

CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**ADDITIONAL COMBINED SCIENCE**

**5130/01**

Paper 1 Multiple Choice

October/November 2003

**1 hour**

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, highlighters, 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.

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.

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



- 1 A body falls from rest, through the air, and reaches terminal velocity.

How can the acceleration of the body during its fall be described?

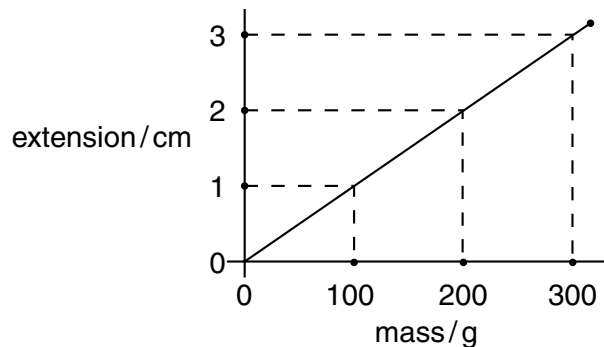
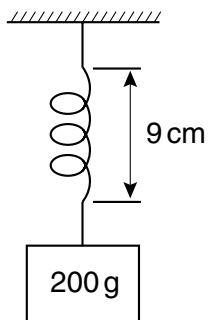
- A constant at  $0 \text{ m/s}^2$
- B constant at  $10 \text{ m/s}^2$
- C decreases from  $10 \text{ m/s}^2$  to  $0 \text{ m/s}^2$
- D increases from  $0 \text{ m/s}^2$  to  $10 \text{ m/s}^2$

- 2 A mass resists changes to its motion.

Which property of the mass is responsible for this resistance?

- A density
- B gravitational potential energy
- C inertia
- D kinetic energy

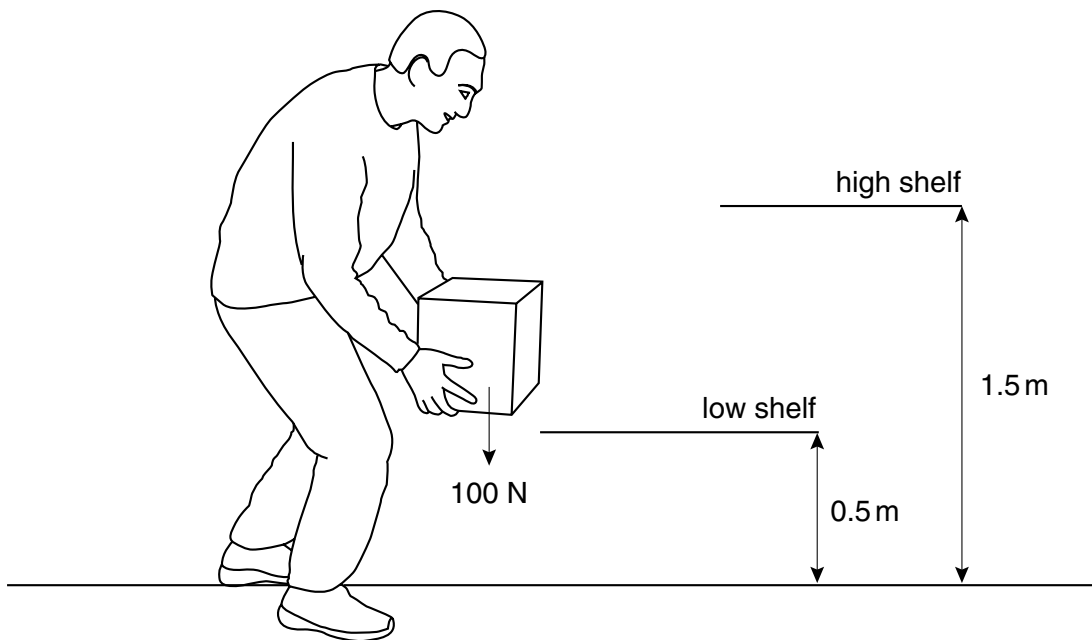
- 3 The diagrams show a spring having a length of 9 cm when loaded with a 200 g mass, and the extension-mass graph for the spring.



What is the length of the spring after the 200 g mass has been removed?

- A 7 cm
- B 8 cm
- C 9 cm
- D 10 cm

- 4 The diagram shows a person lifting a box of weight 100 N from a low shelf to a high shelf.



How much work is done by the person?

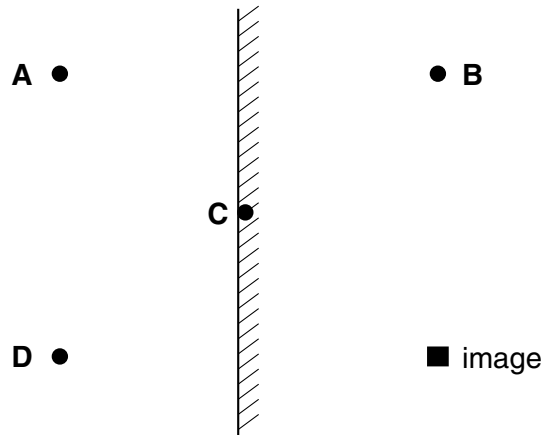
- A 50 J  
 B 100 J  
 C 150 J  
 D 200 J
- 5 The heat passes from the hot water in a metal radiator through the metal and then spreads around the room.

What are the main mechanisms by which the heat is transferred through the radiator and then spread around the room?

|          | through the metal radiator | around the room |
|----------|----------------------------|-----------------|
| <b>A</b> | conduction                 | conduction      |
| <b>B</b> | conduction                 | convection      |
| <b>C</b> | radiation                  | conduction      |
| <b>D</b> | radiation                  | convection      |

- 6 The diagram shows a plane mirror and the position of an image.

Where must the object be placed to form this image?



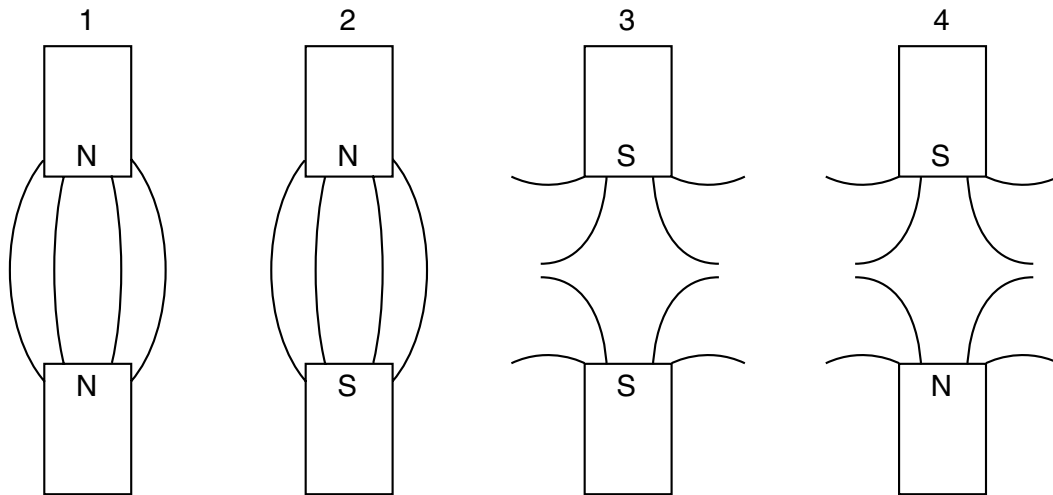
- 7 The table shows how the speed of sound varies with substances of different densities.

| substance         | speed of sound in substance m/s | density of substance kg/m <sup>3</sup> |
|-------------------|---------------------------------|--|
| air (gas)         | 330                             | 1.29                                   |
| oxygen (gas)      | 320                             | 1.43                                   |
| aluminium (solid) | 5100                            | 2710                                   |
| iron (solid)      | 5000                            | 7870                                   |
| lead (solid)      | 1200                            | 11 300                                 |

Which conclusion about the speed of sound can be drawn from this information?

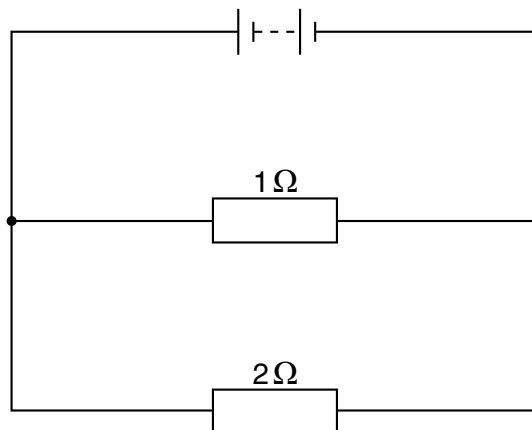
- A The speed increases as the density of the substance increases.
- B The speed is greater in less dense substances.
- C The speed is greater in solids than in gases.
- D The speed is greatest in the densest solid.

- 8 The diagrams show the suggested field lines between the poles of two magnets.



Which are the correct patterns?

- A** 1 and 2      **B** 2 and 3      **C** 3 and 4      **D** 4 and 1
- 9 Electric current is defined as a rate of flow of charge and is measured in amperes, A.  
How can the unit of current, the ampere, also be written?
- A** Cm      **B** C/m      **C** Cs      **D** C/s
- 10 The diagram shows two resistors in parallel with a battery.



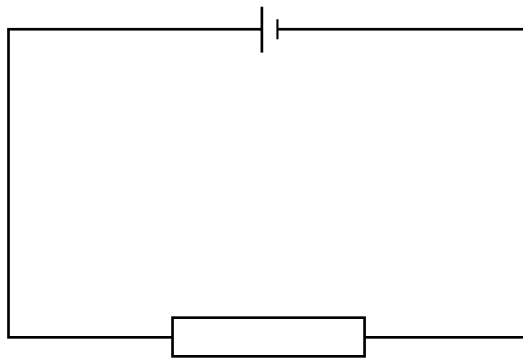
What is the effective resistance of the two resistors?

- A**  $0.67\ \Omega$       **B**  $1.0\ \Omega$       **C**  $1.5\ \Omega$       **D**  $3.0\ \Omega$

- 11 In a simple d.c. motor, the direction of the current is reversed every half-revolution to keep the motor turning in the same direction.

Which part of the motor does this?

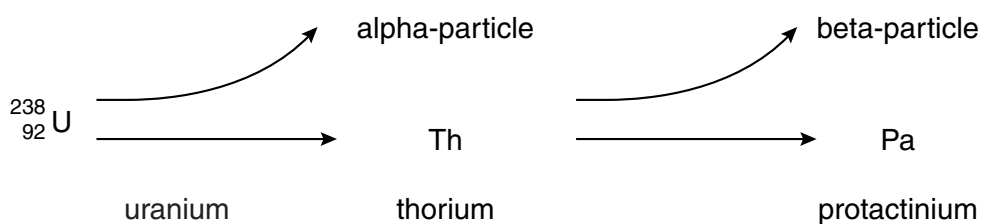
- A brushes
  - B coil
  - C commutator
  - D poles
- 12 An electrical circuit consists of a cell connected to a resistor.



What are the correct directions of the electron flow and of the conventional current flow through the resistor?

|          | electron flow | conventional current flow |
|----------|---------------|---------------------------|
| <b>A</b> | left to right | left to right             |
| <b>B</b> | left to right | right to left             |
| <b>C</b> | right to left | right to left             |
| <b>D</b> | right to left | left to right             |

- 13 The uranium atom  ${}_{92}^{238}\text{U}$  emits an alpha-particle to become thorium, which then emits a beta-particle to become protactinium.



What is the proton number (atomic number) of protactinium?

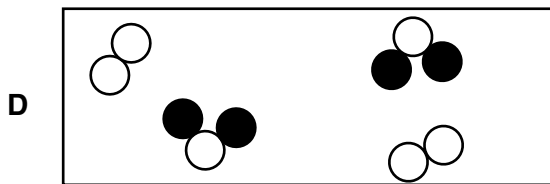
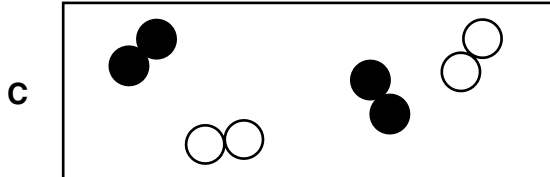
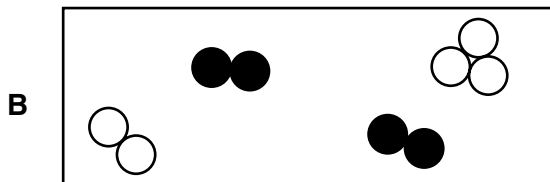
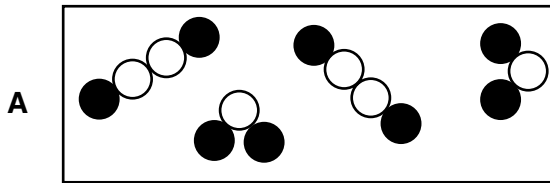
- A 95
- B 91
- C 90
- D 89

14 The neutral atoms of all isotopes of the same element contain the same numbers of

- A electrons and protons.
- B electrons and neutrons.
- C neutrons.
- D neutrons and protons.

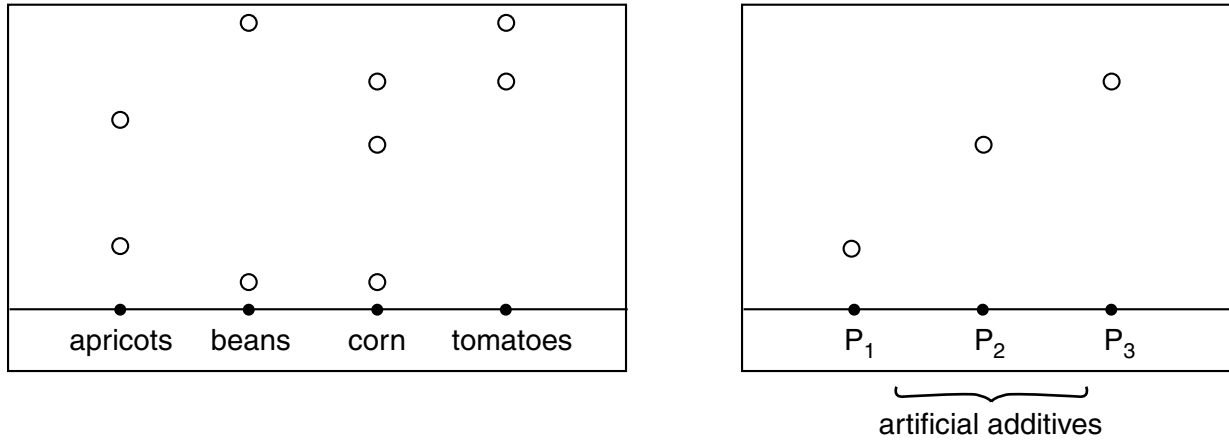
15 ○ and ● represent atoms of different elements.

Which diagram shows a mixture of an element and a compound.



- 16 Samples of tinned apricots, beans, corn and tomatoes were tested for additives using chromatography. The chromatograms were compared with those of three artificial additives, P<sub>1</sub>, P<sub>2</sub> and P<sub>3</sub>.

The results were as follows.



Which tinned food does **not** contain any artificial additives?

- A apricots
  - B beans
  - C corn
  - D tomatoes
- 17 Strontium has an isotope of nucleon number 90.

How many protons, neutrons and electrons are present in an atom of this isotope?

|          | protons | neutrons | electrons |
|----------|---------|----------|-----------|
| <b>A</b> | 38      | 50       | 40        |
| <b>B</b> | 38      | 52       | 38        |
| <b>C</b> | 38      | 52       | 40        |
| <b>D</b> | 40      | 50       | 38        |

- 18 Hydrogen molecules each contain a single covalent bond.

How is this covalent bond formed?

- A A single electron from each hydrogen atom is shared between the two hydrogen atoms.
- B A single electron is shared between two hydrogen atoms.
- C One hydrogen atom transfers an electron to the other hydrogen atom.
- D Two electrons from each hydrogen atom are shared between the two hydrogen atoms.



19 Each of the following substances produces carbon dioxide on complete combustion.

Which one will produce 1.0 mol of carbon dioxide?

- A 2.0 mol of graphite, C
- B 1.5 mol of propane, C<sub>3</sub>H<sub>8</sub>
- C 1.5 mol of ethene, C<sub>2</sub>H<sub>4</sub>
- D 0.5 mol of ethanol, C<sub>2</sub>H<sub>5</sub>OH

20 The results of some tests on polluted river water are shown.

| reagent added slowly until in excess | first observation | second observation                                |
|--------------------------------------|-------------------|---|
| aqueous sodium hydroxide             | white precipitate | precipitate dissolves to give colourless solution |
| aqueous ammonia                      | white precipitate | no further change                                 |

Which metal ion must be present in the water?

- A Al<sup>3+</sup>
- B Ca<sup>2+</sup>
- C Fe<sup>2+</sup>
- D Zn<sup>2+</sup>

21 Which pair of substances is most suitable for the preparation of copper(II) sulphate?

- A aqueous copper(II) nitrate and aqueous sodium sulphate
- B copper and dilute sulphuric acid
- C copper(II) carbonate and dilute sulphuric acid
- D copper(II) oxide and aqueous ammonium sulphate

22 The names and electronic structures of the noble gases are shown.

|         |                 |
|---------|-----------------|
| helium  | 2               |
| neon    | 2, 8            |
| argon   | 2, 8, 8         |
| krypton | 2, 8, 18, 8     |
| xenon   | 2, 8, 18, 18, 8 |

Why do the noble gases in Group 0 form so few compounds?

- A They all have an even number of electrons.
- B They all have a stable arrangement of electrons.
- C They all have eight electrons in the outer shell.
- D They all have two electrons in the first shell.

23 Which statement about the extraction of aluminium from aluminium oxide is true?

- A Aluminium is extracted by heating its oxide with carbon.
- B Aluminium is extracted using electrolysis and is collected at the anode (positive electrode).
- C Aluminium is extracted using platinum electrodes and direct current.
- D Molten cryolite is used as a solvent for aluminium oxide.

24 The table shows the boiling points of the elements found in a sample of liquid air.

| element            | argon | helium | neon | nitrogen | oxygen |
|--------------------|-------|--------|------|----------|--------|
| boiling point / °C | -186  | -269   | -246 | -196     | -183   |

Which elements would be gaseous at  $-190\text{ }^{\circ}\text{C}$

- A argon, helium and nitrogen
- B argon, nitrogen and oxygen
- C helium, neon and nitrogen
- D helium, neon and oxygen

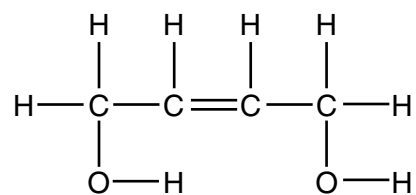
25 Which conditions are used for the manufacture of ammonia by the Haber process?

|          | catalyst used | pressure / at | temperature / °C |
|----------|---------------|---------------|------------------|
| <b>A</b> | iron          | 200           | 450              |
| <b>B</b> | iron          | 450           | 200              |
| <b>C</b> | nickel        | 200           | 450              |
| <b>D</b> | nickel        | 450           | 200              |

26 Bitumen is obtained from crude oil. It is used

- A as aircraft fuel.
- B as fuel for oil stoves.
- C for making polishes.
- D for making roads.

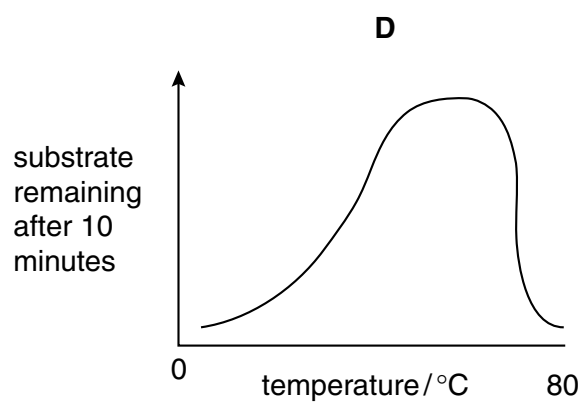
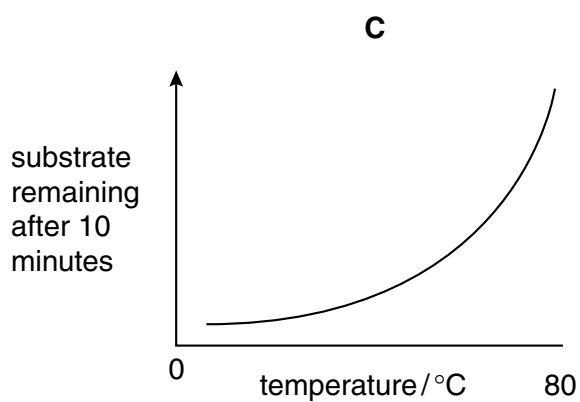
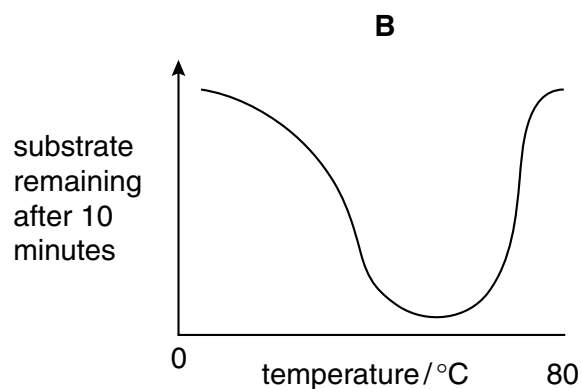
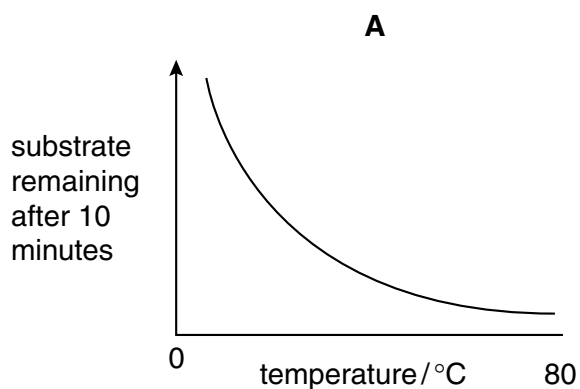
27 The diagram shows the structure of a compound **X**.



How is **X** classified?

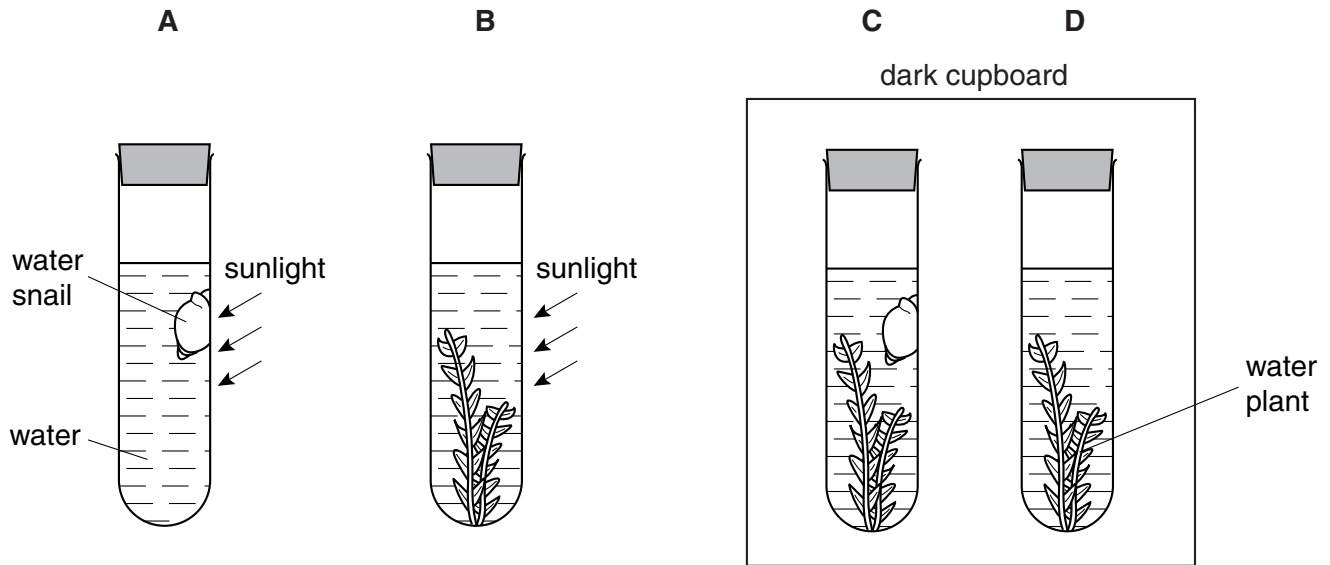
- A** as an acid and as an alcohol  
**B** as an alkene and as an acid  
**C** as an alkene and as an alcohol  
**D** as an alkene and as an ester
- 28 The activity of an enzyme can be measured by finding the amount of substrate remaining after 10 minutes. The more active the enzyme, the **less** substrate will remain.

Which graph shows the effect of temperature on enzyme activity?



29 The investigation shown was set up and left for one hour.

In which test-tube did the concentration of carbon dioxide dissolved in the water **decrease**?



30 The table shows the nutrients in different parts of a meal.

Which food would be most useful in preventing constipation?

|          | food           | energy<br>kJ | protein<br>g | fat<br>g | carbohydrate<br>g | fibre<br>g |
|----------|----------------|--------------|--------------|----------|-------------------|------------|
| <b>A</b> | apple juice    | 163          | 0.1          | 0        | 9.4               | 0          |
| <b>B</b> | ripe banana    | 466          | 1.5          | 0.4      | 27                | 5          |
| <b>C</b> | salad sandwich | 1054         | 19           | 7.3      | 27                | 6.1        |
| <b>D</b> | toffee bar     | 458          | 2.1          | 3.3      | 19                | 1.1        |

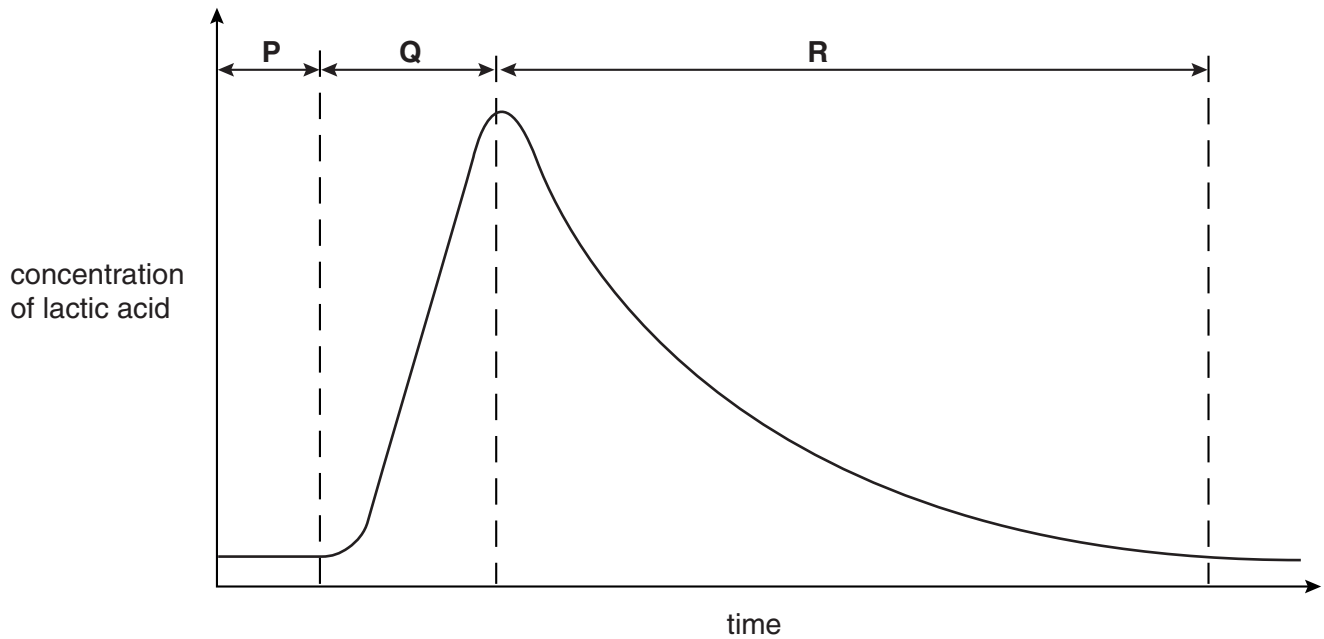
31 Which of the following environmental conditions would cause rapid transpiration?

|          | air  | light  | temperature |
|----------|------|--------|-------------|
| <b>A</b> | damp | bright | cold        |
| <b>B</b> | damp | dim    | warm        |
| <b>C</b> | dry  | bright | warm        |
| <b>D</b> | dry  | dim    | cold        |

32 What causes the drop in blood pressure as blood passes through the lungs?

- A high air pressure in alveoli
- B high blood pressure in left atrium
- C muscular contraction of capillary walls
- D resistance of capillary walls

33 The graph shows the concentration of lactic acid in the blood of an athlete.



During which period of time was the athlete exercising?

- A period **P** only
- B period **Q** only
- C period **R** only
- D periods **P** and **Q**

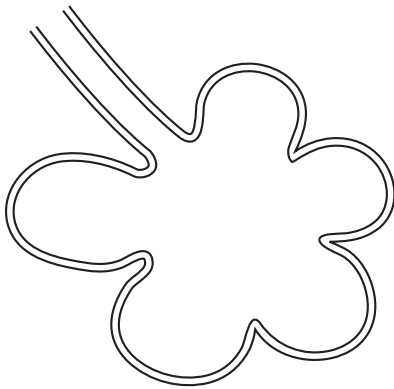
34 Which waste product, made by the liver, is removed from a patient's blood by a kidney machine?

- A carbon dioxide
- B salt
- C urea
- D urine

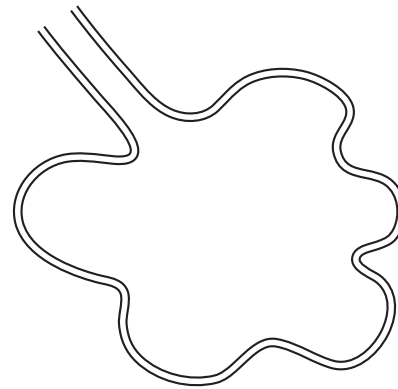
- 35 In temperature control of the body, which types of neurones carry signals from skin receptors to the brain, and from the brain to sweat glands?

|          | from skin receptors to the brain | from the brain to sweat glands |
|----------|----------------------------------|--------------------------------|
| <b>A</b> | motor                            | sensory                        |
| <b>B</b> | motor                            | relay                          |
| <b>C</b> | relay                            | motor                          |
| <b>D</b> | sensory                          | motor                          |

- 36 The diagrams show the structure of the alveoli in the lungs of a healthy person and in someone suffering from emphysema.



healthy

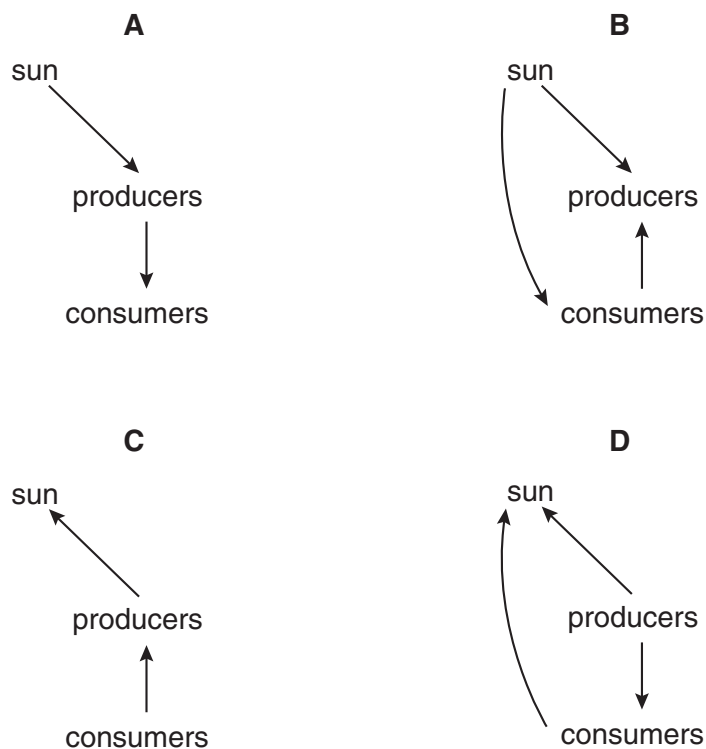


emphysema

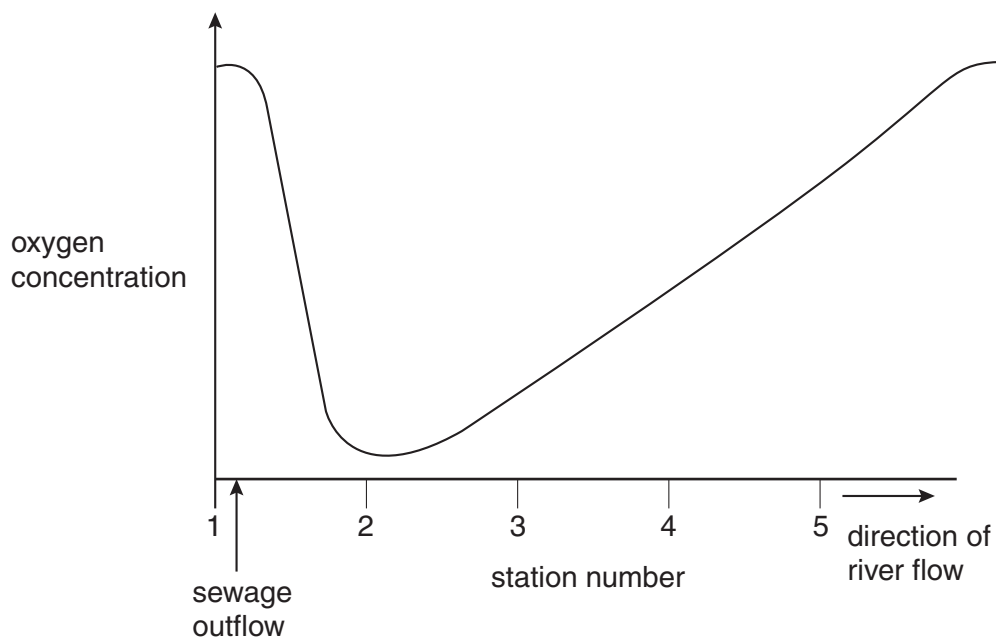
What is the effect of emphysema?

- A** increased chance of lung cancer
- B** inflammation of the walls of the airways
- C** less difficulty in breathing in and out
- D** less efficient gaseous exchange

37 Which diagram shows part of the energy flow in an ecosystem?



38 The graph shows the concentration of oxygen in a river, measured at stations 1 to 5, each 100 m apart. There is a sewage outflow just after station 1.



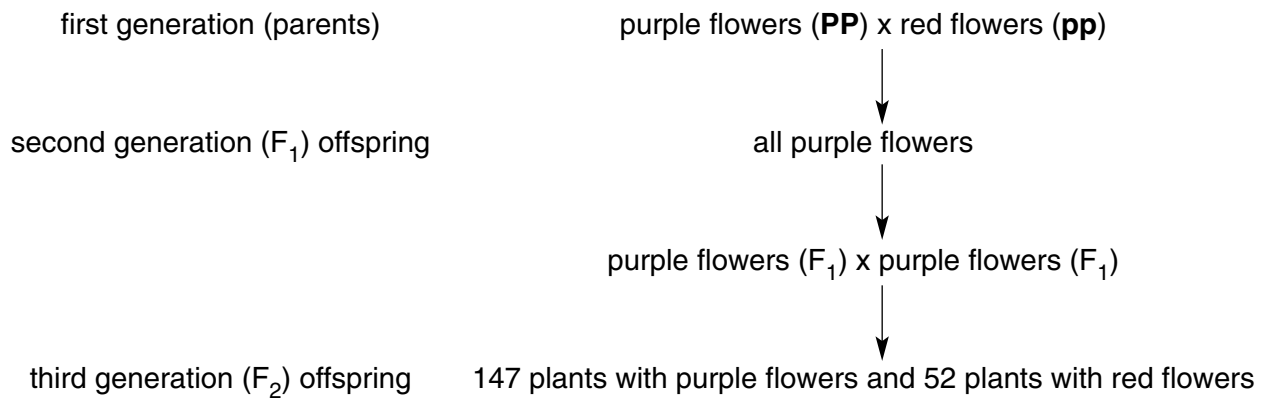
At which stations are the concentrations of organic matter **lowest**?

- A 1 and 5
- B 2 and 3
- C 3 and 4
- D 4 and 5

39 Which of the following is essential for seeds to begin germinating?

- A carbon dioxide
- B light
- C mineral salts
- D oxygen

40 The diagram shows the results of crosses between sweet pea plants. **P** represents the allele for purple flowers and **p** represents the allele for red flowers.



What are the genotypes of the third generation (F<sub>2</sub>) offspring?

- A all **Pp**
- B some **PP** and some **pp** only
- C some **Pp** and some **pp** only
- D some **PP**, some **Pp** and some **pp**







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# DATA SHEET

## The Periodic Table of the Elements

| Group |     | I   | II  | III | IV  | V   | VI  | VII | 0   |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 7     | 9   | 1   |     |     |     |     |     |     | 4   | 2   |
| 3     | 4   | 1   |     |     |     |     |     |     | 2   | 103 |
| 23    | 24  | 11  | 5   | 13  | 14  | 15  | 16  | 17  | 18  |     |
| 39    | 40  | 55  | 59  | 64  | 65  | 70  | 73  | 75  | 79  |     |
| 19    | 20  | 25  | 27  | 28  | 30  | 31  | 32  | 33  | 34  |     |
| 85    | 88  | 91  | 96  | 106 | 108 | 112 | 119 | 122 | 128 |     |
| 37    | 38  | 40  | 42  | 46  | 47  | 48  | 50  | 51  | 52  |     |
| 133   | 137 | 178 | 184 | 192 | 197 | 201 | 207 | 209 | 209 |     |
| 55    | 56  | 72  | 74  | 76  | 78  | 80  | 82  | 83  | 84  |     |
| 87    | 88  | 89  | 91  | 94  | 96  | 97  | 99  | 100 | 101 |     |
|       |     | 140 | 141 | 144 | 150 | 152 | 157 | 159 | 162 |     |
|       |     | 58  | 59  | 60  | 62  | 63  | 64  | 65  | 66  |     |
|       |     | 90  | 91  | 92  | 94  | 95  | 96  | 97  | 98  |     |
|       |     | 175 | 173 | 170 | 167 | 169 | 173 | 173 | 173 |     |
|       |     | 103 | 102 | 101 | 100 | 101 | 102 | 102 | 102 |     |

**\*58-71 Lanthanoid series**

**†90-103 Actinoid series**

a

**X**

b

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.).