

SCIENCE (PHYSICS, CHEMISTRY)

Paper 1 Multiple Choice

5124/01 October/November 2007 1 hour

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.

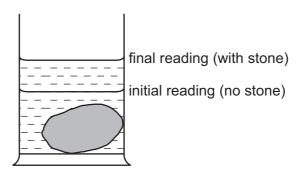
Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

This document consists of 16 printed pages.



1 As part of an experiment to find the density of stone, a stone is lowered into a measuring cylinder partly filled with water.



Which information can be obtained from the measuring cylinder readings?

- **A** The difference between the readings gives the density of stone.
- **B** The difference between the readings gives the volume of the stone.
- **C** The final reading gives the density of stone.
- **D** The final reading gives the volume of the stone.
- 2 When his parachute is fully opened, a parachutist falls towards the ground at a constant speed.

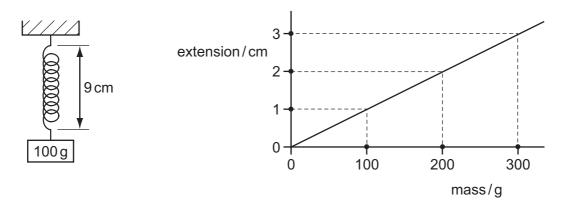
Under these conditions, which statement is correct?

- **A** There are no forces acting on the parachutist.
- **B** The upward force on the parachute is greater than the weight of the parachutist.
- **C** The upward force on the parachute is equal to the weight of the parachutist.
- **D** The upward force on the parachute is less than the weight of the parachutist.
- **3** A sledge of mass 25 kg is pulled across level ground with a horizontal force of 60 N. The constant force of friction is 20 N.

What is the acceleration of the sledge?

A 0.63 m/s^2 **B** 1.6 m/s^2 **C** 2.4 m/s^2 **D** 3.2 m/s^2

4 The diagrams show a spring having a length of 9 cm when loaded with a 100 g mass, and the extension-mass graph for the spring.



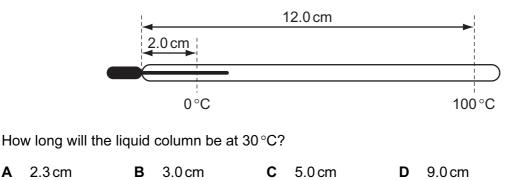
What is the length of the spring after the 100 g mass has been removed?

Α	7 cm	В	8 cm	С	9 cm	D	10 cm

- 5 Which type of energy is converted to thermal energy when atoms combine?
 - A chemical
 - В kinetic
 - С nuclear
 - D solar
- 6 A solid metal bar is heated at one end.

How is the thermal energy transferred to the other end of the bar?

- Α The heated molecules move along the bar, carrying all their energy to the other end.
- В The heated molecules move along the bar, giving energy to other molecules as they pass.
- С The heated molecules stay completely still but pass on their energy to other molecules.
- D The heated molecules vibrate more rapidly and pass on energy to other molecules.
- In a liquid-in-glass thermometer, the liquid column is 2.0 cm long at 0 °C and 12.0 cm long at 7 100°C.



Α

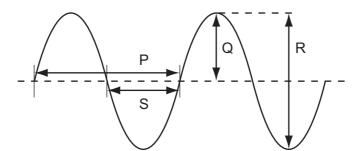
8 Equal volumes of four substances are heated at atmospheric pressure.

The temperature rise is the same for each substance.

Which substance expands the most?

- A air
- B mercury
- **C** steel
- D water

9 The diagram shows the surface of the water as a wave passes across a ripple tank.



Which lengths represent the amplitude and wavelength?

	amplitude	wavelength
Α	Q	Р
в	Q	S
С	R	Р
D	R	S

10 A wave has a frequency of 10^4 Hz.

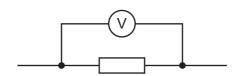
What are the possible values of its velocity and wavelength?

	velocity in m/s	wavelength in m
Α	330	0.33
в	330	33
С	$3 imes 10^8$	30
D	$3 imes 10^8$	$3 imes 10^4$

- 11 Which type of electromagnetic radiation travels at the highest speed through a vacuum?
 - A gamma rays
 - B light waves
 - **C** radio waves
 - D none all have the same speed
- **12** A lightning flash carries 25 C of charge and lasts for 0.01 s.

What is the current?

- **A** 0.0004A **B** 0.25A **C** 25A **D** 2500A
- **13** A voltmeter is connected across a resistor in an electrical circuit.



What does the reading on the voltmeter measure?

- A the work done in driving 1A of current through the resistor
- **B** the work done in driving 1C of charge through the resistor
- **C** the work done in driving 1 J of energy through the resistor
- **D** the work done in driving 1 W of power through the resistor
- **14** A 1.0 Ω resistor and a 2.0 Ω resistor are connected in series across a 12 V d.c. supply.

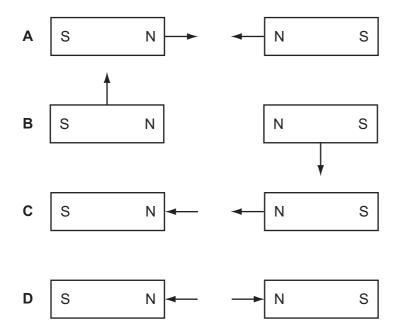
What is the current in the circuit?

- **A** 12A **B** 6.0A **C** 4.0A **D** 0.25A
- **15** The diagram shows some information printed on a light bulb.



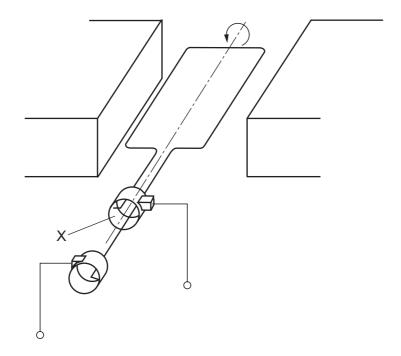
Which current is needed to light the bulb at normal brightness?

A 0.25A **B** 3.0A **C** 4.0A **D** 15A



16 Which diagram shows the correct directions of the magnetic forces on two bar magnets?

17 The diagram shows a simple a.c. generator.



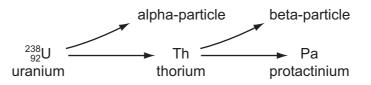
Which name is given to part X?

- A axle
- B carbon brush
- **C** magnet
- D slip ring

	protons	neutrons	electrons
Α	11	12	11
в	11	23	11
С	12	11	12
D	12	23	12

18 How many protons, neutrons and electrons are present in a neutral atom of sodium $^{23}_{11}$ Na?

19 The uranium atom ${}^{238}_{92}$ U emits an alpha-particle to become thorium, which then emits a beta-particle to become protactinium.

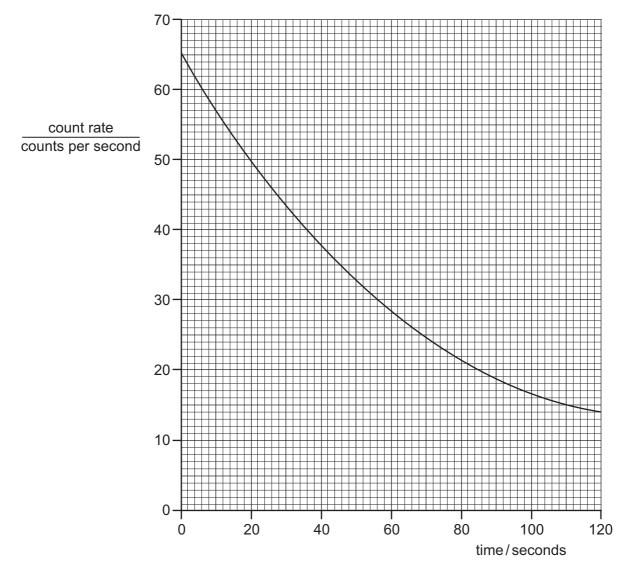


What is the proton number (atomic number) of protactinium?

A 89 **B** 90 **C** 91 **D** 95

20 Ra decays with a half-life of 1600 s. Rn decays with a half-life of 52 s. Po decays with a half-life of 9.1 s. Pb decays with a half-life of 10.6 h.

The changing count rate for one of these radioactive nuclides is shown in the graph.



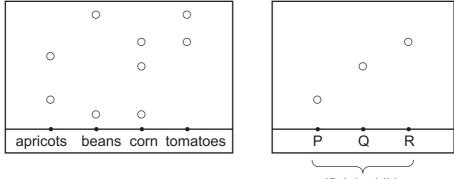
From the half-life shown by the graph, which was the decaying radioactive nuclide?

A Ra **B** Rn **C** Po **D** Pb

21 Samples of tinned apricots, beans, corn and tomatoes are tested for additives by using chromatography.

The chromatograms are compared with those of three artificial additives, P, Q and R.

The results are as follows.



artificial additives

Which tinned food does not contain any artificial additives?

- **A** apricots
- B beans
- C corn
- **D** tomatoes
- 22 A substance is in a state in which its particles are widely spaced and able to move freely.

It changes to a state in which its particles are in contact but still able to move freely.

What is this change called?

- A condensation
- **B** diffusion
- C evaporation
- D freezing
- 23 Element X has proton number 8 and nucleon number 18.

Which particles are present in the X²⁻ ion?

- A 10 electrons, 8 protons, 8 neutrons
- **B** 10 electrons, 8 protons, 10 neutrons
- **C** 10 electrons, 9 protons, 9 neutrons
- **D** 8 electrons, 8 protons, 18 neutrons

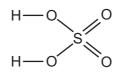
24 The table gives the electronic structure of four elements.

element	electronic structure				
W	2.7				
X	2.8.5				
Y	2.8.6				
Z	2.8.8.2				

Which two elements form an ionic compound?

A W and X **B** W and Y **C** W and Z **D** X and Y

25 A molecule of sulphuric acid has the structural formula shown.



How many electrons are involved in forming all the covalent bonds in one molecule?

A 6 **B** 8 **C** 12 **D** 16

26 The formula of copper(I) oxide is Cu_2O .

How many grams of oxygen are combined with 64g of copper in this compound?

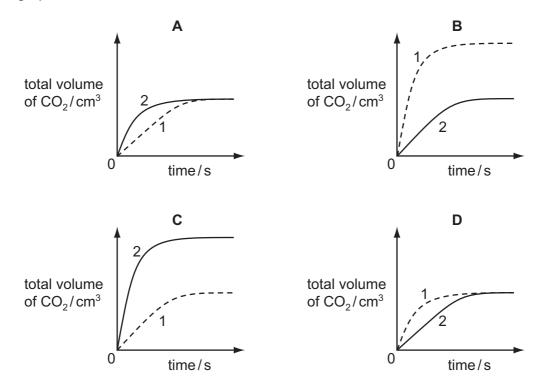
A 8 **B** 16 **C** 32 **D** 64

- 27 Which gas is always produced during photosynthesis?
 - A carbon dioxide
 - B methane
 - C oxygen
 - D water vapour

28 In two separate experiments, the reaction of powdered calcium carbonate with an excess of dilute hydrochloric acid is investigated.

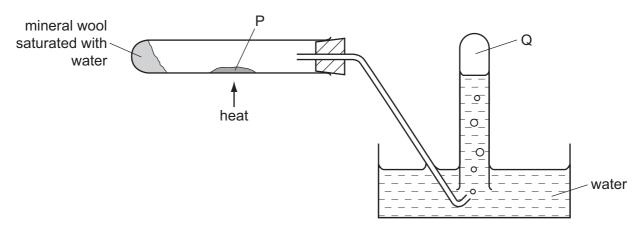
The powder used in experiment 1 is finer than that used in experiment 2. All other conditions are identical in both experiments.

Which graph shows the results?



- **29** Which type of reaction takes place when H⁺ ions and OH⁻ ions react to form water?
 - A condensation
 - **B** ionisation
 - C neutralisation
 - **D** precipitation
- 30 Which statement about the alkali metals is correct?
 - **A** Their melting points decrease on descending the group.
 - **B** Their reactivities decrease on descending the group.
 - **C** They form covalent bonds with the halogens.
 - **D** They form oxides on reacting with water.

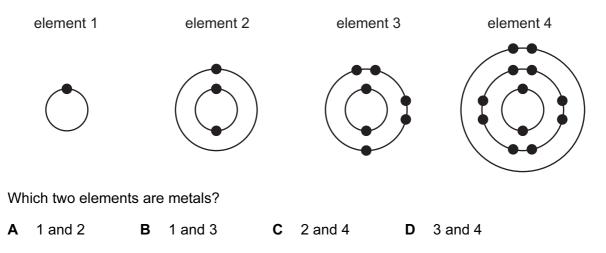
31 In the experiment shown in the diagram, steam is passed over a heated solid P. Gas Q is collected.



What are substances P and Q?

	Р	Q
Α	copper	hydrogen
В	lead	oxygen
С	silver	oxygen
D	zinc	hydrogen

32 The diagrams show the electronic structures of four elements.



- 33 Which substance is added to a blast furnace to remove impurities from iron ore?
 - A carbon
 - **B** limestone
 - C sand
 - D slag

34 Which pollutant is correctly linked to its source?

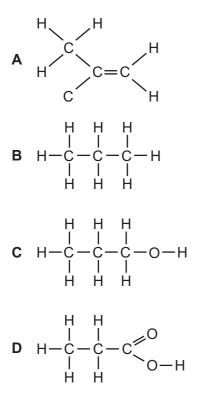
	pollutant	source
Α	carbon monoxide	internal combustion engine
В	methane	volcanoes
С	nitrogen oxide	bacterial decay
D	sulphur dioxide	lightning activity

- 35 Which gas is used to convert vegetable oils into margarine?
 - A carbon dioxide
 - B hydrogen
 - **C** nitrogen
 - D oxygen
- 36 Which statement about the manufacture of ammonia by the Haber Process is correct?
 - A The reactants and product are compounds.
 - **B** The reactants and product are elements.
 - **C** The reactants and product are gases.
 - **D** The reactants are both obtained from the air.
- **37** Bitumen is obtained from crude oil.

What is it used for?

- **A** as fuel for aircraft
- B as fuel for oil stoves
- **C** for making polishes
- D for making roads

38 Which compound decolourises aqueous bromine?

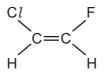


- **39** Compound X has the molecular formula C_2H_6O .
 - X can be made by a fermentation process.
 - X can be oxidised to Y.
 - X can react with Y to form Z and water.

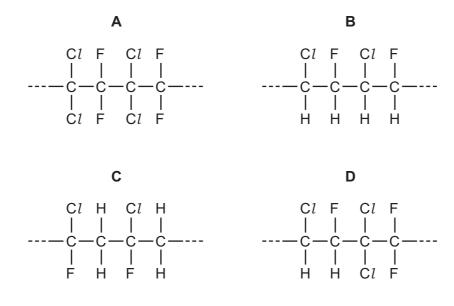
To which homologous series do X, Y and Z belong?

	Х	Y	Z
Α	alcohols	carboxylic acids	esters
в	alcohols	esters	carboxylic acids
С	carboxylic acids	alcohols	esters
D	carboxylic acids	esters	alcohols

40 The diagram shows the structure of a monomer.



Which polymer is made from this monomer?



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	≡		11 5 Boron 27 27 13 Auminium	70 Ga 31	115 In Indium 49	204 T 1 Thallium 81		162 Dysprosium 66	Cf Californium 98
ents				65 Zn 30 ^{Zinc}	112 Cd ^{Cadmium} 48	201 Hg ^{Mercury} 80		159 Tb ^{Terbium} 65	BK Berkelium 97
The Periodic Table of the Elements Group				64 Cu ^{Copper}	108 Ag Silver	197 Au Gold 79		157 Gd Gadolinium 64	96 Curium
Table of tl Group				59 Nickel 28	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium 95
iodic Ta Gr			_	59 Co ²⁷	103 Rh Rhođium 45	192 Ir 1ridium		150 Sm ^{Samarium} 62	Putonium 94
The Per		Hydrogen		56 Fe Iron 26	101 Ru Ruthenium 44	190 OS Osmium 76		Promethium 61	Neptunium 93
				55 Manganese 25	Tc Technetium 43	186 Re Rhenium 75		144 Neodymium 60	238 Uranium 92
				52 Ch romium 24	96 Mo Molybdenum 42	184 V Tungsten 74		141 Pr Praseodymium 59	Pa Protactinium 91
				51 Vanadium 23	93 Nab 11	181 Ta ^{Tantalum} 73		140 Ce ^{Cerium}	232 Tho 90
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