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Cambridge Assessment International Education

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

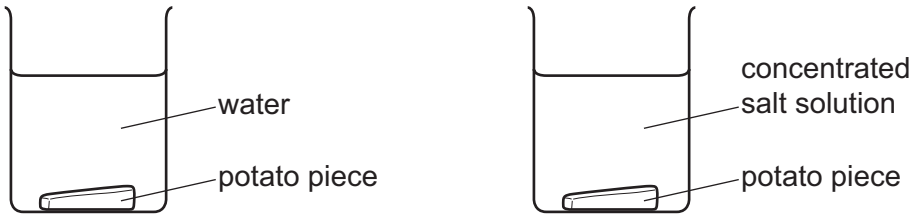
- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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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

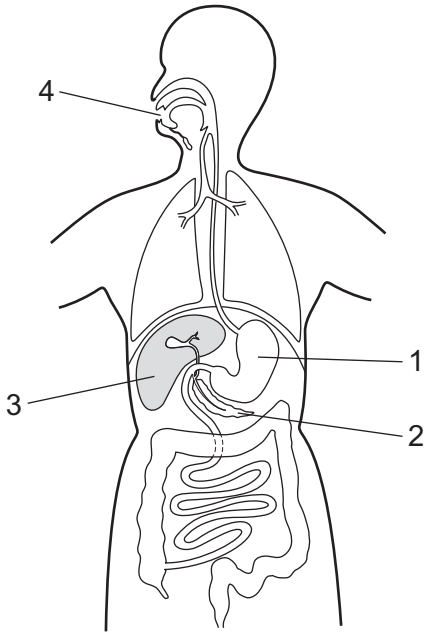
C fibre and vitamin D

D vitamin D and calcium

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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.

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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 of .....1..... . It targets vital organs, increases .....2..... which increases the delivery of oxygen and .....3..... 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

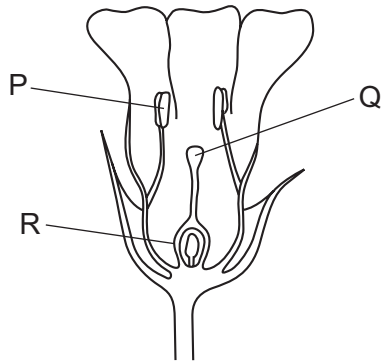
B auxin

C water

D protease

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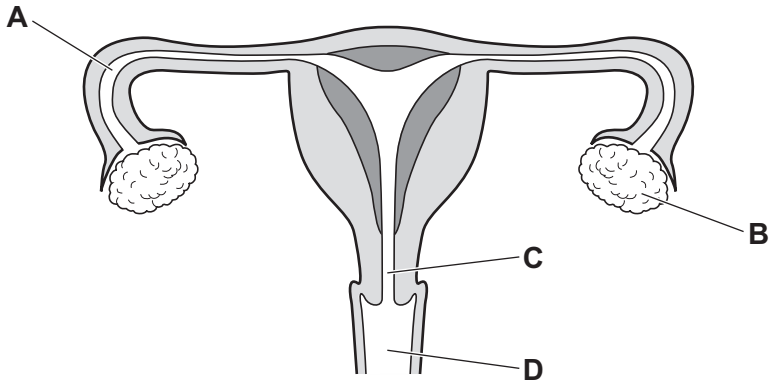
10 The diagram shows a section through a flower.



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?

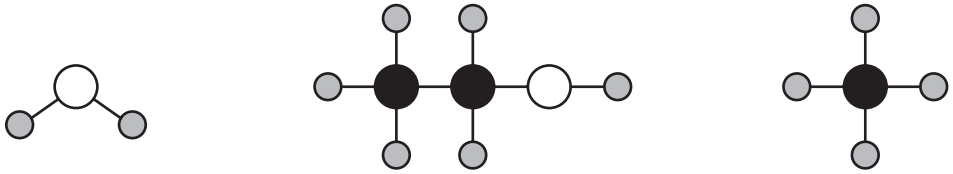
A There is a decrease in the decomposition of producers.

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

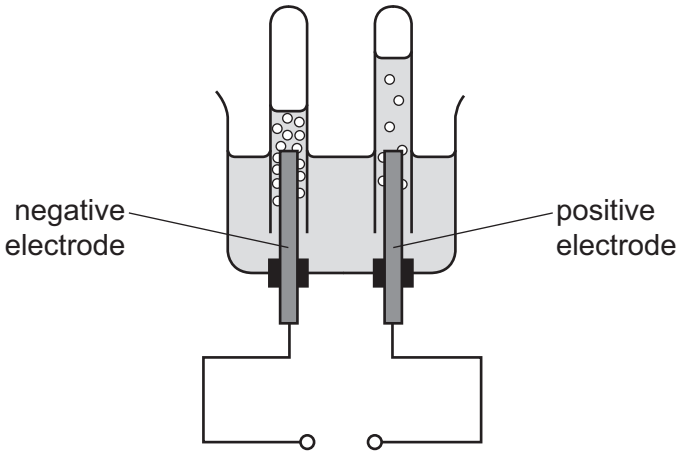
B calcium and fluorine

C magnesium and chlorine

D magnesium and fluorine

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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^+

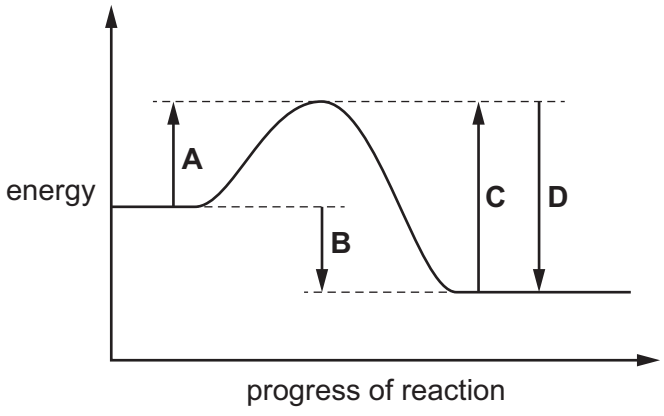
B NO_3^- and SO_4^{2-}

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?



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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.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

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

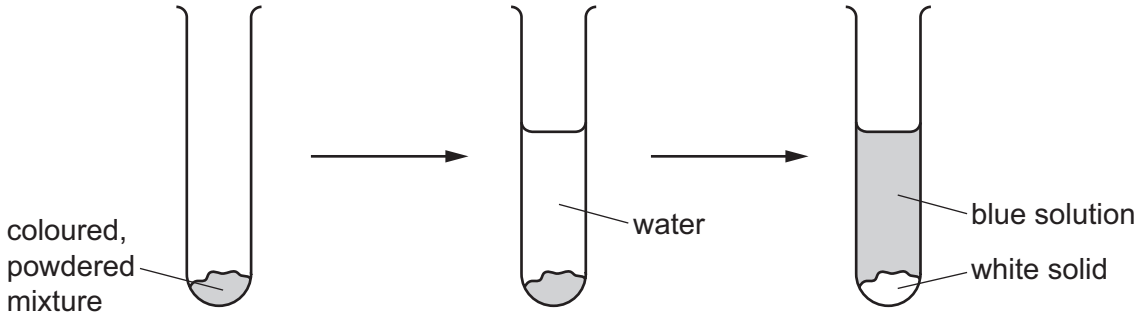
C copper oxide

D copper sulfate

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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

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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

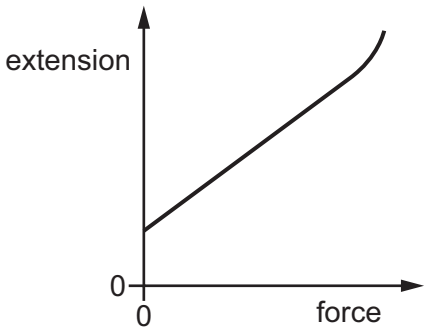
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29 The force acting on a spring is gradually increased from 0 N.

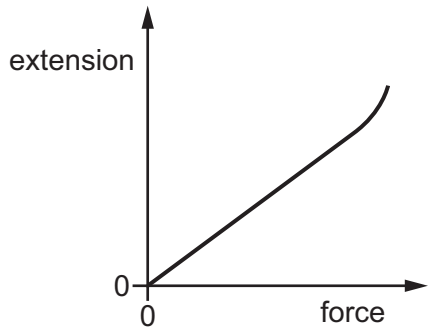
The spring eventually passes its limit of proportionality.

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

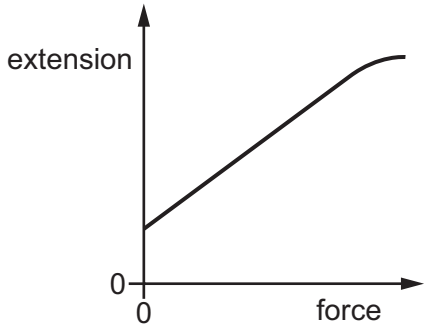
A



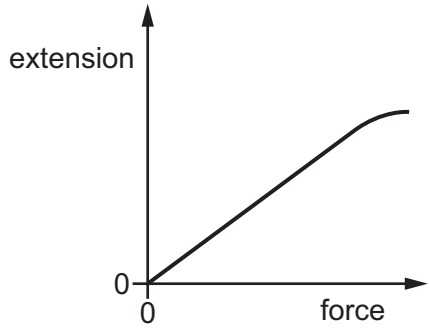
B



C



D



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

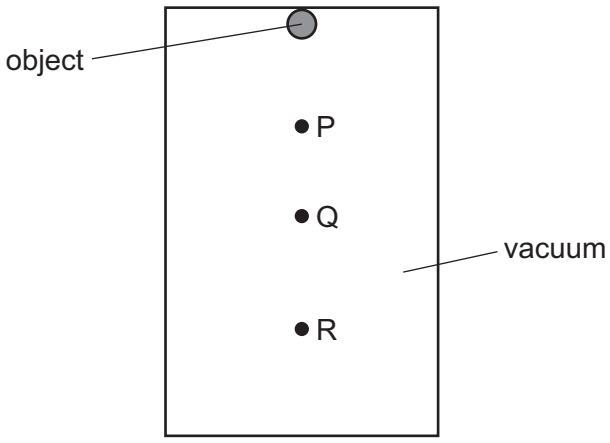
C a football moving upwards freely after being kicked

D a parachutist descending vertically at constant speed

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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

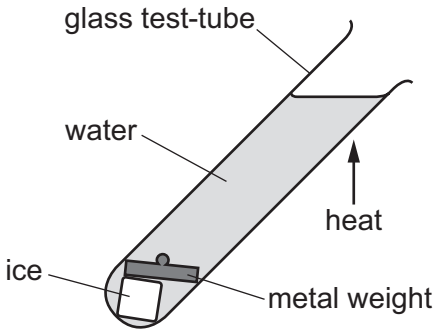
D wind-powered

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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

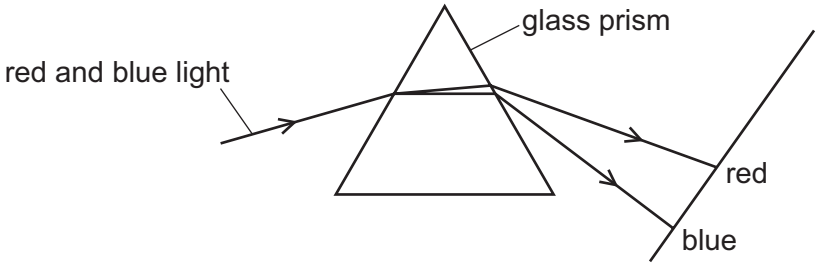
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37 A beam that consists of red and blue light strikes a glass prism.

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

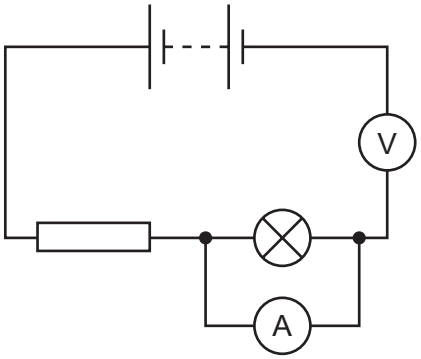


Which light refracts more and which light slows down more as it enters the prism?

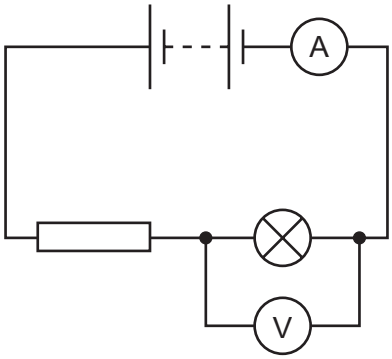
	light that refracts more	light that slows down more
A	blue	blue
B	blue	red
C	red	blue
D	red	red

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

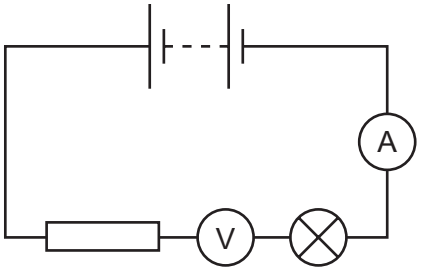
A



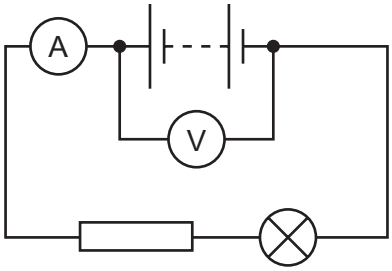
B



C



D

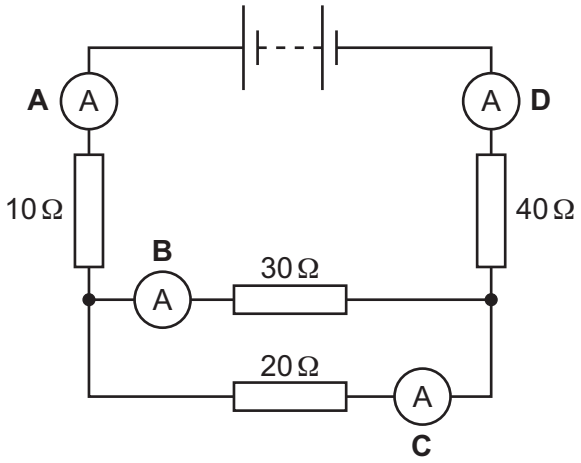


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39 The diagram shows a circuit containing four resistors and four ammeters.

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
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
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 –

Key

atomic number
atomic symbol
name
relative atomic mass

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 dm^3 at room temperature and pressure (r.t.p.).

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