

Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

| CANDIDATE NAME | | | |
|-------------------|-------|---------------------|---------|
| CENTRE NUMBER | | CANDIDATE NUMBER | |
| PHYSICAL SC | IENCE | 0 | 652/32 |
| Paper 3 (Core) | | October/Novemb | er 2018 |

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 hour 15 minutes

- 1 A floating platform is made from several large blocks.
 - (a) One of the blocks is shown in Fig. 1.1.

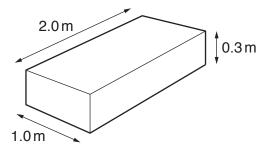


Fig. 1.1

(i) Use information from Fig. 1.1 to calculate the volume of the block.

| volume = r | n^3 | [1 | 1 | |
|------------|-------|----|---|--|
|------------|-------|----|---|--|

(ii) The mass of the block shown in Fig. 1.1 is 9.0 kg.

Calculate the weight of the block. State the unit.

[gravitational field strength $g = 10.0 \,\mathrm{N/kg}$]

(iii) Calculate the density of the block.

(b) A boat enters the harbour.

It approaches the floating platform and then stops.

A speed time graph is shown for this journey in Fig. 1.2.

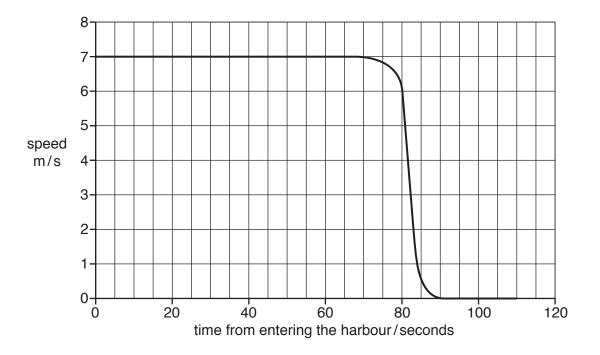


Fig. 1.2

Use the information in Fig. 1.2 to determine

| /i\ | the en | aad of | the h | noat v | whon | it ic | traval | llina | at | constant | Shaad |
|-----|---------|--------|-------|--------|------|-------|--------|----------|----|----------|--------|
| (1) | trie SD | eeu oi | me t | oai 1 | wnen | IL IS | uave | IIII ICI | ลเ | CONSTAIN | Speed. |

..... m/s [1]

(ii) the time taken from when the boat starts slowing down to when it stops.

..... s [1]

[Total: 7]

| Chl | orine | is an element in Period 3 of the Periodic Table. |
|-----|-------|--|
| (a) | Nar | ne the group which contains chlorine. |
| | | [1] |
| (b) | Nar | ne two metals in Period 3. |
| | 1 | |
| | 2 | [2] |
| (c) | Nar | ne one non-metal in Period 3 that is a solid at room temperature. |
| | | [1] |
| (d) | Nar | ne one non-metal in Period 3 that is a gas at room temperature. |
| | | [1] |
| (e) | (i) | Name one element in Period 3 which forms an acidic pollutant when combined with oxygen and water. |
| | | [1] |
| | (ii) | Name this pollutant. |
| | | [1] |
| | | [Total: 7] |

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2

Question 3 starts over the page

3 A worker is using a drill on a road surface.

The drill causes sound waves in the ground, as shown in Fig. 3.1.

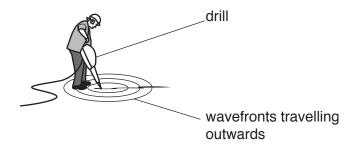


Fig. 3.1

(a) Fig. 3.2 shows a diagram of a wave travelling outwards.

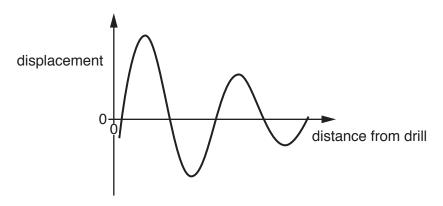


Fig. 3.2

(i) On Fig. 3.2, draw an arrow on the graph to show an **amplitude** of the wave.

Label this arrow with an A. [1]

(ii) On Fig. 3.2, draw an arrow on the graph to show the wavelength of the wave. Label this arrow with a W.

[1]

- (b) The drill makes a loud noise.
 - State how the sound is produced. (i)

.....[1]

(ii) Suggest the range of sound frequencies that humans can hear.

Include the unit in your answer.

..... to unit unit [3]

| | (iii) | Sound waves cannot travel in a vacuum. |
|-----|-------|--|
| | | Suggest why. |
| | | |
| | | [1] |
| (c) | The | drill is connected to an electrical supply using a lead of length 10 m as shown in Fig. 3.3. |
| | The | drill motor operates at its normal speed. |
| | | drill bit lead |
| | | Fig. 3.3 |
| | (i) | The lead is replaced by a lead of length 50 m and the drill operates more slowly. |
| | | State the effect on the current in the drill motor of using the longer lead. |
| | | Explain your answer. |
| | | effect |
| | | explanation |
| | | [2] |
| | (ii) | The insulation of the lead is damaged. |
| | | State one hazard due to damaged insulation. |
| | | |
| | | [1] |
| | | [Total: 10] |
| | | Tiolai. 10 |

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| 4 C | Chlorine | forms | ionic | and | covalent | compounds |
|------------|----------|-------|-------|-----|----------|-----------|
|------------|----------|-------|-------|-----|----------|-----------|

| (a) Complete Table 4.1 which gives information about two compounds of chlorine. | |
|---|--|
|---|--|

Table 4.1

| name of compound | type of bonding | formula |
|-------------------|-----------------|--------------|
| hydrogen chloride | covalent | |
| | ionic | NaC <i>l</i> |

| | | nydrogen chlonde | COVAIEIII | | |
|-----|-----|----------------------------------|--------------------------|---------------------------|-------------|
| | | | ionic | NaC1 | |
| (b) | Giv | ve the formulae of the ions | present in NaC <i>l.</i> | | |
| | ion | 1 | | | |
| | ion | 1 2 | | | [2] |
| (c) | | aw a dot and cross diagrandride. | m to show the electron | arrangement in a molecule | of hydrogen |
| | Sh | ow the outer electrons only | /. | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | [2] |
| (d) | De | scribe the formation of pos | sitive ions and negative | ions. | |
| | pos | sitive ions | | | |
| | | | | | |
| | ne | gative ions | | | |
| | | | | | [2] |

[Total: 8]

[2]

5 Fig. 5.1 is a section through a torch. The torch contains two cells in series, a lamp and component **P**.

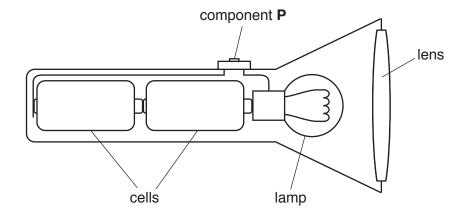


Fig. 5.1

(a) (i) Component P allows the torch to be turned on and off.

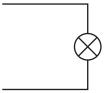


Fig. 5.2

(b) Another torch contains an arrangement with a lens, as shown in Fig. 5.3.

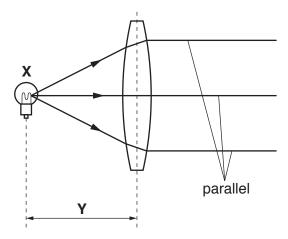


Fig. 5.3

A lamp is placed at point **X** at a distance **Y** from the centre of the lens.

Light from the lamp passes through the lens to form a parallel beam.

| (i) | The rays of light change direction as they enter and leave the lens. |
|-----|--|
| | Name this process and explain why it occurs. |
| | name of process |

| explanation | |
|-------------|-----|
| | [2] |

(ii) State the name of

> point X,

> distance Y.

(c) Fig. 5.4 shows the electromagnetic spectrum.

| | | | | | | |
|-------------|-----------------|---|------|---|--------|---------------|
| radio waves | micro- waves | A | ↓ | С | X-rays | gamma rays |

Fig. 5.4

Name the regions **A** and **B**.

A B [2]

[Total: 10]

[2]

6 Hydrogen peroxide decomposes to form oxygen and water.

Fig. 6.1 shows the apparatus used to decompose hydrogen peroxide.

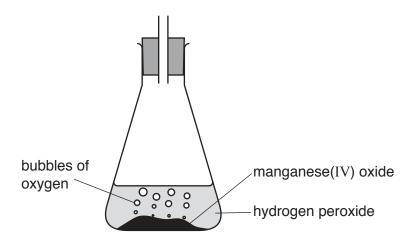


Fig. 6.1

- (a) Complete Fig. 6.1 to show how the oxygen is collected and its volume measured. [2]
- **(b)** Balance the equation for the decomposition of hydrogen peroxide.

$$....... H_2O_2 \rightarrow H_2O + O_2$$
 [1]

(c) The decomposition reaction is very slow without added manganese(IV) oxide.

Manganese(IV) oxide acts as a catalyst and speeds up the reaction.

State **one** other observation that shows that manganese(IV) oxide is a catalyst in this reaction.

[11]

(d) State a name for organic compounds acting as organic catalysts.

.....[1]

[Total: 5]

| (a) | Sta | te two properties of a metal. | |
|-----|------|---|------------|
| | 1 | | |
| | 2 | | |
| | | | [2] |
| (b) | Cop | pper(II) oxide reacts with sulfuric acid to make a salt. | |
| | (i) | Name this salt and the other product of the reaction. | |
| | | salt | |
| | | other product | |
| | | | [2] |
| | (ii) | Explain how this reaction shows that copper(II) oxide is basic. | |
| | | | |
| | | | |
| | | | [2] |
| | | | [Total: 6] |
| | | | |

7

8 Fig. 8.1 shows a cathode-ray oscilloscope (c.r.o.).

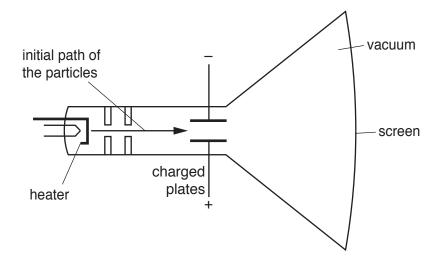


Fig. 8.1

(a) The heater emits particles by thermionic emission.

Name the particles emitted.

.....[1]

(b) Particles move from the heater to the screen. They pass between the charged plates.

The initial path of the particles is shown on Fig. 8.1.

On Fig. 8.1, complete the path of a particle until it hits the screen. [2]

(c) The particles are stopped by the screen.

Energy conversions take place.

Complete the diagram in Fig. 8.2 to show

- (i) the form of energy of the moving particles **before** the particles hit the screen, [1]
- (ii) the two energy forms of this energy **after** the particles hit the screen. [2]

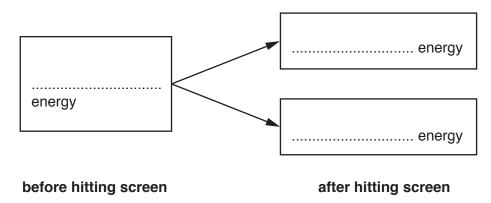


Fig. 8.2

[Total: 6]

9 Calcium oxide (lime) and calcium hydroxide (slaked lime) are made from calcium carbonate, as shown in Fig. 9.1.

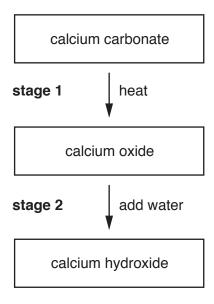


Fig. 9.1

| (a) | Name a raw material which contains calcium carbonate. [1] |
|-----|---|
| (b) | |
| | [1] |
| (c) | Stage 1, shown in Fig. 9.1, is an endothermic process. |
| | Describe the meaning of <i>endothermic</i> . |
| | |
| | [1] |
| (d) | Explain how a reaction can be <i>exothermic</i> even though energy is needed to break chemical bonds during the reaction. |
| | |
| | |
| | [0] |

(e) Lime mortar is a mixture of slaked lime, sand and water. It is used to build brick walls as shown in Fig. 9.2.



Fig. 9.2

The lime mortar becomes hard by reacting with carbon dioxide from the air. This process is very slow and takes many years to complete.

| Suggest why this reaction is very slow. | |
|---|------------|
| | [1] |
| | [Total: 6] |

| 10 | Tritium is a radioactive isotope of hydrogen. | | | | | | | | | | | | |
|----|---|-------------------------------------|--|------------|--|--|--|--|--|--|--|--|--|
| | The | The symbol for tritium is 3_1 H. | | | | | | | | | | | |
| | (a) | (i) | Determine the number of protons in a tritium nucleus. | | | | | | | | | | |
| | | | | [1] | | | | | | | | | |
| | | (ii) | Determine the number of neutrons in a tritium nucleus. | | | | | | | | | | |
| | | | | [1] | | | | | | | | | |
| | (b) | Triti | ium decays by the emission of a beta-particle $\binom{0}{-1}\beta$). | | | | | | | | | | |
| | | Cor | mplete the equation to show the radioactive decay of tritium. | | | | | | | | | | |
| | | | $^{3}_{1}H$ \longrightarrow $^{\dots}_{\dots}He$ + $^{0}_{-1}\beta$ | [2] | | | | | | | | | |
| | (c) | Triti | ium is used in watches to make them glow in the dark. | | | | | | | | | | |
| | | The | e half-life of tritium is about 10 years. | | | | | | | | | | |
| | | Des | scribe changes to the brightness of the watch over 50 years. | | | | | | | | | | |
| | | Exp | plain your answer. | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | [2] | | | | | | | | | |
| | (d) | Des | scribe how radioactive materials used in schools are stored in a safe way. | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | [1] | | | | | | | | | |
| | | | | [Total: 7] | | | | | | | | | |

| Ethe | ene, | C ₂ H ₄ , forms poly(ethene) by addition polymerisation. |
|------|------|---|
| (a) | Nar | ne the feature of ethene which allows addition polymerisation. |
| | | [1] |
| (b) | Dra | w the structure of a repeating monomer unit of poly(ethene). |
| | | |
| | | |
| | | |
| | | [2] |
| (c) | Pro | pene also forms a polymer by addition polymerisation. |
| | Sug | gest the name for this polymer. |
| | | [1] |
| (d) | (i) | Ethene and propene are hydrocarbons. |
| , , | ., | State what is meant by a <i>hydrocarbon</i> . |
| | | |
| | | |
| | | |
| | | [2] |
| | (ii) | State the name and formula of the hydrocarbon which is the main constituent of natural gas. |
| | | name |
| | | formula[2] |
| | | [Total: 8] |

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The Periodic Table of Elements

| | = | ² ¹ | helium | . 01 | Ne | neon 20 | 18 | Ā | argon 40 | 36 | 궃 | krypton 84 | 55 | Xe | xenon 131 | 98 | 牊 | radon | | | |
|-------|----|---------------------------|---------------|---------------|--------------|------------------------------|----|-------|------------------|----|----|-----------------|----|----------|------------------|-------|-------------|-----------------|--------|-----------|--------------------|
| | => | | | 6 | ட | fluorine 19 | 17 | Cl | chlorine 35.5 | 35 | ğ | bromine 80 | 53 | Н | iodine 127 | 85 | Αŧ | astatine | | | |
| | 5 | | | 80 | 0 | oxygen 16 | 16 | ഗ | sulfur 32 | 34 | Se | selenium 79 | 52 | <u>a</u> | tellurium 128 | 84 | Ъ | molonium — | 116 | _ | livermorium - |
| | > | | | 7 | z | nitrogen 14 | 15 | ₾ | phosphorus 31 | 33 | As | arsenic 75 | 51 | Sp | antimony 122 | 83 | <u>B</u> | bismuth 209 | | | |
| | ≥ | | | 9 | O | carbon 12 | 14 | S | silicon 28 | 32 | Ge | germanium 73 | 20 | Sn | tin 119 | 82 | Pb | lead 207 | 114 | Εl | flerovium - |
| | = | | | 5 | В | boron 11 | 13 | A^l | aluminium 27 | 31 | Ga | gallium 70 | 49 | In | indium 115 | 81 | 11 | thallium 204 | | | |
| | | | | | | | | | | 30 | Zu | zinc 65 | 48 | В О | cadmium 112 | 80 | Нg | mercury 201 | 112 | S | opemicium – |
| | | | | | | | | | | 29 | on | copper 64 | 47 | Ag | silver 108 | 62 | Au | gold 197 | 111 | Rg | roentgenium - |
| Group | | | | | | | | | | 28 | Z | nickel 59 | 46 | Pd | palladium 106 | 78 | చ | platinum 195 | 110 | Ds | darmstadtium - |
| Ş | | | | | | | | | | 27 | ဝိ | cobalt 59 | 45 | 格 | modium 103 | 77 | 'n | iridium 192 | 109 | ¥ | meitnerium - |
| | | -] | hydrogen 1 | | | | | | | 26 | | iron 56 | | R | ruthenium 101 | 92 | SO | osmium 190 | 108 | £ | hassium |
| | | | | | | | , | | | 25 | Mn | manganese 55 | 43 | ည | technetium - | 75 | Re | rhenium 186 | 107 | Bh | bohrium – |
| | | | | _ | pol | ass | | | | 24 | ပ် | chromium 52 | 42 | Mo | molybdenum 96 | 74 | ≥ | tungsten 184 | 106 | Sg | seaborgium - |
| | | | Kev | atomic number | atomic symbo | name relative atomic mass | | | | 23 | > | vanadium 51 | 14 | g | niobium 93 | 73 | <u>Б</u> | tantalum 181 | 105 | g O | dubnium - |
| | | | | | atc | re | | | | 22 | j | titanium 48 | 40 | Zr | zirconium 91 | 72 | Ξ | hafnium 178 | 104 | 꿆 | rutherfordium - |
| | | | | | | | | | | 21 | Sc | scandium 45 | 39 | > | yttrium 89 | 57-71 | lanthanoids | | 89–103 | actinoids | |
| | = | | | 4 | Be | beryllium 9 | 12 | Mg | magnesium 24 | 20 | Ca | calcium 40 | 38 | Š | strontium 88 | 99 | Ba | barium 137 | 88 | Ra | radium |
| | _ | | | 8 | = | lithium 7 | 1 | Na | sodium 23 | 19 | ¥ | potassium 39 | 37 | & | rubidium 85 | 55 | S | caesium 133 | 87 | Ŧ | francium - |

| Lu Lu | lutetium 175 | 103 | ئ | lawrencium | |
|------------------------|---------------------|-----|-----------|---------------------|------|
| ° A | ytterbium 173 | 102 | 8 | nobelium | |
| e9 Tm | thulium 169 | 101 | Md | mendelevium | |
| ₈₈ <u>п</u> | erbium 167 | 100 | Fm | fermium | |
| 67 Ho | holmium 165 | 66 | Es | einsteinium | |
| ° A | dysprosium 163 | 86 | ర | californium | |
| e5 Tb | terbium 159 | 97 | 番 | berkelium | |
| ²⁰ Gd | gadolinium 157 | 96 | Cm | curium | |
| es Eu | europium 152 | 92 | Am | americium | |
| 62 Sm | samarium 150 | 94 | Pn | plutonium | |
| Pm | promethium - | 93 | ď | neptunium | |
| © P Z | neodymium 144 | 92 | \supset | uranium 23.8 | 2007 |
| 59 Pr | praseodymium 141 | 91 | Ра | protactinium 231 | 107 |
| Ce SS | cerium 140 | 06 | Ч | thorium | 202 |
| 57 La | lanthanum 139 | 88 | Ac | actinium | |

lanthanoids

actinoids

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