

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

PHYSICAL SCIENCE 0652/01

Paper 1 Multiple Choice October/November 2010

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, highlighters, 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.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.

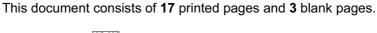
Choose the one you consider correct and record your choice in soft pencil on the separate Answer Sheet.

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 20.





1 Some students are asked to explain why gases diffuse more readily than liquids.

Three of their suggestions are:

- 1 gas molecules are further apart;
- 2 gas molecules move more rapidly;
- 3 liquid molecules vibrate around fixed positions.

Which suggestions are correct?

- A 1 only
- **B** 1 and 2
- C 2 only
- **D** 3 only
- 2 Which substance in the table has ionic bonding?

	boiling point	electrical conductivity		
	/°C	solid	molten	aqueous solution
Α	-80	poor	poor	quite good
В	-26	poor	poor	poor
С	1206	poor	good	good
D	4875	good	good	insoluble

3 Element Y is in the second Period of the Periodic Table.

An atom of element Z has six more protons than an atom of element Y.

Which statement **must** be correct?

- A Elements Y and Z are in the same Period.
- **B** Elements Y and Z have the same number of electrons in the first shell.
- **C** Element Z has six more electrons in its outer shell than element Y.
- **D** The nucleon number of element Z is six more than that of element Y.

4 Some reactions of sulfuric acid are shown.

$$H_2SO_4 + 2KHCO_3 \rightarrow K_2SO_4 + 2H_2O + 2CO_2$$

 $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$
 $H_2SO_4 + MgCO_3 \rightarrow MgSO_4 + H_2O + CO_2$
 $H_2SO_4 + MgO \rightarrow MgSO_4 + H_2O$

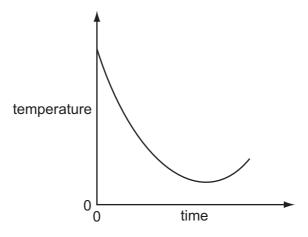
Which compound gives the greatest mass of water when 10 g of it reacts with an excess of sulfuric acid?

[M_r: MgO, 40; MgCO₃, 84; KOH, 56; KHCO₃, 100]

- A KHCO₃
- **B** KOH
- C MgCO₃
- **D** MgO

5 The temperature of two solutions is measured before, during and after they react with each other.

The graph shows the results.



Which terms must apply to this reaction?

	endothermic	neutralisation
Α	✓	✓
В	✓	X
С	X	✓
D	x	X

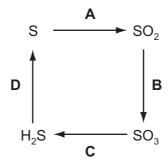
6 The diagram shows a cup of tea with a spoon in it.



What will **not** make the sugar in the tea dissolve more quickly?

- adding more sugar
- В stirring the tea
- C using hotter water
- **D** using more water

Which change shows a reduction? 7



- A colourless solution of solid X has lost its label. Possible identities of X are shown. 8
 - sodium carbonate
 - 2 sodium hydroxide
 - sodium chloride

The solution reacts with an acid, forming a salt and water only.

What could X be?

A 1 only **B** 1 or 2 only **C** 1, 2 or 3 **D** 2 only

9 Aqueous sodium hydroxide and aqueous ammonia each give a white precipitate when added to aqueous zinc sulfate.

What happens when an excess of each of these reagents is added?

	excess NaOH(aq)	excess NH ₃ (aq)
Α	precipitate dissolves	precipitate dissolves
В	precipitate dissolves	precipitate does not dissolve
С	precipitate does not dissolve	precipitate dissolves
D	precipitate does not dissolve	precipitate does not dissolve

10	Which	oxide	IS	has	SIC'

B H₂O **C** MgO

D NO₂

11 Elements X and Y each have a proton number greater than 10 but less than 19.

The proton number of Y is 6 greater than that of X.

Which statements about elements X and Y must be correct?

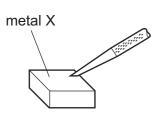
	X is the more metallic	Y is diatomic	X and Y react together
Α	✓	✓	x
В	✓	x	x
С	×	✓	✓
D	X	X	✓

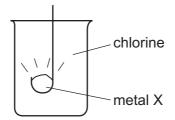
12 Metal X

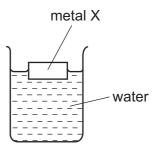
can easily be cut,

reacts with chlorine,

floats on water.







Which metal could X be?

- A copper
- **B** iron
- C magnesium
- **D** potassium
- 13 Which properties of helium explain its use in filling balloons?

	low density	its unreactivity
Α	✓	✓
В	✓	×
С	×	✓
D	x	x

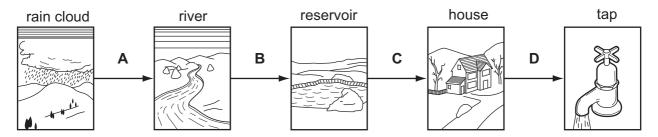
- 14 Which substance is a malleable element that conducts electricity?
 - A aluminium
 - **B** bromine
 - C steel
 - **D** sulfur
- **15** A new container is being developed to carry food and water on long walks. It needs to be light and corrosion resistant.

Which metal would be the most suitable?

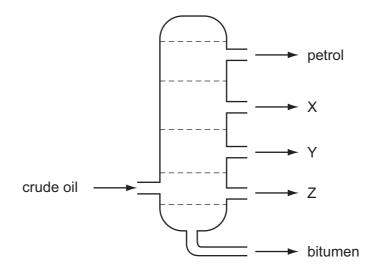
- **A** aluminium
- **B** iron
- C mild steel
- **D** stainless steel

- **16** Which statement is **not** correct?
 - A Carbon monoxide is formed by the incomplete combustion of carbon-containing substances.
 - **B** Car exhaust fumes can contain oxides of nitrogen.
 - **C** Clean air contains approximately 79 % oxygen and 20 % nitrogen.
 - **D** Sulfur dioxide is a common air pollutant.
- 17 Chlorine is added to water to make it safe to drink.

At which stage is chlorine added to the water?



18 The diagram shows the separation of crude oil into fractions.



What could X, Y and Z represent?

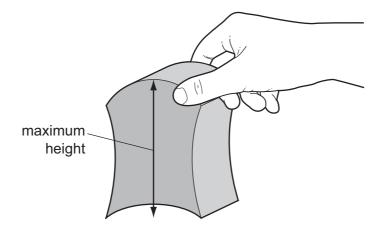
	Х	Υ	Z
Α	diesel	lubricating oil	paraffin
В	lubricating oil	diesel	paraffin
С	paraffin	lubricating oil	diesel
D	paraffin	diesel	lubricating oil

- 19 A homologous series is defined as a group of compounds which have the same
 - A chain length.
 - **B** elements in them.
 - **C** functional group.
 - **D** number of carbon atoms.
- **20** A substance X decolourised aqueous bromine.

What is the name and structure of X?

	name	structure
A	ethane	H H
В	ethane	H H
С	ethene	H H H—C—C—H H H
D	ethene	H H

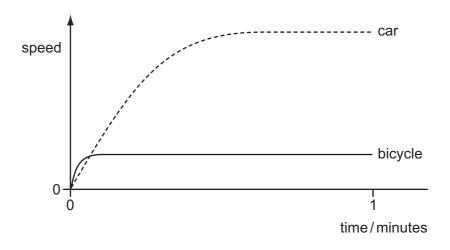
21 The diagram shows a child's building block. Its volume and maximum height are determined.



Which instruments are used?

	to determine the volume	to measure the maximum height
Α	balance	rule
В	measuring cylinder	rule
С	rule	balance
D	rule	measuring cylinder

22 The graph shows the speed of a bicycle and the speed of a car during the first minute after they start to move.

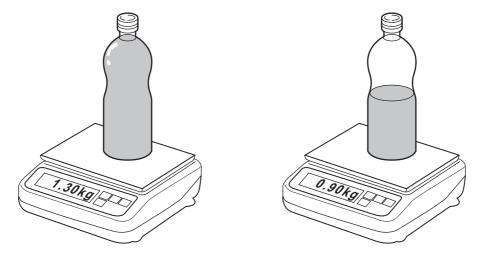


Compared with the car, the bicycle

- A has a greater initial maximum acceleration.
- **B** has a greater steady speed.
- **C** reaches its steady speed later than the car.
- **D** travels further.

23 The mass of a full bottle of cooking oil is 1.30 kg.

When exactly half of the oil has been used, the mass of the bottle plus the remaining oil is 0.90 kg.



What is the mass of the empty bottle?

- **A** 0.40 kg
- **B** 0.50 kg
- **C** 0.65 kg
- **D** 0.80 kg

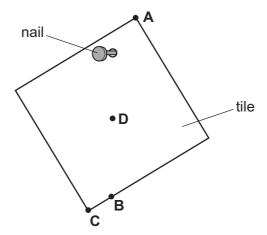
24 Ice has a density of 900 kg/m³, and liquid water has a density of 1000 kg/m³.

What happens to a block of ice as it melts?

- A Its mass decreases.
- **B** Its mass increases.
- C Its volume decreases.
- **D** Its volume increases.

25 A hole is drilled in a square tile. The diagram shows the tile hanging freely on a nail.

Where is the centre of gravity of the tile?



26 A cyclist travels down a hill from rest at point X without pedalling.

The cyclist applies his brakes and the cycle stops at point Y.



Which energy changes have taken place between X and Y?

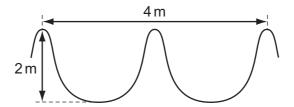
- **A** gravitational potential → internal (heat) → kinetic
- **B** gravitational potential \rightarrow kinetic \rightarrow internal (heat)
- **C** kinetic \rightarrow gravitational potential \rightarrow internal (heat)
- **D** kinetic \rightarrow internal (heat) \rightarrow gravitational potential
- 27 What would be suitable to use as a fixed point for a thermometer?
 - A a lit Bunsen burner
 - B a melting ice cube
 - C hot water in a bath
 - **D** refrigerated milk
- **28** A fridge is fitted with a cooling unit and an oven is fitted with a heater.

The cooling unit can be fitted either at the top or at the bottom of the fridge, and the heater can be fitted either at the top or at the bottom of the oven.

Which row shows the best position to fit the cooling unit and the heater?

	cooling unit	heater
Α	bottom	bottom
В	bottom	top
С	top	bottom
D	top	top

29 The diagram represents a water wave.



Which row shows the amplitude and the wavelength of the waves?

		,
	amplitude/m	wavelength/m
Α	1	2
В	1	4
С	2	2
D	2	4

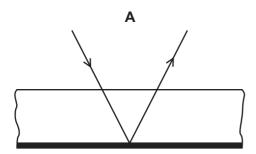
30 What is the correct order of waves in the electromagnetic spectrum?

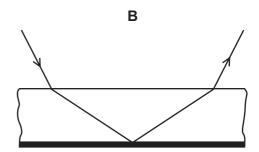
	shortest wavelength		longest wavelength		
Α	gamma-rays	radio waves	visible light		
В	gamma-rays	visible light	radio waves		
С	visible light	gamma-rays	radio waves		
D	visible light	radio waves	gamma-rays		

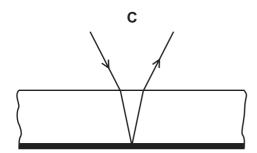
31 The diagram shows a section through a mirror made of thick glass with a metal coating.

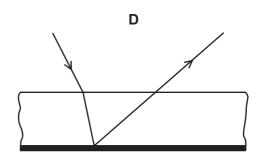


Which diagram shows the path of a ray of light reflected by the mirror?



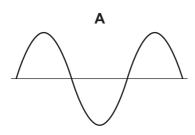


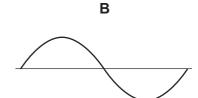


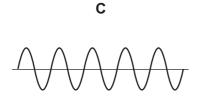


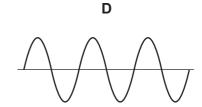
32 The diagrams represent four different sound waves shown on the screen of an oscilloscope. The controls of the oscilloscope are set the same in each case.

Which diagram represents the sound with the highest frequency?

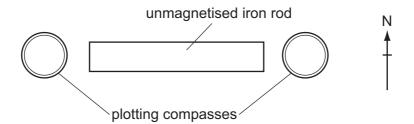




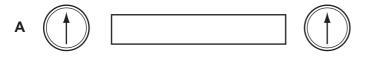




33 Two plotting compasses are positioned, one at each end of an unmagnetised iron rod, which is positioned in an east-west direction.

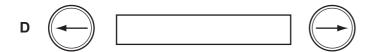


Which diagram shows the directions of the pointers of the plotting compasses?









34 A car headlamp takes a current of 3.0 A when connected to a 12.0 V battery.

What is the resistance of the bulb when it is lit?

Time to the resistance of the ball timen it is not

A 0.25Ω **B** 4.0Ω **C** 15Ω **D** 36Ω

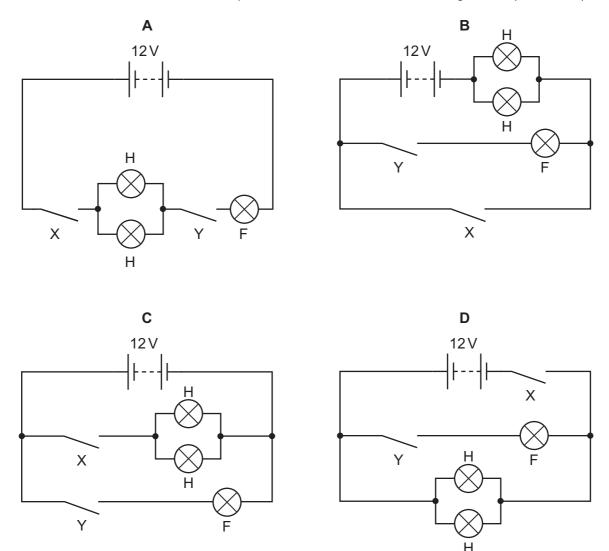
35 When a plastic comb is placed next to a small piece of aluminium foil hanging from a nylon thread, the foil is repelled by the comb.

Why is this?

- **A** The comb is charged and the foil is uncharged.
- **B** The comb is uncharged and the foil is charged.
- **C** The comb and the foil have charge of opposite signs.
- **D** The comb and the foil have charge of the same sign.

36 In a car, the headlamps H are controlled by switch X. The foglamp F is controlled by switch Y, but only comes on if the headlamps are also switched on.

Which circuit would allow all the lamps to work as above and at full brightness (12V each)?



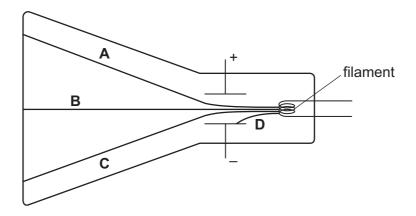
37 A mains electrical circuit uses insulated copper cable and the cable overheats.

To prevent the cable overheating, how should the cable be changed, and why?

- **A** Use thicker copper cable which has less resistance.
- **B** Use thicker insulation which stops the heat escaping.
- **C** Use thinner copper cable which has more resistance.
- **D** Use thinner insulation which allows less heat to escape.

38 In a cathode ray tube, cathode rays are emitted by a filament.

Which line could show the path the rays take, with the connections as shown in the diagram?



39 The half-life of the radioactive isotope caesium $^{137}_{55}$ Cs is 30 years.

Starting with 30 grams of the isotope, what mass of the isotope remains after 90 years?

- **A** 10.0 grams
- **B** 7.50 grams
- **C** 3.75 grams
- **D** 1.25 grams
- **40** What is the number of protons in an atom of ${}^{222}_{86}$ Rn?
 - **A** 86
- **B** 136
- **C** 222
- **D** 308

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DATA SHEET
The Periodic Table of the Elements

	0	Heium 2	Ne Neon 10 Argon 18	84 Kr Krypton 36	131 Xe Xenon 54	Rn Radon 86		175 Lu Lutetium 71	Lr Lawrencium 103
-	\		19 Fluorine 9 35.5 C 1 Chlorine	80 Br Bromine 35	127 I lodine 53	At Astatine 85		173 Yb Ytterbium 70	Nobelium 102
	IN		16 Oxygen 8 32 S Suffur 16	79 Selenium 34	128 Te Tellurium 52	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101
	>		14 Nitrogen 7 31 9 Phosphorus 15	75 AS Arsenic 33	Sb Antimony 51	209 Bi Bismuth 83		167 Er Erbium 68	Fm Fermium
	>		12 Carbon 6 Silicon 14	73 Ge Germanium 32	119 Sn Tin	207 Pb Lead		165 Ho Holmium 67	ES Einsteinium 99
	=		11 B Boron 5 27 A1 Aluminium	70 Ga Gallium 31	115 I n Indium 49	204 T t Thallium 81		162 Dy Dysprosium 66	Cf Californium 98
				65 Zn zinc 30	112 Cd Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	Bk Berkeium 97
				64 C Copper 29	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Curium 96
				59 Nickel 28	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium 95
				59 Cobalt	Rhodium 45	192 I r Iridium 77		Sm Samarium 62	Pu Plutonium
		1 Hydrogen		56 Fe Iron	Ru Ruthenium 44	190 Os Osmium 76		Pm Promethium 61	Np Neptunium 93
				Mn Manganese 25	Tc Technetium 43	186 Re Rhenium 75		144 Nd Neodymium 60	238 U Uranium 92
				52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		141 Pr Praseodymium 59	Pa Protactinium 91
				51 V Vanadium 23	Nobium Nobium 41	181 Ta Tantalum		140 Ce Cerium 58	232 Th Thorium
				48 Ti Titanium 22	91 Zr Zirconium 40	178 Haf Hafnium			nic mass Ibol nic) number
				Scandium 21	89 × Yttrium 39	139 La Lanthanum 57 *	Ac Actinium 89	d series series	a = relative atomic mass X = atomic symbol b = proton (atomic) number
	=		Be Beryllium 4 24 Magnesium 12	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series	<i>a</i> × <i>a</i>
	_		7 Lithium 3 23 Na Sodium 11	39 K Potassium	Rubidium 37	133 CS Caesium 55	Fr Francium 87	*58-71 L	Key

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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