Cambridge IGCSE

**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

**PHYSICAL SCIENCE** **0652/22**

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)



**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 **15** printed pages and **1** blank page.




Cambridge Assessment International Education

[Turn over

**1** Carbon dioxide is a solid at temperatures below –78 °C.

What is **not** a property of solid carbon dioxide?

**A** It has a fixed shape.

**B** It is incompressible.

**C** Its particles are very close together.

**D** Its particles slide past each other.

**2** Which process is used to separate the components of petroleum?

**A** chromatography

**B** crystallisation

**C** filtration

**D** fractional distillation

**3** Magnesium oxide is a compound formed from a metal and a non-metal.

Which statement describes the bonding in magnesium oxide?

**A** Magnesium and oxygen atoms share their outer shell electrons.

**B** Magnesium atoms gain electrons and oxygen atoms lose electrons.

**C** Magnesium atoms lose electrons and oxygen atoms gain electrons.

**D** The magnesium atoms and oxygen atoms both gain electrons.

**4** Diamond and graphite are both forms of the element carbon.

They have macromolecular structures.

Some properties are listed.

1 high melting point

2 each carbon forms four covalent bonds

3 conducts electricity

4 hard

Which of these are the properties of diamond?

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

**5** Chromium(III) sulfate is made of chromium(III) ions, $Cr^{3+}$, and sulfate ions, $SO_4^{2-}$.

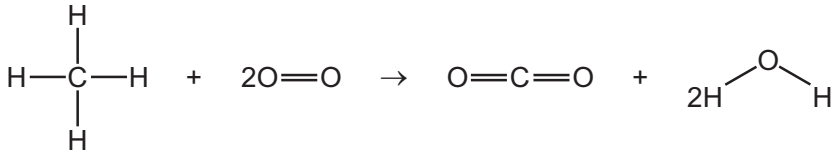
What is the formula of chromium(III) sulfate?

**A** $CrSO_4$ **B** $Cr_2(SO_4)_3$ **C** $Cr_3SO_4$ **D** $Cr_3(SO_4)_2$

**6** What is the relative formula mass, $M_r$, of aluminium oxide $Al_2O_3$?

**A** 43 **B** 50 **C** 102 **D** 113

**7** Methane reacts with oxygen to form carbon dioxide and water. Heat is given out during the reaction.



Which row identifies the number of bonds that are broken and the type of process when the bonds are broken?

| | bonds broken | type of process when the bonds are broken |
|---|---|---|
| **A** | 2C=O and 4O–H | endothermic |
| **B** | 2C=O and 4O–H | exothermic |
| **C** | 4C–H and 2O=O | endothermic |
| **D** | 4C–H and 2O=O | exothermic |

**8** The equation for the reaction of magnesium with copper(II) oxide is shown.

$$CuO + Mg \rightarrow MgO + Cu$$

Which statement is correct?

**A** Copper(II) oxide is oxidised.

**B** Copper(II) oxide is reduced.

**C** Magnesium oxide is oxidised.

**D** Magnesium oxide is reduced.





[Turn over

**9** Which row describes metallic and non-metallic oxides?

| | metallic oxides | non-metallic oxides |
|---|---|---|
| **A** | acidic | basic |
| **B** | amphoteric or basic | acidic or neutral |
| **C** | amphoteric only | acidic only |
| **D** | basic only | acidic only |

**10** How are elements with one electron in their outer shell described?

**A** Group I metals

**B** Group I non-metals

**C** Group VII metals

**D** Group VII non-metals

**11** Lithium has a lower density than sodium. Sodium is more reactive than lithium.

Which sentence predicts the properties of the Group I element, rubidium?

**A** It is less dense and less reactive than sodium.

**B** It is less dense and more reactive than sodium.

**C** It is more dense and less reactive than sodium.

**D** It is more dense and more reactive than sodium.

**12** Which element is mixed with copper to make brass?

**A** argon

**B** carbon

**C** iodine

**D** zinc

**13** An element, Y, reacts with aqueous copper sulfate and copper is produced.

The same element does not react with aqueous zinc sulfate.

What is the position of Y in the reactivity series?

**A** above zinc and above copper

**B** above zinc and below copper

**C** below zinc and above copper

**D** below zinc and below copper

**14** Which reaction in the extraction of iron from hematite is **not** a redox reaction?

**A** $C + O_2 \rightarrow CO_2$

**B** $C + CO_2 \rightarrow 2CO$

**C** $CaCO_3 \rightarrow CaO + CO_2$

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

**15** Which substance is used as a chemical test for water?

**A** anhydrous copper(II) sulfate

**B** hydrated cobalt(II) chloride

**C** hydrated copper(II) sulfate

**D** pink cobalt(II) chloride

**16** Which fuel does **not** produce carbon dioxide during complete combustion?

**A** coal

**B** hydrogen

**C** natural gas

**D** petroleum

**17** Which statements about members of the same homologous series are correct?

1 They have the same ending to their name.

2 They have the same functional group.

3 They have the same molecular formula.

4 They have the same relative molecular mass.

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

**18** Which statements about the alkanes are correct?

1 They are generally unreactive except in terms of burning.

2 They burn in air to produce carbon dioxide and water.

3 They contain carbon to carbon double bonds.

4 They decolourise bromine water.

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

**19** When hexane is heated in the presence of a catalyst, it decomposes to give ethane, hydrogen and another hydrocarbon Y.

The equation for the reaction is shown.

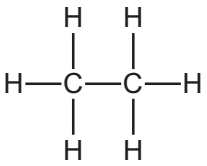
$$C_6H_{14} \rightarrow C_2H_4 + Y + H_2$$

Which type of hydrocarbon is Y and what is its formula?

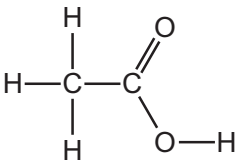
| | type of hydrocarbon | formula |
|---|---|---|
| **A** | alkane | $C_4H_8$ |
| **B** | alkane | $C_4H_{10}$ |
| **C** | alkene | $C_4H_8$ |
| **D** | alkene | $C_4H_{10}$ |

**20** Which structure represents an unsaturated hydrocarbon?

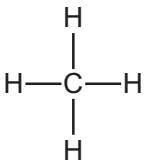
**A**



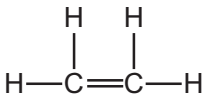
**B**



**C**



**D**



**21** A student carries out an experiment to determine the period of a simple pendulum.

The student starts counting oscillations when the stopwatch reads 5.00 s and stops the stopwatch at the end of the 20th oscillation.

The diagram shows the stopwatch when the student starts counting oscillations and at the end of 20 oscillations.


stopwatch when counting starts


stopwatch at the end of 20 oscillations

What is the period of the pendulum?

**A** 0.25 s **B** 0.82 s **C** 1.07 s **D** 1.32 s

**22** A light ball is dropped from rest from a high cliff.

Which row shows what happens after the ball is dropped and before it reaches terminal velocity?

| | speed of ball | acceleration of ball |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | remains constant |
| **C** | increases | decreases |
| **D** | increases | remains constant |

**23** Three properties of a body are its mass, its shape and its size.

Which row correctly shows whether these properties can be changed by a force?

| | mass | shape | size |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✓ | ✗ |
| **C** | ✓ | ✗ | ✓ |
| **D** | ✗ | ✓ | ✓ |

key

✓ = can be changed

✗ = cannot be changed





[Turn over

**24** A force $F$ acts on an object that moves in a straight line through a distance $d$.

The change in energy of the object is equal to $F \times d$.

Which statement **must** be correct?

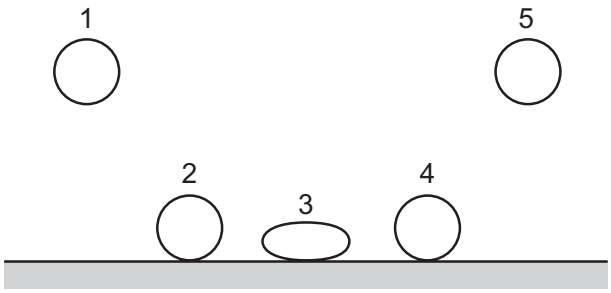
**A** $F$ is in the same direction as $d$.

**B** $F$ is perpendicular to $d$.

**C** The object gains gravitational potential energy.

**D** The object is moving at constant speed.

**25** The diagram shows a number of stages of a soft ball bouncing.




Between which two stages does the kinetic energy transfer to elastic (strain) energy?

**A** 1 to 2 **B** 2 to 3 **C** 3 to 4 **D** 4 to 5

**26** A ball is thrown vertically upwards with a speed of 5.00 m / s.

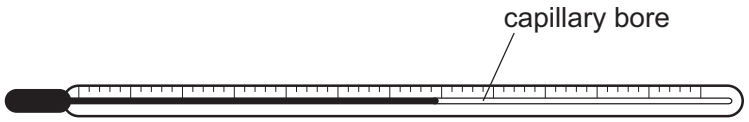
All of the ball's initial kinetic energy is transferred into gravitational potential energy.

What is the maximum height reached by the ball?

The acceleration of free fall is 10.0 m / $s^2$.

**A** 0.250 m **B** 1.25 m **C** 2.50 m **D** 12.5 m

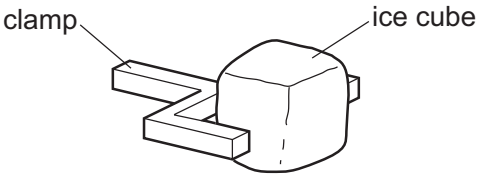
**27** The internal diameter of the capillary bore of a thermometer is increased.




How does this affect the range and the sensitivity of the thermometer?

| | range | sensitivity |
|---|---|---|
| **A** | increased | decreased |
| **B** | increased | increased |
| **C** | no change | decreased |
| **D** | no change | increased |

**28** An ice cube is held in a clamp. The air next to the ice cube becomes very cold.




What happens to the density of the air as the air becomes colder and in which direction does the cold air move?

| | density change of the air | direction the air moves |
|---|---|---|
| **A** | decreases | downwards |
| **B** | decreases | upwards |
| **C** | increases | downwards |
| **D** | increases | upwards |



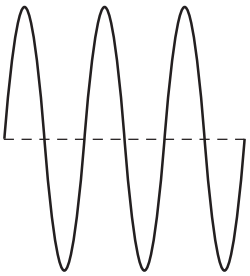


[Turn over

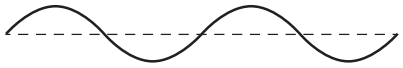
**29** The diagrams represent water waves in a deep pond. The diagrams are all drawn to the same scale and the waves are all moving with the same speed.

Which diagram shows the wave with the highest frequency?

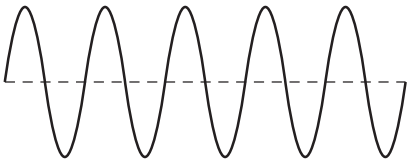
**A**



**B**



**C**



**D**

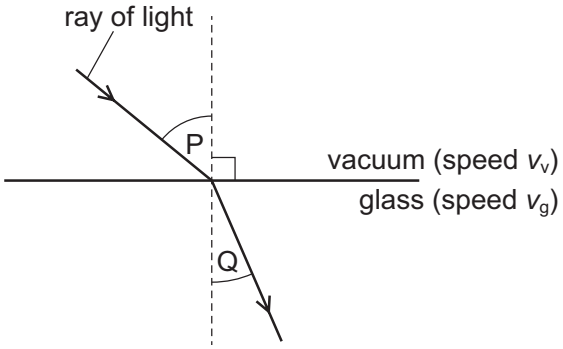
**30** The speed of light in a vacuum is $v_v$.

The speed of light in glass is $v_g$.

Light passes from a vacuum into glass.

The diagram shows the change in direction of the light.

Angles P and Q are labelled.




Which row compares $v_v$ with $v_g$ and gives an expression for the refractive index of the glass?

| | speeds | refractive index |
|---|---|---|
| **A** | $v_v < v_g$ | $\frac{\sin P}{\sin Q}$ |
| **B** | $v_v < v_g$ | $\frac{\sin Q}{\sin P}$ |
| **C** | $v_v > v_g$ | $\frac{\sin P}{\sin Q}$ |
| **D** | $v_v > v_g$ | $\frac{\sin Q}{\sin P}$ |

**31** What is the approximate speed of electromagnetic waves in air?

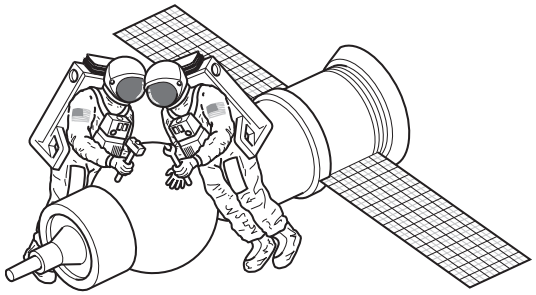
**A** $3 \times 10^2\,m/s$ **B** $3 \times 10^4\,m/s$ **C** $3 \times 10^6\,m/s$ **D** $3 \times 10^8\,m/s$





[Turn over

**32** Two astronauts without radios can only communicate in space if their helmets are touching. There is no air in space.



What does this show about sound?

**A** It can travel through a solid and a vacuum.

**B** It can travel through a solid but cannot travel through a vacuum.

**C** It cannot travel through a solid but can travel through a vacuum.

**D** It cannot travel through either a solid or a vacuum.

**33** In 2.0 hours, a charge of 5000 C flows at a constant rate past a point in a circuit.

What is the current in the circuit?

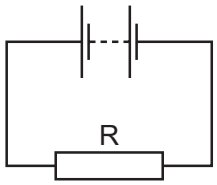
**A** 0.69 A **B** 42 A **C** 2500 A **D** 10 000 A

**34** The current in a battery is 5.00 A. The battery supplies 2.70 kJ of energy in 1.0 minute.

What is the e.m.f. of the battery?

**A** 0.540 V **B** 9.00 V **C** 13.5 V **D** 32.4 V

**35** A circuit contains a battery and a resistor R.




Another resistor is now added in series with R.

Which statement is correct?

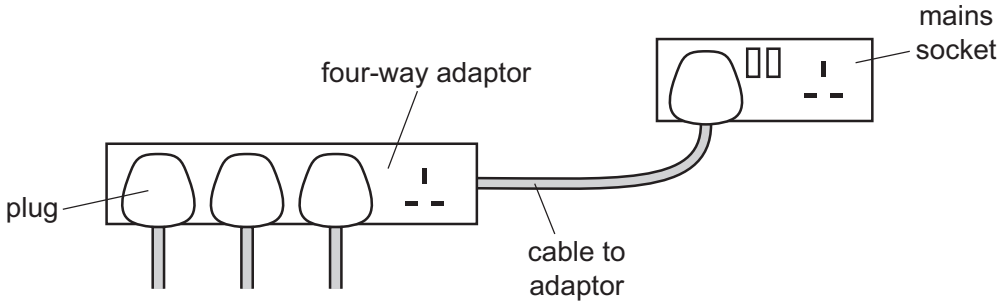
**A** The e.m.f. of the battery decreases.

**B** The e.m.f. of the battery increases.

**C** The p.d. across R decreases.

**D** The p.d. across R increases.

**36** A four-way adaptor is connected by a cable to the mains supply. The cable is protected by a 13 A fuse.




Which use of the adaptor causes the fuse protecting the cable to 'blow'?

| | number of plugs used | current in plugs |
|---|---|---|
| **A** | 1 | 12 A |
| **B** | 2 | 10 A and 10 A |
| **C** | 3 | 3 A, 4 A and 5 A |
| **D** | 4 | 2 A, 2 A, 3 A and 3 A |

**37** In a transformer, how is an e.m.f. induced across the secondary coil?

**A** The primary coil and the secondary coil are connected in parallel.

**B** The primary coil and the secondary coil are connected in series.

**C** The primary coil produces a changing magnetic field that links to the secondary coil.

**D** The primary coil produces a constant magnetic field that links to the secondary coil.

**38** A current-carrying coil experiences a turning effect when it is placed in a magnetic field.

Which row gives two changes to the coil that each result in a greater turning effect?

| | number of turns on the coil | current in the coil |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | increases |
| **C** | increases | decreases |
| **D** | increases | increases |





[Turn over

**39** Americium-241 ( $^{241}_{95}Am$ ) decays to neptunium-237 ( $^{237}_{93}Np$ ).

One or two particles are emitted during this decay.

Which particles are emitted?

**A** an $\alpha$-particle only

**B** a $\beta$-particle only

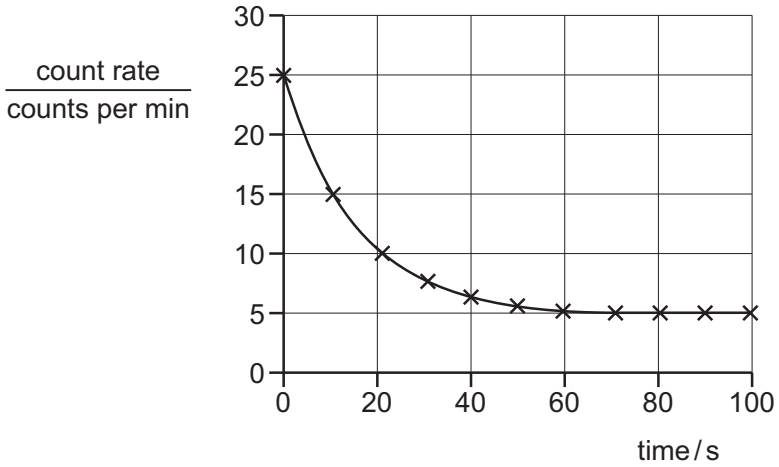
**C** an $\alpha$-particle and a $\beta$-particle

**D** two $\beta$-particles

**40** A teacher investigates the radiation emitted by a radioactive source.

She places a detector near the source and records how the count rate changes with time.

The results are shown on the graph.




Which row gives the count rate due to the source at the start of the experiment, and the count rate due to background radiation?

| | count rate due to the source at start / counts per minute | count rate due to background radiation / counts per minute |
|---|---|---|
| **A** | 20 | 5 |
| **B** | 20 | 20 |
| **C** | 25 | 5 |
| **D** | 25 | 20 |

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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 – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**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.).