



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

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PHYSICAL SCIENCE

0652/31

Paper 3 (Core)

October/November 2018

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 an HB pencil for any diagrams, graphs, tables or rough working.

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

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

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.

This document consists of **18** printed pages and **2** blank pages.

1 Fig. 1.1 shows a toy car in two positions on a ramp.

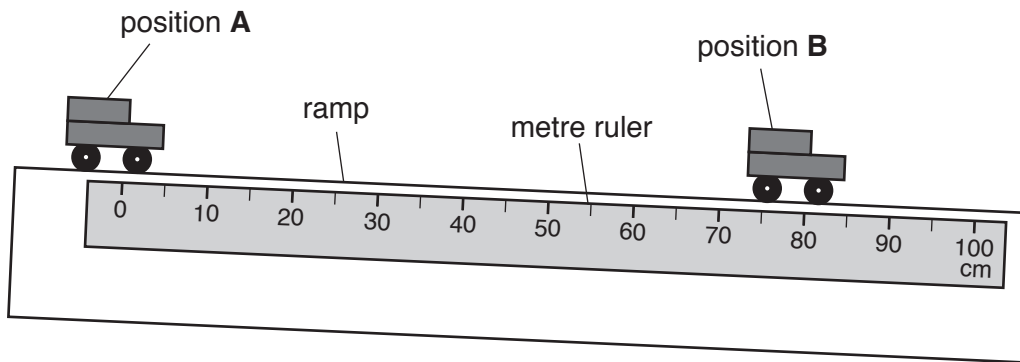


Fig. 1.1

The car is released from position **A**. It moves at a constant speed down the ramp. It takes 3.2 seconds to reach position **B**.

A metre ruler is used to measure the distance it has travelled.

(a) (i) Use Fig. 1.1 to determine the distance the car travels in moving from position **A** to position **B**.

distance = cm [2]

(ii) Calculate the speed of the car down the ramp.

speed = cm/s [2]

(b) On the axes on Fig. 1.2, sketch the speed time graph for the car as it travels down the ramp.

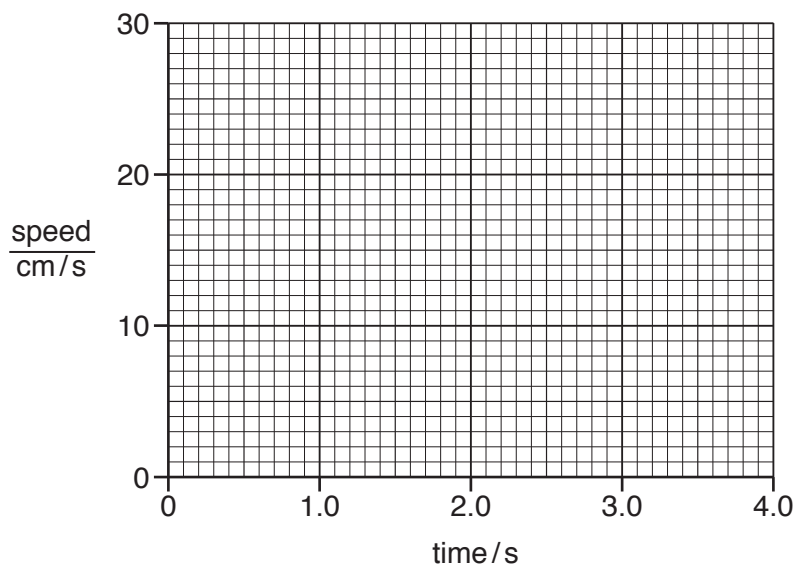


Fig. 1.2

[2]

[Total: 6]

2 The transition elements are a collection of metals in the Periodic Table.

Transition metals or their compounds are often used as catalysts.

(a) State **two** other general properties of transition elements.

1

2

[2]

(b) Some metals occur 'native' in the Earth's crust.

Name **two** transition elements which occur native.

1

2

[2]

(c) Name the transition metal alloyed with chromium to make stainless steel.

..... [1]

(d) Name the transition metal in the ore hematite.

..... [1]

[Total: 6]

3 Fig. 3.1 shows a waterfall.

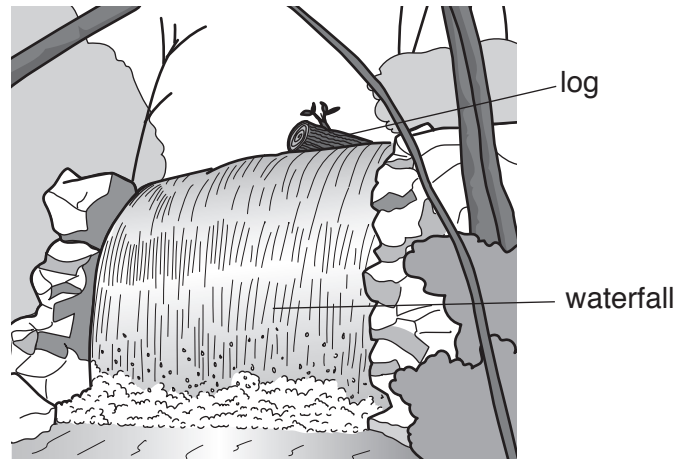


Fig. 3.1

A log at the top of the waterfall falls over the edge.

(a) (i) State the form of energy that the log has due to its position at the top of the waterfall.

..... [1]

(ii) State **two** forms of energy to which energy is transferred as the log falls.

1

2

[2]

(b) A log is caught on the bank of the river, as shown in Fig. 3.2.

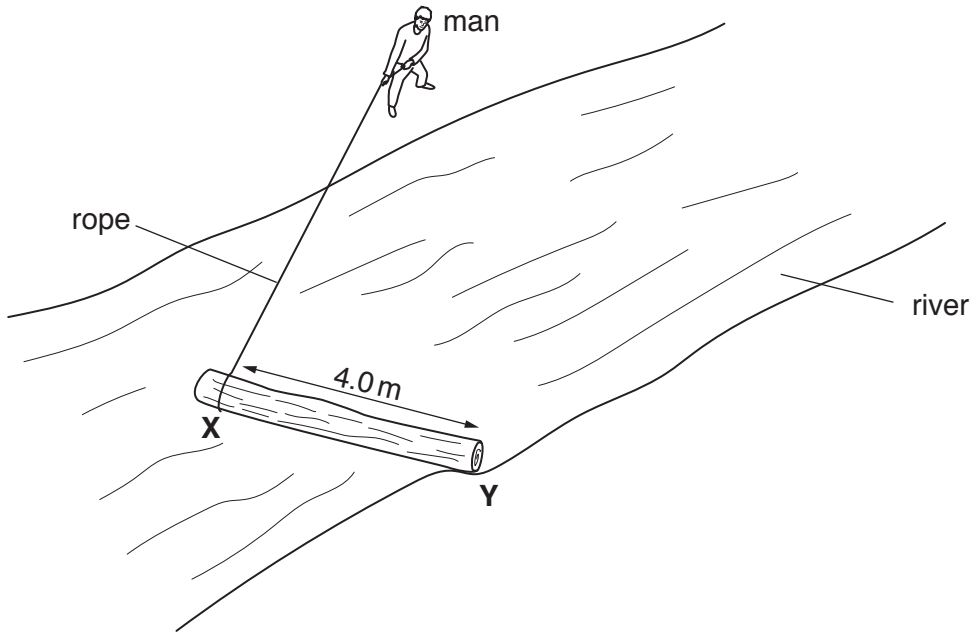


Fig. 3.2

A man attaches the rope to the log at point **X** and pulls it with a force of 350 N at right angles to the log.

Point **Y** acts as a pivot. The distance between point **X** and point **Y** is 4.0 m.

(i) Calculate the moment of the 350 N force about point **Y**.

Show your working.

moment = Nm [2]

(ii) Describe what is meant by the *moment of a force about a point*.

.....

 [1]

[Total: 6]

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

(a) State why sodium is in Group I.

.....
 [1]

(b) The representation of sodium in the Periodic Table is shown in Fig. 4.1.

7
11 Na sodium 23
19

Fig. 4.1

State what the numbers 11 and 23 represent.

11
 23 [2]

(c) Sodium reacts with chlorine to form an ionic compound.

(i) Name this ionic compound.

..... [1]

(ii) Write a balanced chemical equation for this reaction.

..... [2]

(d) Complete Table 4.1 to give the formulae of the two ions in potassium iodide.

Table 4.1

name	formula of ion
potassium	
iodide	

[2]

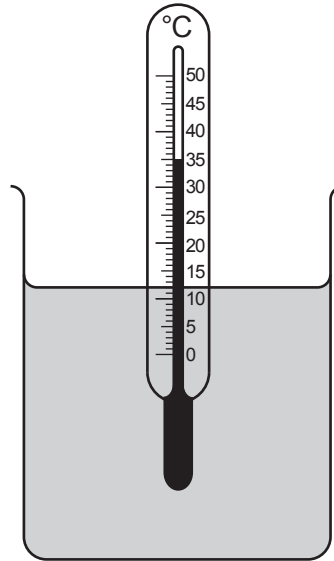
[Total: 8]

- 5 Fig. 5.1 and Fig. 5.2 show a liquid-in-glass thermometer at room temperature and the same thermometer in a beaker of warm water.



at room temperature

Fig. 5.1



in beaker of warm water

Fig. 5.2

- (a) (i) Record the temperature of the warm water.

temperature = °C [1]

- (ii) Explain why the liquid in the thermometer moves up the thermometer when the temperature rises.

.....
 [1]

- (b) The Celsius scale has two fixed points.

Name one fixed point.

..... [1]

- (c) Water in a beaker is boiling.

Describe what happens when water boils.

.....

 [2]

[Total: 5]

6 Ethanol can be used as a fuel.

It burns in air in an exothermic reaction.

(a) State what is meant by *exothermic*.

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

(b) (i) Balance this equation for the burning of ethanol.



(ii) Name **one** product of this reaction.

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

(c) Explain why it is dangerous to burn ethanol in a limited supply of air.

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

(d) Name a fuel that does **not** produce any carbon containing compounds when it is burned.

..... [1]

[Total: 6]

7 Fig. 7.1 shows a side view of water waves in a shallow tank.

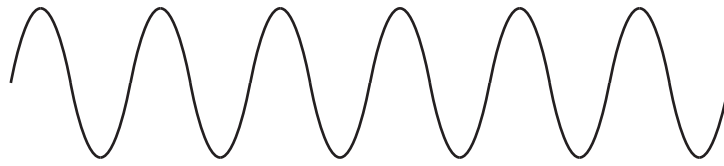


Fig. 7.1

(a) On Fig 7.1, draw an arrow to show

(i) the amplitude of the wave and label this arrow **A**, [1]

(ii) the wavelength of the wave and label this arrow λ . [1]

(b) Fig. 7.2 shows a view of the water waves from above.

The wavefronts move from deep water to an area of shallow water.

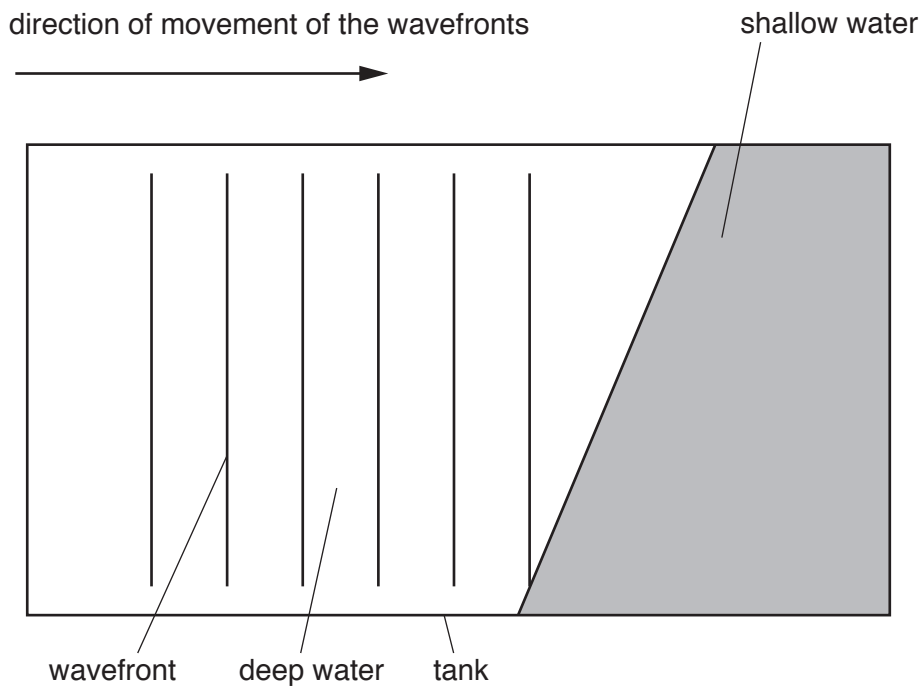


Fig. 7.2

(i) On Fig. 7.2, draw **three** more wavefronts to show what happens when the wavefronts enter the shallow water. [3]

(ii) Name the process which occurs as the wavefronts enter the shallow water.

..... [1]

[Total: 6]

- 8 The alkanes are members of a homologous series.

Table 8.1 gives the names and formulae of some alkanes.

Table 8.1

name	formula
methane	CH ₄
ethane	C ₂ H ₆
propane
butane	C ₄ H ₁₀

- (a) Complete Table 8.1 by suggesting the formula of propane.

Propane has three carbon atoms per molecule.

[1]

- (b) Calculate the relative molecular mass, M_r , of butane.

[A_r : C, 12; H, 1]

M_r [1]

- (c) (i) Ethene, C₂H₄, is an unsaturated hydrocarbon.

Draw the structures of ethene and ethane in the space below.

ethene

ethane

[2]

(ii) Name the reagent used to show that ethene is unsaturated and that ethane is saturated.

State the observation made for each hydrocarbon with this reagent.

reagent

observation with ethene

.....

observation with ethane

..... [3]

[Total: 7]

9 Fig. 9.1 shows the electromagnetic spectrum.

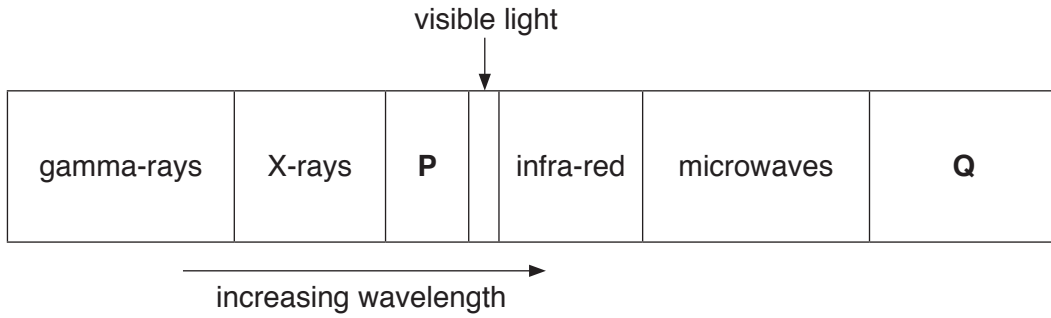


Fig. 9.1

(a) Name the type of wave found at

(i) P, [1]

(ii) Q. [1]

(b) As the wavelength of the waves increases, state what happens to the speed of the waves in a vacuum.

..... [1]

(c) Fig. 9.2 shows a cup of coffee emitting thermal radiation.

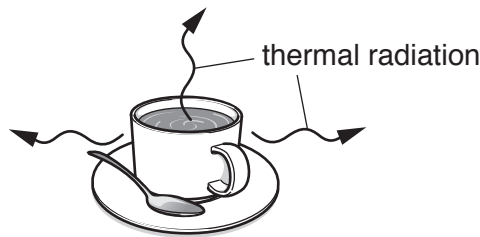


Fig. 9.2

Identify the part of the electromagnetic spectrum emitted by the cup as thermal radiation.

..... [1]

[Total: 4]

10 Fig. 10.1 shows how drinking water is obtained from river water.

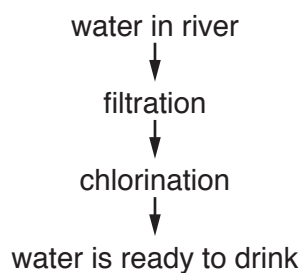


Fig. 10.1

(a) State what is removed from the river water during filtration

..... [1]

(b) (i) State what is added to the water during chlorination.

..... [1]

(ii) State how chlorination makes the water safe to drink.

..... [1]

(c) A student uses anhydrous copper(II) sulfate to test for the presence of water.

(i) Describe the colour change when she adds water to the anhydrous copper(II) sulfate.

starting colour

final colour [2]

(ii) State how anhydrous copper(II) sulfate is obtained from hydrated copper(II) sulfate for use in this test.

..... [1]

[Total: 6]

11 Fig. 11.1 is a circuit diagram.

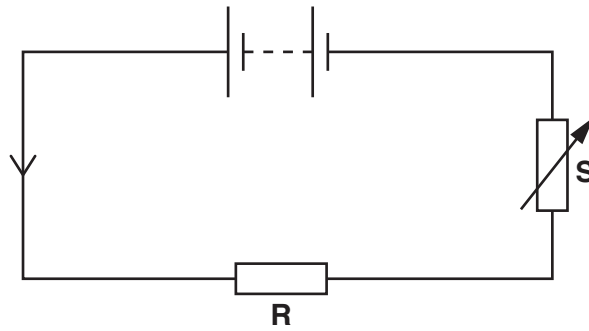


Fig. 11.1

(a) Name component **S**.

.....[1]

(b) The potential difference across resistor **R** is 4.0V.

The current in **R** is 1.6A.

(i) Determine the current in component **S**.

current = A [1]

(ii) Calculate the resistance of resistor **R**.

Show your working and state the unit.

resistance = unit [3]

(c) An identical resistor **T** is connected in parallel with resistor **R**, as shown in Fig. 11.2.

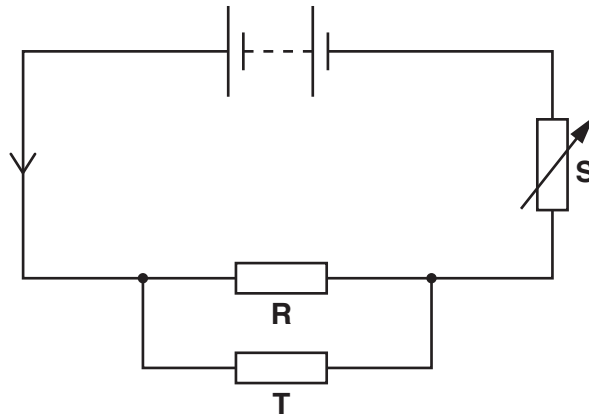


Fig. 11.2

State the effect of adding resistor **T** on the current supplied by the battery.

Explain your answer.

effect

explanation

..... [2]

[Total: 7]

- 12 (a) Aluminium saucepans do not burn when they are used to cook food but powdered aluminium explodes when it is close to a naked flame.

Explain why the aluminium behaves differently in these two situations.

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

- (b) (i) Describe another situation where fine powders in the air are dangerously explosive.

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

- (ii) Suggest a safety precaution which helps prevent explosions when working with fine powders.

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

- (c) Ammonia is a chemical used in industry. It is made by reacting hydrogen gas with nitrogen gas.

- (i) Name a raw material which could be used as a source of nitrogen.

..... [1]

- (ii) The reaction to make ammonia can be very slow.

Suggest **two** ways of making the reaction faster.

1

2

[2]

[Total: 7]

13 For this question, you will be expected to use the Periodic Table on page 20.

^{131}I is an unstable isotope of iodine.

(a) (i) Determine how many protons there are in a nucleus of this isotope.

number of protons = [1]

(ii) Determine how many neutrons there are in a nucleus of this isotope.

number of neutrons = [1]

(iii) Determine how many electrons there are in a neutral atom of this isotope.

number of electrons = [1]

(b) The isotope decays by the emission of a beta-particle.

(i) State the nature of a beta-particle.

..... [1]

(ii) State how the number of protons and the number of neutrons in the nucleus changes when a beta-particle is emitted.

change to the number of protons

.....

change to the number of neutrons

.....

[2]

[Total: 6]

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