Cardinal Newman Catholic School

Holy Cross Catholic Multi Academy Company

YEAR 11

Summer 2024

Triple Science Practice Booklet

FOUNDATION TIER ONLY

AQA

Name:

For each Topic in Paper 1 there are 4/5 practice questions.

Remember they can ask you questions linked to all five topics.

How to use this booklet:

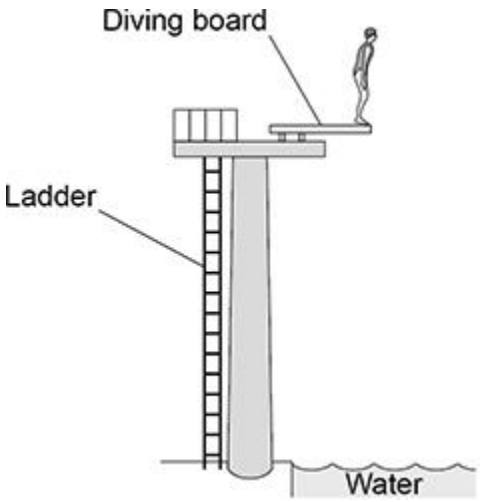
1. Complete revision for each topic
2. Put away your notes/resources and try to answer the questions in the best way possible.
3. Look at the mark scheme at the back of the booklet and compare it to your answer – add anything you have missed off in green pen.
4. Go back to the revision guide/your resources to go over anything you are unsure of.

Contents

P1 Energy

Q1.

The figure below shows a diver about to dive off a diving board.



(a) Complete the sentences.

Choose answers from the box.

elastic potential	**gravitational potential**	**kinetic**	**nuclear**

As the diver falls towards the water there is a decrease in

her _____ energy.

As the diver falls towards the water there is an increase in

her _____ energy.

(2)

(b) Write down the equation which links kinetic energy (E_k), mass (m) and speed (v).

_____

(1)

(c) At the instant the diver hits the water, the kinetic energy of the diver is 5040 J.

The speed of the diver is 12 m/s.

Calculate the mass of the diver.

_____

_____

_____

_____

Mass = _____ kg

(3)

(d) Most of the kinetic energy of the diver is transferred to the water.

How does this affect the thermal energy of the water?

Tick (✓) **one** box.

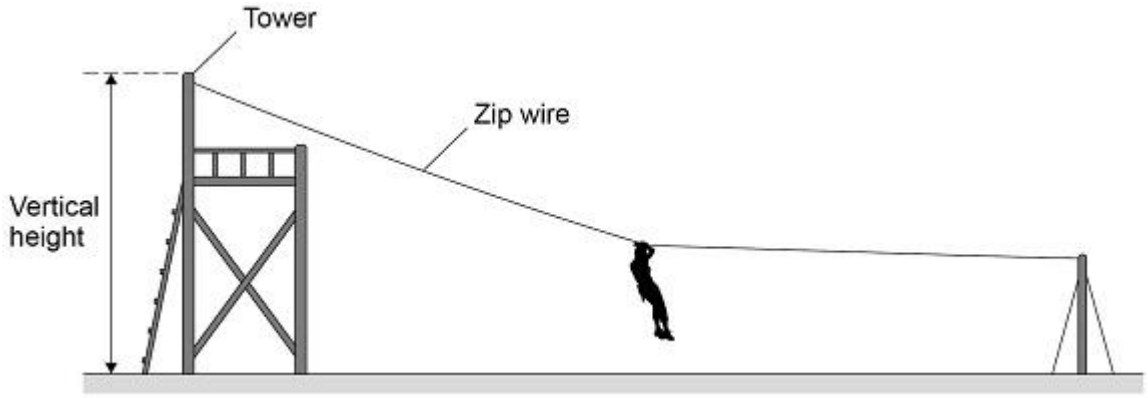
The thermal energy decreases.	☐
The thermal energy stays the same.	☐
The thermal energy increases.	☐

(1)

(Total 7 marks)

Q2.

The following figure shows a person sliding down a zip wire.



(a) Describe how the vertical height of the tower could be measured accurately.

_____

_____

_____

_____

(2)

(b) When using the zip wire, the person moved through a vertical height of 2.0 m

The person has a mass of 45 kg

gravitational field strength = 9.8 N/kg

Calculate the change in gravitational potential energy of the person.

Use the equation:

gravitational potential energy = mass × gravitational field strength × height

Change in gravitational potential energy = _____ J

(2)

(c) Give **three** factors that affected the kinetic energy of the person as she reached the bottom of the zip wire.

1 _____

2 _____

3 _____

(3)

(Total 7 marks)

P2 Electricity

Q3.

Electricity can be generated using various energy sources.

(a) Give **one** advantage and **one** disadvantage of using nuclear power stations rather than gas-fired power stations to generate electricity.

Advantage _____

Disadvantage _____

(2)

(b) (i) A single wind turbine has a maximum power output of 2 000 000 W.

The wind turbine operated continuously at maximum power for 6 hours.

Calculate the energy output in kilowatt-hours of the wind turbine.

_____

_____

_____

Energy output = _____ kWh

(2)

(ii) Why, on average, do wind turbines operate at maximum power output for only 30% of the time?

_____

_____

(1)

(c) An on-shore wind farm is made up of many individual wind turbines.

They are connected to the National Grid using underground power cables.

Give **one** advantage of using underground power cables rather than overhead power cables.

_____

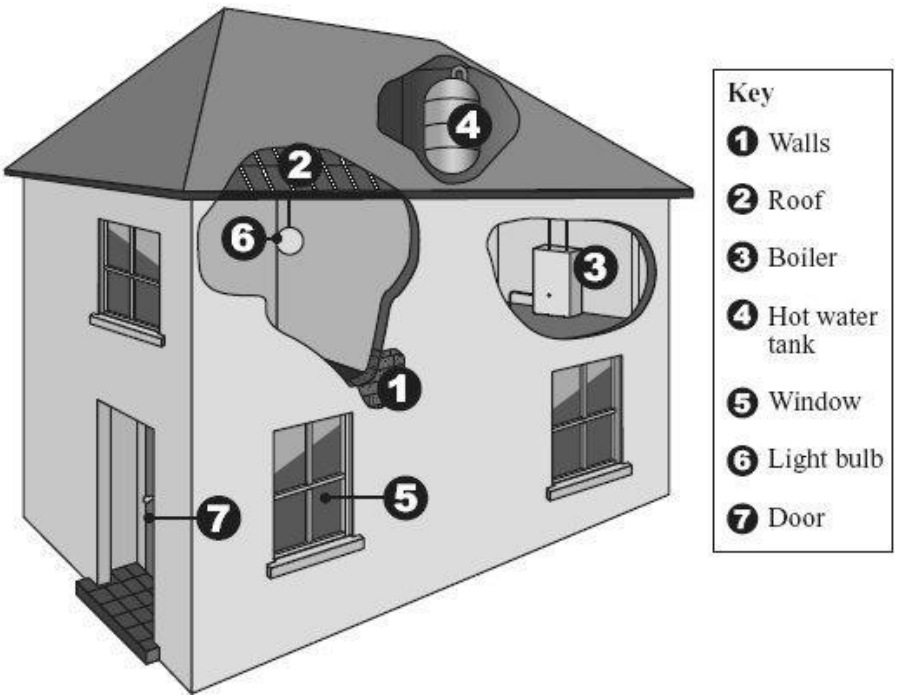
_____

(1)

(Total 6 marks)

Q4.

The drawing shows parts of a house where it is possible to reduce the amount of energy lost.



(a) Give **one** way in which the amount of energy lost can be reduced from each of the following parts of the house.

1, **2** and **4** _____

5 _____

7 _____

(3)

(b) Energy consumption can be reduced by using a more efficient boiler or more efficient light bulbs.

What is meant by a *more efficient* light bulb?

_____

_____

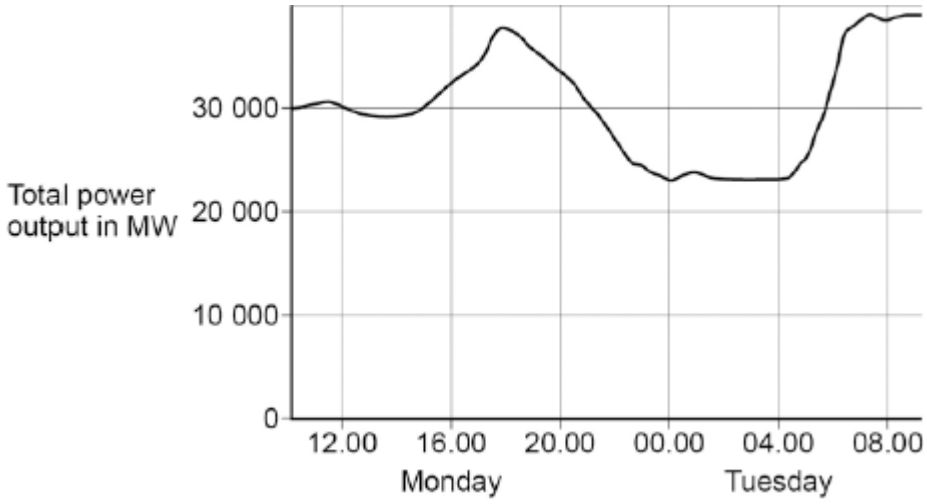
(1)

(Total 4 marks)

Q5.

The National Grid ensures that the supply of electricity always meets the demand of the consumers.

The figure below shows how the output from fossil fuel power stations in the UK varied over a 24-hour period.



(a) Suggest **one** reason for the shape of the graph between 15.00 and 18.00 on Monday.

_____

_____

(1)

(b) Gas fired power stations reduce their output when demand for electricity is low.

Suggest **one** time on the figure above when the demand for electricity was low.

_____

_____

(1)

(c) The National Grid ensures that fossil fuel power stations in the UK only produce about 33% of the total electricity they could produce when operating at a maximum output.

Suggest **two** reasons why.

1. _____

_____

2. _____

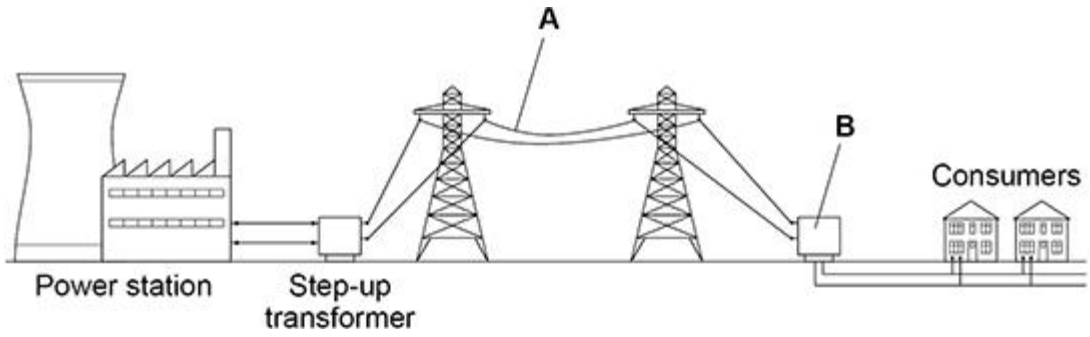
_____

(2)

(Total 4 marks)

Q6.

The figure below shows part of the National Grid linking a power station to consumers.



(a) Name the parts of the figure above labelled **A** and **B**.

A _____

B _____

(2)

(b) Electricity is transmitted through **A** at a very high potential difference.

What is the advantage of transmitting electricity at a very high potential difference?

Tick (✓) **one** box.

A high potential difference is safer for consumers.	☐
Less thermal energy is transferred to the surroundings.	☐
Power transmission is faster.	☐

(1)

(c) The power station generates electricity at a potential difference of 25 000 V.

The energy transferred by the power station in one second is 500 000 000 J.

Calculate the charge flow from the power station in one second.

Use the equation:

$$\text{charge flow} = \frac{\text{energy}}{\text{potential difference}}$$

Charge flow in one second = _____ C

(2)

The electricity supply to a house has a potential difference of 230 V.

The table below shows the current in some appliances in the house.

Appliance	**Current in amps**
Dishwasher	6.50
DVD player	0.10
Lamp	0.40
TV	0.20

(d) Calculate the total power of all the appliances in the table above.

Use the equation:

power = potential difference × current

Total power = _____ W

(3)

(e) Each appliance in the table above is switched on for 2 hours.

Which appliance will transfer the most energy?

Give a reason for your answer.

Appliance _____

Reason _____

_____

_____

(2)

(f) The average energy transferred from the National Grid every second for each person in the UK is 600 J.

There are 32 000 000 seconds in one year.

Calculate the average energy transferred each year from the National Grid for each person in the UK.

_____

_____

_____

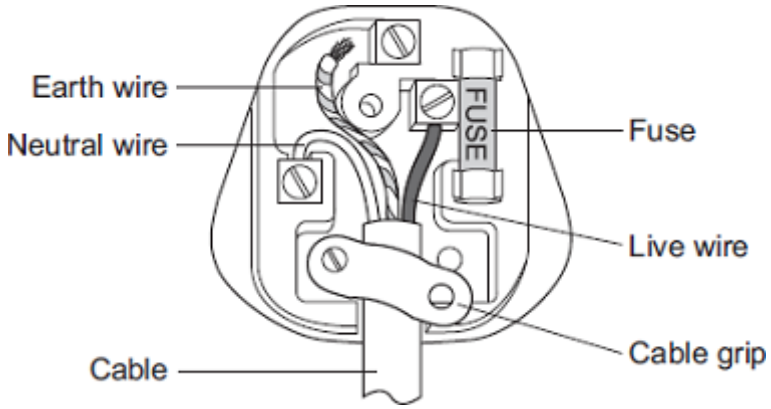
Average energy transferred = _____ J

(2)

(Total 12 marks)

Q7.

(a) The diagram shows the inside of an incorrectly wired three-pin plug.



(i) What **two** changes need to be made so that the plug is wired correctly?

1. _____

_____

2. _____

_____

(2)

(ii) The fuse inside a plug is a safety device.

Explain what happens when too much current passes through a fuse.

_____

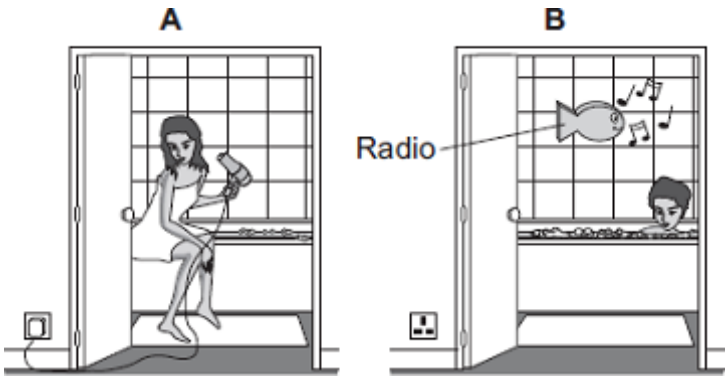
_____

_____

_____

(2)

(b) Each of these pictures shows an electrical appliance being used in a bathroom.



Using the hairdryer in picture **A** is dangerous. However, it is safe to use the battery-operated radio in picture **B**.

Explain why.

_____

_____

_____

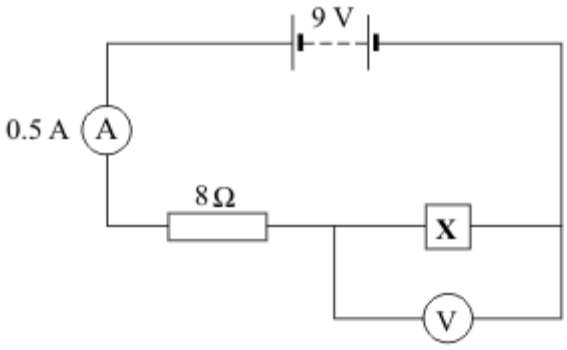
_____

(2)

(Total 6 marks)

Q8.

(a) The circuit diagram drawn below includes a component labelled **X**.



(i) Calculate the potential difference across the 8 ohm resistor.

Show clearly how you work out your answer.

_____

_____

Potential difference = _____ volts

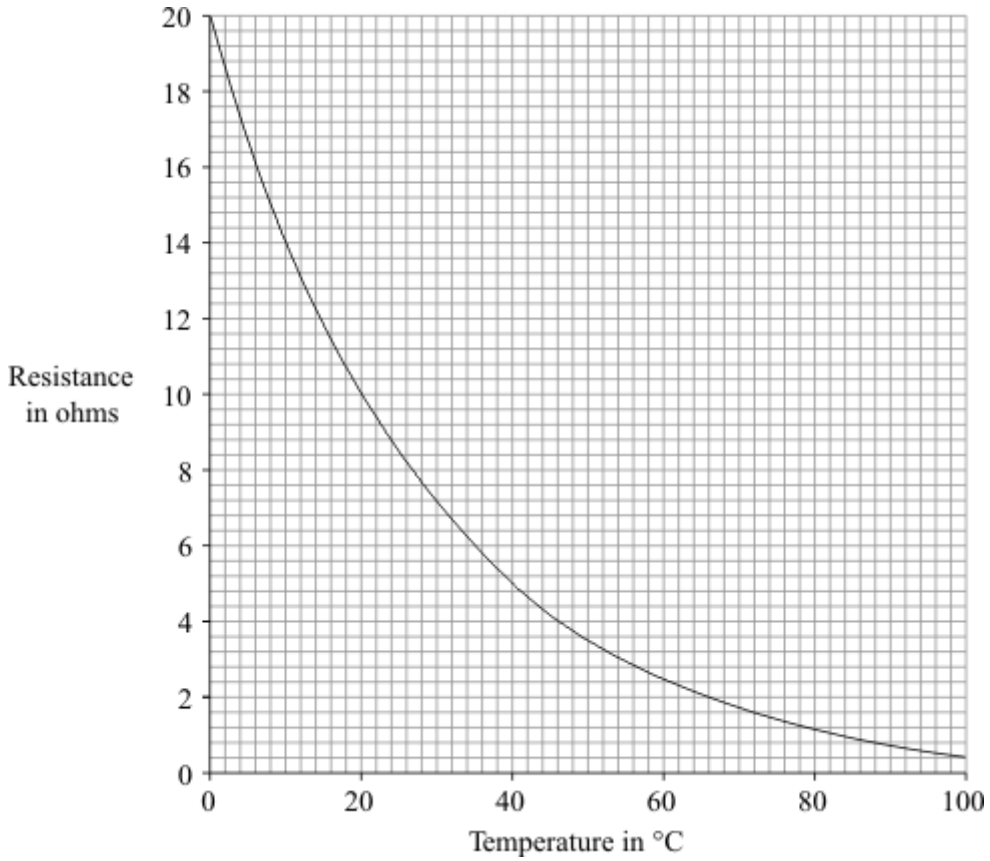
(2)

(ii) What is the potential difference across component **X**?

_____

(1)

(b) The graph shows how the resistance of component **X** changes with temperature.



(i) What is component **X**?

_____

(1)

(ii) Over which range of temperatures does the resistance of component **X** change the most?

Put a tick (✓) next to your choice.

0 °C to 20 °C ☐

20 °C to 40 °C ☐

40 °C to 60 °C ☐

60 °C to 80 °C ☐

80 °C to 100 °C ☐

(1)

(Total 5 marks)

Q9.

(i) Write the equation which shows the relationship between the electric *current*, the *power* and the *voltage*.

_____

_____

(1)

(ii) Calculate the power if the current is 5 A and the voltage is 400 000 V. Show clearly how you work out your answer and give the unit.

_____

_____

Power = _____

(2)

(Total 3 marks)

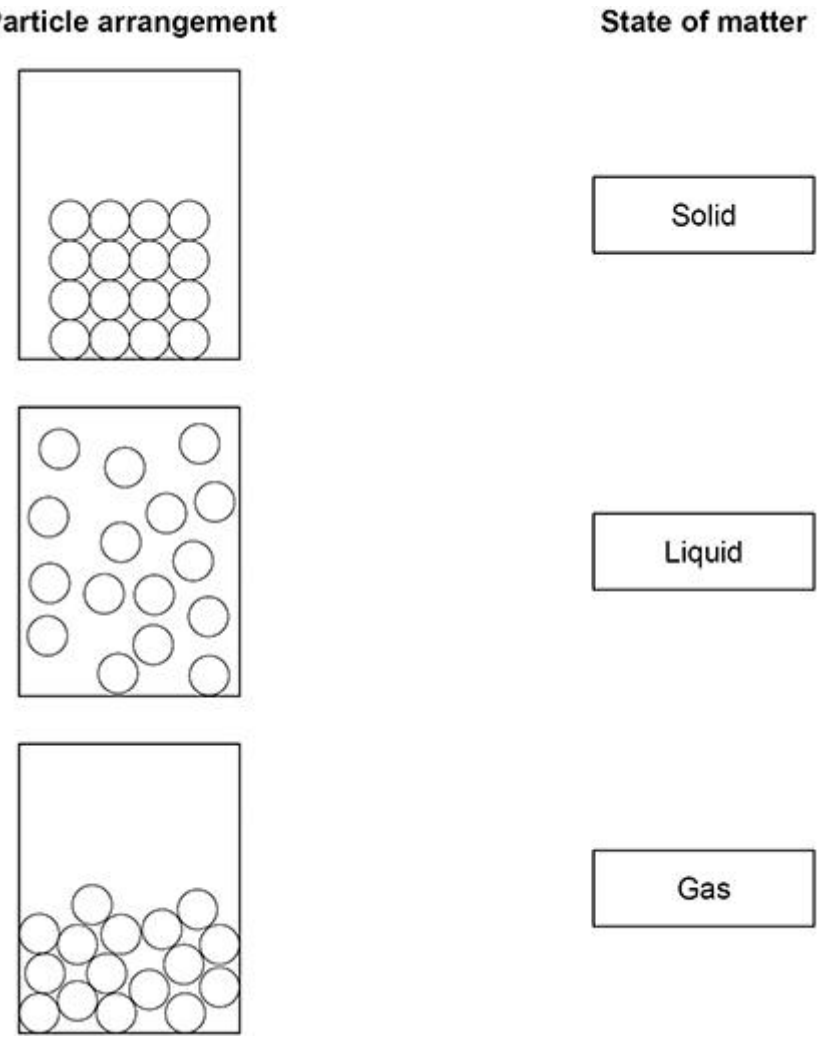
P3 Particle Model of Matter

Q10.

(a) A student investigated the three states of matter.

The arrangement of particles in the three states of matter are different.

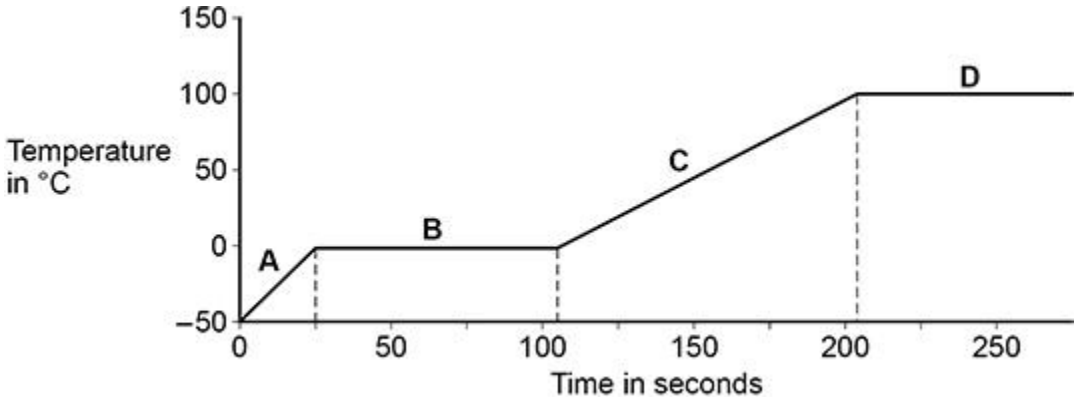
Draw **one** line from each particle arrangement to the state of matter.



(2)

A large lump of ice was heated and changed state.

The figure below shows how the temperature varied with time.



(b) Which part of the figure above shows when the ice was melting?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(c) Which part of above the figure above shows when the water was boiling?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(d) Which property of the water particles changes as the temperature of the water increases?

Tick (✓) **one** box.

The kinetic energy of the particles ☐

The mass of each particle ☐

The number of particles ☐

(1)

(e) Calculate the thermal energy needed to melt 0.250 kg of ice at 0 °C.

specific latent heat of fusion of water = 334 000 J/kg

Use the equation:

thermal energy = mass × specific latent heat

_____

_____

_____

Thermal energy = _____ J

(2)

(f) Complete the sentence.

Choose the answer from the box.

condenses	**evaporates**	**ionises**	**sublimates**

A substance is heated and changes directly from a solid to a gas.

The substance _____.

(1)

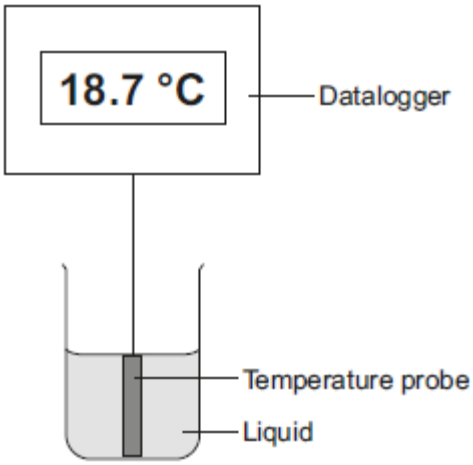
(Total 8 marks)

Q11.

A student investigated the cooling effect of evaporation.

She used the equipment (datalogger and probe) shown in **Figure 1** to measure how the temperature of a liquid changed as the liquid evaporated.

Figure 1



(a) Which type of variable was the temperature in this investigation?

Tick (✔) **one** box.

	Tick (✔)
control	
dependent	
independent	

(1)

(b) Before the investigation started, the student checked the accuracy of three different temperature probes. The student put the probes in a beaker of boiling water that had a temperature of 100.0 °C.
The readings from the three temperature probes are shown in **Figure 2**.

Figure 2

Probe A	Probe B	Probe C
99.8	100.1	103.2

Which **one** of the temperature probes, **A**, **B** or **C**, was **least** accurate?

Write the correct answer in the box.

Give a reason for your answer.

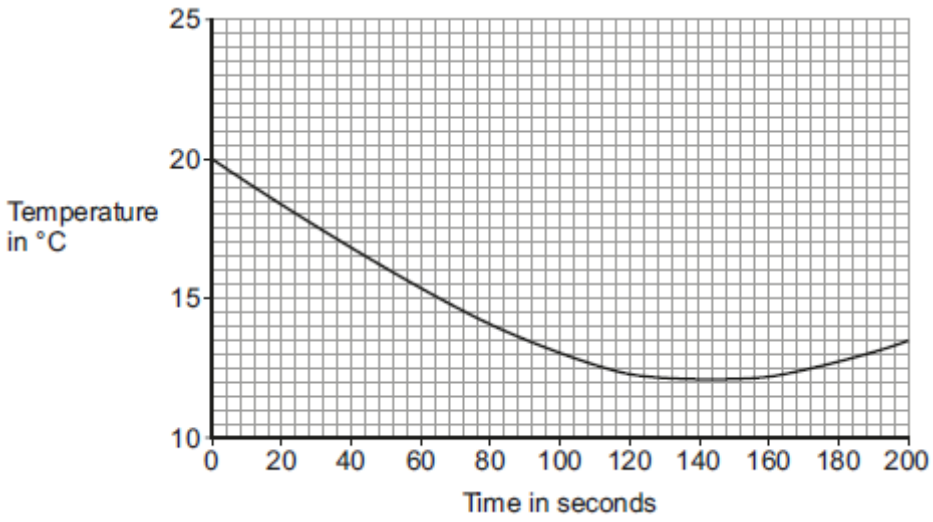
_____

_____

(2)

(c) **Figure 3** shows how the temperature recorded changed during the investigation.

Figure 3



(i) Use **Figure 3** to determine the lowest temperature recorded as the liquid evaporated.

Temperature = _____ °C

(1)

(ii) Use **Figure 3** to determine how long it took for all the liquid to evaporate. Give a reason for your answer.

Time = _____ seconds

Reason: _____

_____

(2)

(iii) How would increasing the starting temperature of the liquid above 20 °C affect the rate of evaporation of the liquid?

_____

_____

(1)

(Total 7 marks)

Q12.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

The information in the box is about the properties of solids and gases.

Solids:

• have a fixed shape • are difficult to compress (to squash). Gases: • will spread and fill the entire container • are easy to compress (to squash).

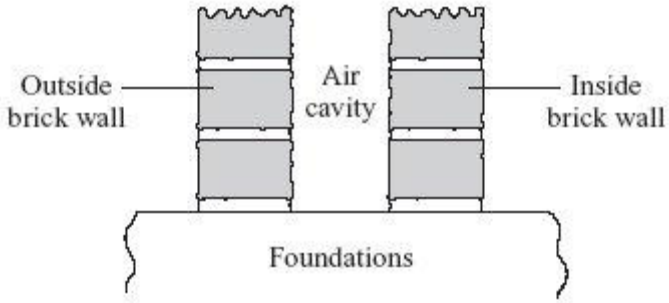
Use your knowledge of kinetic theory to explain the information given in the box.

You should consider:
- the spacing between the particles
- the movement of individual particles
- the forces between the particles.

(Total 6 marks)

Q13.

(a) The diagram shows a section through the walls of a house built in 1930.



Explain how the air cavity between the two walls reduces the heat transfer from the house.

_____

_____

_____

_____

(2)

(b) The table shows the installation costs and yearly savings on energy bills for different methods of insulating a house.

Method of insulation	**Installation costin £**	**Yearly saving on energy bills in £**
Double glazing	4000	65
Loft insulation	240	60
Cavity wall insulation	600	80

(i) Give **one** reason why loft insulation is often fitted to an old house before double glazing or cavity wall insulation.

_____

_____

(1)

(ii) The time it takes for the saving on energy bills to equal the cost of installing the insulation is called the pay-back time.

Calculate the pay-back time for loft insulation.

_____

Pay-back time = _____ years

(1)

P4 Atomic Structure

Q14.

The ancient Greeks thought that atoms were tiny spheres that could not be divided into anything smaller.

Since then, different discoveries have led to the model of the atom changing.

Some of the discoveries are given in the table below.

The mass of an atom is concentrated in the nucleus.	**A**
Electrons orbit the nucleus at specific distances.	**B**
The nucleus contains neutrons.	**C**
The nucleus contains positively charged protons.	**D**

(a) Which discovery was the earliest?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Which discovery was the most recent?

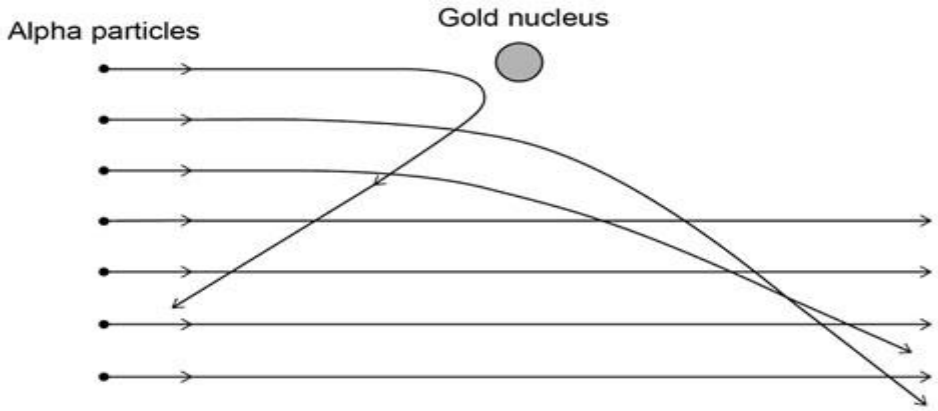
Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(c) The alpha particle scattering experiment led to the nuclear model of the atom.

The figure below shows the paths of alpha particles travelling close to a gold nucleus.



Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

attracts	**decreases**	**does not change**
increases	**reflects**	**repels**

Alpha particles and gold nuclei are both positively charged.

The gold nucleus _____ the alpha particles.

As the alpha particle approaches the gold nucleus, the electric field strength experienced by the alpha particle _____.

As an alpha particle approaches the gold nucleus, the force experienced by the alpha particle _____.

(3)

(d) The results of the alpha particle scattering experiment were reproducible.

What does reproducible mean?

Tick (✓) **one** box.

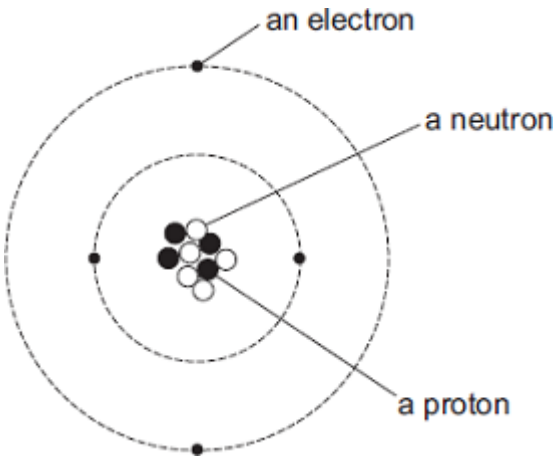
Another scientist repeats the experiment and gets the same results.	☐
Another scientist repeats the experiment and gets different results.	☐
The same scientist repeats the experiment and gets the same results.	☐
The same scientist repeats the experiment and gets different results.	☐

(1)

(Total 6 marks)

Q15.

The diagram represents an atom of beryllium. The three types of particle that make up the atom have been labelled.



(a) Use the labels from the diagram to complete the following statements.

Each label should be used once.

The particle with a positive charge is _____ .

The particle with the smallest mass is _____ .

The particle with no charge is _____ .

(2)

(b) What is the mass number of a beryllium atom?

Draw a ring around your answer.

4	**5**	**9**	**13**

Give a reason for your answer.

_____

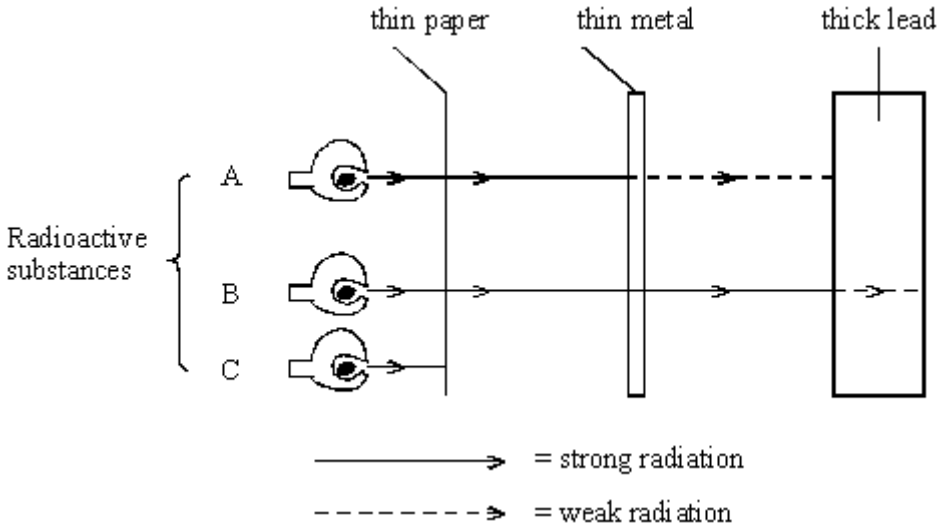
_____

(2)

(Total 4 marks)

Q16.

The diagram shows what happens to the radiation from three radioactive substances when different materials are put in the way.



Choose types of radiation from this list to complete the table below.

α (**alpha**) β (**beta**) γ (**gamma**) UV **(ultraviolet)**

RADIOACTIVE SUBSTANCE	TYPE OF RADIATION IT EMITS
A	
B	
C	

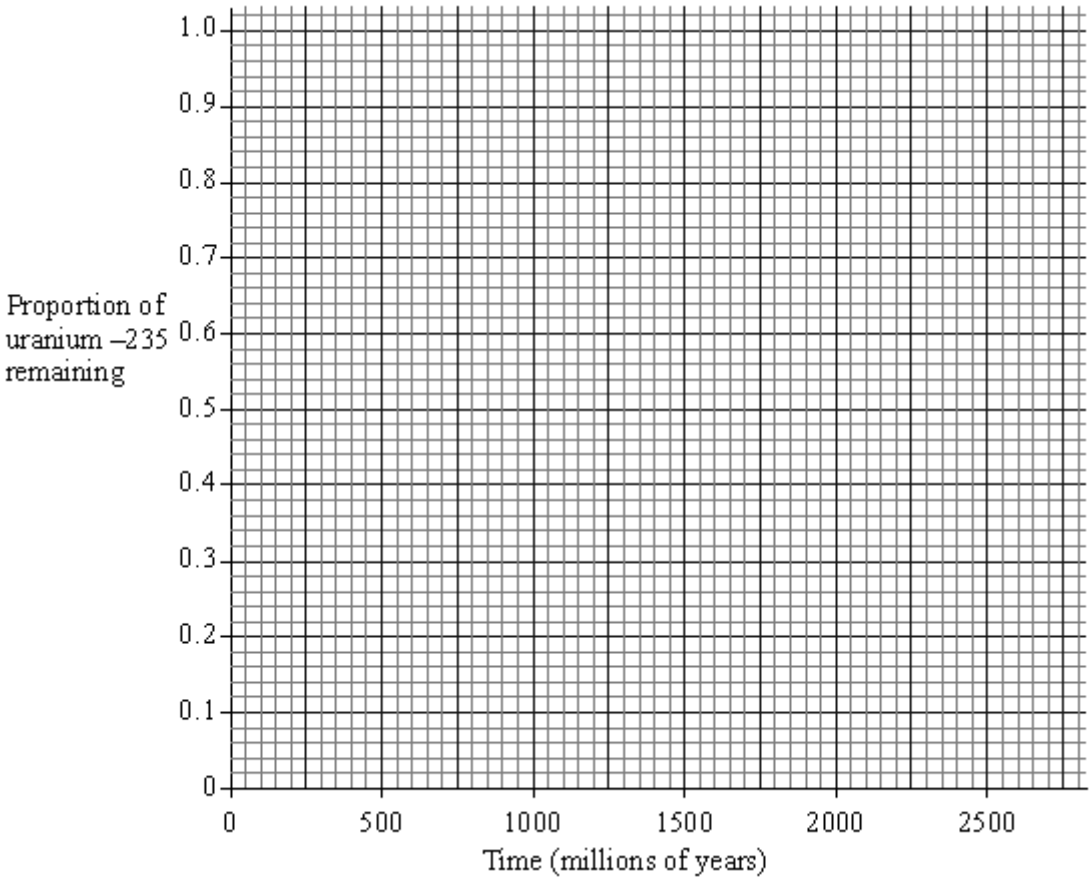
(Total 3 marks)

Q17.

Some rocks contain the radioactive isotope uranium-235 (^{235}U).

^{235}U has a half-life of 700 million years and, as it decays, lead-207 (^{207}Pb) is eventually formed.

(a) Draw a decay curve for ^{235}U on the graph below.



(4)

(b) Samples of an igneous rock gave an average ratio of 70 atoms of ^{235}U to 30 atoms of ^{207}Pb.

Use the decay curve you have drawn to estimate the age of the igneous rock.

Answer _____ million years.

(1)

(c) A sandstone rock which lies above the igneous rock contains traces of uranium-235 and of lead-207.

Why might it be unsatisfactory to use this uranium for dating the sandstone?

_____

_____

_____

_____

(2)

(Total 7 marks)

Mark schemes

Q1.

(a) gravitational potential

this order only

1

kinetic

1

(b) kinetic energy = 0.5 × mass × speed^2

or

$E_k = ½mv^2$

1

(c) $5040 = 0.5 \times m \times 12^2$

1

$$m = \frac{5040}{0.5 \times 12^2}$$

1

m = 70 (kg)

1

(d) the thermal energy increases.

1

[7]

Q2.

(a) use a tape measure

allow use a metre rule

allow use a laser measure

1

one person holding the top and another person holding the bottom

or

use a set square to ensure tape measure is vertical

allow use a plumb-line to ensure tape measure is vertical

or

take repeat readings and calculate a mean

1

(b) $E_p = 45 \times 9.8 \times 2.0$

an answer of 880 (J) or 882 (J) scores 2 marks

1

$E_p = 880$ (J)

1

(c) any **3** from:

- change in vertical height
- mass / weight
- speed / velocity
- air resistance or drag

  allow body position

  allow wind
- friction (between zip line and pulley)
- gradient / angle (of the zip wire)
- length of zip wire

  ignore gravitational field strength

3

[7]

Q3.

(a) advantage

any **one** from:

- produce no / little greenhouse gases / carbon dioxide

  allow produces no / little polluting gases

  allow doesn't contribute to global warming / climate change

  allow produce no acid rain / sulphur dioxide

  reference to atmospheric pollution is insufficient

  produce no harmful gases is insufficient
- high(er) energy density in fuel

  accept one nuclear power station produces as much power as several gas power stations

  nuclear power stations can supply a lot of or more energy is insufficient
- long(er) operating life

  allow saves using reserves of fossil fuels or gas

1

disadvantage

any **one** from:

- produce (long term) radioactive waste

  accept waste is toxic

  accept nuclear for radioactive
- accidents at nuclear power stations may have far reaching or long term consequences
- high(er) decommissioning costs

  accept high(er) building costs
- long(er) start up time

1

(b) (i) 12 000 (kWh)

*allow **1** mark for correct substitution eg*

2000 × 6

or

2 000 000 × 6

or

$$\frac{12\,000\,000}{1000}$$

*an answer of 12 000 000 scores **1** mark*

2

(ii) any idea of unreliability, eg

- wind is unreliable
  reference to weather alone is insufficient
- shut down if wind too strong / weak
- wind is variable

1

(c) any **one** from:

- cannot be seen
- no hazard to (low flying) aircraft / helicopters
- unlikely to be or not damaged / affected by (severe) weather
  unlikely to be damaged is insufficient
- (normally) no / reduced shock hazard
  safer is insufficient
  less maintenance is insufficient
  installed in urban areas is insufficient

1

[6]

Q4.

(a) insulation

allow example e.g fibreglass

1

double glazing

allow curtains

1

draught excluder

allow double glazing / close fitting door

allow turning down thermostat once only / turn down the heating

1

(b) transfers more useful energy

allow converts more energy into light / less into heat / less energy wasted

1

[4]

Q5.

(a) power output increases (to meet demand) due to people returning home from work / school

accept many electrical appliances are switched on (which increases demand)

1

accept other sensible suggestions

(b) 00.00

accept midnight

1

allow answers between 00.00 and 04.00

(c) any **two** from:

- conserves fuel reserves
- spare capacity to compensate for unreliable renewable resources
- provides spare capacity in case of power station emergency shut-down
- so as to not make unnecessary environmental impact

2

[4]

Q6.

(a) A: transmission / power cables

allow transmission / power lines

allow cables

ignore wires

1

B: step-down transformer

1

(b) less thermal energy is transferred to the surroundings.

1

(c) charge flow = $\frac{500\,000\,000}{25\,000}$

1

charge flow = 20 000 (C)

1

(d) total current = 7.20 (A)

1

P = 230 × 7.20

allow a correct substitution of an incorrect total current

1

P = 1656 (W)

allow a correct calculation using an

incorrect total current

1

(e) dishwasher

1

has the largest current
or
has the largest power (input)

1

(f) E = 600 × 32 000 000

1

E = 19 200 000 000 (J)
or
E = 1.92×10^{10} (J)

1

[12]

Q7.

(a) (i) connect the earth wire (to pin)
answers must be in terms of correcting the faults

1

screw cable grip (across cable)
accept tighten the cable grip

1

(ii) any **two** from:

- fuse gets (very) hot
- fuse melts

accept blows for melts
*do **not** accept break / snap fuse / blow up*

- circuit breaks / switches off

accept stops current flowing

2

(b) any **two** from:

- hairdryer is plugged into mains (electricity socket)
it refers to hairdryer
hairdryer works from the mains

or
hairdryer is using 230 V
accept 240 for 230

- water conducts electricity
*do **not** accept water and electricity don't mix*

- radio is low power / current / pd / voltage

accept radio not connected to the mains
*do **not** accept radio is waterproof*

- (the current in / pd across) hairdryer more likely to give a (fatal) electric shock

  accept the idea of electrocution if hairdryer is wet
  accept the idea of radio not causing electrocution if wet

2

[6]

Q8.

(a) (i) 4 (V)

*allow **1** mark for correct substitution*

2

(ii) 5 (V) or (9 – their (a)(i)) correctly calculated

e.c.f

*do **not** allow a negative answer*

1

(b) (i) thermistor

c.a.o

1

(ii) 0°C to 20°C

1

[5]

Q9.

(i) power = current × voltage
or any correctly transposed version

accept watts = amps × volts

accept P = IV

do not credit P = CV

accept p.d. for voltage triangle acceptable only if used correctly in (ii)

1

(ii) 2 000 000 (1)

2000 kilowatts/kW (2)

accept KW

watts/W (1)

2 megawatts/MW (2)

*do not credit mW (1) if correct method is clearly shown but answer is numerically incorrect **or** unit is absent **or** incorrect*

do not credit any working from an incorrect equation in (d)(i) but an appropriate unit should be

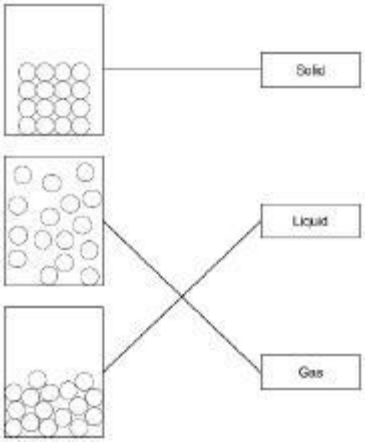
credited

2

[3]

Q10.

(a)



2 marks for all correct
1 mark for 1 or 2 correct

2

(b) **B**

1

(c) **D**

1

(d) the kinetic energy of the particles

1

(e) E = 0.250 × 334 000

1

E = 83 500 (J)

1

(f) sublimates

1

[8]

Q11.

(a) dependent

1

(b) (probe) C

allow 103.2

1

largest difference between reading and actual temperature

reason only scores if C chosen
accept larger

it is 3.2 greater is insufficient

comparing C with only one other probe is insufficient

1

(c) (i) 12(°C)

accept a value between 12.0 and 12.2 inclusive

1

(ii) 140 (seconds)

accept an answer between 130 and 150 inclusive

1

temperature starts to rise

only scores if time mark awarded

accept the temperature was lowest (at this time)

1

(iii) increase

accept faster (rate)

1

[7]

Q12.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1–2 marks)
Considers either solid or gas and describes at least one aspect of the particles.

or

Considers both solids and gases and describes an aspect of each.

Level 2 (3–4 marks)
Considers both solids and gases and describes aspects of the particles.

or

Considers one state and describes aspects of the particles and explains at least one of the properties.

or

Considers both states and describes an aspect of the particles for both and explains a property for solids or gases.

Level 3 (5–6 marks)
Considers both states of matter and describes the spacing and movement /

forces between the particles. Explains a property of both solids and gases.

examples of the points made in the response

extra information

Solids

- (particles) close together
- (so) no room for particles to move closer (so hard to compress)
- vibrate about fixed point
- strong forces of attraction (at a distance)
- the forces become repulsive if the particles get closer
- particles strongly held together / not free to move around (shape is fixed)

any explanation of a property must match with the given aspect(s) of the particles.

Gases

- (particles) far apart
- space between particles (so easy to compress)
- move randomly
- negligible / no forces of attraction
- spread out in all directions (to fill the container)

[6]

Q13.

(a) air is (a good) insulator

1

or air is a poor conductor

accept air cavity / 'it' for air

reducing heat transfer by <u>conduction</u>

accept stops for reduces
ignore convection
*do **not** accept radiation*
*do **not** accept answers in terms of heat being trapped*

1

(b) (i) most cost effective

accept it is cheaper or low<u>est</u> cost
accept shortest payback time
accept in terms of reducing heat loss by the largest amount
*do **not** accept it is easier*
ignore most heat is lost through the roof

1

(ii) 4

1

[4]

Q14.

(a) A

1

(b) C

1

(c) repels

1

increases

1

increases

1

in this order only

(d) another scientist repeats the experiment and

gets the same results

1

[6]

Q15.

(a) proton

all 3 in correct order

electron

*allow **1** mark for 1 correct do **not***

neutron

accept letters p, e, n

2

(b) 9

reason only scores if 9 is chosen

1

number of neutrons and protons

1

[4]

Q16.

A β / beta
B γ / gamma
C α / alpha

for 1 mark each

[3]

Q17.

(a) one relevant point correctly plotted

gains 1 mark

but two relevant points correctly plotted
gains 2 marks

but three relevant points correctly plotted
gains 3 marks

curved line drawn accurately through the points
for 1 further mark

4

(b) age of igneous rock = 400 ± 100 million years

1

(c) sandstone is a sedimentary rock
for 1 mark

there is likely to be some lead-207 present
or from the rocks from which the sandstone was formed
for 1 mark

(*allow* ^{207}Pb may not have come from this ^{235}U)

2

[7]