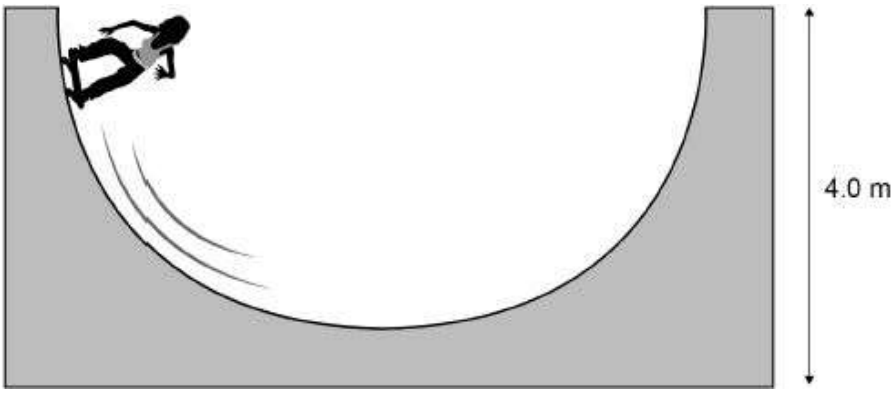
Year 11 Weekly Homework
Physics (paper 1)
All Questions to be completed

Q1.

The diagram below shows a girl skateboarding on a semi-circular ramp.



The girl has a mass of 50 kg

(a) Calculate the gravitational potential energy (g.p.e.) of the girl at the top of the ramp.

Use the equation:

g.p.e. = mass × gravitational field strength × height

gravitational field strength = 9.8 N/kg

_____

_____

g.p.e. = _____ J

(2)

(b) The girl has a speed of 7 m/s at the bottom of the ramp.

Calculate the kinetic energy of the girl at the bottom of the ramp.

Use the equation:

kinetic energy = 0.5 × mass × $(\text{speed})^2$

_____

_____

Kinetic energy = _____ J

(2)

(c) Not all of the g.p.e. has been transferred to kinetic energy.

Which **two** statements explain why?

Tick **two** boxes.

Some energy is wasted. ☐

The mass of the girl is too low. ☐

The ramp is not high enough. ☐

The g.p.e. of the girl is not zero. ☐

The speed of the girl is too great. ☐

(2)

(d) Explain how lubricating the wheels of the skateboard can increase the speed of the girl.

Use ideas about energy in your explanation.

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)

Q2.

An energy input of 1.3×10^{18} J is supplied each year by power stations to the National Grid.

Not all of this energy is supplied to consumers. Some of the energy is wasted in the distribution process.

(a) Write the equation which links efficiency, total input energy transfer and useful output energy transfer.

_____

_____

(1)

(b) The energy supplied each year to consumers is 1.2×10^{18} J

Calculate the efficiency of the distribution process.

Efficiency = _____

(2)

(c) How is electrical power transmitted across the National Grid to make the process as efficient as possible?

Tick **one** box.

At a high potential difference and a high current ☐

At a high potential difference and a low current ☐

At a low potential difference and a high current ☐

At a low potential difference and a low current ☐

(1)

(d) Write the equation which links energy transferred, power and time.

(1)

(e) A wind turbine supplies a power output of 8000 kW for 1200 seconds.

Calculate the energy transferred by the wind turbine in kJ

Energy transferred = _____ kJ

(3)

(f) Describe the environmental advantages and disadvantages of using wind turbines to generate electricity in the UK.

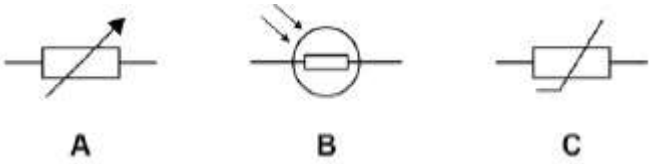
(4)

(Total 12 marks)

Q3.

Figure 1 shows the circuit symbol for three different components.

Figure 1



(a) Which component is a variable resistor?

Tick **one** box.

A ☐ **B** ☐ **C** ☐

(1)

(b) Which component is a thermistor?

Tick **one** box.

A ☐ **B** ☐ **C** ☐

(1)

(c) In which component will the resistance decrease when the temperature increases?

Tick **one** box.

A ☐ **B** ☐ **C** ☐

(1)

(d) In which component will the resistance decrease when the light intensity increases?

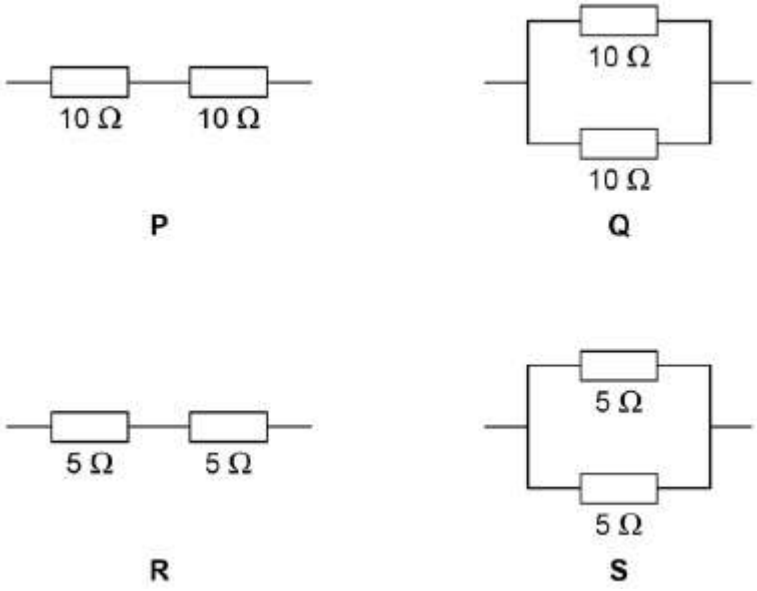
Tick **one** box.

A ☐ **B** ☐ **C** ☐

(1)

Figure 2 shows four different arrangements of resistors.

Figure 2



(e) Two of the arrangements are in series and two are in parallel.

Describe the difference between a series and a parallel arrangement.

_____

_____

_____

_____

(2)

(f) Which arrangement has a resistance of 10 Ω?

Tick **one** box.

P ☐ **Q** ☐ **R** ☐ **S** ☐

(1)

(g) Which arrangement has the highest resistance?

Tick **one** box.

P ☐ Q ☐ R ☐ S ☐

(1)

(h) A student connects a resistor to a cell for 60 seconds.

The current through the resistor is 0.97 A

Calculate the charge flow.

Use the equation:

charge flow = current × time

Give your answer to 2 significant figures.

_____

_____

_____

_____

_____

_____

Charge flow = _____ C

(3)

(Total 11 marks)

Q4.

A set of Christmas tree lights is made from twenty identical lamps connected in series.

(a) Each lamp is designed to take a current of 0.25 A. The set plugs directly into the 230 V mains electricity supply.

(i) Write down the equation that links current, potential difference and resistance.

_____

_____

(1)

(ii) Calculate the resistance of **one** of the lamps. Show clearly how you work out your final answer and give the unit.

_____

_____

_____

_____

Resistance = _____

(4)

(iii) What is the total resistance of the set of lights?

_____

_____

Total resistance = _____

(1)

(b) How does the resistance of a filament lamp change as the temperature of the filament changes?

_____

_____

_____

_____

(1)

(Total 7 marks)

Q5.

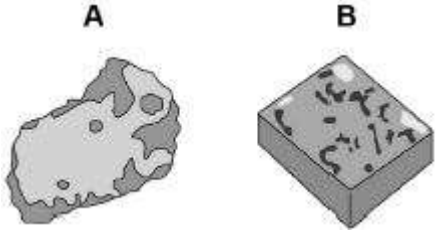
Two large semi-precious stones are discovered.

A student is asked to find out what material each of the two stones is made of.

The student does this by determining the density of the material of each stone.

Figure 1 shows the two stones.

Figure 1



(a) The student wants to measure the volume of stone **A**. Stone **A** cannot be measured

using a metre rule as the stone is an irregular shape.

Describe how the student could determine the volume of stone **A** by putting it into water.

_____

_____

_____

_____

_____

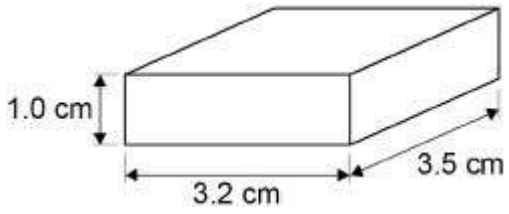
_____

(3)

The student makes measurements of stone **B** using a metre rule.

The measurements of stone **B** are shown **in Figure 2**.

Figure 2



(b) Which piece of equipment could the student use to get a more accurate measurement of the length of stone **B**?

Tick **one** box.

Electronic balance ☐

Microscope ☐

Newtonmeter ☐

Vernier callipers ☐

(1)

(c) Use the following equation to calculate the volume of stone **B** in cm^3

volume = length × width × height

_____

_____

Volume = _____ cm^3

(1)

(d) The mass of stone **B** is 56 grams.

Use your answer from part **(c)** to calculate the density of stone **B** in g/cm^3

Use the following equation.

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

_____

_____

_____

_____

Density = _____ g/cm^3

(2)

(e) The student calculates the density of the material stone **A** is made of as 5.2 g/cm^3

The student looks up the density of some materials in a text book.

Figure 3 shows this information.

Figure 3

Material	Density in g/cm^3
Amber	1.1 – 1.2
Cubic Zirconia	5.5 – 5.9
Garnet	3.8 – 3.9
Haematite	5.1 – 5.3

What material is stone **A** made of?

Tick **one** box.

Amber ☐

Cubic Zirconia ☐

Garnet ☐

Haematite ☐

(1)

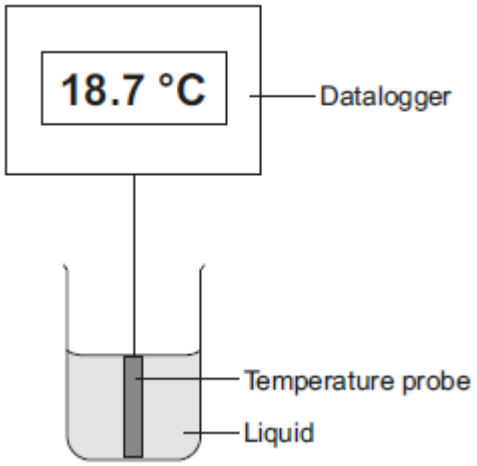
(Total 8 marks)

Q6.

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.

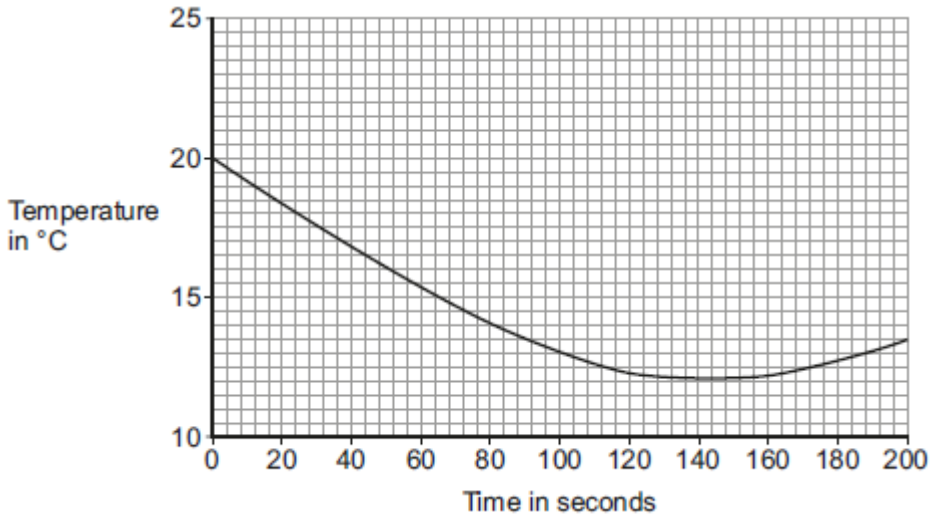
_____

_____

(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)

Q7.

Alpha particles, beta particles and gamma rays are types of nuclear radiation.

(a) Describe the structure of an alpha particle.

_____

_____

(1)

(b) Nuclear radiation can change atoms into ions by the process of ionisation.

(i) Which type of nuclear radiation is the least ionising?

Tick (✔) **one** box.

alpha particles	☐
beta particles	☐
gamma rays	☐

(1)

(ii) What happens to the structure of an atom when the atom is ionised?

_____

_____

(1)

(c) People working with sources of nuclear radiation risk damaging their health.

State **one** precaution these people should take to reduce the risk to their health.

_____

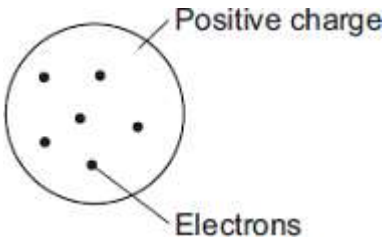
_____

(1)

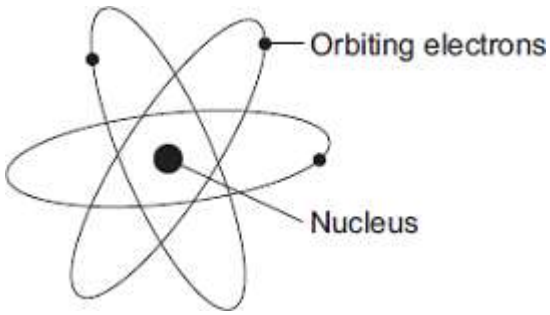
(Total 4 marks)

Q8.

In the early part of the 20th century, scientists used the 'plum pudding' model to explain the structure of the atom.



Following work by Rutherford and Marsden, a new model of the atom, called the 'nuclear' model, was suggested.



Describe the differences between the two models of the atom.

(Total 4 marks)