Cambridge Assessment International Education

Cambridge IGCSE™

PHYSICAL SCIENCE **0652/21**

Paper 2 Multiple Choice (Extended) **October/November 2020**

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

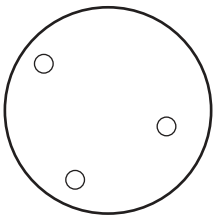
- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.

[Turn over

1 Which diagram represents the arrangement of particles in a liquid?

A



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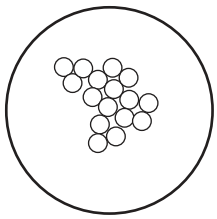

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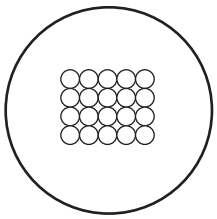

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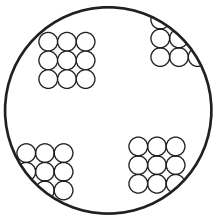


2 A bottle of a solid is labelled as shown.

CITRIC ACID
(anhydrous)

melting point: 153 °C

The melting point of a sample from the bottle is measured.

The sample melts over a temperature range from 140 °C to 150 °C.

Which statement explains this observation?

A The sample contains a mixture of citric acid and other solids.

B The sample is too large.

C The sample has a pH less than 7.

D The sample is too small.

3 Which statement describes a compound?

A It is a mixture of two or more elements.

B It is a substance containing two or more elements chemically combined.

C It is a substance that can be easily separated by physical means.

D It is a substance that cannot be broken down by chemical means.

4 Four different atoms are represented by the symbols shown.

$^{23}_{11}W$ $^{24}_{12}X$ $^{26}_{12}Y$ $^{26}_{13}Z$

Which statement about these atoms is correct?

A Elements W and X have the same properties because they have the same number of neutrons.

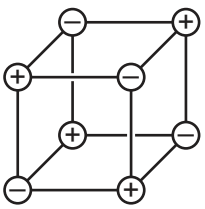
B Elements W and Z have the same properties because they are in the same period of the Periodic Table.

C Elements X and Y have the same properties because they have the same number of outer shell electrons.

D Elements Y and Z have the same properties because they have the same number of electrons.

5 Which diagram represents the structure of an ionic compound?

A



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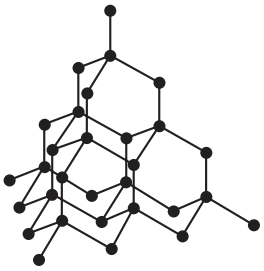

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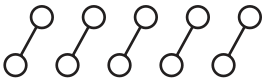

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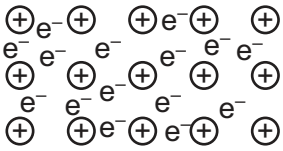


6 Which molecules both contain double covalent bonds?

A C_2H_4 and CH_3OH

B C_2H_4 and CO_2

C H_2 and C_2H_4

D H_2 and CH_3OH

7 The formula of aluminium sulfate is $Al_2(SO_4)_3$.

Which row shows the number of atoms of each element in aluminium sulfate?

	Al	S	O
A	2	1	4
B	2	1	12
C	2	3	4
D	2	3	12

8 Ethyl ethanoate has the formula $CH_3CO_2C_2H_5$.

What is the relative molecular mass M_r of this compound?

A 48 **B** 72 **C** 88 **D** 124

9 Increasing the temperature of a reaction mixture increases the rate of the reaction.

Which statement explains the effect of increasing the temperature?

A When the temperature is increased the activation energy decreases.

B When the temperature is increased the particles get bigger and so collide more frequently.

C When the temperature is increased the particles move faster so collisions become more frequent.

D When the temperature is increased the substances reacting become more concentrated.

10 Word equations for two reactions are shown.

zinc oxide + carbon → zinc + carbon monoxide

iron + copper oxide → copper + iron oxide

Which statement about the two reactions is correct?

A Carbon and copper oxide have been oxidised.

B Carbon and iron have been reduced.

C Zinc oxide and copper oxide have been oxidised.

D Zinc oxide and copper oxide have been reduced.

11 Wasp stings contain an alkali.

The pH values of some substances are shown.

substance	pH value
saliva	7.4
lime	12.4
salt solution	7.0
vinegar	3.5

Which substance could be used to neutralise a wasp sting?

A lime

B saliva

C salt solution

D vinegar

12 Zinc oxide reacts separately with both dilute hydrochloric acid and aqueous sodium hydroxide to form solutions.

Manganese oxide reacts with dilute hydrochloric acid to form a solution, but does not react with aqueous sodium hydroxide.

Which row describes zinc oxide and manganese oxide?

	zinc oxide	manganese oxide
A	amphoteric	acidic
B	amphoteric	basic
C	neutral	acidic
D	neutral	basic

13 Which row describes the trends from left to right across a period of the Periodic Table?

	number of outer shell electrons	character of the element
A	decreases	become less metallic
B	decreases	become more metallic
C	increases	become less metallic
D	increases	become more metallic

[Turn over

14 The elements in Group VII of the Periodic Table are known as the halogens.

Which statement about the trends shown by the halogens is correct?

A The ability to displace halide ions from solutions decreases down the group.

B The atomic radius decreases down the group.

C The colours of the elements get lighter down the group.

D The melting points of the elements decrease down the group.

15 Iron is produced from iron oxide using a redox reaction.

The equation for the reaction is shown.

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

Which statement about this reaction is correct?

A Carbon dioxide is oxidised.

B Carbon monoxide is reduced.

C Iron is oxidised.

D Iron oxide is reduced.

16 Which of the statements about water are correct?

1 Water is used as a solvent.

2 Water is used to prevent iron from rusting.

3 Water is a compound that contains two parts of oxygen to one part of hydrogen.

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

17 Nitrogen oxides are produced in a car engine.

Which type of reaction catalytically removes nitrogen oxides from the exhaust fumes?

A combustion

B oxidation

C reduction

D thermal decomposition

18 Which statement explains why the members of a homologous series have similar chemical properties?

A They are atoms of the same element with the same outer electron arrangement.

B They are compounds with the same functional group.

C They are compounds with the same molecular formula.

D They are elements with the same outer electrons.

19 One member of the alkane homologous series is butane which is used as a fuel.

What are the products of combustion when butane is burned in excess air?

A carbon and water

B carbon dioxide and hydrogen

C carbon dioxide and water

D carbon monoxide and water

20 Ethanol is made by fermentation.

Which row shows the conditions used in this process?

	temperature / °C	catalyst	pressure / atmospheres
A	30	phosphoric acid	1
B	30	yeast	1
C	300	phosphoric acid	65
D	300	yeast	65

21 A micrometer screw gauge can be used to measure a distance.

Which is the most appropriate distance to measure using this instrument?

A the diameter of a 500 ml beaker

B the length of a laboratory

C the length of a mobile phone (cell phone)

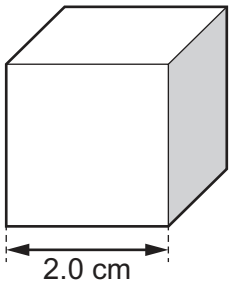
D the thickness of a sheet of card

22 The distance of an object above the surface of a planet is gradually increased. The value of the gravitational field strength decreases as the distance increases.

What happens to the mass and what happens to the weight of the object as the distance increases?

	mass	weight
A	decreases	decreases
B	decreases	stays the same
C	stays the same	decreases
D	stays the same	stays the same

23 The diagram shows a solid cube of metal. Each side has a length of 2.0 cm. The mass of the cube is 72 g.

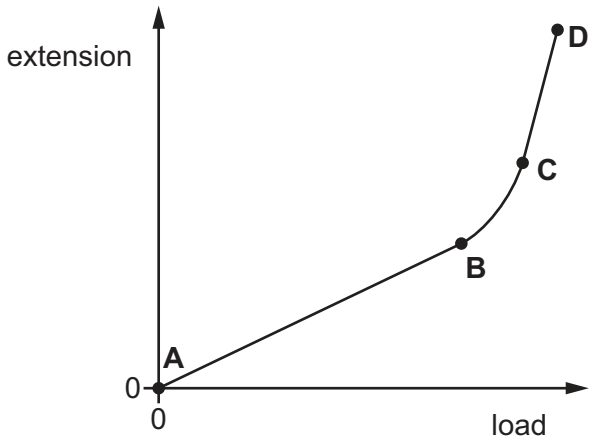


What is the density of the metal?

A 9.0 g / cm^3 **B** 18 g / cm^3 **C** 288 g / cm^3 **D** 576 g / cm^3

24 The diagram shows the extension–load graph for a spring.

Which labelled point is the limit of proportionality?



25 An object of mass 5.0 kg moves at a constant speed to the right in a straight line.

A resultant force of 25 N to the left starts to act on the object.

What happens to the object immediately after the force is applied?

A Its speed decreases at 0.20 m / s^2.

B Its speed decreases at 5.0 m / s^2.

C Its speed increases at 0.20 m / s^2.

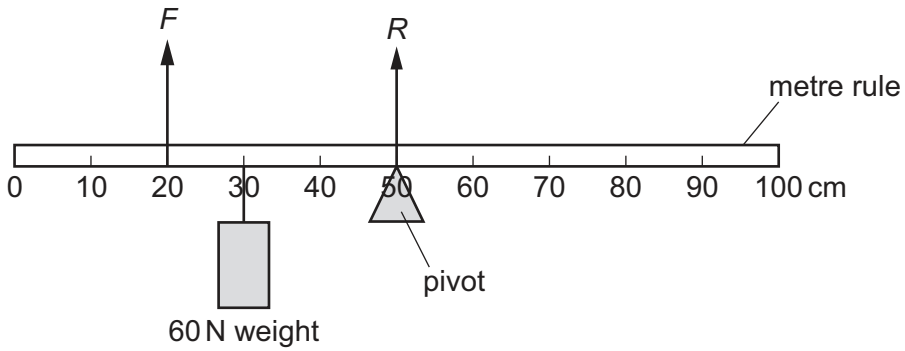
D Its speed increases at 5.0 m / s^2.

26 The diagram shows a uniform metre rule that is in equilibrium.

It is supported by a pivot at the 50 cm mark and by an upward force *F* at the 20 cm mark. A 60 N weight is suspended from the rule at the 30 cm mark.

A force *R* acts upwards at the pivot.

The weight of the rule can be ignored.



What are the values *F* and *R*?

	F / N	*R* / N
A	40	10
B	40	20
C	90	36
D	90	60

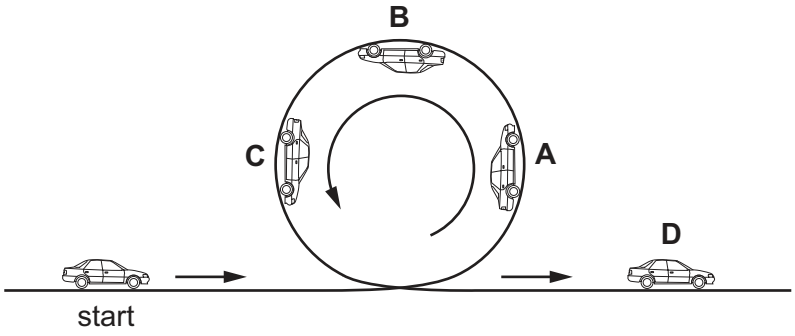
27 A ball of mass 0.25 kg has 18 J of kinetic energy.

What is the speed of the ball?

A 3.0 m / s **B** 7.2 m / s **C** 9.0 m / s **D** 12 m / s

28 A toy car without a motor is pushed, then follows the looped track shown.

At which labelled point on the track is the kinetic energy (energy of motion) of the car decreasing and the potential energy (energy of position) increasing?



29 A student measures his power output by lifting a load of weight *W* through a vertical height *h*. In time *t*, he lifts the load *n* times.

The student changes one of these variables to increase his power output.

Which change produces this increase?

A decreasing *h*

B decreasing *n*

C decreasing *t*

D decreasing *W*

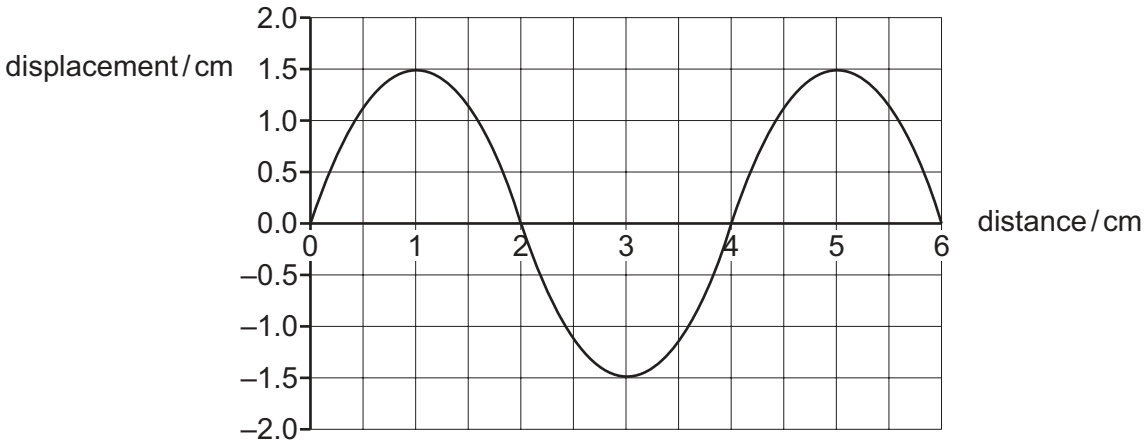
30 A liquid-in-glass thermometer P can measure temperatures between –10 °C and 110 °C. Its scale is 30 cm long.

A second liquid-in-glass thermometer Q can measure temperatures between 30 °C and 45 °C. Its scale is 10 cm long.

Which thermometer has the greater range and which is the more sensitive?

	thermometer with greater range	thermometer that is more sensitive
A	P	P
B	P	Q
C	Q	P
D	Q	Q

31 The diagram represents a water wave on the surface of a pond.



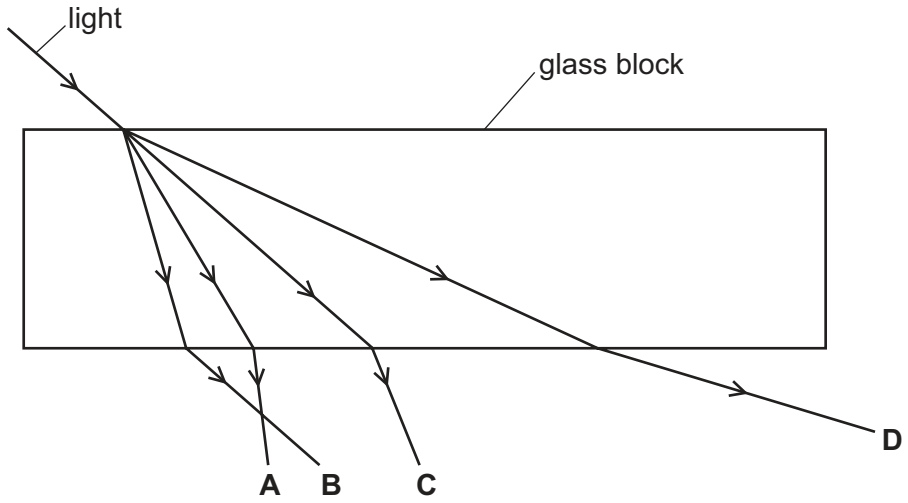
The frequency of the wave is 3.0 Hz.

What is the speed of the wave?

A 0.75 cm / s **B** 1.5 cm / s **C** 12 cm / s **D** 18 cm / s

32 The diagram shows light incident on a glass block.

Which labelled arrow shows the path of the light after it has passed through the block?



33 What is the approximate range of frequencies of sound that can be heard by the human ear?

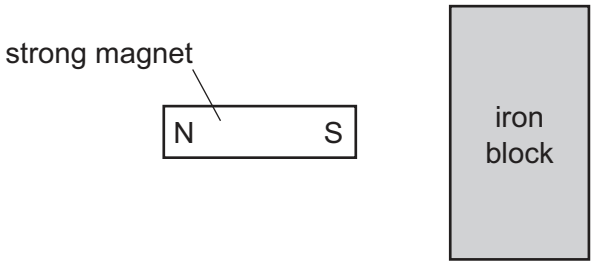
A 2 Hz to 2000 Hz

B 2 kHz to 2000 kHz

C 20 Hz to 20 000 Hz

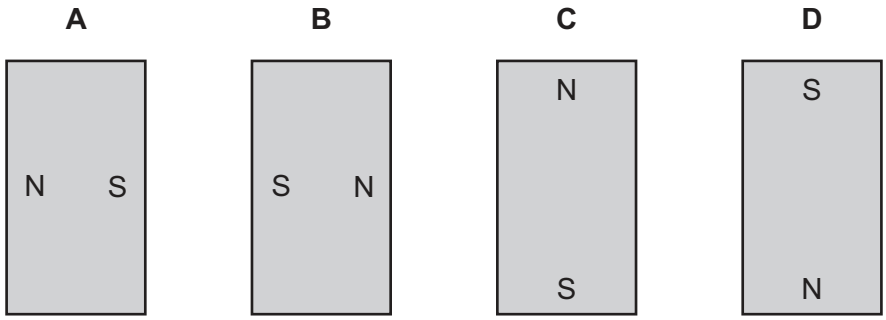
D 20 kHz to 20 000 kHz

34 A strong permanent magnet is placed close to an iron block, as shown in the diagram.



Magnetic poles are induced in the iron block.

What is the arrangement of the induced poles?



35 Two plastic rods are each rubbed with a cloth.

The rods are brought close to each other and they move apart.

Which statement explains this?

A Like charges repel.

B Like poles repel.

C Unlike charges repel.

D Unlike poles repel.

36 The electromotive force (e.m.f.) of a battery is 6.0 V.

Which statement is correct?

A The battery supplies 1.0 J of energy in driving 6.0 C of charge around a complete circuit.

B The battery supplies 6.0 J of energy in driving 1.0 C of charge around a complete circuit.

C The battery supplies 1.0 W of power in driving 6.0 C of charge around a complete circuit.

D The battery supplies 6.0 W of power in driving 1.0 C of charge around a complete circuit.

37 Overheating of a cable in an electric circuit is a safety hazard.

How can overheating of the cable be prevented?

A Do not switch off the circuit with damp hands.

B Make sure that the current does not become too large.

C Use thicker insulation on the cable.

D Use a thinner cable.

38 The diagram represents the nucleus of an atom.

Which diagram represents the nucleus of a different isotope of this atom?

A

B

C

D

39 The emissions from a radioactive source pass through a sheet of lead that is 10 mm thick.

Which type of radiation is emitted from the source and how is it affected by an electric field?

	type of emission	effect of electric field
A	α	deflected from positive to negative
B	α	no deflection
C	γ	deflected from positive to negative
D	γ	no deflection

[Turn over

40 A radioactive nucleus emits a β-particle.

What happens to the nucleus?

A Its nucleon number decreases.

B Its nucleon number stays the same.

C Its proton number decreases.

D Its proton number stays the same.

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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.).