



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES

0654/11

Paper 1 Multiple Choice

October/November 2016

45 minutes

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

* 3 4 9 6 7 2 6 2 0 8 *

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 **16**.

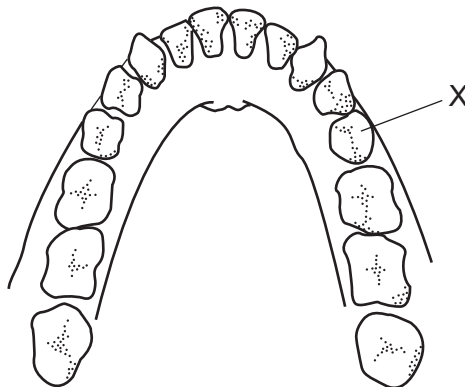
Electronic calculators may be used.

This document consists of **16** printed pages.

- 1 The plant *Mimosa pudica* grows in Central and South America. Its leaves close up rapidly when touched.

Which two characteristics are shown by this action?

- A growth and movement
 - B growth and sensitivity
 - C movement and sensitivity
 - D respiration and growth
- 2 Which statement about enzymes is correct?
- A Amylase breaks down fats into fatty acids and glycerol.
 - B Amylase breaks down proteins into amino acids.
 - C Lipase breaks down fats into fatty acids and glycerol.
 - D Lipase breaks down proteins into amino acids.
- 3 The diagram shows human teeth in the lower jaw.

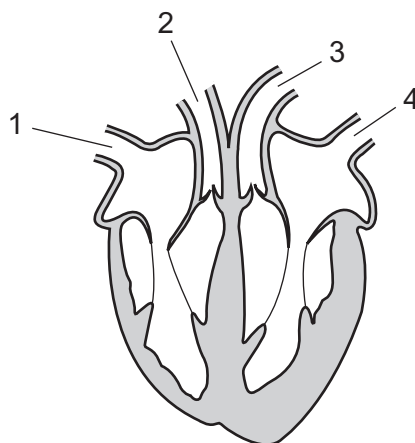


What type of tooth is X?

- A canine
- B incisor
- C molar
- D premolar

3

4 The diagram shows a section through the human heart.



Which two blood vessels are arteries?

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

5 A plant is growing in an open field. The table shows the weather conditions on four different days in the same week.

On which day does the plant lose water the fastest?

| | day | rainfall/mm | average humidity/% | average temperature/°C | sunshine/hours |
|----------|-----------|-------------|--------------------|------------------------|----------------|
| A | Monday | 5 | 95 | 20 | 5 |
| B | Tuesday | 2 | 98 | 18 | 4 |
| C | Wednesday | 2 | 90 | 22 | 8 |
| D | Thursday | 0 | 75 | 25 | 7 |

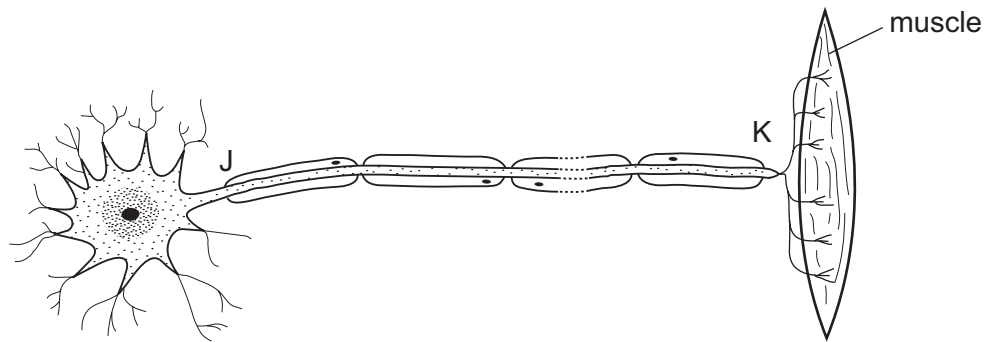
6 Which substance is absorbed from the alveoli?

- A** carbon dioxide
B oxygen
C nitrogen
D water vapour

7 Which statement about expired air is correct?

- A** It contains 16% oxygen.
B It contains 21% oxygen.
C It contains more carbon dioxide than nitrogen.
D It contains no oxygen.

- 8 The diagram shows a neurone and associated structures.



What type of neurone is shown and in which direction do impulses travel?

| | type of neurone | direction of impulse |
|----------|-----------------|----------------------|
| A | motor | J to K |
| B | motor | K to J |
| C | sensory | J to K |
| D | sensory | K to J |

- 9 What are the effects of adrenaline?

| | blood glucose concentration | pulse rate |
|----------|-----------------------------|------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

- 10 Two plants, P and Q, each give rise to one offspring. The two offspring are genetically identical.

How were plants P and Q produced and how did they reproduce?

| | how P and Q were produced | how P and Q reproduced |
|----------|---------------------------|------------------------|
| A | asexually | asexually |
| B | asexually | sexually |
| C | sexually | asexually |
| D | sexually | sexually |

11 Which part of the male reproductive system transports both sperm and urine?

- A prostate gland
- B sperm duct
- C testis
- D urethra

12 The diagram shows a food chain.

Which organisms pass the greatest amount of energy along the food chain?



13 Which molecule contains carbon?

- A ammonia
- B fat
- C sulfuric acid
- D water

14 Which substances exist as covalent molecules?

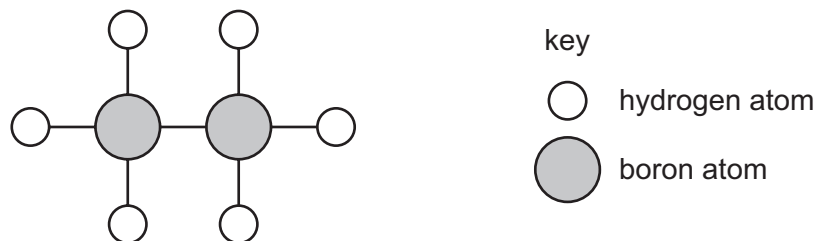
- 1 chlorine
- 2 helium
- 3 ethanol
- 4 sodium chloride

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

15 Which row describes the properties of a covalent compound?

| | volatility | electrically conductive when molten |
|----------|------------|-------------------------------------|
| A | high | no |
| B | high | yes |
| C | low | no |
| D | low | yes |

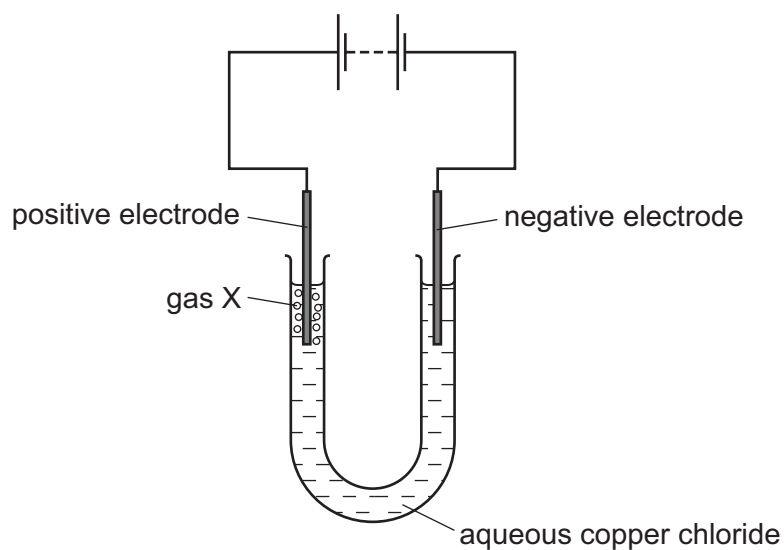
16 A model of a molecule is shown.



Which row shows the formula of this molecule and describes the type of bonding between the atoms?

| | formula | bonding |
|----------|------------------------|----------|
| A | 2BH_3 | covalent |
| B | 2BH_3 | ionic |
| C | B_2H_6 | covalent |
| D | B_2H_6 | ionic |

17 Apparatus used to electrolyse aqueous copper chloride is shown.



The negative electrode is called the1..... . Gas X turns damp red litmus paper2..... .

Which words complete gaps 1 and 2?

| | 1 | 2 |
|----------|---------|-------|
| A | anode | blue |
| B | anode | white |
| C | cathode | blue |
| D | cathode | white |

- 18 Which type of reaction and which temperature change take place when an acid reacts with an alkali?

| | type of reaction | temperature change |
|----------|------------------|--------------------|
| A | endothermic | decrease |
| B | endothermic | increase |
| C | exothermic | decrease |
| D | exothermic | increase |

- 19 Dilute hydrochloric acid reacts with solid calcium carbonate.

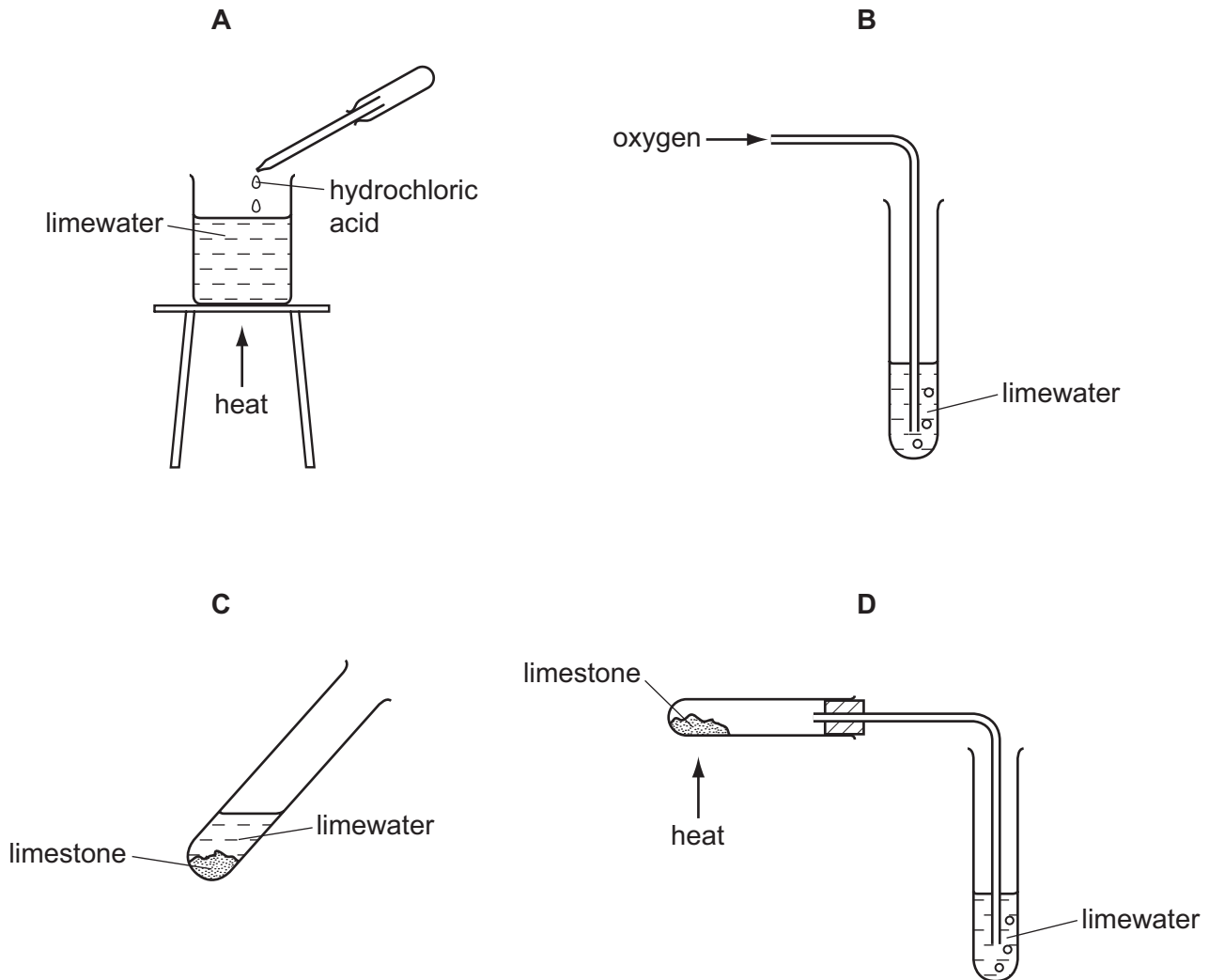
Which change decreases the speed of the reaction?

- A** Decrease the concentration of the hydrochloric acid.
- B** Decrease the size of the calcium carbonate particles.
- C** Increase the surface area of the calcium carbonate.
- D** Increase the temperature of the acid.

- 20 Which row describes metallic oxides and non-metallic oxides?

| | metallic oxides | non-metallic oxides |
|----------|-----------------|---------------------|
| A | acidic | acidic |
| B | acidic | basic |
| C | basic | acidic |
| D | basic | basic |

21 In which experiment does limewater become milky?



22 Which statement about the Periodic Table is correct?

- A Elements are listed in order of neutron number.
- B Elements are listed in order of nucleon number.
- C Elements are listed in order of proton number.
- D Elements are listed in order of relative atomic mass.

23 Which statement about lithium, sodium and potassium is **not** correct?

- A They are in the same group of the Periodic Table.
- B They are in the same period of the Periodic Table.
- C They float on water.
- D They react with water to give a flammable gas.

24 Some properties of aluminium are listed.

- 1 It conducts heat.
- 2 It has a low density.
- 3 It has strong alloys.
- 4 It is resistant to corrosion.

Which properties make aluminium useful in aircraft manufacture?

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

25 Which conditions are required for rusting?

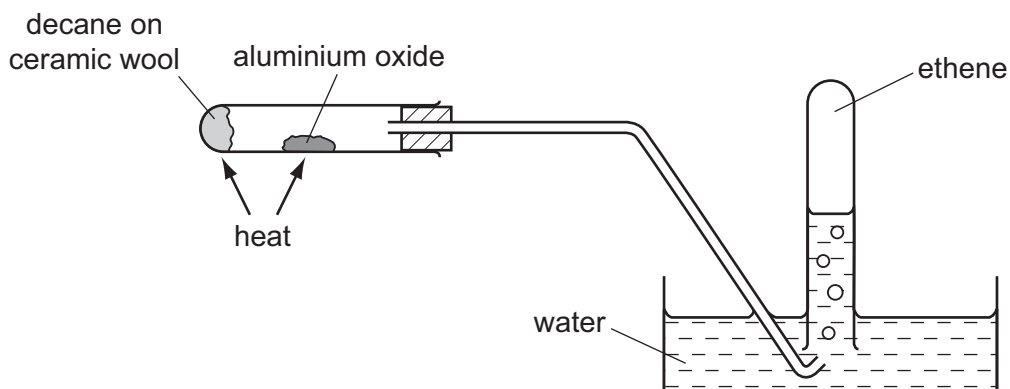
- A** air only
B air and water
C salt and water
D water only

26 Which process and type of reaction describes the formation of lime from limestone?

| | process | type of reaction |
|----------|-----------------------|------------------|
| A | addition of water | endothermic |
| B | thermal decomposition | endothermic |
| C | addition of water | exothermic |
| D | thermal decomposition | exothermic |

27 Ethene is formed when decane, $C_{10}H_{22}$, is passed over hot aluminium oxide.

The aluminium oxide is unchanged in this process.



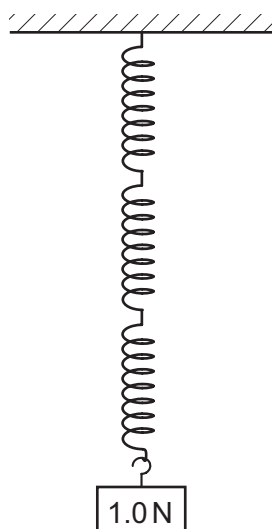
Which terms describe the type of reaction and the role of the aluminium oxide?

| | type of reaction | role of aluminium oxide |
|----------|-------------------------|-------------------------|
| A | cracking | catalyst |
| B | cracking | compound |
| C | fractional distillation | catalyst |
| D | fractional distillation | compound |

28 A student tests three identical springs. Each spring stretches by 3.0 cm when a 3.0 N load is suspended from one end of it. The extension of each spring is directly proportional to the load applied.

The three springs are connected together as shown.

A 1.0 N load is placed on the end of the springs.



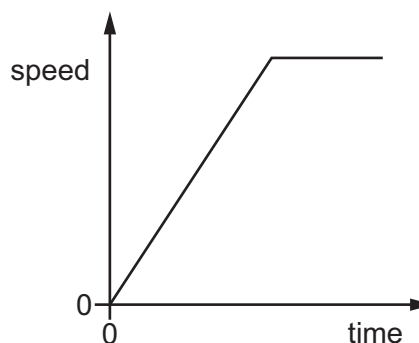
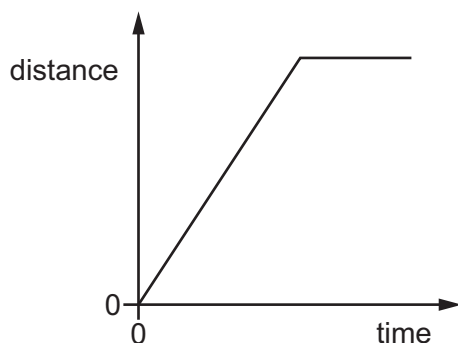
What is the total extension of all the springs together?

- A** 1.0 cm **B** 3.0 cm **C** 6.0 cm **D** 9.0 cm

29 Which is a unit of power?

- A kilogram
- B joule
- C newton
- D watt

30 The diagram shows two graphs. Graph 1 is a distance/time graph. Graph 2 is a speed/time graph.



Which of the graphs represent a car that travels at a constant speed and then stops?

- A graph 1 and graph 2
 - B graph 1 only
 - C graph 2 only
 - D neither graph 1 nor graph 2
- 31 A liquid in an open container is evaporating, but not boiling.

Which molecules escape as the liquid evaporates, and from where do they escape?

- A Any of the molecules escape but only from the surface.
- B Any of the molecules escape and from any part of the liquid.
- C Only molecules with enough energy escape and only from the surface.
- D Only molecules with enough energy escape but from any part of the liquid.

32 Thermal energy is supplied to a gas at constant pressure.

What happens to the volume of the gas and what happens to the temperature of the gas?

| | volume | temperature |
|----------|-----------|-------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

33 How is thermal energy transferred in a vacuum?

- A** by conduction and convection
- B** by convection and radiation
- C** by convection only
- D** by radiation only

34 A water wave passes point Y.

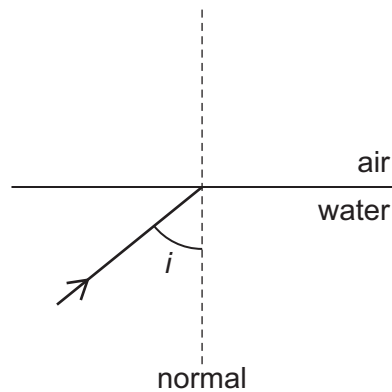
A student counts how many wave crests pass point Y in 30 seconds.

Using **only** this information, what can the student calculate?

- A** the amplitude of the wave
- B** the frequency of the wave
- C** the speed of the wave
- D** the wavelength of the wave

35 The diagram shows a ray of light travelling in water towards air above the water.

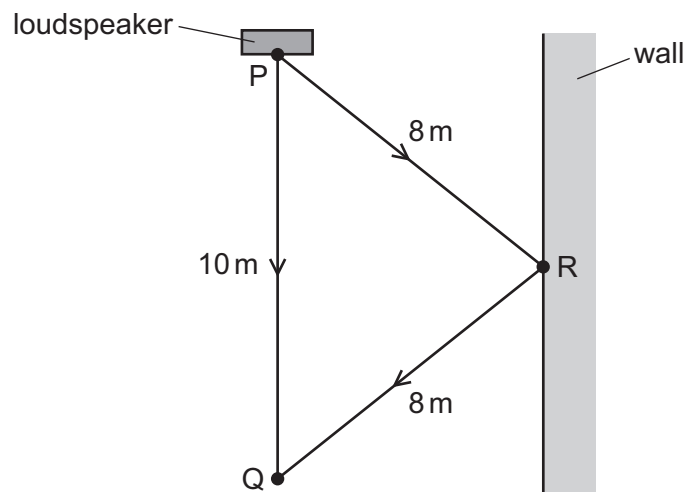
The angle of incidence i is slightly less than 49° .



The critical angle for water is 49° .

What is the angle of refraction of the ray?

- A slightly less than 49°
 - B slightly less than 90°
 - C slightly more than 49°
 - D slightly more than 90°
- 36 Sound from a loudspeaker at P travels directly to Q. Sound also reaches Q after being reflected from a wall at R.

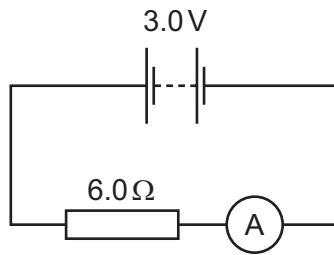


The speed of sound is 330 m/s .

What is the **difference** in time for sound to travel from P to Q by the two routes?

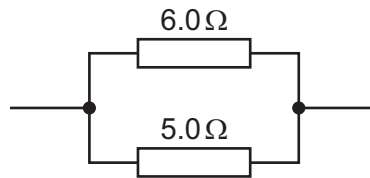
- A $\left(\frac{6}{330}\right) \text{ s}$
- B $\left(\frac{16}{330}\right) \text{ s}$
- C $(6 \times 330) \text{ s}$
- D $(16 \times 330) \text{ s}$

- 37 The diagram shows a 3.0V battery connected to a 6.0Ω resistor and an ammeter.



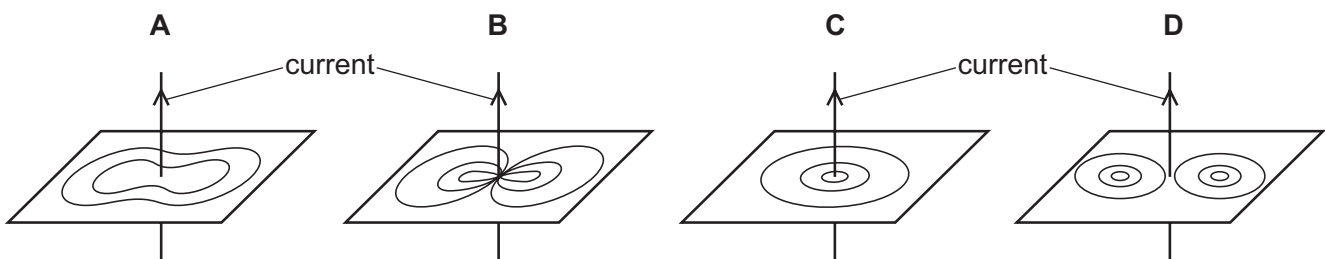
What is the reading on the ammeter?

- A** 0.50A **B** 2.0A **C** 9.0A **D** 18A
- 38 The diagram shows a 6.0Ω and a 5.0Ω resistor connected in parallel.

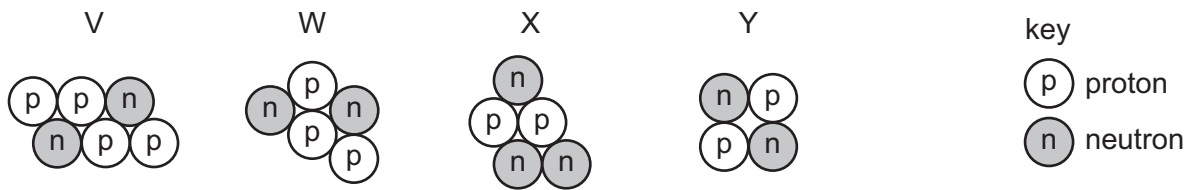


What is their combined resistance?

- A** less than 5.0Ω
B exactly 5.5Ω
C between 5.6Ω and 6.0Ω
D exactly 11Ω
- 39 Which diagram shows the magnetic field pattern around a straight wire carrying a current?



40 The diagrams represent the nuclei of four different atoms V, W, X and Y.



Which two diagrams represent isotopes of the same element?

- A** V and W **B** W and X **C** X and Y **D** Y and V

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The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | | |
|-----------------------------------|------------------------------------|--|--|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|------------------------------------|-------------------------------------|----------------------------------|-------------------------------------|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| 3 Li lithium 7 | 4 Be beryllium 9 | Key atomic number atomic symbol name relative atomic mass | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 1 H hydrogen 1 | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium — | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57–71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium — | 85 At astatine — | 86 Rn radon — |
| 87 Fr francium — | 88 Ra radium — | 89–103 actinoids | 104 Rf rutherfordium — | 105 Db dubnium — | 106 Sg seaborgium — | 107 Bh bohrium — | 108 Hs hassium — | 109 Mt meitnerium — | 110 Ds darmstadtium — | 111 Rg roentgenium — | 112 Cn copernicium — | 114 Fl flerovium — | 116 Lv livermorium — | — | — | — | — |

| | | | | | | | | | | | | | | | |
|-------------|-------------------------------------|-----------------------------------|--|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|----------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium — | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium — | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium — | 94 Pu plutonium — | 95 Am americium — | 96 Cm curium — | 97 Bk berkelium — | 98 Cf californium — | 99 Es einsteinium — | 100 Fm fermium — | 101 Md mendelevium — | 102 No nobelium — | 103 Lr lawrencium — |

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