Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number	Candidate Number

Physics

International Advanced Level
Unit 6: Practical Skills in Physics II

Sample Assessment Materials for first teaching September 2018

Time: 1 hour 20 minutes

Paper Reference
WPH16/01

You must have:
Scientific calculator, Ruler

Total Marks

Instructions

- Use **black** ink or **black** ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Show all your working out in calculations and include units where appropriate.**

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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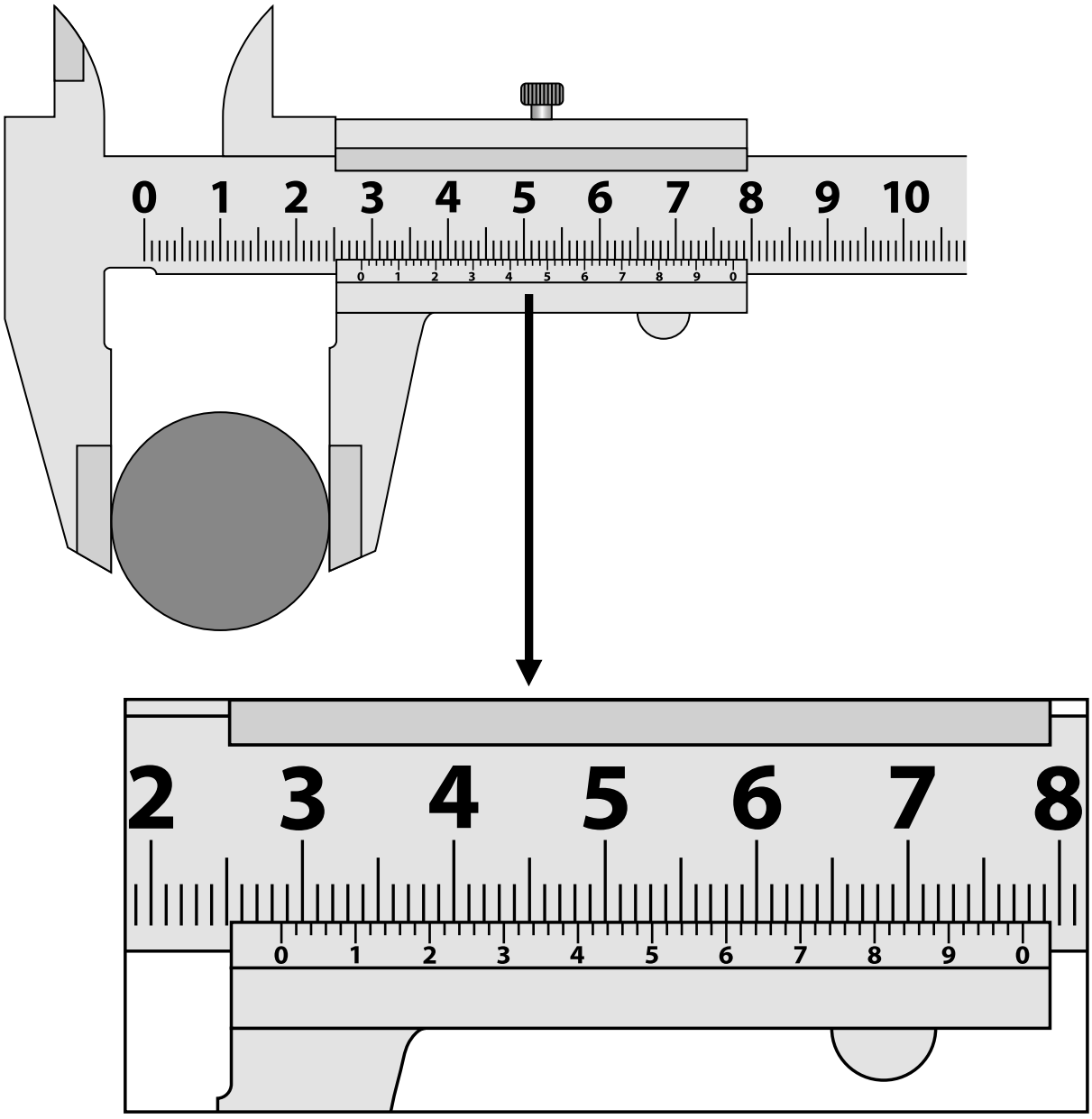
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Answer ALL questions.

1 A student is asked to determine the density of the steel used to make a ball bearing.

The diameter of the ball bearing is measured across three different places using vernier calipers.



(a) Read the measurement shown on the calipers.

Add the reading to the table below.

(1)

	Reading 1	**Reading 2**	**Reading 3**
Diameter/cm	2.854	2.861	

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(b) Calculate the mean value for the diameter of the ball bearing.

(1)

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Mean value for diameter = ...

(c) The mass of the ball bearing is measured as 98.00 g with negligible uncertainty.

Calculate the density of the steel.

(3)

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Density = ...

(d) Calculate the percentage uncertainty in the value of density in (c).

(2)

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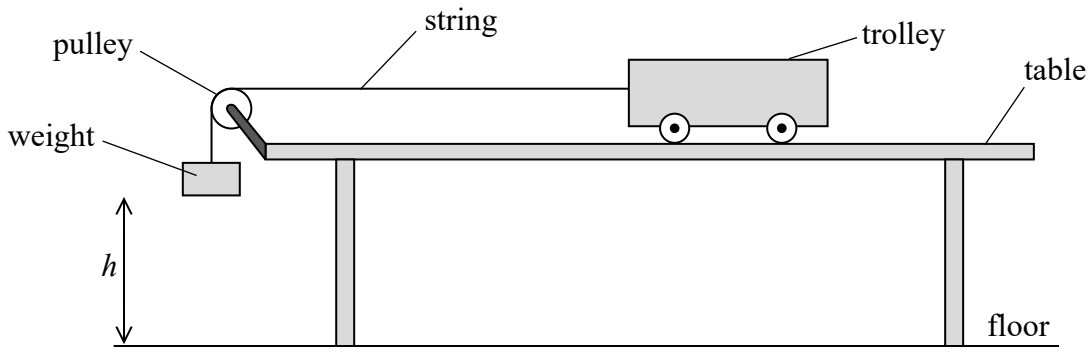
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Percentage uncertainty = ...

(Total for Question 1 = 7 marks)

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2 A student investigated momentum. He set up the apparatus as shown.



The trolley started from rest with the weight close to the pulley and at a height h above the floor.

(a) Add to the diagram to show how the height h should be measured.

(1)

(b) The student recorded h as 885 mm. He recorded the time t for the weight to fall through h and repeated this several times. His measurements are shown below.

t/s					Mean t/s
2.94	2.76	3.28	3.15	3.02	3.0

(i) The mean t has been recorded to two significant figures.

Explain why this is the appropriate number of significant figures in this case.

(2)

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(ii) The maximum velocity v of the trolley is given by

$$v = \frac{2h}{t}$$

Calculate v.

(1)

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v = ...

(iii) Calculate a value for the maximum momentum of the trolley and falling weight.

mass of trolley = 0.930 kg

mass of falling weight = 0.030 kg

(1)

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Maximum momentum = ...

(c) An equation that includes momentum is $F\Delta t = \Delta p$.

(i) Use this equation to calculate the maximum momentum of the trolley and falling weight.

(1)

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Maximum momentum = ...

(ii) Suggest why you would **not** expect the maximum momentum in (b)(iii), calculated from the student's results, to be the same as the value calculated in (c)(i).

(1)

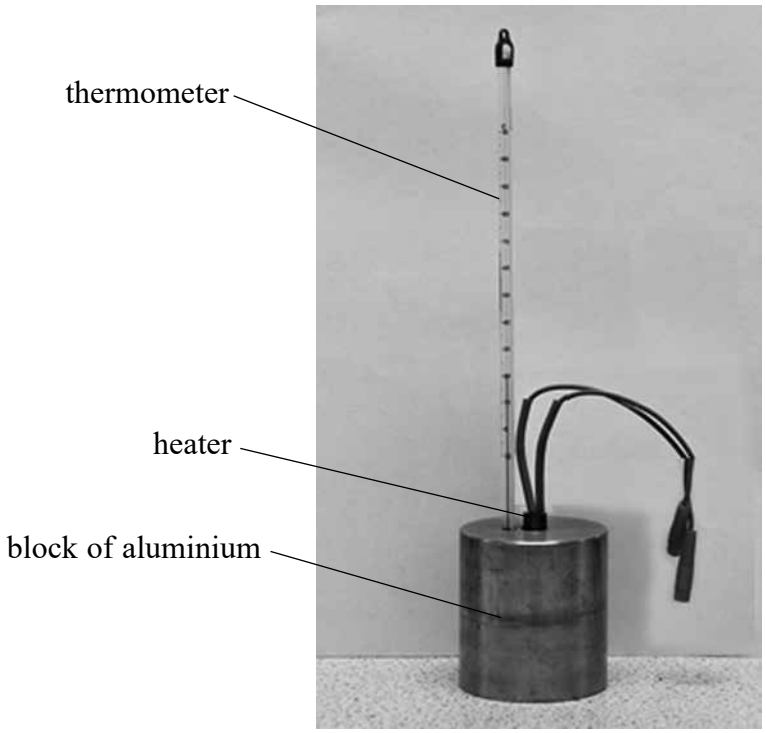
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(Total for Question 2 = 7 marks)

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3 A student determines the specific heat capacity of aluminium. She uses a block of aluminium that has holes in it designed to take an electric heater and a thermometer.



She puts the block of aluminium in a freezer until its temperature is 10 °C below room temperature. She then heats the block of aluminium until its maximum temperature is 10 °C above room temperature.

(a) Write a plan for this experiment.

You should include

- a circuit diagram
- a description of the measurements you would take
- how you would use the data obtained.

(5)

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(b) The student cooled the block and then heated it to above room temperature to improve the accuracy of the experiment.

Explain why this would improve the accuracy of the experiment.

(2)

(Total for Question 3 = 7 marks)

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4 A coil with an iron core was connected to an a.c. power supply. A second coil with an iron core was connected to a voltmeter as shown. The meter displayed the induced potential difference V, in volts, across the second coil.



The student investigated the effect of inserting aluminium between the coils. The student inserted an aluminium plate in the gap between the coils and recorded the new reading V on the voltmeter. She repeated this for varying thicknesses t of aluminium.

t/mm	V/V
0	0.44
1.50	0.41
3.5	0.38
5.51	0.35
6.72	0.33
8.22	0.31

(a) (i) Criticise the recording of this data.

(2)

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(ii) State two variables that would need to be controlled in this investigation.

(2)

(iii) State the resolution of the voltmeter as shown in the diagram.

(1)

(iv) The resolution of the voltmeter can be changed so the display shows fewer or more significant figures. The student changed the number of significant figures shown on the voltmeter from three to two, as shown in the photograph.

Suggest why this might have been a sensible change to make.

(1)

(v) The student states that the readings for V are precise.

Explain why this is **not** correct.

(2)

(b) (i) The student suggests that the results show that V is inversely proportional to t.

State why this suggestion cannot be true. Your answer does **not** require a calculation.

(1)

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(ii) Another student suggests that the relationship is of the form

$$V = V_0 e^{-bt}$$

where b is a constant.

Describe how you would test this suggestion graphically.

(2)

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(Total for Question 4 = 11 marks)

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5 A teacher demonstrated how the intensity of gamma rays varied with distance from a source.

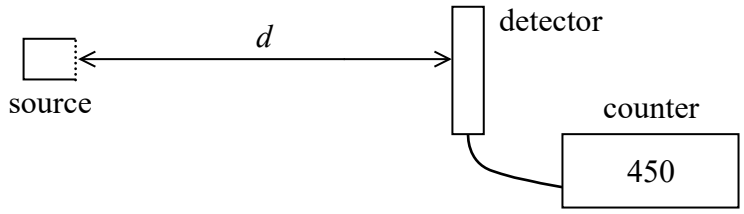
(a) Describe an experiment to confirm that the source emits gamma radiation.

(3)

(b) Describe two safety precautions that should be taken when using radioactive sources.

(2)

(c) The teacher used the set-up shown below.



The teacher measured the distance *d* from the source to the detector and the corresponding count during a time *t*. Her results are shown in the table below.

***d* / cm**	**Count**	***t* / s**
5.0	1163	30
6.0	897	30
7.0	586	30
9.0	793	60
11.0	559	60
13.0	469	60

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(i) The teacher decided to change the period for the count rate from 30 s to 60 s as the distance between the source and detector became greater.

Give a reason why this was appropriate.

(1)

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(ii) The teacher initially increased d by intervals of 1 cm then increased the interval to 2 cm.

Give a reason why this was appropriate.

(1)

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(d) The relationship between d and the count rate C is given by

$$d = \frac{k}{\sqrt{C}} - x$$

where k and x are constants.

(i) Plot a suitable graph on the grid opposite to show that these data are consistent with this relationship. Use the additional columns for your processed data.

background count rate = 58 counts minute^{-1}

***d* / cm**	**Count**	**Time for count/s**				
5.0	1163	30				
6.0	897	30				
7.0	586	30				
9.0	793	60				
11.0	559	60				
13.0	469	60				

(8)

(ii) Use your graph to determine the values of k and x.

(3)

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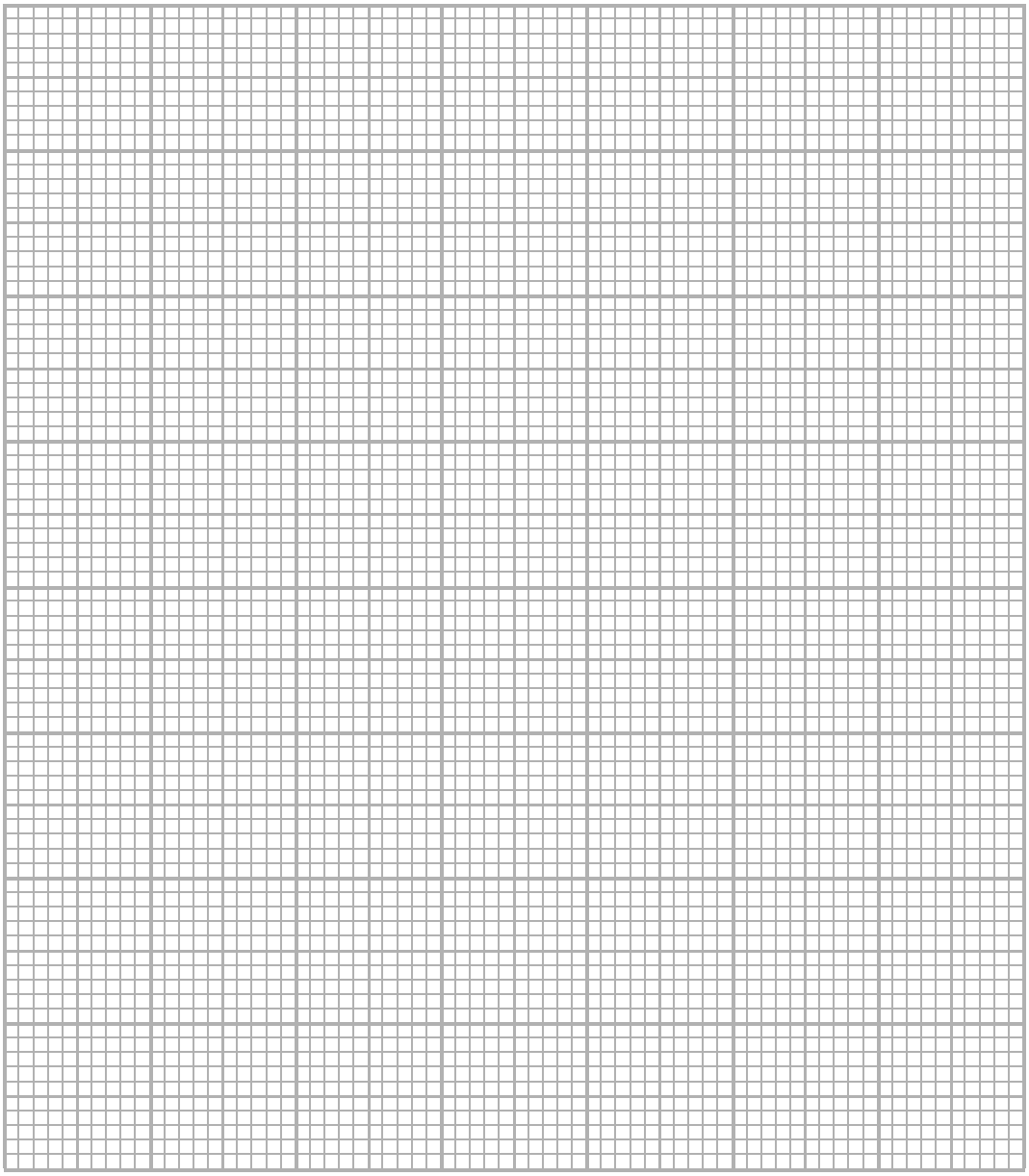
k = ...

x = ...

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(Total for Question 5 = 18 marks)

TOTAL FOR PAPER = 50 MARKS

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