



COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

October/November 2019

45 minutes

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

* 0 7 1 3 6 0 1 9 0 5 *

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 A biologist keeps a potted plant in a laboratory.

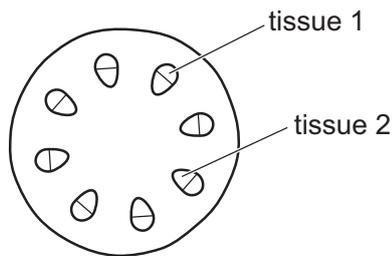
Which feature of the potted plant shows that it is a living organism?

- A It grows larger over time.
- B It has green leaves.
- C The compost in the pot dries after he waters it.
- D The stems contain xylem.

2 Which statement about human gametes is correct?

- A Egg cells are much smaller than sperm cells.
- B Egg cells are produced in larger numbers than sperm cells.
- C Egg cells have a jelly coating that changes after fertilisation.
- D The flagellum is an adaptive feature of an egg cell.

3 The diagram shows a cross section of a stem.



Which row shows the correct names and functions of the tissues?

| | tissue 1 | | tissue 2 | |
|----------|----------|----------------|----------|-----------------------|
| | name | function | name | function |
| A | phloem | support only | phloem | transport only |
| B | phloem | transport only | xylem | support and transport |
| C | xylem | transport only | phloem | support and transport |
| D | xylem | support only | xylem | transport only |

- 4 1 cm³ of substance **X** is added to 10 cm³ starch suspension and mixed. Food tests are carried out immediately after mixing and again after an hour.

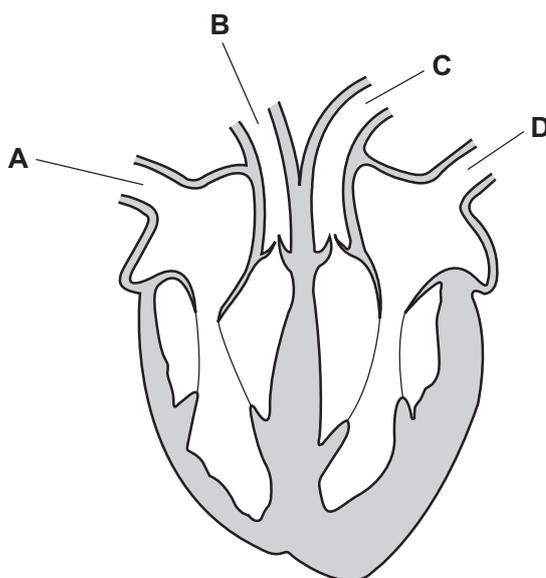
The results of the tests are shown in the table.

| test reagent | colour of solution after mixing | colour of solution after one hour |
|---------------------|---------------------------------|-----------------------------------|
| Benedict's solution | blue | orange |
| iodine solution | blue/black | brown |

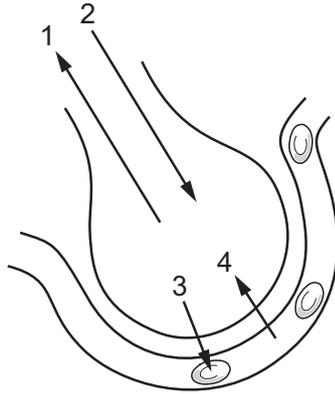
What is substance **X**?

- A amylase
 - B protease
 - C lipase
 - D sugar
- 5 The diagram represents the human heart and four blood vessels.

Which blood vessel contains blood at the highest pressure?



- 6 The diagram shows an alveolus and a blood capillary.



Which two arrows represent gas exchange by diffusion only?

- A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4
- 7 Which statement about aerobic respiration is correct?
- A It exchanges gases through the walls of the alveoli.
 B It expels carbon dioxide from the lungs.
 C It only produces carbon dioxide and energy.
 D It uses oxygen to release energy from glucose.

- 8 Nitrates in the soil are taken up by the roots of a plant.

What are the nitrates used to make?

- A fat
 B glucose
 C protein
 D starch
- 9 Which statement about sexual reproduction is **always** correct?
- A It involves only one parent.
 B It involves the fusion of nuclei.
 C It produces genetically identical offspring.
 D It takes place only in animals.

10 Which row gives the most suitable characteristics of a wind-pollinated flower?

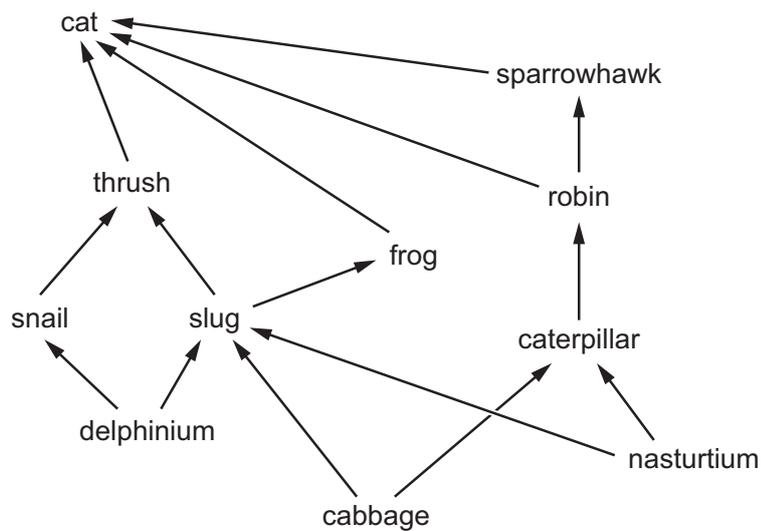
| | pollen grains | anthers | stigma |
|----------|---------------|---------|--------|
| A | smooth | few | small |
| B | smooth | many | large |
| C | sticky | few | large |
| D | sticky | many | small |

11 A developing fetus is connected to its mother by an umbilical cord and placenta.

What is the function of the placenta?

- A** to allow the mixing of the mother's blood with the blood of the fetus
- B** to exchange nutrients and waste
- C** to keep the fetus warm
- D** to stop the fetus from moving

12 The diagram shows a food web.



How could the frog be classed?

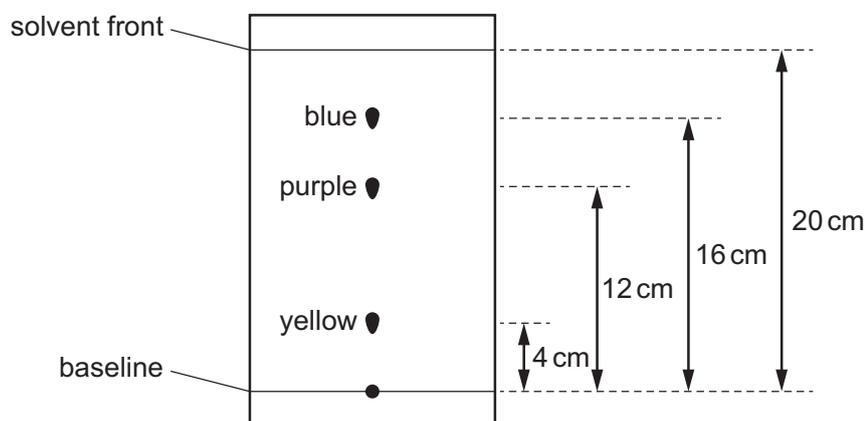
- A** second trophic level and secondary consumer
- B** second trophic level and tertiary consumer
- C** third trophic level and secondary consumer
- D** third trophic level and tertiary consumer

- 13 The table shows the possible effects of two processes on the concentration of two gases in the atmosphere.

| | process | concentration of gases in atmosphere | |
|---|----------------------------|--------------------------------------|----------|
| | | carbon dioxide | oxygen |
| 1 | combustion of fossil fuels | decrease | increase |
| 2 | combustion of fossil fuels | increase | decrease |
| 3 | deforestation | decrease | increase |
| 4 | deforestation | increase | decrease |

Which rows show the effects of deforestation and combustion of fossil fuels on the concentration of carbon dioxide and oxygen in the atmosphere?

- A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4
- 14 The chromatogram of a black ink containing three dyes is shown.



What is the R_f value of the purple ink?

- A 0.2 B 0.4 C 0.6 D 1.67
- 15 A white solid X is formed when magnesium reacts with oxygen.

What is X?

- A a compound
 B a mixture
 C an alloy
 D an element

16 The fertiliser ammonium sulfate has the formula $(\text{NH}_4)_2\text{SO}_4$.

How many atoms of each element are present in the formula?

| | number of hydrogen atoms | number of nitrogen atoms | number of oxygen atoms | number of sulfur atoms |
|----------|--------------------------|--------------------------|------------------------|------------------------|
| A | 4 | 1 | 1 | 1 |
| B | 4 | 2 | 4 | 1 |
| C | 8 | 1 | 4 | 1 |
| D | 8 | 2 | 4 | 1 |

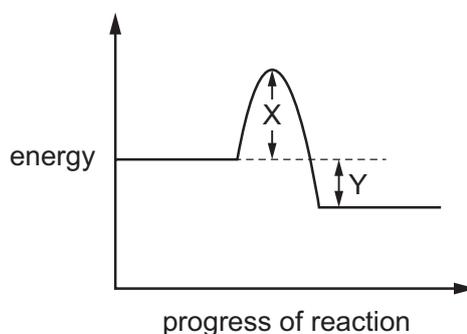
17 Element X is a non-metal used in the treatment of the water supply.

It is made during the electrolysis of a metal salt.

What is the colour of X and at which electrode is it made?

| | colour | electrode |
|----------|--------------|-----------|
| A | red | anode |
| B | red | cathode |
| C | yellow-green | anode |
| D | yellow-green | cathode |

18 The energy level diagram for a reaction is shown.



Which statement is correct?

- A** X is the energy change of the reaction.
- B** Y is the activation energy of the reaction.
- C** The energy change of the reaction is larger than the activation energy of the reaction.
- D** The reaction is exothermic.

19 Dilute hydrochloric acid reacts with excess calcium carbonate.

The amount of carbon dioxide made in one minute is recorded.

The experiment is repeated using the same volume of more concentrated hydrochloric acid.

How does the volume of carbon dioxide collected in one minute and the frequency of collisions of reacting particles change?

| | volume of carbon dioxide | frequency of collisions |
|----------|--------------------------|-------------------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

20 Copper sulfate is a soluble salt.

How are pure crystals of copper sulfate prepared?

- A** Mix copper chloride solution with sodium sulfate solution, filter, rinse and dry.
- B** React copper oxide with excess dilute sulfuric acid, evaporate, cool, filter, rinse and dry.
- C** React excess copper carbonate, with dilute sulfuric acid, filter, evaporate, cool, filter, rinse and dry.
- D** React excess copper with dilute sulfuric acid, filter, evaporate, cool, filter, rinse and dry.

21 Which row describes the reactivity and the electronic structure of a noble gas?

| | reactivity | electronic structure |
|----------|------------|------------------------|
| A | reactive | full outer shell |
| B | reactive | incomplete outer shell |
| C | unreactive | incomplete outer shell |
| D | unreactive | full outer shell |

22 Which statement about alloys is correct?

- A** They are made from metals because metals are poor electrical conductors.
- B** They are mixtures of compounds that contain metals.
- C** They have all the same properties as the metals from which they are made.
- D** They have different properties to the metals from which they are made.

- 23** Which statement about the extraction of iron in a blast furnace is **not** correct?
- A** Carbon dioxide reduces iron oxide.
B Carbon monoxide is oxidised by iron oxide.
C Carbon reduces carbon dioxide.
D The high temperatures required are produced by reacting carbon with oxygen.
- 24** What is the composition of clean air?
- A** 78% nitrogen, 21% carbon dioxide and small amounts of other gases
B 78% nitrogen, 21% oxygen and small amounts of other gases
C 78% oxygen, 21% carbon dioxide and small amounts of other gases
D 78% oxygen, 21% nitrogen and small amounts of other gases
- 25** Which two gases cause an enhanced greenhouse effect when their concentrations in the atmosphere increase?
- A** carbon monoxide and carbon dioxide
B carbon dioxide and methane
C methane and sulfur dioxide
D sulfur dioxide and carbon monoxide
- 26** Gasoline is one fraction obtained from petroleum.

Which row describes the boiling point of the compounds and the molecules in this fraction?

| | boiling point | molecules |
|----------|------------------------------------|--|
| A | they have different boiling points | they contain different numbers of carbon atoms |
| B | they have different boiling points | they contain the same number of carbon atoms |
| C | they have the same boiling point | they contain different numbers of carbon atoms |
| D | they have the same boiling point | they contain the same number of carbon atoms |

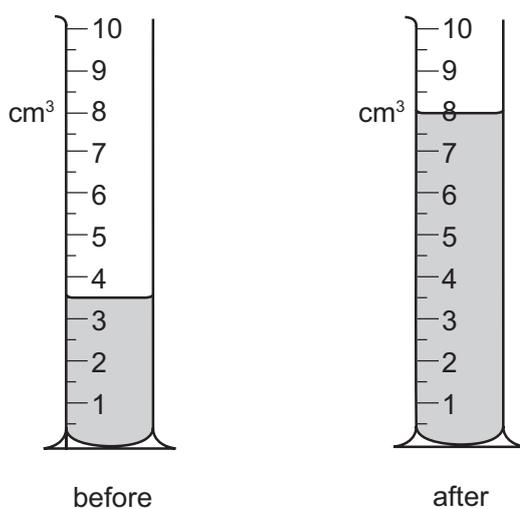
27 Which hydrocarbons belong to the same homologous series?

- A C_2H_2 , C_2H_4 , C_2H_6
- B CH_4 , C_2H_4 , C_3H_4
- C C_2H_4 , C_3H_6 , C_4H_8
- D C_2H_4 , C_3H_8 , C_4H_{10}

28 A measuring cylinder contains liquid.

More liquid is now poured into the measuring cylinder.

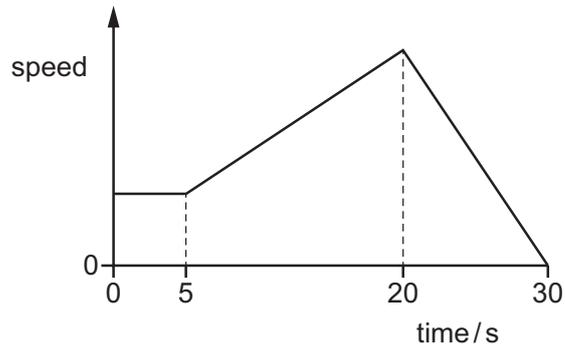
The diagrams show the measuring cylinder before and after the liquid is poured into it.



What volume of liquid is **poured** into the measuring cylinder?

- A 3.5 cm^3
- B 4.0 cm^3
- C 4.5 cm^3
- D 8.0 cm^3

- 29 The graph shows how the speed of a car changes with time. The car travels at constant speed, then accelerates, and finally brakes to a stop.



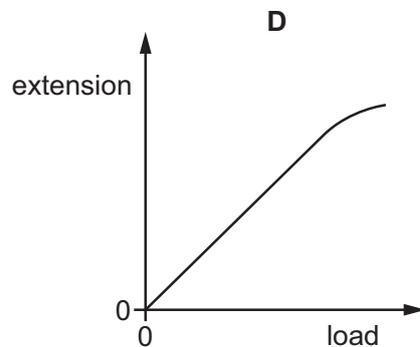
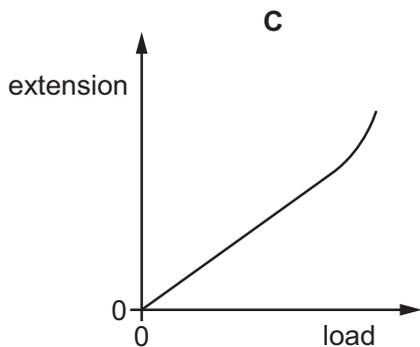
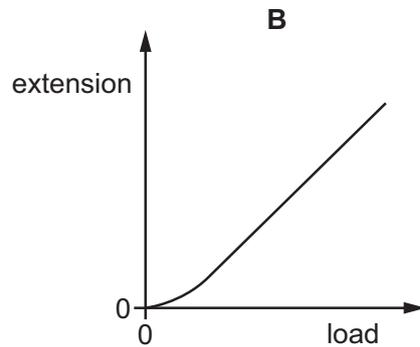
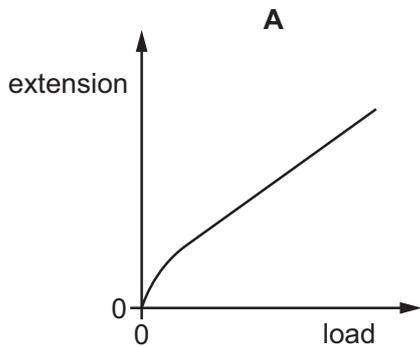
The car travels 60 m while it brakes to a stop.

What is the average speed of the car while it is braking?

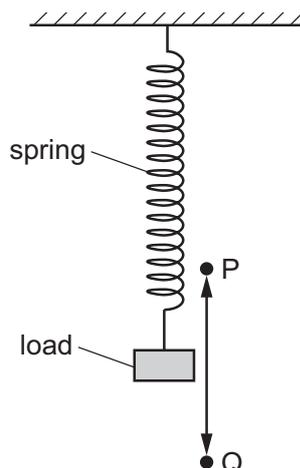
- A 3.0 m/s B 4.0 m/s C 6.0 m/s D 12 m/s
- 30 A spring obeys Hooke's law until it reaches its limit of proportionality.

A load is hung from the spring. The load is gradually increased and the spring is stretched beyond its limit of proportionality.

Which is the extension-load graph for the spring?



31 The diagram shows a load attached to a spring.



The load is pulled down and then released so that it oscillates between point P (highest point) and point Q (lowest point).

Which form of energy does the load have at point P?

- A gravitational potential energy only
- B kinetic energy only
- C kinetic energy and gravitational potential energy
- D neither kinetic energy nor gravitational potential energy

32 Liquids consist of molecules that are constantly moving.

Which row describes the motion of the molecules in a liquid and compares the forces between them to the forces between molecules in a gas?

| | motion of molecules | forces between molecules |
|---|---------------------------------|--------------------------|
| A | random | stronger than in a gas |
| B | random | weaker than in a gas |
| C | vibrating about fixed positions | stronger than in a gas |
| D | vibrating about fixed positions | weaker than in a gas |

33 A circular bowl in a room contains water.

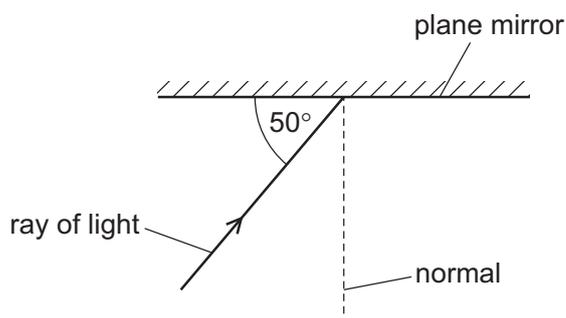
Which two factors both ensure that the smallest quantity of water evaporates in a day?

| | temperature of room | diameter of bowl |
|----------|---------------------|------------------|
| A | high | large |
| B | high | small |
| C | low | large |
| D | low | small |

34 In which process is thermal energy transferred by molecular vibrations?

- A** conduction
- B** convection
- C** evaporation
- D** radiation

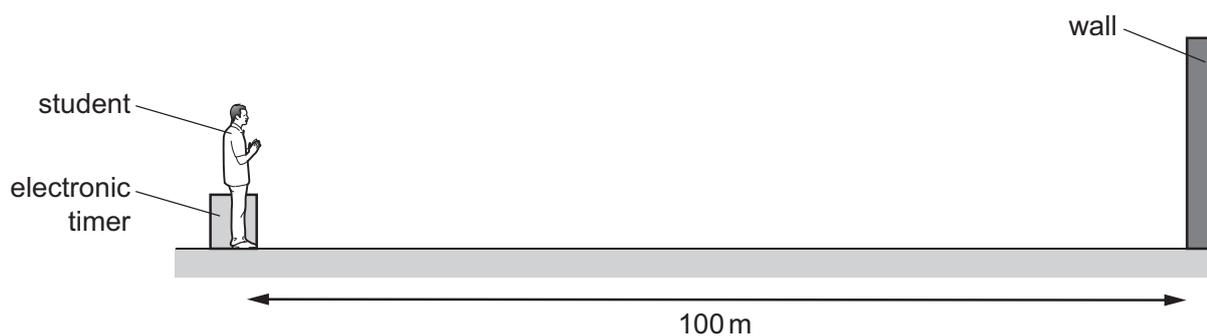
35 The diagram shows light striking a plane mirror.



What is the angle of reflection of the ray when it is reflected from the mirror?

- A** 40°
- B** 50°
- C** 80°
- D** 100°

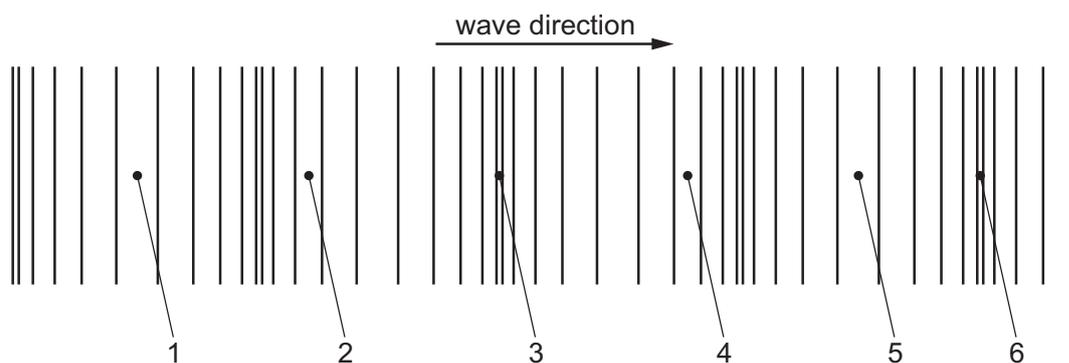
- 36 A student measures the speed of sound. He claps his hands and the sound reflects from a wall that is 100 m away from him.



An electronic timer next to the student detects the echo of the sound 0.60 s after it is made.

Which calculation gives the speed of sound?

- A $\frac{200}{0.30}$ m/s B $\frac{200}{0.60}$ m/s C $\frac{100}{0.60}$ m/s D $\frac{100}{1.2}$ m/s
- 37 The diagram represents a sound wave travelling in air.



Which numbered points are at the centre of a compression and which numbered points are at the centre of a rarefaction?

| | centre of a compression | centre of a rarefaction |
|----------|-------------------------|-------------------------|
| A | 1 and 5 | 2 and 4 |
| B | 1 and 5 | 3 and 6 |
| C | 3 and 6 | 1 and 5 |
| D | 3 and 6 | 2 and 4 |

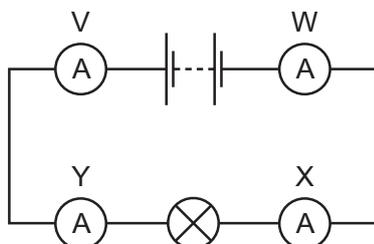
38 A piece of wire has a resistance of $8.0\ \Omega$.

The length of the wire is doubled and the diameter of the wire is halved.

What is the new resistance of the wire?

- A $2.0\ \Omega$ B $4.0\ \Omega$ C $8.0\ \Omega$ D $64\ \Omega$

39 Four ammeters V, W, X and Y are connected in the circuit shown.



Which ammeters have the same reading as each other?

- A V and W only
 B V and Y only
 C X and Y only
 D V, W, X and Y

40 There is a current I in a lamp. The potential difference across the lamp is V and the power produced by the lamp is P .

In a second lamp, the current is $2I$ and the potential difference across it is $\frac{V}{2}$.

What is the power produced by this other lamp?

- A $\frac{P}{4}$ B $\frac{P}{2}$ C P D $2P$

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | | |
|----------------------------|-----------------------------|--|---------------------------------|---------------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|---------------------------|
| I | II | III | IV | V | VI | VII | VIII | | | | | | | | | | |
| | | 1 H hydrogen 1 | | | | | | | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | | | | | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulphur 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 — | 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.).