



Cambridge IGCSE™

COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

February/March 2023

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

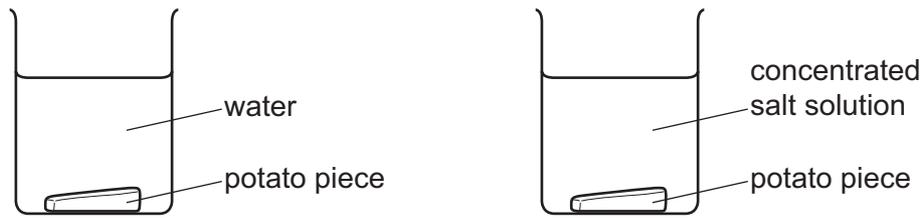
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages.



- 1 Two pieces of potato are cut to have exactly the same mass and shape. The mass is measured and recorded.



One piece of potato is placed in water and the other piece is placed in concentrated salt solution.

They are both left for one hour.

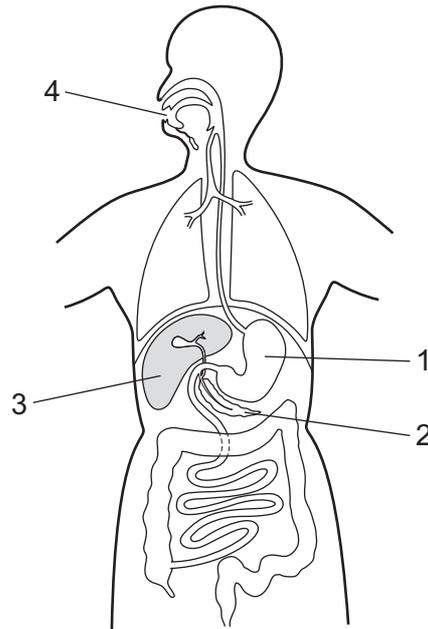
The mass of each piece of potato is then measured again.

What happens to the mass of each piece of potato?

| | mass of potato placed in water | mass of potato placed in concentrated salt solution |
|----------|--------------------------------|-----------------------------------------------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

- 2 Under which conditions is an enzyme described as being denatured?
- A** when it is cooled to a low temperature
 - B** when it is turned into a dry powder for storage
 - C** when it is used to catalyse a different reaction
 - D** when the shape of the active site is permanently changed
- 3 Which two nutrients are needed for healthy bone and tooth development?
- A** calcium and iron
 - B** fibre and vitamin C
 - C** fibre and vitamin D
 - D** vitamin D and calcium

4 The diagram shows some organs of the human body.



Which two structures carry out both mechanical and chemical digestion?

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

5 Which statement describes a feature of the root hair cells of plants?

- A** They help the roots to move between soil particles in the ground.
B They have fully permeable cell membranes to improve nitrate ion entry.
C They have large surface areas to increase water uptake by osmosis.
D They have partially permeable cell walls to give the cells more strength.

6 Which statement about all arteries is correct?

- A** They always contain oxygenated blood.
B They have many valves on their inner walls.
C They have a wide lumen.
D They transport blood away from the heart.

- 7 The table shows the differences in the composition of carbon dioxide, oxygen and water vapour for inspired and expired air.

Which row shows the most likely composition for human inspired and expired air?

| | carbon dioxide % | | oxygen % | | water vapour % | |
|----------|------------------|---------|----------|---------|----------------|---------|
| | inspired | expired | inspired | expired | inspired | expired |
| A | 4 | 0.04 | 21 | 16 | 1 | 1 |
| B | 0.04 | 4 | 21 | 16 | 1 | 6 |
| C | 0.04 | 4 | 16 | 21 | 6 | 1 |
| D | 4 | 0.04 | 16 | 21 | 6 | 6 |

- 8 Adrenaline is produced by the adrenal glands in times of1..... . It targets vital organs, increases2..... which increases the delivery of oxygen and3..... to the brain and muscles, preparing the body for 'flight or fight'.

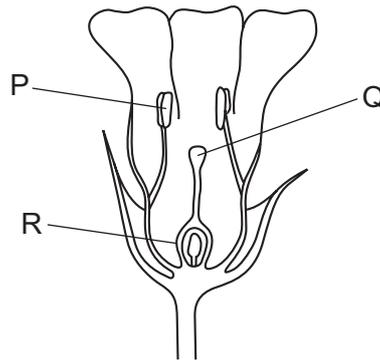
Which words complete gaps 1, 2 and 3?

| | 1 | 2 | 3 |
|----------|------------|----------------|----------|
| A | stress | heart rate | glucose |
| B | stress | breathing rate | glycogen |
| C | relaxation | breathing rate | glucose |
| D | relaxation | heart rate | glycogen |

- 9 Which chemical is involved in controlling the growth of plant shoots?

- A** amylase
- B** auxin
- C** water
- D** protease

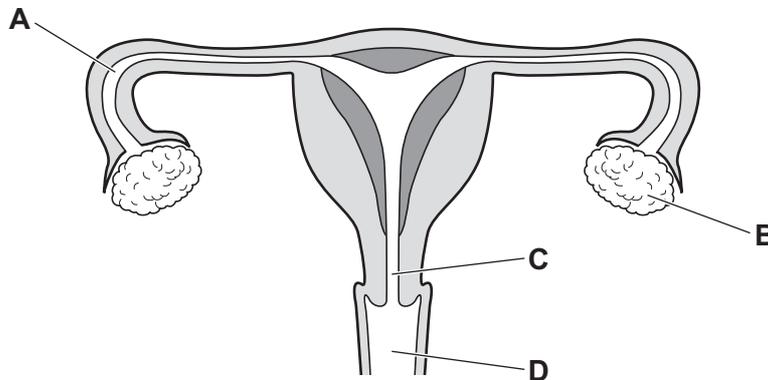
10 The diagram shows a section through a flower.



Which row identifies the labelled parts of the flower?

| | P | Q | R |
|----------|--------|--------|--------|
| A | anther | ovary | stigma |
| B | anther | stigma | ovary |
| C | stamen | carpel | sepal |
| D | stamen | sepal | carpel |

11 Where does fertilisation take place?



12 A woodland consists of trees, other plants and animals.

Which term describes this woodland and the interaction of its living things with each other and their environment?

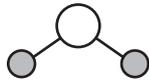
- A** ecosystem
- B** food web
- C** habitat
- D** trophic level

13 The concentration of nitrate ions in a lake increases.

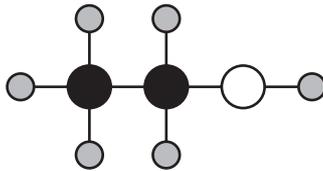
Why does this result in a decrease in the number of fish in the lake?

- A There is a decrease in the decomposition of producers.
- B There is a decrease in the growth of producers.
- C There is an increase in aerobic respiration by decomposers.
- D There is an increase in dissolved oxygen.

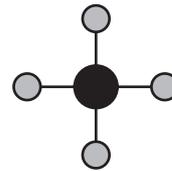
14 The structures of three molecules are shown.



water



ethanol



methane

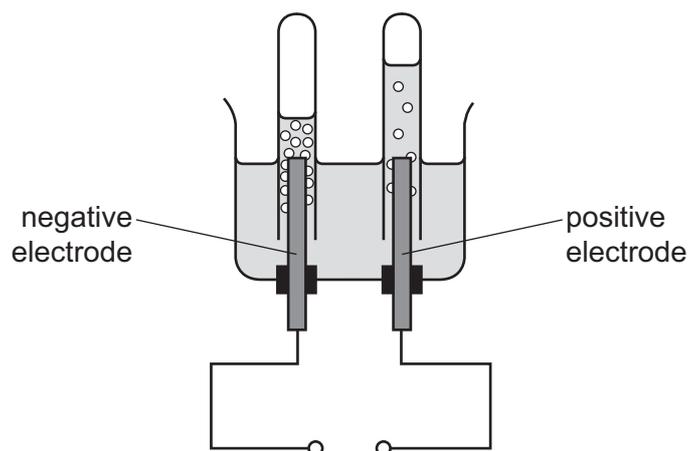
How many atoms are in each molecule?

| | water | ethanol | methane |
|----------|-------|---------|---------|
| A | 2 | 3 | 2 |
| B | 2 | 4 | 5 |
| C | 3 | 3 | 2 |
| D | 3 | 9 | 5 |

15 Which elements react together to give positive ions and negative ions that all have the same electronic structure as argon?

- A calcium and chlorine
- B calcium and fluorine
- C magnesium and chlorine
- D magnesium and fluorine

16 The diagram shows an experiment to electrolyse dilute sulfuric acid.



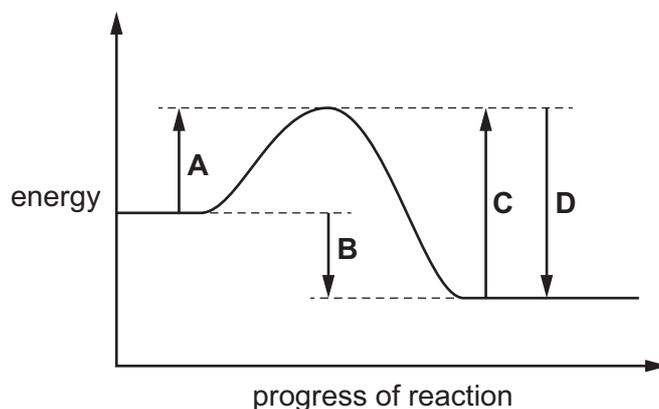
Which statement explains why bubbles form at the positive electrode?

- A Oxide ions lose electrons to form oxygen.
 - B Hydroxide ions lose electrons to form hydrogen.
 - C Hydroxide ions lose electrons to form oxygen and water.
 - D Hydrogen ions gain electrons to form hydrogen.
- 17 The reaction between aqueous lead(II) nitrate and dilute sulfuric acid produces insoluble lead(II) sulfate.

Which ions do **not** change state in this reaction?

- A NO_3^- and H^+
 - B NO_3^- and SO_4^{2-}
 - C Pb^{2+} and H^+
 - D Pb^{2+} and SO_4^{2-}
- 18 The energy level diagram for an exothermic reaction is shown.

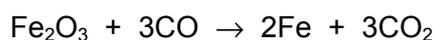
Which arrow represents the activation energy for this reaction?



19 Which statement explains the effect of temperature on the rate of a reaction?

- A At a higher temperature, more particles have sufficient energy to overcome the activation energy.
- B At a higher temperature, the particles collide less frequently.
- C At a lower temperature, the particles collide with more energy and so more bonds are broken.
- D At a lower temperature, the particles have a lower concentration.

20 The equation for one of the reactions that occurs in a blast furnace is shown.



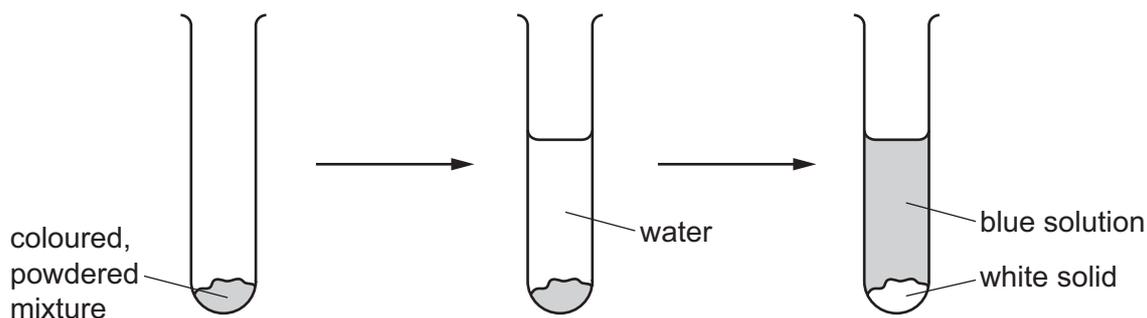
Which row identifies the oxidising agent in this reaction and explains its role as an oxidising agent?

| | oxidising agent | explanation |
|---|-----------------|---------------------------------------|
| A | carbon monoxide | causes iron(III) oxide to gain oxygen |
| B | carbon monoxide | causes iron(III) oxide to lose oxygen |
| C | iron(III) oxide | causes carbon monoxide to gain oxygen |
| D | iron(III) oxide | causes carbon monoxide to lose oxygen |

21 Which solid reacts with sulfuric acid to produce a gas?

- A copper
- B copper carbonate
- C copper oxide
- D copper sulfate

- 22 Some water is added to a coloured, powdered mixture. After shaking, a blue solution and a white solid are seen.



What does the powder contain?

- A sodium chloride and copper(II) oxide
 - B sodium chloride and copper(II) sulfate
 - C barium sulfate and copper(II) oxide
 - D barium sulfate and copper(II) sulfate
- 23 Which row describes a noble gas?

| | type of particle | reactivity |
|---|------------------|------------|
| A | diatomic | high |
| B | diatomic | low |
| C | monatomic | high |
| D | monatomic | low |

- 24 Why is potassium more reactive than sodium?

- A Potassium accepts electrons more readily than sodium.
- B Potassium forms positive ions more readily than sodium.
- C Sodium accepts electrons more readily than potassium.
- D Sodium forms positive ions more readily than potassium.

- 25 Which colour change is seen when water is added to anhydrous cobalt(II) chloride?

- A white to blue
- B pink to blue
- C blue to white
- D blue to pink

26 Which statements about air pollutants are correct?

- 1 Sulfur dioxide can damage buildings.
- 2 Oxides of nitrogen are harmful to health.
- 3 Carbon monoxide is a poisonous gas.
- 4 Carbon monoxide can damage buildings.

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

27 Which statement about the homologous series of alkenes is correct?

- A** They are all saturated hydrocarbons.
- B** They all have the same physical properties.
- C** Their molecules have the same ratio of carbon atoms to hydrogen atoms.
- D** They all have the same molecular formula.

28 A measuring cylinder on a balance contains 40 cm^3 of water. The reading on the balance is 30 g.

A stone is lowered into the water in the measuring cylinder until it is completely submerged.

The level of the water in the measuring cylinder is now at the 66 cm^3 mark. The density of the stone is 2.0 g/cm^3 .

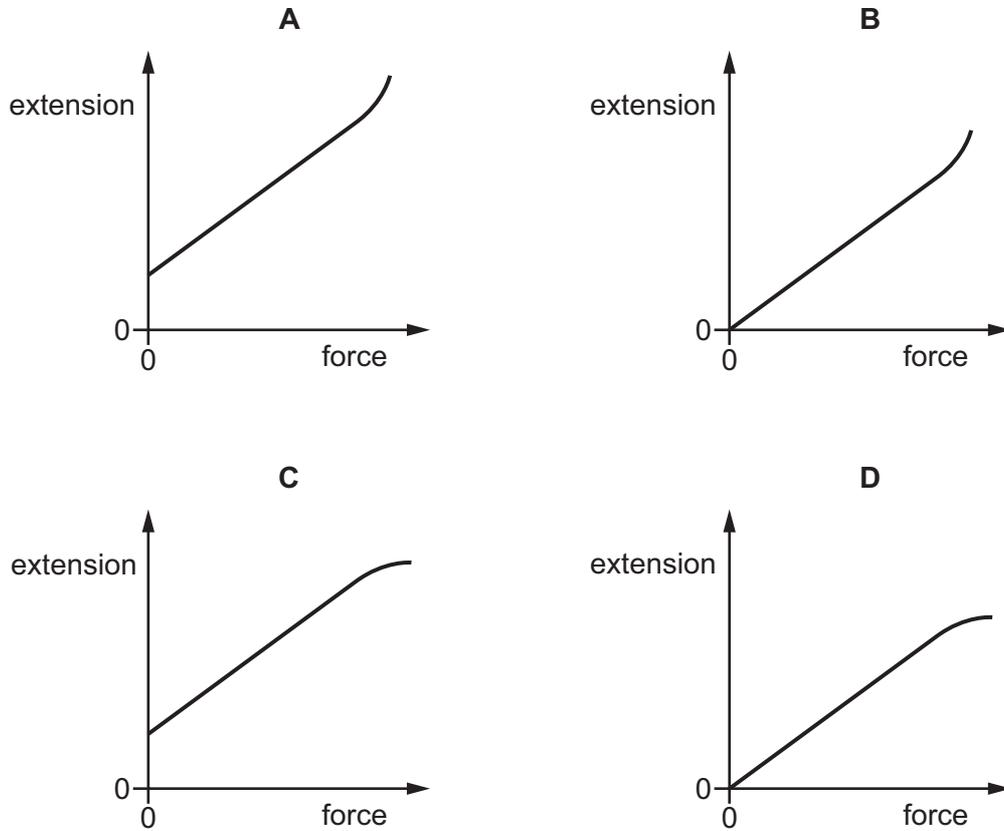
What is the reading on the balance now?

A 43 g **B** 52 g **C** 82 g **D** 162 g

29 The force acting on a spring is gradually increased from 0 N.

The spring eventually passes its limit of proportionality.

Which graph shows how the extension of the spring changes as the force increases?

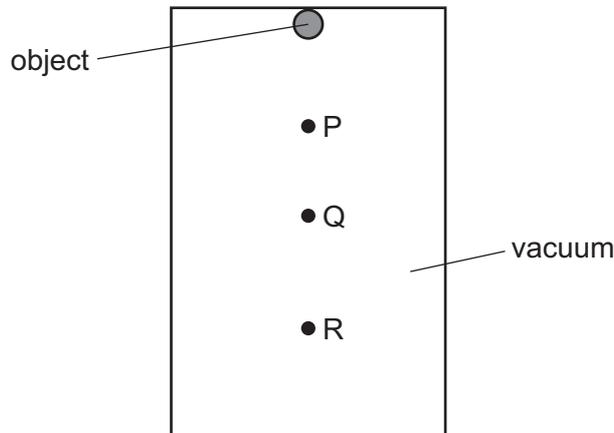


30 Which object has a resultant force acting on it?

- A a book at rest on a table
- B a car travelling up a hill in a straight line at constant speed
- C a football moving upwards freely after being kicked
- D a parachutist descending vertically at constant speed

31 An object is falling in a vacuum.

As the object falls, it passes through points P, Q and R.



Which statement describes the total quantity of energy of the object as it falls?

- A It is greatest at point P.
- B It is greatest at point Q.
- C It is greatest at point R.
- D It is the same at points P, Q and R.

32 Four students have different masses.

The students take different times to run the same distance up the same hill. The gravitational field strength is 10 N/kg .

Which student produces the greatest power?

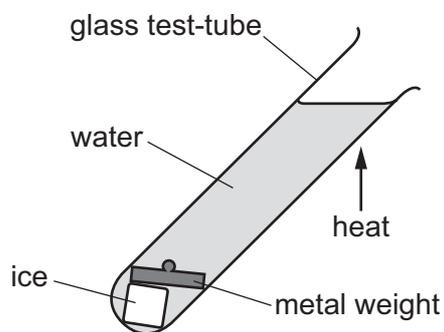
| | mass of student/kg | time taken /s |
|----------|--------------------|---------------|
| A | 50 | 11 |
| B | 55 | 11 |
| C | 60 | 16 |
| D | 85 | 16 |

33 Which type of power station produces greenhouse gases when generating electricity?

- A coal-fired
- B geothermal
- C hydroelectric
- D wind-powered

- 34 A glass test-tube contains cold water. The diagram shows a small block of ice trapped at the bottom of the test-tube by a metal weight.

The top of the test-tube is heated at the position shown. Very soon, the water at the top of the test-tube is boiling, but the ice at the bottom has just started to melt.



What does this experiment show about thermal conduction?

- A Conduction can only occur upwards.
 - B Conduction cannot occur in a liquid.
 - C Glass is a good thermal conductor.
 - D Water is a bad thermal conductor.
- 35 In which states of matter can convection occur?

| | in a solid | in a liquid | in a gas |
|----------|------------|-------------|----------|
| A | no | no | yes |
| B | no | yes | yes |
| C | yes | no | no |
| D | yes | yes | no |

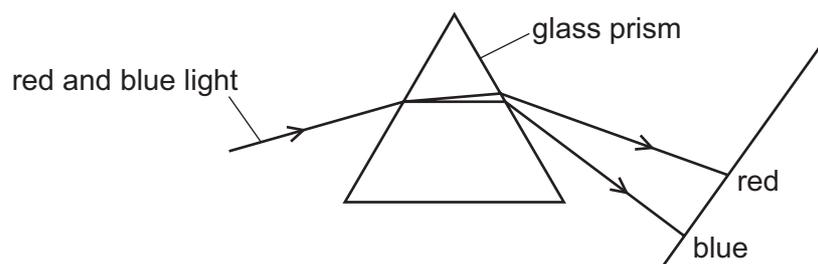
- 36 Visible light and sound are both waves.

Which row describes the nature of these waves?

| | visible light | sound |
|----------|---------------|--------------|
| A | longitudinal | longitudinal |
| B | longitudinal | transverse |
| C | transverse | longitudinal |
| D | transverse | transverse |

37 A beam that consists of red and blue light strikes a glass prism.

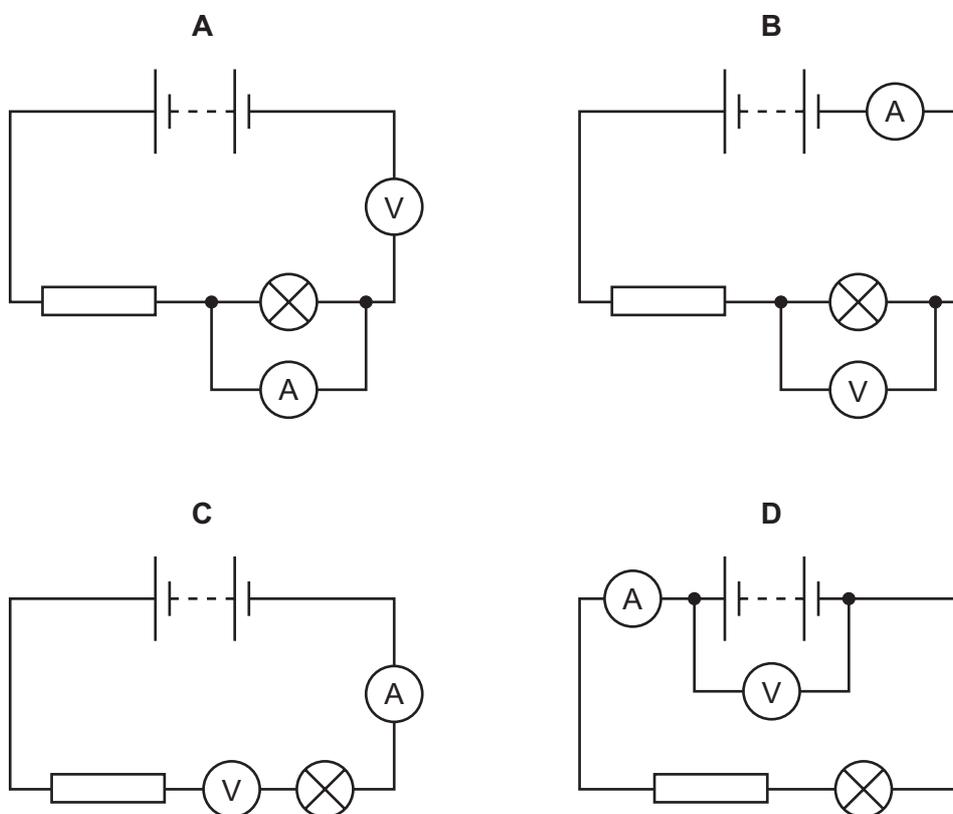
As the beam enters the prism, it splits into a red ray and a blue ray, as shown.



Which light refracts more and which light slows down more as it enters the prism?

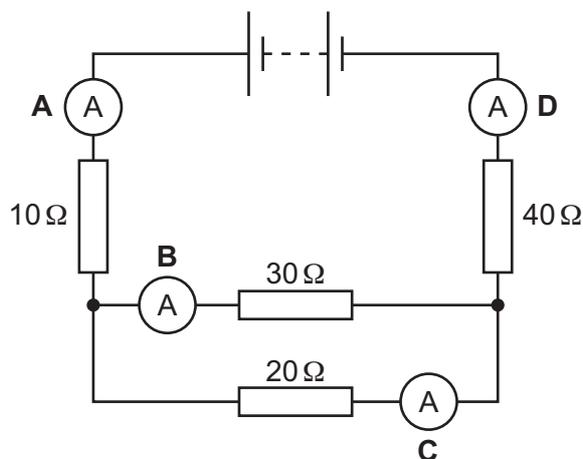
| | light that refracts more | light that slows down more |
|----------|--------------------------|----------------------------|
| A | blue | blue |
| B | blue | red |
| C | red | blue |
| D | red | red |

38 Which circuit is used to measure the current in a lamp and the potential difference (p.d.) across the lamp?



39 The diagram shows a circuit containing four resistors and four ammeters.

Which ammeter has the smallest reading?



40 When a computer is switched on, the current increases quickly to 3.1 A and then decreases slowly to a steady value of 1.0 A when the computer is in use.

The cable connecting the computer to the power supply can safely carry a current of 10.0 A.

The circuit contains a fuse.

Which fuse rating is used to provide suitable protection?

- A** 1 A **B** 3 A **C** 5 A **D** 13 A

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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 | 11 Na sodium 23 | 12 Mg magnesium 24 | <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | | | | |
| 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 — | 113 Nh nihonium — | 114 Fl flerovium — | 115 Mc moscovium — | 116 Lv livermorium — | 117 Ts tennessine — | 118 Og oganesson — |

| | | | | | | | | | | | | | | | |
|-------------|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| 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.).