

239055396

## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

| CANDIDATE<br>NAME                  |  |                |   |                    |                       |  |
|------------------------------------|--|----------------|---|--------------------|-----------------------|--|
| CENTRE<br>NUMBER                   |  |                | CANDIDATE<br>NUMBER   |                    |                       |  |
| PHYSICAL SC<br>Paper 2 (Core)      |  |                | C   | )<br>Dctober/Nov   | 0652/21<br>ember 2011 |  |
|                                    |  |                |   | 1 hour             | 15 minutes            |  |
|                                    | swer on the Quest<br>laterials are requi |                |   |                    |                       |  |
|                                    | INSTRUCTIONS                             | FIRST          |   |                    |                       |  |
| Write in dark blu<br>You may use a | ue or black pen.<br>soft pencil for any  | y diagrams, gi | and name on all the work you hand in.<br>aphs, tables or rough working. |                    |                       |  |
|                                    | oles, paper clips, h<br>E IN ANY BARCO   |                | lue or correction fluid.  | For Examiner's Use |                       |  |
| DO NOT WRIT                        | E IN ANY BARCO                           | JDES.          |   | 1                  |                       |  |
| Answer all ques                    |  |                |   | 2                  |                       |  |
| A copy of the P                    | eriodic Table is pr                      | rinted on page | e 16.   | 3                  |                       |  |
|                                    |  | -              | vork securely together.   | 4                  |                       |  |
| The number of question.            | marks is given in                        | n brackets [ ] | at the end of each question or part                                     | 5                  |                       |  |
|                                    |  |                |   | 6                  |                       |  |
|                                    |  |                |   | 7                  |                       |  |
|                                    |  |                |   | 8                  |                       |  |
|                                    |  |                |   | 9                  |                       |  |
|                                    |  |                |   | 10                 |                       |  |
|                                    |  |                |   | 11                 |                       |  |
|                                    |  |                |   | 12                 |                       |  |
|                                    |  |                |   | 13                 |                       |  |
|                                    |  |                |   | Total              |                       |  |

This document consists of 16 printed pages.



For Examiner's Use

| balance              | beaker           | burette         | spatula          | thermometer             |     |
|----------------------|------------------|-----------------|------------------|-------------------------|-----|
| Choose the item from | m the list which | you would use t | o carry out each | of the following action | າຣ. |
| (a) weigh 0.5g of    | copper(II) carbo | onate           |                  |                         |     |

A list of apparatus commonly found in the laboratory is shown below.

2 Two cars are being tested on a straight level track.

Fig. 2.1 shows the speed-time graphs for the two cars, each of mass 1500 kg.

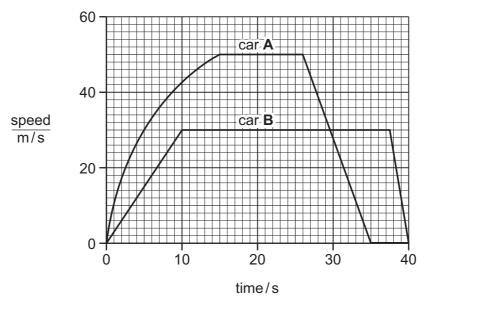


Fig. 2.1

(a) Determine the maximum speed of car A.



1

(b) Describe the motion of car B during the last 2.5 s of the test. For Examiner's Use [2] ..... (c) Use the graph to determine the distance travelled by car B during the first 10 s of the test. distance = \_\_\_\_\_m [2] (d) From 10.0s to 37.5s car B is travelling at constant speed in a straight line. (i) State the resultant force on the car during this time. force = \_\_\_\_\_ [1] (ii) Explain why the car engine must continue to do work during this period. [1] ..... (e) At the beginning of the test both cars accelerate from rest. Explain which car produces the greater accelerating force. [2] 

0652/21/O/N/11

3

| 3 | (a) | Give an example of an ionic compound and an example of a covalent compound.        | For<br>Examiner's |
|---|-----|--|-------------------|
|   |     | ionic compound   | Use               |
|   |     | covalent compound [2]  |                   |
|   | (b) | Describe <b>two</b> differences in the properties of ionic and covalent compounds. |                   |
|   |     | 1  |                   |
|   |     |  |                   |
|   |     | 2  |                   |
|   |     | [2]  |                   |

(c) Draw a dot and cross diagram to show the electron arrangement in an atom of magnesium.

[2]

4

| 4 | (a) | Name the main ore of aluminium.   | [1] | For<br>Examiner's<br>Use |
|---|-----|---|-----|--------------------------|
|   | (b) | Explain why aluminium is not extracted from its ore by heating with carbon. |     |                          |
|   |     |   |     |                          |

**5** A student is investigating the melting of fruit flavoured crushed ice. Initially, the temperature of the ice is -10 °C. He measures the temperature every 30 s.

Fig. 5.1 shows the apparatus he uses.

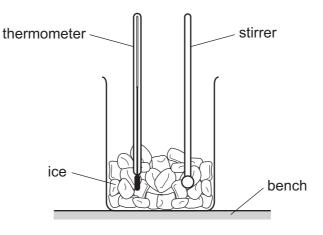
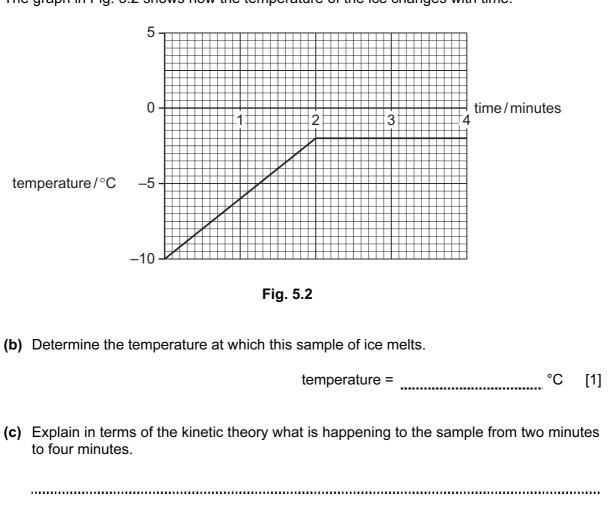


Fig. 5.1

(a) (i) Explain why the student stirs the crushed ice just before taking each temperature reading.

......[1] (ii) Suggest why, in the first two minutes of the experiment, the temperature of the ice rises, even though there is no apparent heat source. [2] 



.....

\_\_\_\_\_

7

. . . . . . . . . . . . .

[2]

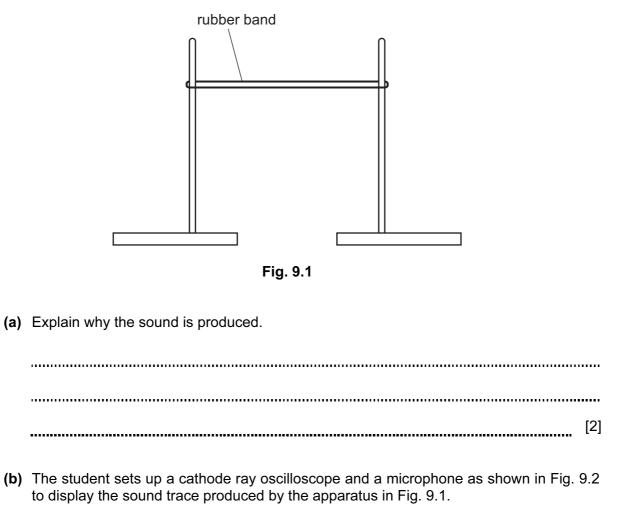
## (a) Complete Table 6.1 by putting in the missing names, formulae and molar masses. 6

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|             | name   | formula                          | mass of 1 mole/g  |  |  |
|-------------|--|----------------------------------|-------------------|--|--|
|             |  | H <sub>2</sub> O                 |                   |  |  |
|             | hydrogen chloride  |                                  | 36.5              |  |  |
|             | sodium fluoride  |                                  | 42                |  |  |
|             |  | N <sub>2</sub>                   |                   |  |  |
|             |  |                                  | [4]               |  |  |
| (t          | <ul> <li>(b) Give the symbols for the ions in sodium fluoride and the number of protons present in each ion.</li> <li>sodium ion</li></ul> |                                  |                   |  |  |
|             | fluoride ion   |                                  | ns [2             |  |  |
| <b>7</b> TI | he radioactive isotope <sup>105</sup> Rh de  | ecays by emitting a beta-parti   | cle (β-particle). |  |  |
| (a          | a) (i) State the number of pro   | otons in the nucleus of this isc | otope.            |  |  |
|             | (ii) Calculate the number o  |                                  | protons =[1]      |  |  |
|             |  |                                  |                   |  |  |
|             |  | number of n                      | eutrons =[1       |  |  |

|   | (b) | (i)          | What is a beta-particle?   | For<br>Examiner's<br>Use |
|---|-----|--------------|--|--------------------------|
|   |     |              |  | [1]                      |
|   |     | (ii)         | Describe the changes in the nucleus when a beta-particle is emitted.                                 |                          |
|   |     |              |  |                          |
|   |     |              |  | [2]                      |
| 8 | (a) |              | e an advantage and a disadvantage of using hydrogen as a fuel for motor vehicles                     | i.                       |
|   |     | adv          | antage   |                          |
|   |     | disa         | advantage  | [2]                      |
|   | (b) | Wri          | te a balanced equation for the burning of hydrogen in air.   | [2]                      |
|   | (c) |              | scribe a test for hydrogen and state the expected result.  |                          |
|   |     | test<br>resi |  | [2]                      |
|   | (d) | The<br>(i)   | e reaction between hydrogen and nitrogen is an important industrial process.<br>Name the gas formed. |                          |
|   |     | (ii)         | Name this industrial process.  | [1]                      |
|   |     | . /          |  | [1]                      |

**9** A student experiments with a rubber band. She stretches it between two retort stands and notices that it produces a sound when she plucks it. The apparatus is shown in Fig. 9.1.



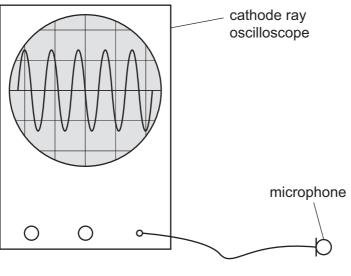
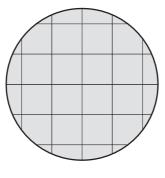


Fig. 9.2

For

Examiner's Use (i) She now plucks the rubber band so that a quieter note of the same frequency is heard.

Draw, on Fig. 9.3, the trace that is now seen.



[2]

For

Examiner's Use

Fig. 9.3

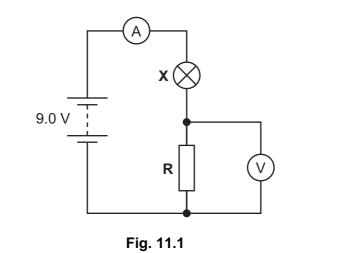
(ii) She moves the stands further apart. She plucks the band again. The frequency of the sound now heard is greater than before.

Explain what is meant by the term *frequency* and state the unit used to measure it.

| unit | [/ | 2] |
|------|----|----|

| 10 | Chl | orine is in Group VII of the Periodic Table.                                      |       |  |  |  |  |
|----|-----|---|-------|--|--|--|--|
|    | (a) | Name this Group.  |       |  |  |  |  |
|    |     |   | [1]   |  |  |  |  |
|    | (b) | Name another element in this Group.   | [1]   |  |  |  |  |
|    |     |   | [.]   |  |  |  |  |
|    | (c) | State <b>one</b> use of chlorine.   |       |  |  |  |  |
|    |     |   | [1]   |  |  |  |  |
|    | (d) | Name the Group II element which is in the same period as chlorine.                |       |  |  |  |  |
|    |     |   | [1]   |  |  |  |  |
|    | (e) | Describe how, using chlorine, you can show that a solution contains bromide ions. |       |  |  |  |  |
|    |     |   |       |  |  |  |  |
|    |     |   |       |  |  |  |  |
|    |     |   | [2]   |  |  |  |  |
|    | (f) | Write down the number of electrons in a bromine atom and in a bromide ion.        |       |  |  |  |  |
|    |     | bromine atom  | ••••• |  |  |  |  |
|    |     | bromide ion   | [2]   |  |  |  |  |

**11** Fig. 11.1 shows an electric circuit. The e.m.f. of the battery is 9.0 V.



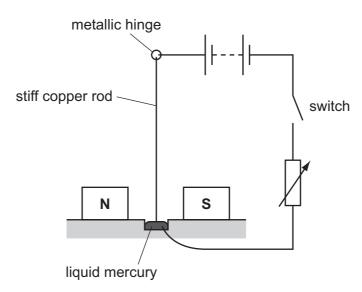
| (a) | Nar   | ne component <b>X</b> .  |  | [1] |
|-----|-------|--|--|-----|
| (b) | The   | resistance of resistor <b>R</b> is $12\Omega$ and<br>Calculate the combined resistance | the resistance of component <b>X</b> is 8.0 $\Omega$ . |     |
|     | (-)   |  |  |     |
|     | (ii)  | Calculate the current measured by  | resistance = $\Omega$ the ammeter.                     | [1] |
|     | (iii) | Calculate the reading on the voltme  | current =<br>ter.                                      | [2] |
|     |       |  | reading =V   | [2] |

| 12 | Met<br>seri | hane and ethane are hydrocarbons. They are members of the same homologous es. | For<br>Examiner's<br>Use |
|----|-------------|---|--------------------------|
|    | (a)         | Name this homologous series.  |                          |
|    |             | [1]   |                          |
|    | (b)         | Give the name and formula of the next member of this series.                  |                          |
|    |             | name  |                          |
|    |             | formula[2]  |                          |
|    | (c)         | Explain why ethanol, $C_2H_5OH$ , is not a hydrocarbon.                       |                          |
|    |             |   |                          |
|    |             | [2]   |                          |

**13 (a)** Fig. 13.1 shows a stiff copper rod suspended between two magnetic poles. The copper rod is freely hinged at the top.

15

For Examiner's Use



## Fig. 13.1

| (a) | Draw, on Fig. 13.1, the magnetic field between the poles.  | [3]  |
|-----|--|------|
| (b) | Explain why a current passes through the circuit when the switch is closed.                                |      |
|     |  |      |
|     |  | •••• |
|     |  | [2]  |
| (c) | State what will be observed when switch is closed.   |      |
|     |  |      |
|     |  |      |
|     |  | [2]  |
|     |  |      |
| (d) | The connections to the battery are reversed so that the current in the circuit is in t opposite direction. | he   |
|     | State how the observations change.   |      |
|     |  |      |
|     |  | [1]  |

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[Turn over

|  |       | 0   | 4   | Helium<br>2   | cc  | Ne          | Neon<br>10     | 40            | Ar             | Argon<br>18     | 84               | Kr             | Krypton<br>36   | 131           | Xe              | Xenon<br>54      |                | Rn             | Radon<br>86       |               |                             | 175                      | Lutetium<br>71           | _                        | ۲                  | Lawrencium<br>103   |                |  |
|--|-------|-----|-----|---------------|-----|-------------|----------------|---------------|----------------|-----------------|------------------|----------------|-----------------|---------------|-----------------|------------------|----------------|----------------|-------------------|---------------|-----------------------------|--------------------------|--------------------------|--------------------------|--------------------|---|----------------|--|
|  |       | ١١٨ |     |               | 10  | 2 🏨         | Fluorine<br>9  | 35.5          | Cl             | Chlorine<br>17  | 80               | Ŗ              | Bromine<br>35   | 127           | I               | lodine<br>53     |                | At             | Astatine<br>85    |               |                             | 173                      | Yb<br>Ytterbium          |                          | No                 | Nobelium<br>102   |                |  |
|  |       | ١٨  |     | 4             | 2 0 | Oxygen<br>8 | 32             | S             | Sulfur<br>16   | 79              | Se               | Selenium<br>34 | 128             | Te            | Tellurium<br>52 |                  | Ро             | Polonium<br>84 |                   |               | 169                         | Thulium<br>Thulium       | 8                        | Md                       | Mendelevium<br>101 |   |                |  |
|  |       | ^   |     |               |     | 14          | z              | Nitrogen<br>7 | 31             | ٩               | Phosphorus<br>15 | 75             | As              | Arsenic<br>33 | 122             | Sb               | Antimony<br>51 | 209            | Bi                | Bismuth<br>83 |                             |                          | 167                      | Er<br>Erbium<br>68       | 8                  | Fm  | Fermium<br>100 |  |
|  |       | 2   |     |               |     | <u>ט</u> י  | Carbon<br>6    | 28            | Si             | Silicon<br>14   | 73               | Ge             | Germanium<br>32 | 119           | Sn              | 50 Tin           | 207            | Pb             | Lead<br>82        |               |                             | 165                      | Holmium<br>67            | 5                        | Es                 | Einsteinium<br>99   |                |  |
|  |       | ≡   |     | 11            | 2   | Boron<br>5  | 27             | ٩l            | Auminium<br>13 | 70              | Ga               | Gallium<br>31  | 115             | In            | Indium<br>49    | 204              | LΙ             | Thallium<br>81 |                   |               | 162                         | Dysprosium<br>66         | 8                        | ç                        | Californium<br>98  | The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.). |                |  |
| ents   |       |     |     |               |     |             |                |               |                |                 | 65               | Zn             | Zinc<br>30      | 112           | Cd              | Cadmium<br>48    | 201            | Hg             | Mercury<br>80     |               |                             | 159                      | Tb<br>Terbium            | 3                        | BĶ                 | Berkelium<br>97   | ature and      |  |
| DATA SHEET<br>The Periodic Table of the Elements |       |     |     |               |     |             |                |               |                |                 | 64               | Cu             | Copper<br>29    | 108           | Ag              | Silver<br>47     | 197            | Au             | Gold<br>79        |               |                             | 157                      | Gd<br>Gadolinium<br>64   | 5                        | Cm                 | Curium<br>96  | n tempera      |  |
| DATA SHEET<br>ic Table of th                     | Group |     |     |               |     |             |                |               |                |                 | 59               | ÏZ             | Nickel<br>28    | 106           | Pd              | Palladium<br>46  | 195            | F              | Platinum<br>78    |               |                             | 152                      | Europium<br>63           | Europium<br>63           | Am                 | Americium<br>95   | m³ at rool     |  |
| DAT<br>riodic Ta                                 | G     |     |     |               | -   |             |                |               |                |                 | 59               | ပိ             | Cobalt<br>27    | 103           | Rh              | Rhodium<br>45    | 192            | Ir             | Iridium<br>77     |               |                             | 150                      | Samarium<br>Samarium     | 4                        | Pu                 | Plutonium<br>94   | as is 24 dı    |  |
| The Pe   |       |     | - 1 | Hydrogen<br>1 |     |             |                |               |                |                 | 56               | Fe             | lron<br>26      | 101           | Ru              | Ruthenium<br>44  | 190            | os             | Osmium<br>76      |               |                             |                          | Promethium<br>61         | 5                        | dN                 | Neptunium<br>93   | of any ga      |  |
|  |       |     |     |               |     |             |                |               |                |                 | 55               | Mn             | Manganese<br>25 |               | Ľ               | Technetium<br>43 | 186            | Re             | Rhenium<br>75     |               |                             | 144                      | Neodymium<br>60          |                          | D                  | Uranium<br>92   | one mole       |  |
|  |       |     |     |               |     |             |                |               |                |                 | 52               | ບັ             | Chromium<br>24  | 96            | Мо              | Molybdenum<br>42 | 184            | 3              | Tungsten<br>74    |               |                             | 141                      | Pr<br>Praseodymium<br>50 | 3                        | Ра                 | Protactinium<br>91  | olume of       |  |
|  |       |     |     |               |     |             |                |               |                |                 | 51               | >              | Vanadium<br>23  | 93            | qN              | Niobium<br>41    | 181            | Ta             | Tantalum<br>73    |               |                             | 140                      |                          | 232                      | Ч                  | Thorium<br>90   | The v          |  |
|  |       |     |     |               |     |             |                |               |                |                 | 48               | F              | Titanium<br>22  | 91            | Zr              | Zirconium<br>40  | 178            |                | + Hafnium<br>* 72 |               | L                           | 1                        |                          | mic mass                 | lodr               | mic) number   |                |  |
|  |       |     |     |               |     |             |                | T             |                |                 | 45               | Sc             | Scandium<br>21  | 89            | ≻               | Yttrium<br>39    | 139            | La             | Lanthanum<br>57 * | 227           | Ac<br>Actinium<br>89        | l series                 | series                   | a = relative atomic mass | X = atomic symbol  | b = proton (atomic) number  |                |  |
|  |       | =   |     |               | σ   | Be .        | Beryllium<br>4 | 24            | Mg             | Magnesium<br>12 | 40               | Ca             | Calcium<br>20   | 88            | Sr              | Strontium<br>38  | 137            | Ba             | Barium<br>56      | 226           | Radium<br>88                | *58-71 Lanthanoid series | 190-103 Actinoid series  | a                        | ×                  | q   |                |  |
|  |       | _   |     |               | 2   | Ē           | Lithium<br>3   | 23            | Na             | Sodium<br>11    | 39               | ¥              | Potassium<br>19 | 85            | Rb              | Rubidium<br>37   | 133            | cs             | Caesium<br>55     |               | <b>Fr</b><br>Francium<br>87 | *58-711                  | 190-103                  |                          | Key                | q   |                |  |

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