



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**CO-ORDINATED SCIENCES**

**0654/11**

Paper 1 Multiple Choice

**October/November 2015**

**45 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)



**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.  
Do not use staples, paper clips, glue or correction fluid.  
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.  
**DO NOT WRITE IN ANY BARCODES.**

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.  
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.  
Any rough working should be done in this booklet.  
A copy of the Periodic Table is printed on page 20.  
Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.

1 The following three equations represent metabolic processes.

- 1 glucose  $\rightarrow$  glycogen
- 2 carbon dioxide + water  $\rightarrow$  glucose + oxygen
- 3 oxygen + glucose  $\rightarrow$  carbon dioxide + water

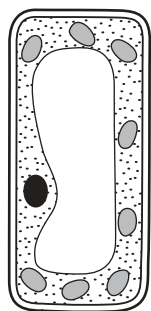
Which equations represent nutrition and respiration?

|          | nutrition | respiration |
|----------|-----------|-------------|
| <b>A</b> | 1         | 2           |
| <b>B</b> | 2         | 3           |
| <b>C</b> | 3         | 1           |
| <b>D</b> | 3         | 2           |

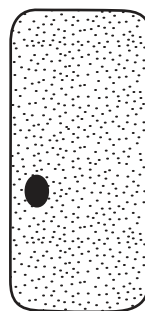
2 What is correct for **all** living organisms?

- A** They are sensitive to changes in their environment.
- B** They excrete solid waste from their bodies.
- C** They feed on other living organisms.
- D** They grow larger by increasing their cell number.

3 The diagram shows a plant cell and an animal cell. The two cells are **not** drawn to the same scale.



magnification  
 $\times 1000$



magnification  
 $\times 2000$

The actual height of the animal cell is 0.02 mm.

What is the height of the plant cell?

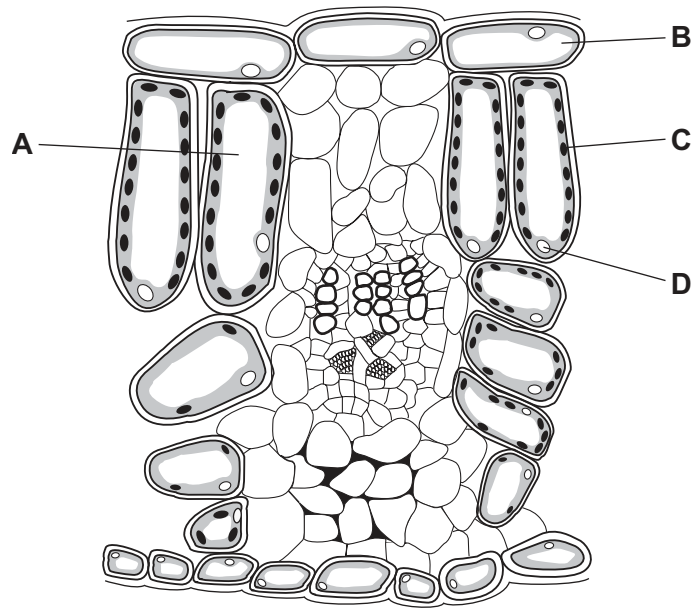
- A** 0.01 mm
- B** 0.02 mm
- C** 0.04 mm
- D** 40 mm

4 What would be capable of digesting an enzyme?

- A amylase
- B bile
- C lipase
- D protease

5 The diagram shows a section through a leaf.

Where are carbohydrates made?

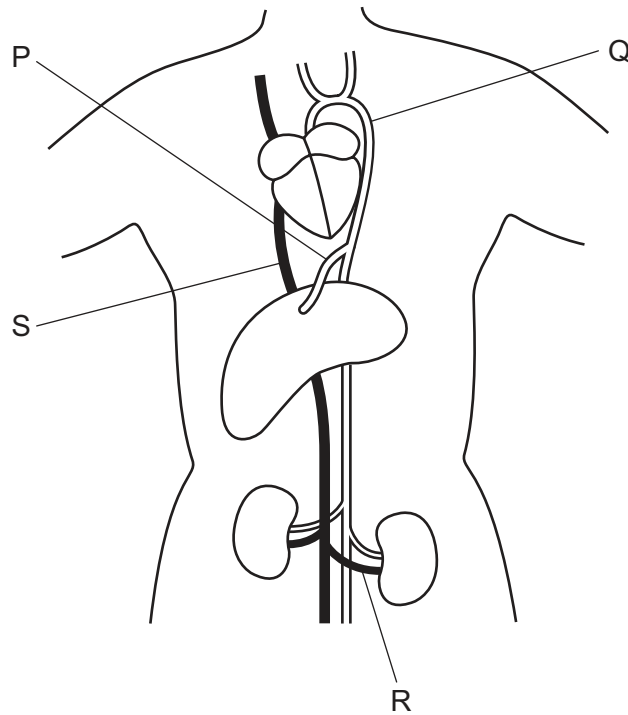


6 Nutrient molecules are made up from smaller molecules. Nutrients can be identified by food tests.

Which row correctly describes a protein?

|          | smaller molecules | test which gives a positive result |
|----------|-------------------|------------------------------------|
| <b>A</b> | amino acids       | Benedict's test                    |
| <b>B</b> | amino acids       | biuret test                        |
| <b>C</b> | sugars            | Benedict's test                    |
| <b>D</b> | sugars            | biuret test                        |

7 The diagram shows the heart, liver and kidneys with connecting blood vessels.



What are the labelled blood vessels?

|          | aorta | hepatic artery | vena cava | renal vein |
|----------|-------|----------------|-----------|------------|
| <b>A</b> | Q     | P              | S         | R          |
| <b>B</b> | Q     | R              | S         | P          |
| <b>C</b> | S     | P              | Q         | R          |
| <b>D</b> | S     | R              | Q         | P          |

8 Which part of the alimentary canal is in the form of a coiled tube?

- A** oesophagus
- B** pancreas
- C** rectum
- D** small intestine

9 Which row shows the changes that occur during exercise?

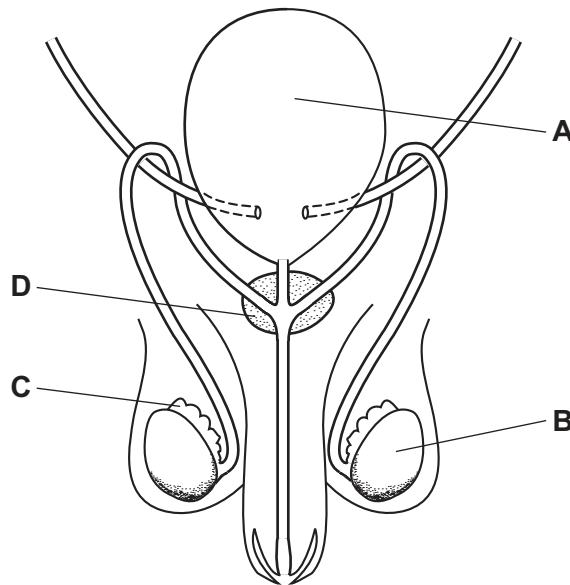
|          | breathing rate | depth of breathing |
|----------|----------------|--------------------|
| <b>A</b> | greater        | greater            |
| <b>B</b> | greater        | same               |
| <b>C</b> | same           | greater            |
| <b>D</b> | same           | same               |

10 To which environmental stimulus is a plant root responding when it grows downwards?

- A** a decrease in soil water content
- B** light falling on the leaves of the plant
- C** rising temperature
- D** the force of gravity

11 The diagram shows the male reproductive system.

Which structure produces the hormones that control adolescence?



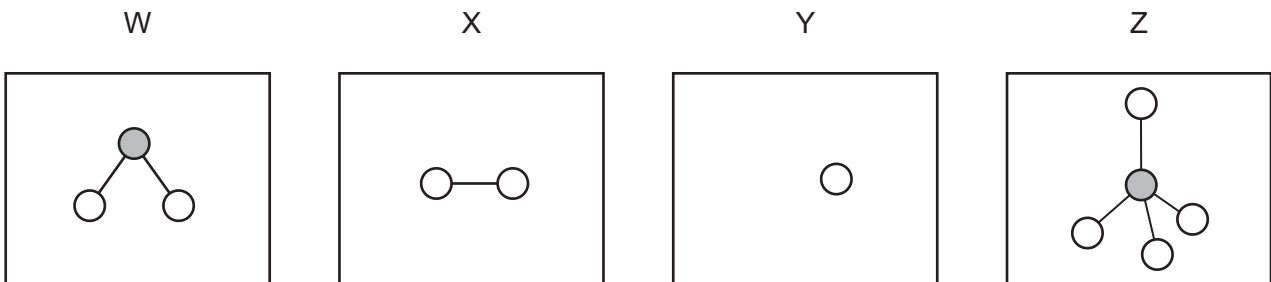
12 What are the features of human reproduction?

|          | haploid nuclei fuse | zygote formed in oviduct | offspring genetically identical |
|----------|---------------------|--------------------------|---------------------------------|
| <b>A</b> | ✓                   | ✓                        | ✗                               |
| <b>B</b> | ✓                   | ✗                        | ✓                               |
| <b>C</b> | ✗                   | ✓                        | ✗                               |
| <b>D</b> | ✗                   | ✗                        | ✓                               |

13 Deforestation can cause global warming because it leads to

- A** build up of carbon dioxide.
- B** extinction of species.
- C** flooding of low-lying areas.
- D** loss of soil.

14 W, X, Y and Z are diagrams of atoms and molecules.

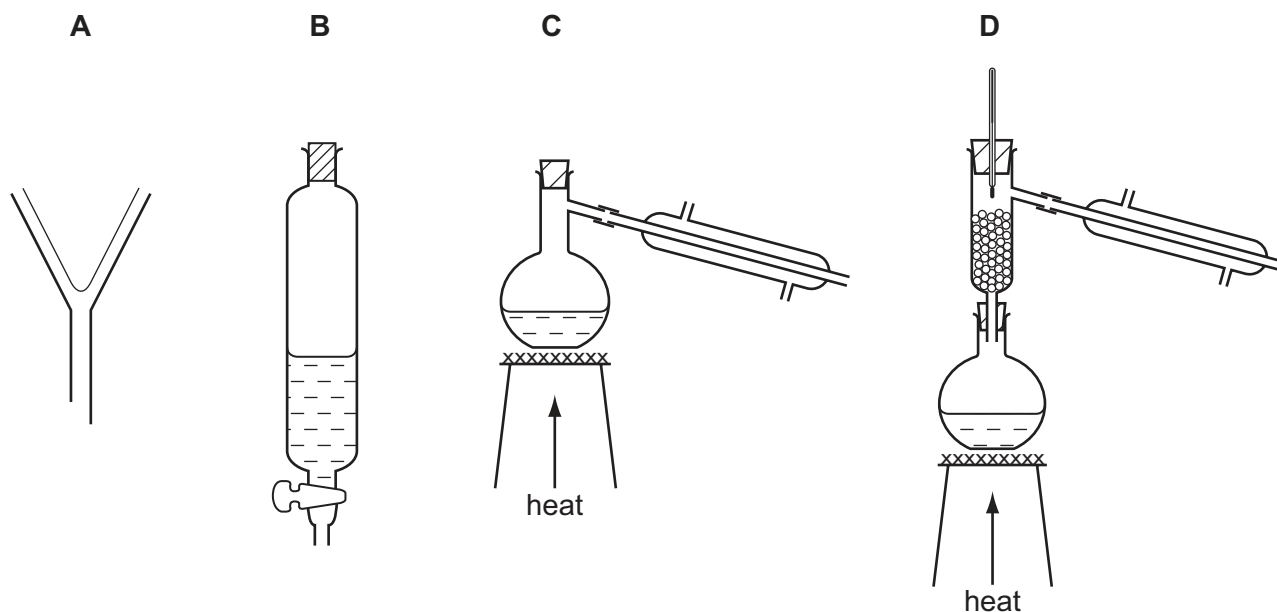


Which statement is correct?

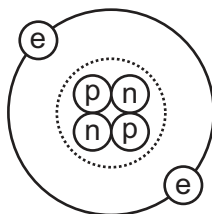
- A** W and Z are molecules and X and Y are atoms.
- B** W, X and Z are molecules and Y is an atom.
- C** W, Y and Z are molecules and X is an atom.
- D** X, Y and Z are molecules and W is an atom.

15 Hexane and octane are liquid hydrocarbons that mix together.

Which method is used to separate a mixture of these two liquids?



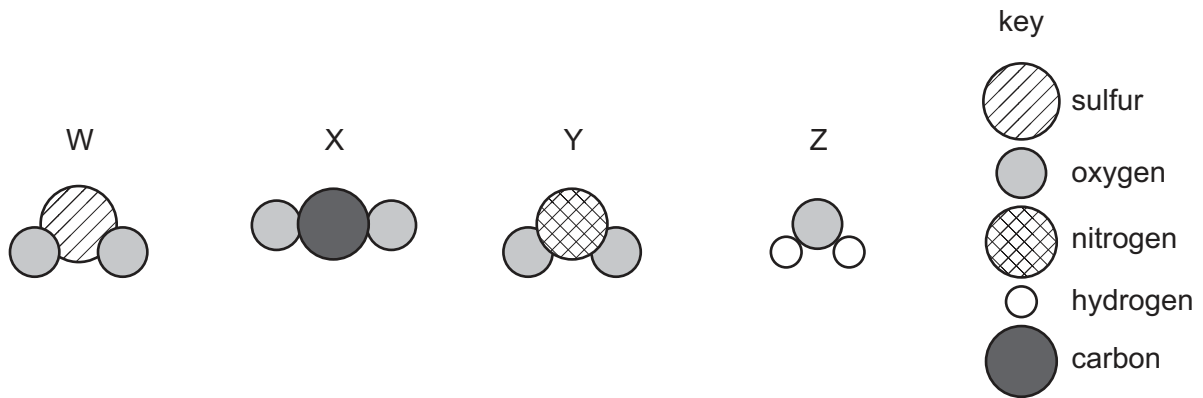
16 The diagram shows a helium atom.



Which particles in the helium atom have approximately the same mass?

- A electron and proton only
  - B electron and neutron only
  - C proton and neutron only
  - D electron, proton and neutron
- 17 Which change is a physical change?
- A burning fuels
  - B electrolysis of dilute sulfuric acid
  - C melting ice
  - D neutralising acids

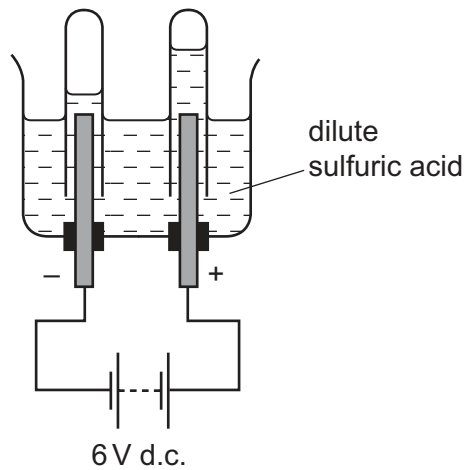
18 Diagrams W, X, Y and Z represent the structures of four different compounds.



Which row identifies these compounds?

|          | W               | X                | Y                | Z                |
|----------|-----------------|------------------|------------------|------------------|
| <b>A</b> | NO <sub>2</sub> | CO <sub>2</sub>  | H <sub>2</sub> O | SO <sub>2</sub>  |
| <b>B</b> | NO <sub>2</sub> | H <sub>2</sub> O | SO <sub>2</sub>  | CO <sub>2</sub>  |
| <b>C</b> | SO <sub>2</sub> | CO <sub>2</sub>  | NO <sub>2</sub>  | H <sub>2</sub> O |
| <b>D</b> | SO <sub>2</sub> | NO <sub>2</sub>  | CO <sub>2</sub>  | H <sub>2</sub> O |

19 The diagram shows the electrolysis of dilute sulfuric acid.



Which substance is produced at the negative electrode?

- A** hydrogen
- B** oxygen
- C** sulfur dioxide
- D** water



20 Lime is manufactured by heating limestone.

Lime is used to control the acidity of soil.

Which types of chemical change occur in these two reactions?

|          | heating limestone | controlling acidity |
|----------|-------------------|---------------------|
| <b>A</b> | endothermic       | oxidation           |
| <b>B</b> | endothermic       | neutralisation      |
| <b>C</b> | exothermic        | oxidation           |
| <b>D</b> | exothermic        | neutralisation      |

21 Nitrogen from the air is used to manufacture ammonia.



Why is a catalyst used in this reaction?

- A** Nitrogen from the air is not pure.
- B** Nitrogen is a gas at room temperature.
- C** Nitrogen is a non-metallic element.
- D** Nitrogen is not very reactive.

22 Hydrochloric acid reacts with excess solid sodium carbonate to form sodium chloride, water and carbon dioxide gas.

Which method is used to investigate the speed of this reaction?

- A** Measure the pH of the reaction mixture after 10 minutes.
- B** Measure the time taken for all of the solid to dissolve.
- C** Measure the total volume of gas produced.
- D** Measure the volume of gas produced every minute.

23 The table shows the results of some tests on a compound.

| test                            | result            |
|---------------------------------|-------------------|
| adding dilute sodium hydroxide  | green precipitate |
| adding acidified barium nitrate | white precipitate |

What is the compound?

- A iron(II) chloride
- B iron(II) sulfate
- C iron(III) chloride
- D iron(III) sulfate

24 An element is a solid at room temperature and does **not** conduct electricity.

What is the proton number of this element?

- A 11                      B 19                      C 35                      D 53

25 Some of the gases found in polluted air are listed.

- 1 carbon monoxide
- 2 carbon dioxide
- 3 nitrogen dioxide
- 4 sulfur dioxide

Which gases cause the erosion of buildings?

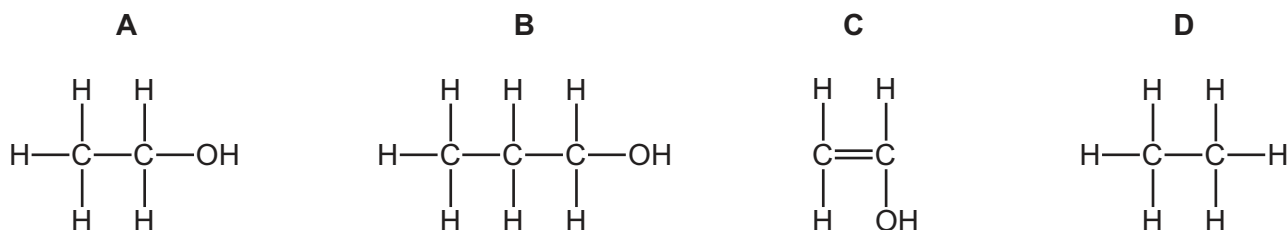
- A 1 and 3              B 1 and 4              C 2 and 4              D 3 and 4

26 What is limestone?

- A calcium carbonate
- B calcium chloride
- C calcium hydroxide
- D calcium oxide

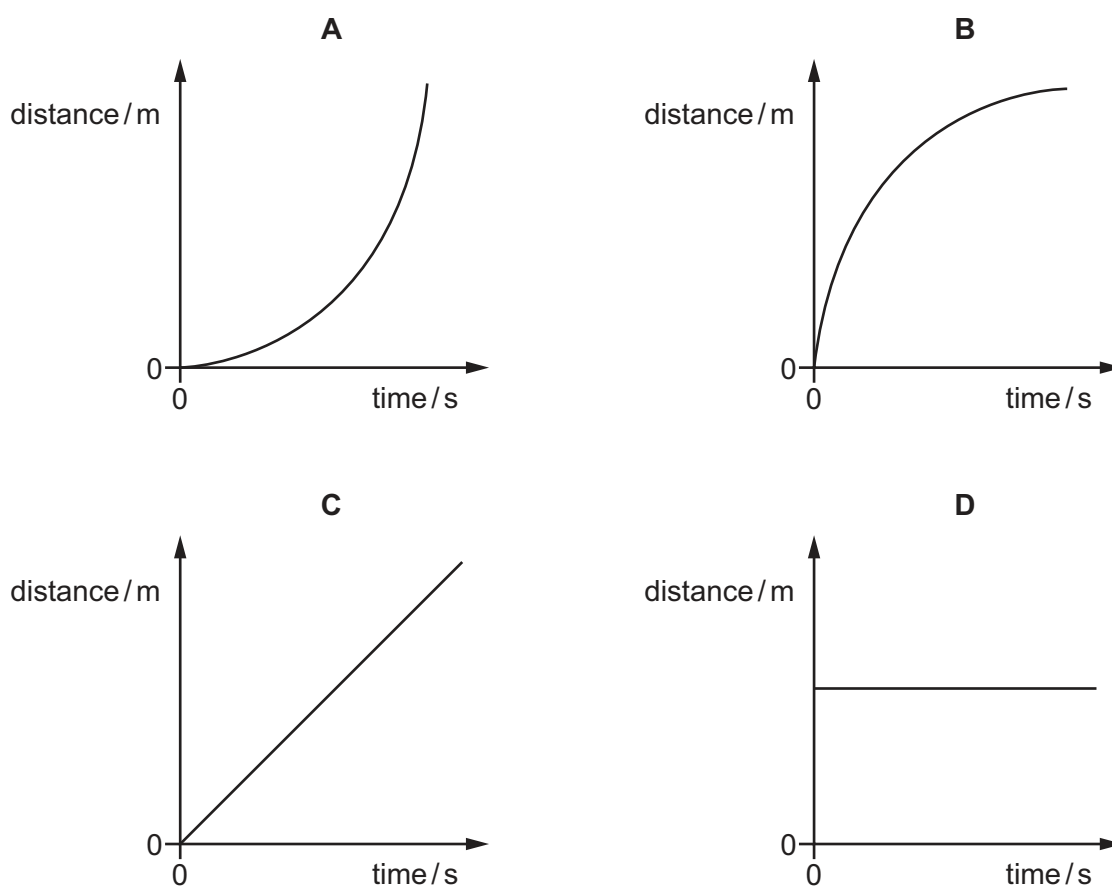
27 Four molecules are shown.

Which structure represents ethanol?



28 The following are distance/time graphs.

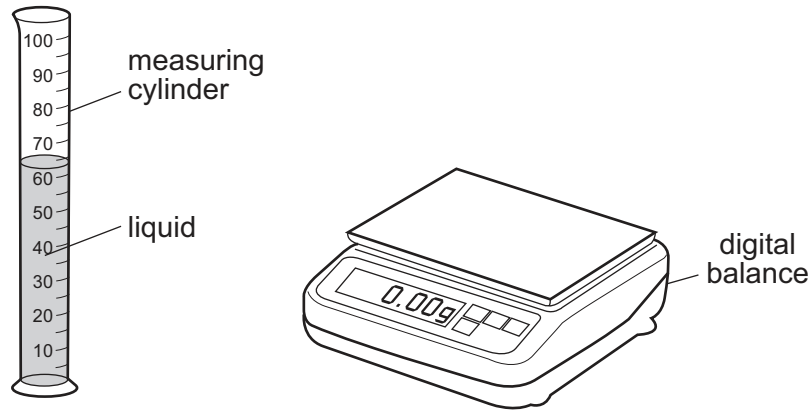
Which graph shows an object moving at constant speed?



29 Which row identifies a quantity or quantities that can be measured in newtons?

|          | electromotive force (e.m.f.) | mass | weight |
|----------|------------------------------|------|--------|
| <b>A</b> | no                           | no   | yes    |
| <b>B</b> | no                           | yes  | yes    |
| <b>C</b> | yes                          | no   | no     |
| <b>D</b> | yes                          | yes  | no     |

30 A student pours liquid into a measuring cylinder.

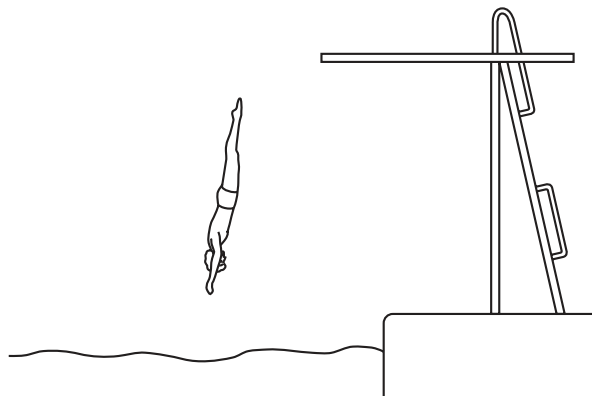


The student records the volume of the liquid from the scale on the measuring cylinder. He then puts the measuring cylinder containing the liquid on a balance and records the mass.

What else needs to be measured before the density of the liquid can be calculated?

- A the depth of the liquid in the measuring cylinder
- B the mass of the empty measuring cylinder
- C the temperature of the liquid in the measuring cylinder
- D the volume of the empty measuring cylinder

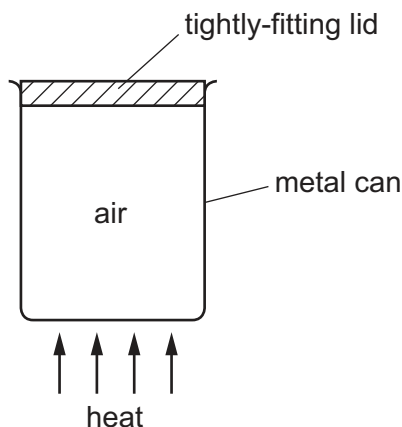
31 The diagram shows a man diving into water.



Which form of energy is increasing as he falls?

- A chemical
- B gravitational
- C kinetic
- D strain

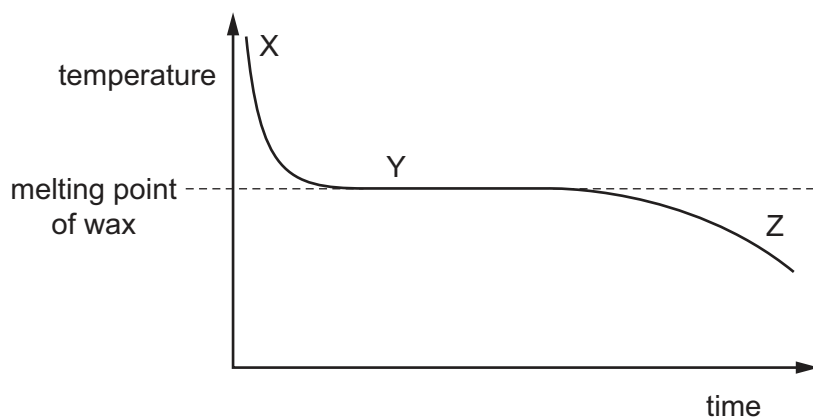
- 32 Some air is trapped inside a metal can with a tightly-fitting lid.



The can is heated strongly behind a safety screen. The lid is blown off by the increased pressure of the air inside the can.

What causes the increase in pressure of the air inside the can?

- A The air molecules expand and take up more room.
  - B The air molecules move more quickly.
  - C The number of molecules inside the can increases.
  - D The volume occupied by the molecules decreases.
- 33 A student carries out an experiment to find the melting point of wax. The graph shows how the temperature of the wax changes as it changes from liquid to solid.

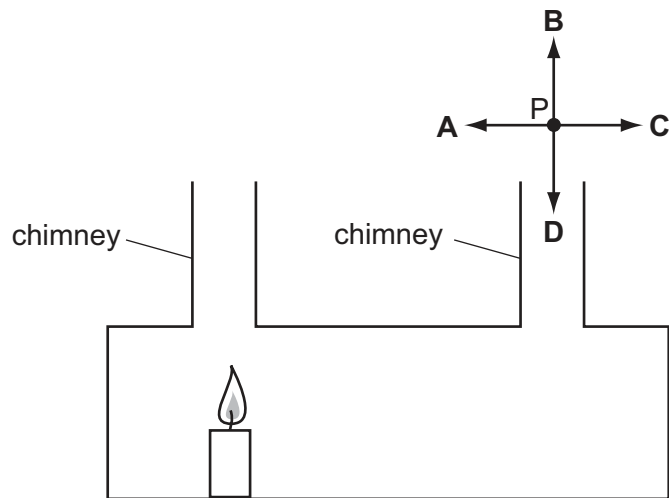


Which statement is correct?

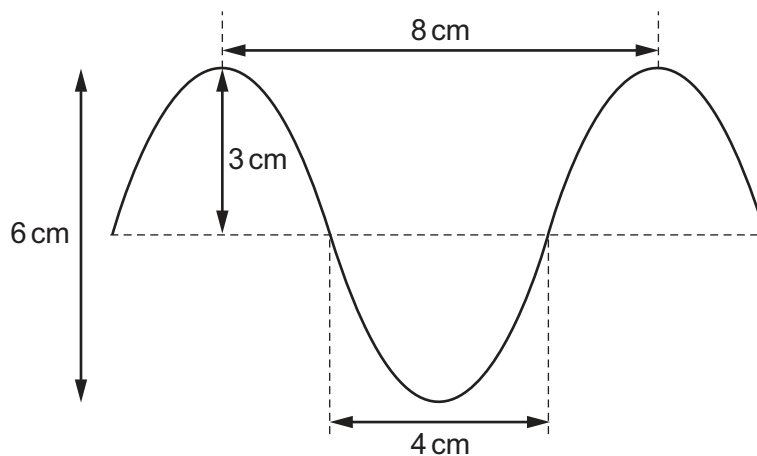
- A At X the temperature drops more slowly than at Z.
- B At Y all the wax is solid.
- C At Y thermal energy is being given out by the wax.
- D At Z the wax molecules are far apart.

- 34 A teacher demonstrates convection currents using a lighted candle in a box with two chimneys. She holds a smoking taper at point P.

In which direction does the convection current cause the smoke to move?



- 35 The diagram shows a wave.

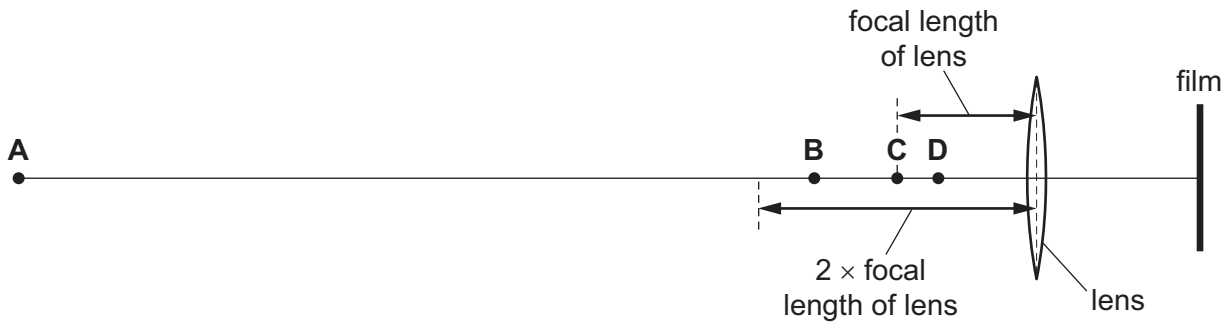


What are the amplitude and the wavelength of this wave?

|          | amplitude / cm | wavelength / cm |
|----------|----------------|-----------------|
| <b>A</b> | 3              | 4               |
| <b>B</b> | 3              | 8               |
| <b>C</b> | 6              | 4               |
| <b>D</b> | 6              | 8               |

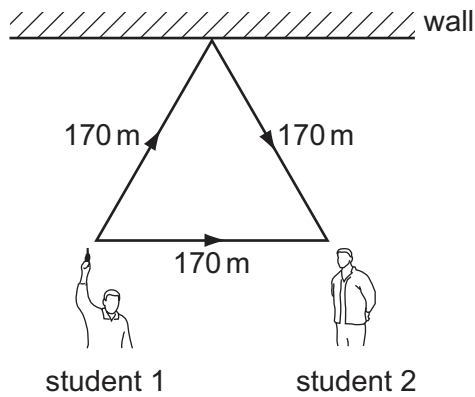
- 36 The converging lens in a camera is used to make an image on a film. The image is smaller than the object.

At which labelled point is the object positioned?



- 37 Student 1 and student 2 stand 170 m apart as shown in the diagram.

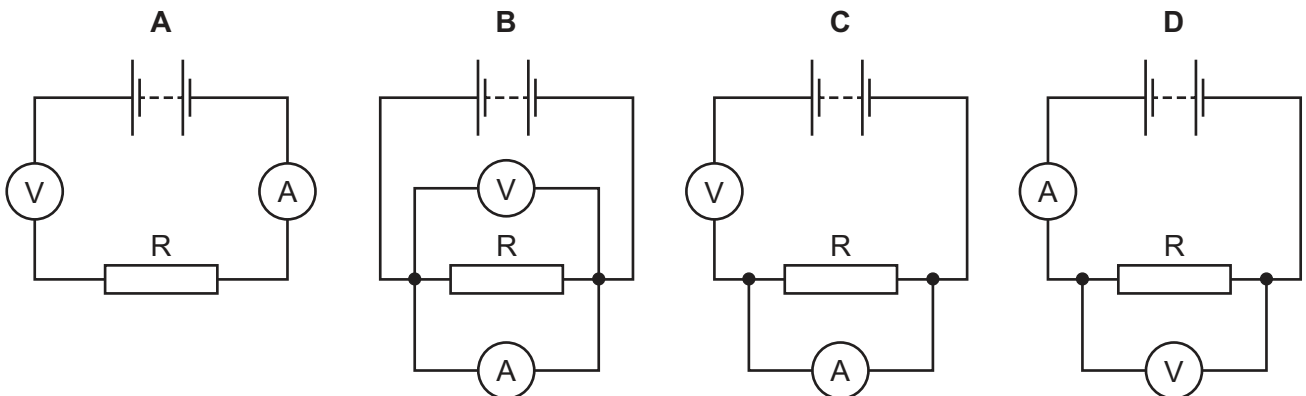
Student 1 fires a starting pistol. Student 2 hears the sound twice, once by the direct route and once from the reflection from the wall.



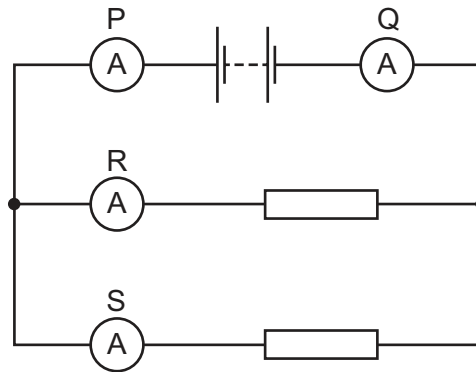
The speed of sound in air is 340 m/s. What is the interval between hearing the two sounds?

- A 0.25 s      B 0.50 s      C 1.0 s      D 2.0 s
- 38 A student wishes to determine the resistance of resistor R. She uses a circuit including a voltmeter and an ammeter.

Which circuit should be used?



- 39 A student uses four ammeters P, Q, R and S to measure the current in different parts of the circuit shown.



Which two ammeters read the largest current?

- A** P and Q      **B** P and R      **C** R and Q      **D** R and S
- 40 The table compares an atom of carbon-13 and an atom of nitrogen-14.

|                    | carbon-13 | nitrogen-14 |
|--------------------|-----------|-------------|
| nucleon number $A$ | 6         | 7           |
| proton number $Z$  | 13        | 14          |

A neutral atom of carbon-13 and a neutral atom of nitrogen-14 have the same number of

- A** electrons.  
**B** ions.  
**C** neutrons.  
**D** protons.









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

|                                   |                                    | Group                              |                                    |                                    |                                     |                                     |                                    |                                  |                                    |                                 |                                  |                                   |                                    |                                   |                                    |                                   |                                  |
|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|----------------------------------|------------------------------------|---------------------------------|----------------------------------|-----------------------------------|------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------------|
| I                                 | II                                 | III                                | IV                                 | V                                  | VI                                  | VII                                 | 0                                  |                                  |                                    |                                 |                                  |                                   |                                    |                                   |                                    |                                   |                                  |
| 1<br><b>H</b><br>Hydrogen<br>1    |                                    |                                    |                                    |                                    |                                     |                                     |                                    |                                  |                                    |                                 | 2<br><b>He</b><br>Helium<br>2    |                                   |                                    |                                   |                                    |                                   |                                  |
| 3<br><b>Li</b><br>Lithium<br>4    | 9<br><b>Be</b><br>Beryllium<br>4   |                                    |                                    |                                    |                                     |                                     |                                    |                                  |                                    |                                 |                                  | 10<br><b>Ne</b><br>Neon<br>10     |                                    |                                   |                                    |                                   |                                  |
| 11<br><b>Na</b><br>Sodium<br>11   | 12<br><b>Mg</b><br>Magnesium<br>12 | 13<br><b>Al</b><br>Aluminium<br>13 | 14<br><b>Si</b><br>Silicon<br>14   | 15<br><b>P</b><br>Phosphorus<br>15 | 16<br><b>S</b><br>Sulfur<br>16      | 17<br><b>Cl</b><br>Chlorine<br>17   | 18<br><b>Ar</b><br>Argon<br>18     |                                  |                                    |                                 |                                  |                                   |                                    |                                   |                                    |                                   |                                  |
| 19<br><b>K</b><br>Potassium<br>19 | 20<br><b>Ca</b><br>Calcium<br>20   | 21<br><b>Sc</b><br>Scandium<br>21  | 22<br><b>Ti</b><br>Titanium<br>22  | 23<br><b>V</b><br>Vanadium<br>23   | 24<br><b>Cr</b><br>Chromium<br>24   | 25<br><b>Mn</b><br>Manganese<br>25  | 26<br><b>Fe</b><br>Iron<br>26      | 27<br><b>Co</b><br>Cobalt<br>27  | 28<br><b>Ni</b><br>Nickel<br>28    | 29<br><b>Cu</b><br>Copper<br>29 | 30<br><b>Zn</b><br>Zinc<br>30    | 31<br><b>Ga</b><br>Gallium<br>31  | 32<br><b>Ge</b><br>Germanium<br>32 | 33<br><b>As</b><br>Arsenic<br>33  | 34<br><b>Se</b><br>Selenium<br>34  | 35<br><b>Br</b><br>Bromine<br>35  | 36<br><b>Kr</b><br>Krypton<br>36 |
| 37<br><b>Rb</b><br>Rubidium<br>37 | 38<br><b>Sr</b><br>Strontium<br>38 | 39<br><b>Y</b><br>Yttrium<br>39    | 40<br><b>Zr</b><br>Zirconium<br>40 | 41<br><b>Nb</b><br>Niobium<br>41   | 42<br><b>Mo</b><br>Molybdenum<br>42 | 43<br><b>Tc</b><br>Technetium<br>43 | 44<br><b>Ru</b><br>Ruthenium<br>44 | 45<br><b>Rh</b><br>Rhodium<br>45 | 46<br><b>Pd</b><br>Palladium<br>46 | 47<br><b>Ag</b><br>Silver<br>47 | 48<br><b>Cd</b><br>Cadmium<br>48 | 49<br><b>In</b><br>Indium<br>49   | 50<br><b>Sn</b><br>Tin<br>50       | 51<br><b>Sb</b><br>Antimony<br>51 | 52<br><b>Te</b><br>Tellurium<br>52 | 53<br><b>I</b><br>Iodine<br>53    | 54<br><b>Xe</b><br>Xenon<br>54   |
| 55<br><b>Cs</b><br>Caesium<br>55  | 56<br><b>Ba</b><br>Barium<br>56    | 57<br><b>La</b><br>Lanthanum<br>57 | 72<br><b>Hf</b><br>Hafnium<br>72   | 73<br><b>Ta</b><br>Tantalum<br>73  | 74<br><b>W</b><br>Tungsten<br>74    | 75<br><b>Re</b><br>Rhenium<br>75    | 76<br><b>Os</b><br>Osmium<br>76    | 77<br><b>Ir</b><br>Iridium<br>77 | 78<br><b>Pt</b><br>Platinum<br>78  | 79<br><b>Au</b><br>Gold<br>79   | 80<br><b>Hg</b><br>Mercury<br>80 | 81<br><b>Tl</b><br>Thallium<br>81 | 82<br><b>Pb</b><br>Lead<br>82      | 83<br><b>Bi</b><br>Bismuth<br>83  | 84<br><b>Po</b><br>Polonium<br>84  | 85<br><b>At</b><br>Astatine<br>85 | 86<br><b>Rn</b><br>Radon<br>86   |
| 87<br><b>Fr</b><br>Francium<br>87 | 88<br><b>Ra</b><br>Radium<br>88    | 89<br><b>Ac</b><br>Actinium<br>89  |                                    |                                    |                                     |                                     |                                    |                                  |                                    |                                 |                                  |                                   |                                    |                                   |                                    |                                   |                                  |

|                                  |  |                                     |                                      |                                     |                                    |                                      |                                      |                                      |                                      |                                    |  |                                     |                                       |                                      |                                   |                                  |                                   |                                     |                                    |
|----------------------------------|--|-------------------------------------|--------------------------------------|-------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--|-------------------------------------|---------------------------------------|--------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|-------------------------------------|------------------------------------|
| 140<br><b>Ce</b><br>Cerium<br>58 | 141<br><b>Pr</b><br>Praseodymium<br>59 | 142<br><b>Nd</b><br>Neodymium<br>60 | 143<br><b>Pm</b><br>Promethium<br>61 | 144<br><b>Nd</b><br>Neodymium<br>60 | 145<br><b>Eu</b><br>Europium<br>63 | 146<br><b>Gd</b><br>Gadolinium<br>64 | 147<br><b>Pm</b><br>Promethium<br>61 | 148<br><b>Sm</b><br>Samarium<br>62   | 149<br><b>Eu</b><br>Europium<br>63   | 150<br><b>Sm</b><br>Samarium<br>62 | 151<br><b>Gd</b><br>Gadolinium<br>64   | 152<br><b>Eu</b><br>Europium<br>63  | 153<br><b>Tb</b><br>Terbium<br>65     | 154<br><b>Dy</b><br>Dysprosium<br>66 | 155<br><b>Ho</b><br>Holmium<br>67 | 156<br><b>Er</b><br>Erbium<br>68 | 157<br><b>Tm</b><br>Thulium<br>69 | 158<br><b>Yb</b><br>Ytterbium<br>70 | 159<br><b>Lu</b><br>Lutetium<br>71 |
| 90<br><b>Th</b><br>Thorium<br>90 | 91<br><b>Pa</b><br>Protactinium<br>91  | 92<br><b>U</b><br>Uranium<br>92     | 93<br><b>Np</b><br>Neptunium<br>93   | 94<br><b>Pu</b><br>Plutonium<br>94  | 95<br><b>Am</b><br>Americium<br>95 | 96<br><b>Cm</b><br>Curium<br>96      | 97<br><b>Bk</b><br>Berkelium<br>97   | 98<br><b>Cf</b><br>Californium<br>98 | 99<br><b>Es</b><br>Einsteinium<br>99 | 100<br><b>Fm</b><br>Fermium<br>100 | 101<br><b>Md</b><br>Mendelevium<br>101 | 102<br><b>No</b><br>Nobelium<br>102 | 103<br><b>Lr</b><br>Lawrencium<br>103 |                                      |                                   |                                  |                                   |                                     |                                    |

\*58-71 Lanthanoid series  
†90-103 Actinoid series

|   |          |
|---|----------|
| a | <b>X</b> |
| b | <b>X</b> |

Key  
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.).