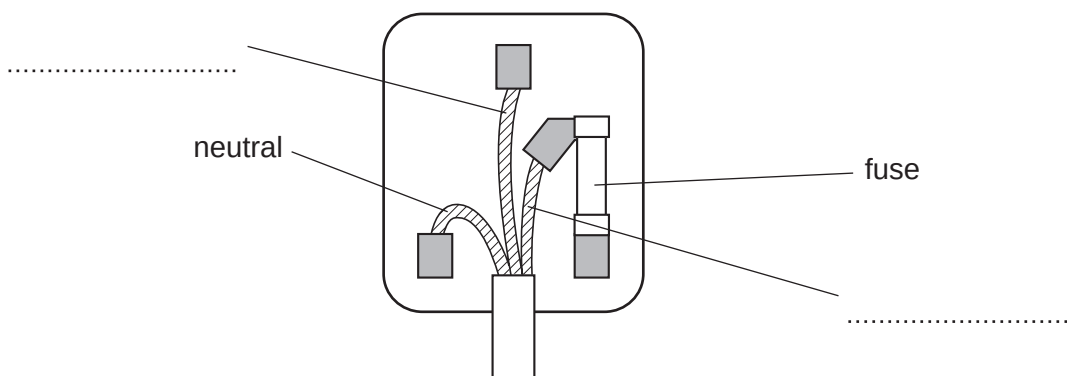


Fig. 19.1

- (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]
- [1]
- (b) Describe the trend in the melting points of these elements. [1]
- [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
		1 H Hydrogen 1															
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	101 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	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86
87 Fr Francium	226 Ra Radium 88	227 Ac Actinium 89															
*58-71 Lanthanoid series †90-103 Actinoid series																	
a X b a = relative atomic mass X = atomic symbol b = proton (atomic) number																	
Key																	
			140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	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	238 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103	

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