



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.

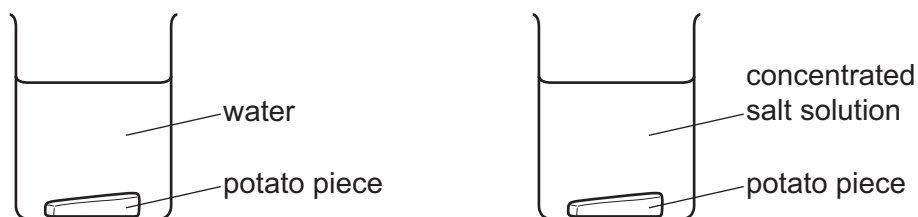
INFORMATION

- 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.

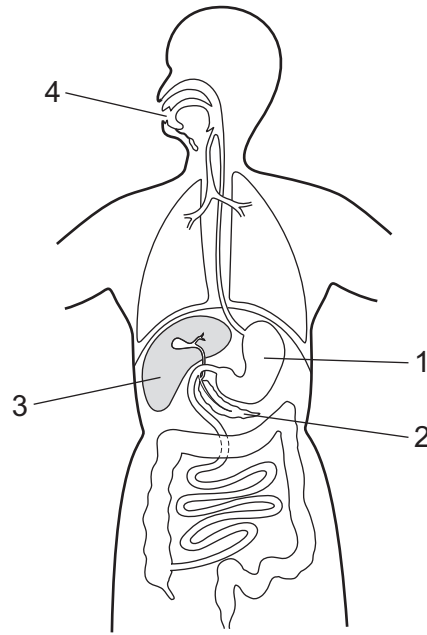
The mass of each piece of potato is then measured again.

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'.

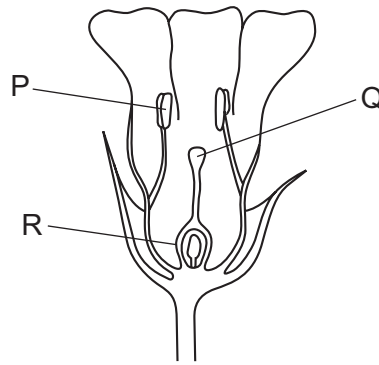
Which words complete gaps 1, 2 and 3?

	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

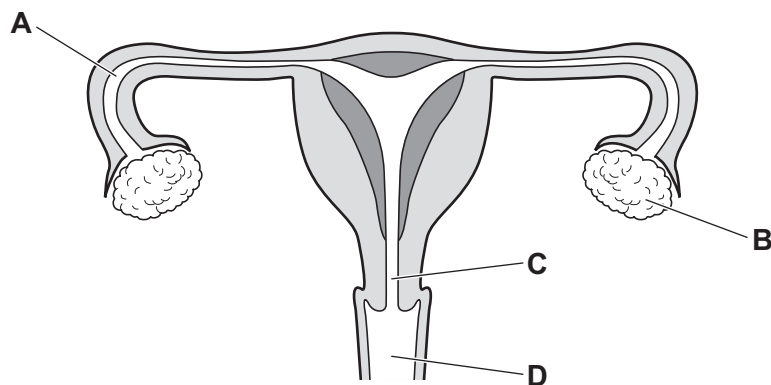
10 The diagram shows a section through a flower.



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?

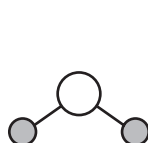
- A** ecosystem
- B** food web
- C** habitat
- D** trophic level

- 13** The concentration of nitrate ions in a lake increases.

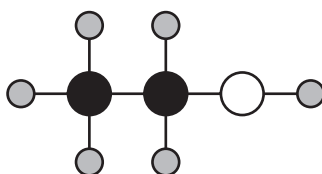
Why does this result in a decrease in the number of fish in the lake?

- 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.

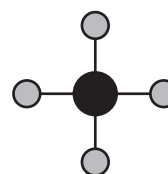
- 14** The structures of three molecules are shown.



water



ethanol



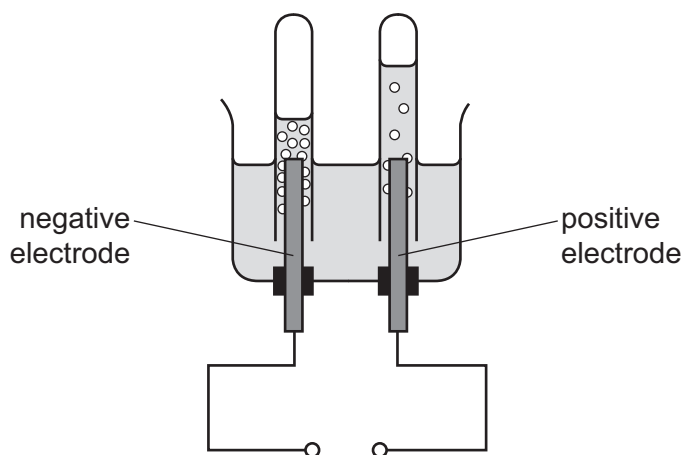
methane

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.



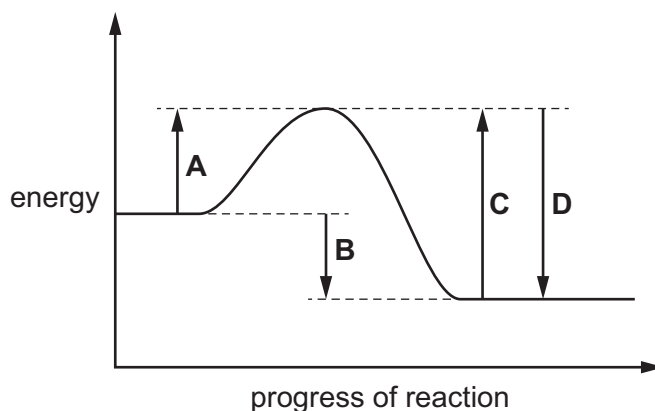
Which statement explains why bubbles form at the positive electrode?

- 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.

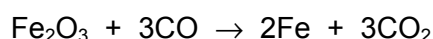
Which arrow represents the activation energy for this reaction?



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.



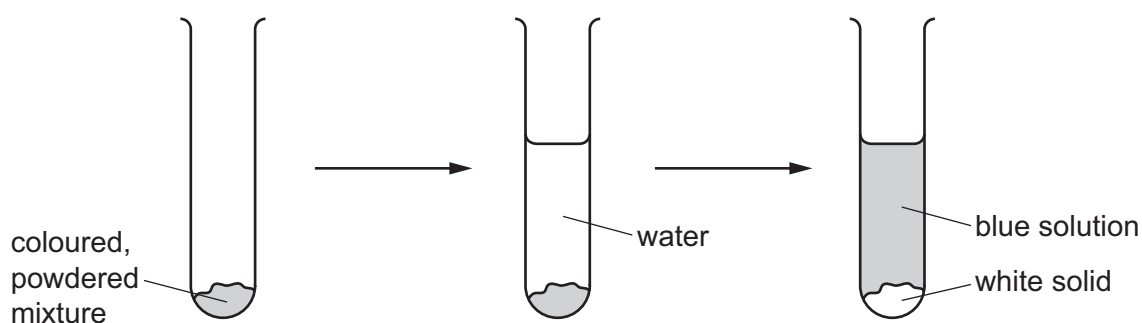
Which row identifies the oxidising agent in this reaction and explains its role as an oxidising agent?

	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 .

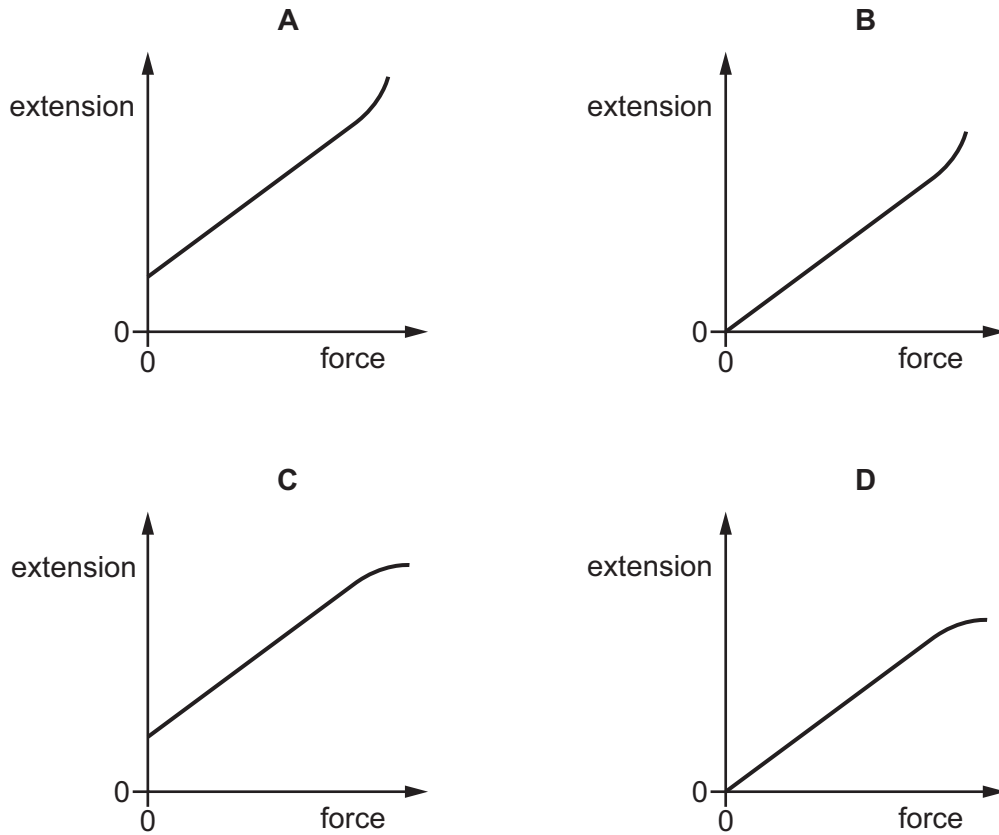
What is the reading on the balance now?

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?

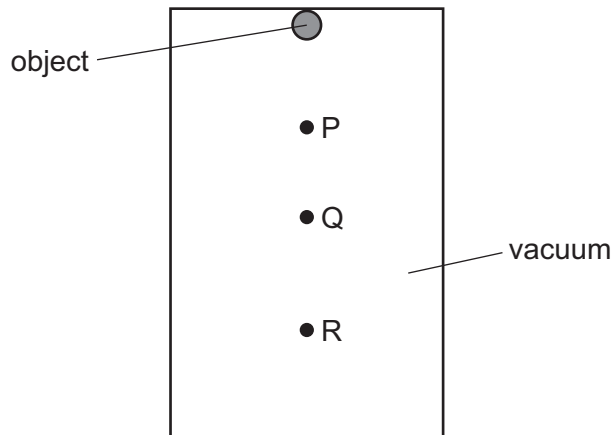


- 30** Which object has a resultant force acting on it?

- 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?

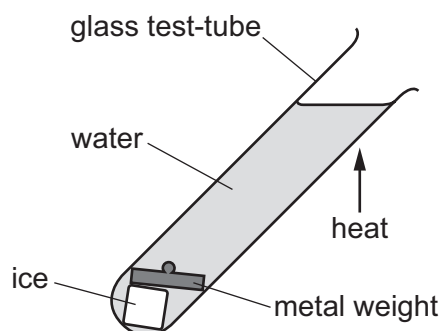
	mass of student / kg	time taken / s
A	50	11
B	55	11
C	60	16
D	85	16

- 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

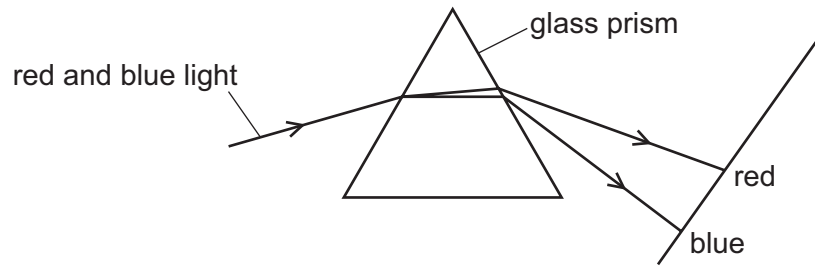
- 36** Visible light and sound are both waves.

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.

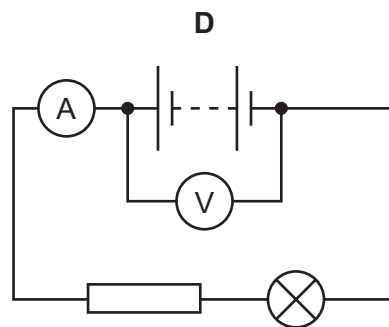
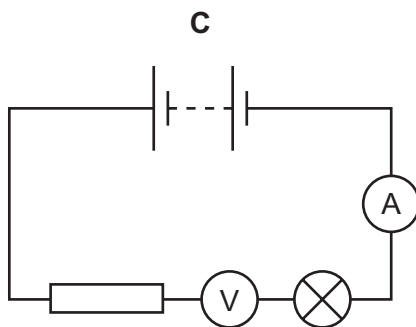
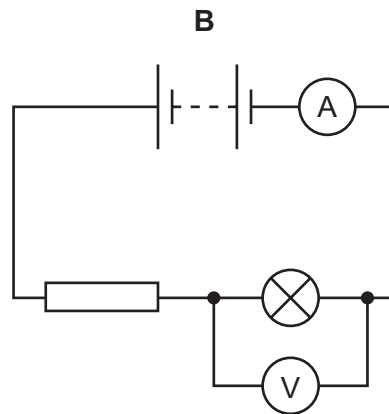
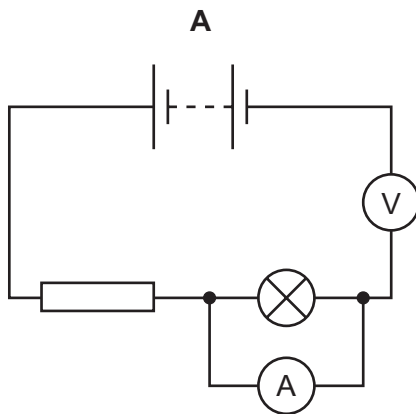
As the beam enters the prism, it splits into a red ray and a blue ray, as shown.



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

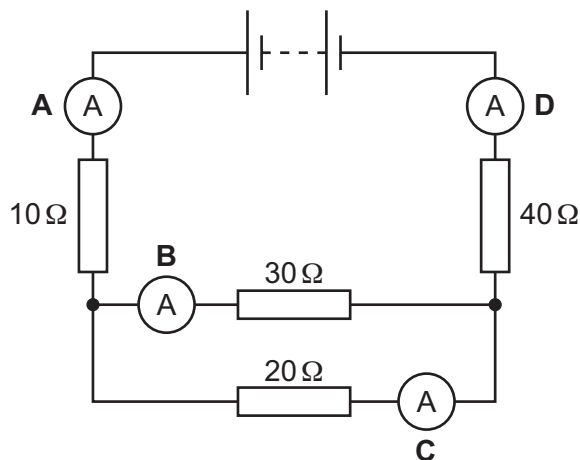
	light that refracts more	light that slows down more
A	blue	blue
B	blue	red
C	red	blue
D	red	red

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	
1Hhydrogen1 Key atomic number atomic symbol name relative atomic mass																		
3Li lithium 7	4Be beryllium 9																	
11Na sodium 23	12Mg magnesium 24	13Al aluminium 27	14Si silicon 28	15P phosphorus 31	16S sulfur 32	17Cl chlorine 35.5	18Ar argon 40											
19K potassium 39	20Ca calcium 40	21Sc scandium 45	22Ti titanium 48	23V vanadium 51	24Cr chromium 52	25Mn manganese 55	26Fe iron 56	27Co cobalt 59	28Ni nickel 59	29Cu copper 64	30Zn zinc 65	31Ga gallium 70	32Ge germanium 73	33As arsenic 75	34Se selenium 79	35Br bromine 80	36Kr krypton 84	
37Rb rubidium 85	38Sr strontium 88	39Y yttrium 89	40Zr zirconium 91	41Nb niobium 93	42Mo molybdenum 96	43Tc technetium —	44Ru ruthenium 101	45Rh rhodium 103	46Pd palladium 106	47Ag silver 108	48Cd cadmium 112	49In indium 115	50Sn tin 119	51Sb antimony 122	52Te tellurium 128	53I iodine 127	54Xe xenon 131	
55Cs caesium 133	56Ba barium 137	57–71 lanthanoids		72Hf hafnium 178	73Ta tantalum 181	74W tungsten 184	75Re rhenium 186	76Os osmium 190	77Ir iridium 192	78Pt platinum 195	79Au gold 197	80Hg mercury 201	81Tl thallium 204	82Pb lead 207	83Bi bismuth 209	84Po polonium —	85At astatine —	86Rn radon —
87Fr francium —	88Ra radium —	89–103 actinoids		104Rf rutherfordium —	105Db dubnium —	106Sg seaborgium —	107Bh bohrium —	108Hs hassium —	109Mt meitnerium —	110Ds darmstadtium —	111Rg roentgenium —	112Cn copernicium —	113Nh nihonium —	114Fl flerovium —	115Mc moscovium —	116Lv livermorium —	117Ts tennessine —	118Og oganeson —

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
	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.).