ST MARY'S SCIENCE DEPARTMENT:

PHYSICS

F

GCSE PHYSICS
HOMEWORK BOOK
TOPIC 4: ATOMIC STRUCTURE
PART 1: ATOMIC RADIATION
STUDENT BOOK

YOU MUST ANSWER ALL THREE SECTIONS IN EACH PART OF THE HOMEWORK TASKS

NAME	
CLASS	
TEACHER	
FORM	

TASK	MARK	GRADE
1		
2		
3		
4		
OVERALL		

GCSE PHYSICS

YEAR 10

TOPIC 2

HOMEWORK SCHEDULE

Please use the following table to ensure each homework task is completed and submitted on time.

Carrying out these homework tasks can only increase your ability to gain a high grade in the GCSE examinations.

Failure to hand in work on time will lead to sanctions to complete this work.

Task	Submission Date	Completed?	On Time?
Task 1 Atomic Structure			
Task 2 Models of the Atom			
Task 3 Nuclear Decay			
Task 4 Nuclear Equations			

PHYSICS DEPARTMENT MARKING CODE

ID = Insufficient detail in answer
W = Wrong understanding of physics
IR = Irrelevant information given.
V = This is too vague to get a mark.
AQ = Answer the question asked
R = Read the question/information
M = Maths mistake
BOD = Benefit of the doubt given.
E = Explain the answer further please.
U = Wrong units used.
SF = Wrong significant figures used.
SP = Wrong spelling of a technical term
SR = Same reason given an answer twice.

A circle means this lost you marks
An underline means this gained you marks

PLEASE READ

This homework booklet has made with custom selected examination questions and activities to assess your understanding in the concepts covered in class. This will increase your familiarity with the style of examination questions.

Carrying out these questions can only increase your ability to gain a high grade in the GCSE examination.

Thank you for your hard work in completing this book, and good luck.

Mr. Turnbull

TASK 1: ATOMIC STRUCTURE

SPEC CHECK

Content	Achieved?
Atoms are very small, having a radius of about 1×10^{-10} metres.	
The basic structure of an atom is a positively charged nucleus composed of both protons and neutrons surrounded by negatively charged electrons.	
The radius of a nucleus is less than 1/10 000 of the radius of an atom.	
Most of the mass of an atom is concentrated in the nucleus.	
The electrons are arranged at different distances from the nucleus (different energy levels). The electron arrangements may change with the absorption of electromagnetic radiation (move further from the nucleus; a higher energy level) or by the emission of electromagnetic radiation (move closer to the nucleus; a lower energy level).	
In an atom, the number of electrons is equal to the number of protons in the nucleus. Atoms have no overall electrical charge. All atoms of an element have the same number of protons.	
The number of protons in an atom of an element is called its atomic number. The total number of protons and neutrons in an atom is called its mass number.	
Atoms can be represented as shown in this example: (Mass number) 23 (Atomic number) 11 Na	
Atoms of the same element can have different numbers of neutrons; these atoms are called isotopes of that element. Students should be able to relate differences between isotopes to differences in conventional representations of their identities, charges and masses.	
Atoms turn into positive ions if they lose one or more outer electron(s).	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	What Topics Do I Need to Revise?

SECTION A

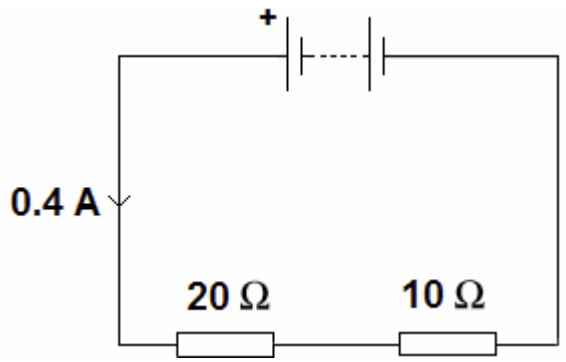
Electricity Revision

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

Q1. An electrical circuit is shown in **Figure 3**.

Figure 3



Q1.1 The current in the circuit is direct current.

What is meant by direct current?

[1 mark]

Tick **one** box.

Current that continuously changes direction.	☐
Current that travels directly to the component.	☐
Current that is always in the same direction.	☐

Q1.2 The equation which links current, potential difference and resistance is:

potential difference = current x resistance

Calculate the potential difference across the battery in the circuit in **Figure 3.**

[3 marks]

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Potential Difference = _____ V

Q1.3 The equation which links current, potential difference and power is:

power = current x potential difference

Calculate the power output of the battery in **Figure 3**.

Give your answer **to one significant figure**.

[2 marks]

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.....

Power = _____ W

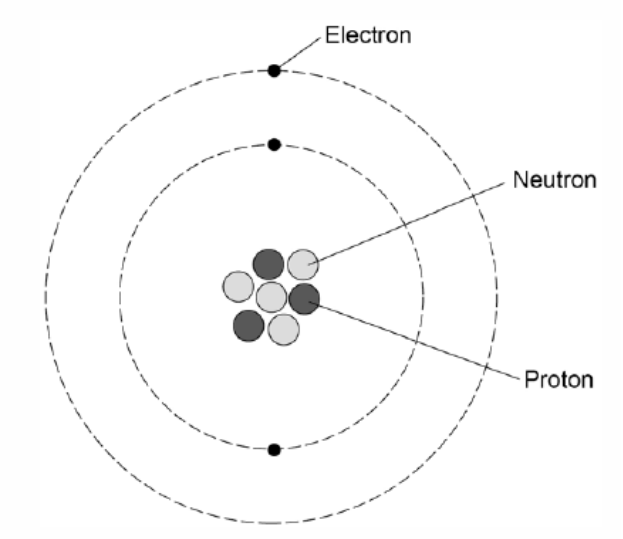
SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

Q1. Figure 10 shows a lithium atom.

Figure 10



Q1.1 What is the mass number of this lithium atom?

[1 mark]

Tick **one** box.

3 ☐ 4 ☐ 7 ☐ 10 ☐

Q1.2 What is the atomic number of a lithium atom?

[2 marks]

Tick **one** box.

3 ☐ 4 ☐ 7 ☐ 10 ☐

Give a reason for your answer.

.....

.....

Q1.3 Complete the sentence.

Choose the answer from the box.

[1 mark]

circles	levels	rings

The electrons in an atom orbit in different energy _____ .

Q1.4 Some atomic nuclei are unstable and decay by emitting an alpha particle or a beta particle.

Complete the symbols for an alpha particle and a beta particle.

Use answers from the box.

[3 marks]

–1	0	1	2	4

Alpha $\square^{\square}He$

Beta $\square^{0}e$

SECTION C This will contain questions on content found later in the course

This is a challenge question to extend your understanding.

You should aim to spend **10 minutes** answering this section.

Q1.1 Complete the table about atomic particles.

[2 marks]

ATOMIC PARTICLE	RELATIVE MASS	RELATIVE CHARGE
proton		+1
neutron	1	0
electron	negligible	

Read the following passage about potassium.

Potassium is a metallic element in Group 1 of the Periodic Table.
It has a proton (atomic) number of 19.
Its most common isotope is potassium-39,

Another isotope, potassium-40, ($^{40}_{19}K$), is a radioisotope.

Q1.2 State the number of protons, neutrons and electrons in potassium-39.

[2 marks]

Number of Protons .....

Number of Neutrons .....

Number of Electrons .....

Q1.3 Explain why potassium-40 has a different mass number from potassium-39.

[1 mark]

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Q1.4 What is meant by a radioisotope?

[1 mark]

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Q1.5 Atoms of potassium-40 change into atoms of a different element. This element has a proton (atomic) number of 20 and a mass number of 40.

Name, or give the symbol of, this new element.

[1 mark]

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Q1.6 Explain in terms of atomic structure, why potassium-39 and potassium-40 have the same chemical reactions.

[1 mark]

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Q1.7 Name a suitable detector that could be used to show that potassium-40 gives out radiation.

[1 mark]

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Q1.8 Name a disease which can be caused by too much exposure to a radioactive substance such as potassium-40.

[1 mark]

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FEEDBACK

Overall Mark:	**/23**
Section A: Mark	/6
Section B: Mark	/7
Section C: Mark	/10

GRADE ACHIEVED:

5	☐	**1**	☐
4	☐	**U**	☐
3	☐		
2	☐		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision. ☐ Complete outstanding work. ☐ Make corrections as indicated by the teacher. ☐ Attend intervention for this topic ☐ Include more information in responses. ☐ Include more key words in responses. ☐ Attend departmental revision sessions. ☐ Read the questions carefully. ☐ Explain your answers in more detail. ☐ Carry out revision on Seneca Learning.	☐ Revise the equations. ☐ Check the units on answers. ☐ Check the correct amount of sig figs on answers. ☐ Check to convert values correctly. ☐ Show your full working out. ☐ Check your calculations. ☐ Revise the science investigative skills. ☐ Revise the key concepts of the topics. ☐ Thoroughly check your work for mistakes. Other:

Student response:

TASK 2: MODELS OF THE ATOM

SPEC CHECK

Content	Achieved?
New experimental evidence may lead to a scientific model being changed or replaced.	
Before the discovery of the electron, atoms were thought to be tiny spheres that could not be divided.	
The discovery of the electron led to the plum pudding model of the atom. The plum pudding model suggested that the atom is a ball of positive charge with negative electrons embedded in it.	
The results from the alpha particle scattering experiment led to the conclusion that the mass of an atom was concentrated at the centre (nucleus) and that the nucleus was charged. This nuclear model replaced the plum pudding model.	
Niels Bohr adapted the nuclear model by suggesting that electrons orbit the nucleus at specific distances. The theoretical calculations of Bohr agreed with experimental observations.	
Later experiments led to the idea that the positive charge of any nucleus could be subdivided into a whole number of smaller particles, each particle having the same amount of positive charge. The name proton was given to these particles.	
The experimental work of James Chadwick provided the evidence to show the existence of neutrons within the nucleus. This was about 20 years after the nucleus became an accepted scientific idea.	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	What Topics Do I Need to Revise?

SECTION A **Electricity Revision**

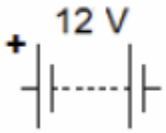
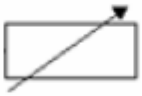
This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

Q1. A student wants to investigate how the current through a filament lamp affects its resistance.

Q1.1 Use the circuit symbols in the boxes to draw a circuit diagram that she could use.

[2 marks]

12 V battery	variable resistor	filament lamp	voltmeter	ammeter
				

Q1.2 Describe how the student could use her circuit to investigate how the current through a filament lamp affects its resistance.

[4 marks]

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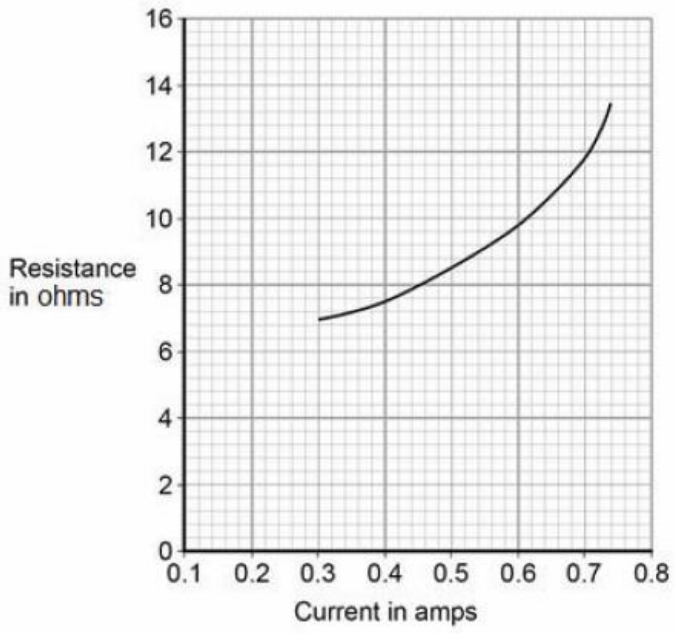
The student's results are shown in **Figure 6.**

Figure 6



Q1.3 Describe how the resistance of the filament lamp changes as the current through it increases.

[1 mark]

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Q1.4 Use **Figure 6** to estimate the resistance of the filament lamp when a current of 0.10 A passes through the lamp.

[1 mark]

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Resistance =_____ Ω

The current–potential difference graphs of three components are shown in **Figure 7**.

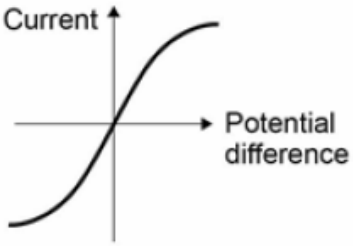
Q1.5 Use answers from the box to identify each component.

[3 marks]

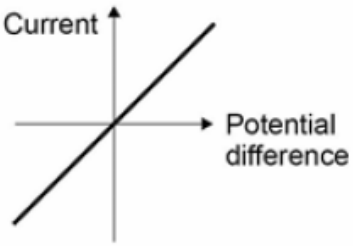
diode	**filament lamp**	**light dependent resistor**
resistor at constant temperature		**thermistor**

Figure 7

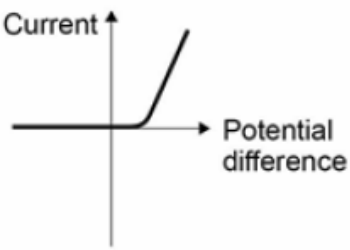
Graph A



Graph B



Graph C



SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

Q1. Scientists sometimes replace one scientific model with a different model.

For example, in the early 20th Century the plum pudding model of the atom was replaced by the nuclear model of the atom.

Explain what led to the plum pudding model of the atom being replaced by the nuclear model of the atom.

[6 marks]

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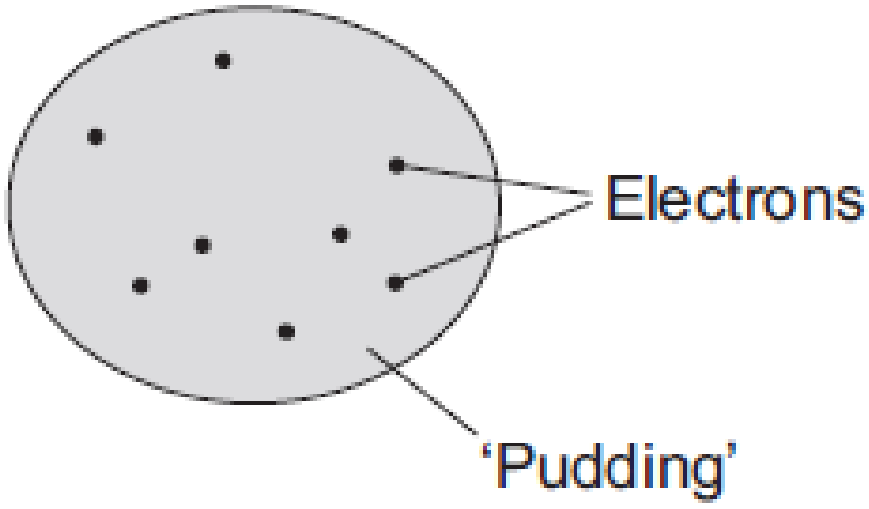
SECTION C

This will contain questions on content found later in the course

This is a challenge question to extend your understanding.

You should aim to spend **10 minutes** answering this section.

Q1. The 'plum pudding' model of the atom was used by scientists in the early part of the 20th century to explain atomic structure.



Q1.1 Those scientists knew that atoms contained electrons and that the electrons had a negative charge. They also knew that an atom was electrically neutral overall.

What did this allow the scientists to deduce about the 'pudding' part of the atom?

[1 mark]

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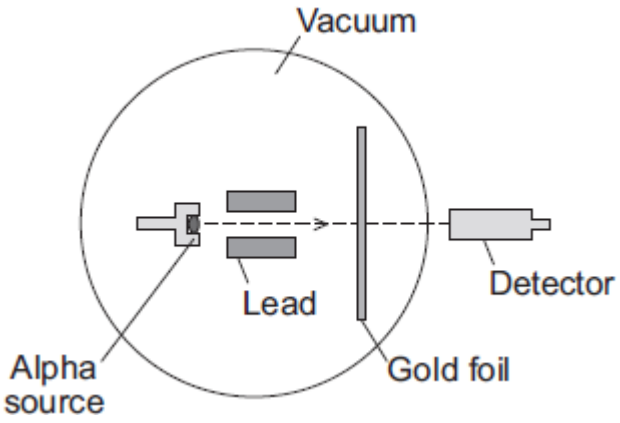
Q1.2 An experiment, designed to investigate the 'plum pudding' model, involved firing alpha particles at a thin gold foil.



If the 'plum pudding' model was correct, then most of the alpha particles would go straight through the gold foil. A few would be deflected, but by less than 4 °.

The results of the experiment were unexpected. Although most of the alpha particles did go straight through the gold foil, about 1 in every 8 000 was deflected by more than 90 °.

Why did this experiment lead to a new model of the atom, called the nuclear model, replacing the 'plum pudding' model?

[1 mark]

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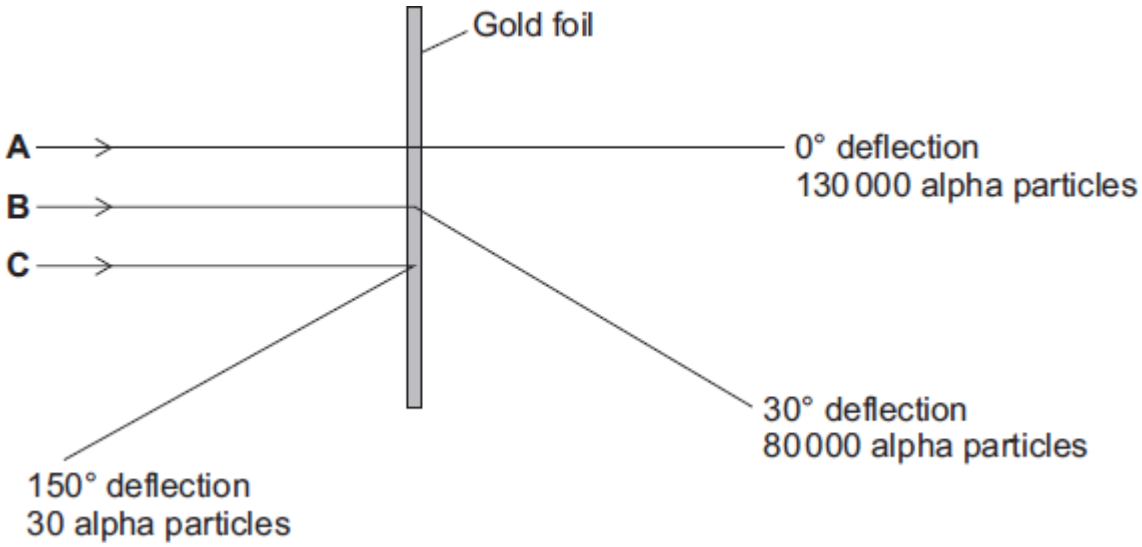
The diagram shows the paths, **A**, **B** and **C**, of three alpha particles. The total number of alpha particles deflected through each angle is also given.



Q1.3 Using the nuclear model of the atom, explain the three paths, **A**, **B** and **C**.

[3 marks]

A

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B

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C

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Q1.4 Using the nuclear model, the scientist E. Rutherford devised an equation to predict the proportion of alpha particles that would be deflected through various angles.

The results of the experiment were the same as the predictions made by Rutherford.

What was the importance of the experimental results and the predictions being the same?

[1 mark]

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FEEDBACK

Overall Mark:	**/23**
Section A: Mark	/11
Section B: Mark	/6
Section C: Mark	/6

GRADE ACHIEVED:

5	☐	**1**	☐
4	☐	**U**	☐
3	☐		
2	☐		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision. ☐ Complete outstanding work. ☐ Make corrections as indicated by the teacher. ☐ Attend intervention for this topic ☐ Include more information in responses. ☐ Include more key words in responses. ☐ Attend departmental revision sessions. ☐ Read the questions carefully. ☐ Explain your answers in more detail. ☐ Carry out revision on Seneca Learning.	☐ Revise the equations. ☐ Check the units on answers. ☐ Check the correct amount of sig figs on answers. ☐ Check to convert values correctly. ☐ Show your full working out. ☐ Check your calculations. ☐ Revise the science investigative skills. ☐ Revise the key concepts of the topics. ☐ Thoroughly check your work for mistakes. Other:

Student response:

TASK 3: NUCLEAR DECAY

SPEC CHECK

Content	Achieved?
Some atomic nuclei are unstable. The nucleus gives out radiation as it changes to become more stable. This is a random process called radioactive decay.	
Activity is the rate at which a source of unstable nuclei decays. Activity is measured in becquerel (Bq)	
Count-rate is the number of decays recorded each second by a detector (e.g. Geiger-Muller tube).	
The nuclear radiation emitted may be: an alpha particle (α) – this consists of two neutrons and two protons, it is the same as a helium nucleus a beta particle (β) – a high speed electron ejected from the nucleus as a neutron turns into a proton a gamma ray (γ) – electromagnetic radiation from the nucleus	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?

What Topics Do I Need to Revise?

SECTION A

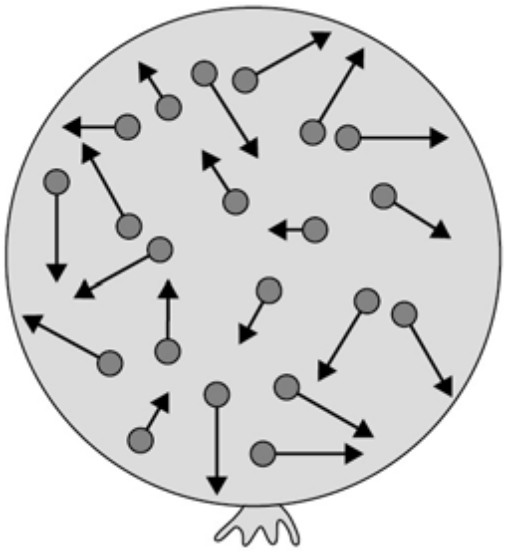
Particle Model of Matter Revision

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

Q1. Figure 12 shows a balloon filled with helium gas.

Figure 12



Q1.1 Describe the movement of the particles of helium gas inside the balloon.

[2 marks]

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Q1.2 What name is given to the total kinetic energy and potential energy of all the particles of helium gas in the balloon?

[1 mark]

Tick **one** box.

External energy ☐

Internal energy ☐

Movement energy ☐

Q1.3 Write down the equation which links density, mass and volume.

[1 mark]

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Q1.4 The helium in the balloon has a mass of 0.00254 kg.

The balloon has a volume of 0.0141 m3.

Calculate the density of helium. Choose the correct unit from the box.

[3 marks]

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Density = _____ Unit = _____

SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

Q1. Alpha, beta and gamma are types of nuclear radiation.

Q1.1 Draw one line from each type of radiation to what the radiation consists of.

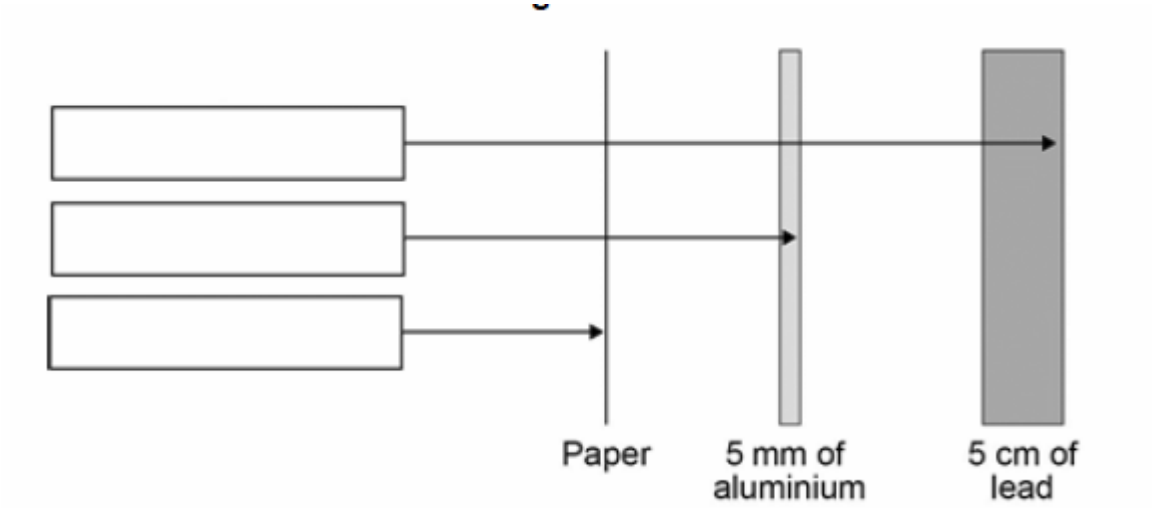
[3 marks]

Type of radiation	What radiation consists of
Alpha	Two protons and two neutrons
Beta	Electron from the nucleus
Gamma	Electromagnetic radiation
	Neutron from the nucleus

A teacher demonstrates the penetration of alpha, beta and gamma radiation through varied materials.

The demonstration is shown in **Figure 10.**

Figure 10



Q1.2 Complete **Figure 10** by writing the name of the correct radiation in each box.

[2 marks]

Q1.3 Give **two** safety precautions the teacher should have taken in the demonstration.

[2 marks]

Precaution 1

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.....

Precaution 2

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.....

SECTION C This will contain questions on content found later in the course

This is a challenge question to extend your understanding.

You should aim to spend **10 minutes** answering this section.

Q1. Atoms are very small and most of their mass is concentrated in the nucleus.

Electrons orbit at different distances from the nucleus.

Q1.1 A nucleus is much smaller than an atom.

Approximately, how many times smaller is a nucleus than an atom?

[1 mark]

Tick **one** box.

100	☐
1000	☐
10 000	☐
100 000	☐

The electrons in an atom can only orbit at specific distances from the nucleus.

Q1.2 State what causes an electron's distance from the nucleus to increase or decrease.

[2 marks]

Increase

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Decrease

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Q1.3 Atoms have different atomic numbers and mass numbers.

In terms of sub-atomic particles, describe the difference between an atom's atomic number and its mass number.

[2 marks]

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Q1.4 Transmutation is the name given to a process where one element changes into another.

Explain and compare how two different types of radioactive decay can cause transmutation.

[4 marks]

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FEEDBACK

Overall Mark:	**/23**
Section A: Mark	/7
Section B: Mark	/7
Section C: Mark	/9

GRADE ACHIEVED:

5	☐	**1**	☐
4	☐	**U**	☐
3	☐		
2	☐		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
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Student response:

TASK 4: NUCLEAR EQUATIONS

SPEC CHECK

Content	Achieved?
Nuclear equations are used to represent radioactive decay. In a nuclear equation, an alpha particle may be represented by the symbol: $^{4}_{2}He$ and a beta particle by the symbol: $^{0}_{-1}e$	
The emission of the different types of nuclear radiation may cause a change in the mass and /or the charge of the nucleus. For example: $^{219}_{86}\text{radon} \longrightarrow {}^{215}_{84}\text{polonium} + {}^{4}_{2}He$	
So alpha decay causes both the mass and charge of the nucleus to decrease. $^{14}_{6}\text{carbon} \longrightarrow {}^{14}_{7}\text{nitrogen} + {}^{0}_{-1}e$	
So beta decay does not cause the mass of the nucleus to change but does cause the charge of the nucleus to increase.	
Students should be able to use the names and symbols of common nuclei and particles to write balanced equations that show single alpha (α) and beta (β) decay. This is limited to balancing the atomic numbers and mass numbers. The identification of daughter elements from such decays is not required.	
The emission of a gamma ray does not cause the mass or the charge of the nucleus to change.	

Target Setting

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

What Topics Do I Know Well?	What Topics Do I Need to Revise?

Electricity Revision

SECTION A

This is a revision question on a previous topic.

You should aim to spend **10 minutes** answering this section.

Q1. An electrician is replacing an old electric shower with a new one.

The inside of the old shower is shown in **Figure 11**.

Figure 11

Q1.1 The electrician should not change the shower unless he switches off the mains electricity supply.

Explain why.

[2 marks]

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Q1.2 The new shower has a power output of 10 690 W when it is connected to the 230 V mains electricity supply.

The equation which links current, potential difference and power is:

$$\text{current} = \frac{\text{power}}{\text{potential difference}}$$

Calculate the current passing through the new shower.

Give your answer to **two significant figures**.

[4 marks]

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Current = _____A

Q1.3 The new shower has a higher power rating than the old shower.

How does the power of the new shower affect the cost of using the shower?

Give a reason for your answer.

[2 marks]

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SECTION B

This is a question to revise understanding carried out in lesson.

You should aim to spend **10 minutes** answering this section.

Q1. Sources of background radiation are either natural or man-made.
Q1.1 Which two of the sources listed in the table are natural sources of background radiation?

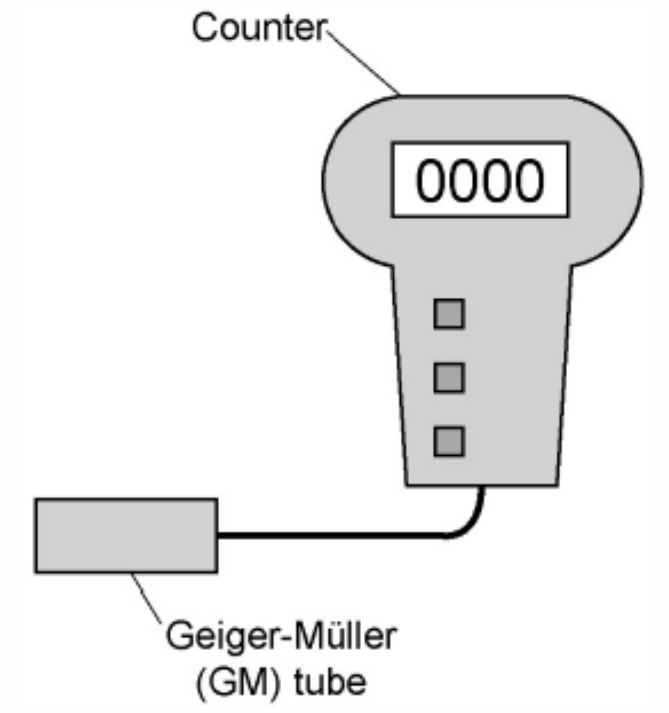
[2 marks]

Tick **two** boxes.

Cosmic rays	☐
Medical X-rays	☐
Nuclear power stations	☐
Nuclear weapons testing	☐
Radon gas	☐

A teacher used a Geiger-Müller (GM) tube and counter to measure the background radiation in his laboratory.
Figure 13 shows the GM tube and counter.

Figure 13



Q1.2 Table 4 gives three readings taken by the teacher at three different times on the same day.

Table 4

Counts in 1 minute
16
21
18

What is the most likely reason for the readings being different?

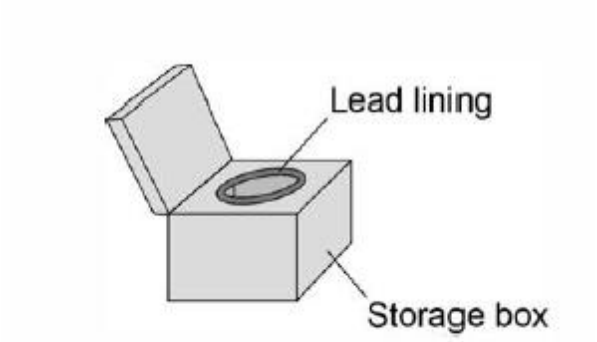
[1 mark]

Tick **one** box.

- Radioactive decay is a random process. ☐
- The air pressure in the laboratory increased. ☐
- The background radiation increased during the day. ☐
- The temperature in the laboratory decreased. ☐

Q1.3 The teacher takes a radioactive source from a storage box.
Figure 14 shows the box.

Figure 14



Why does storing the radioactive source in the box reduce the risk of radiation exposure to the teacher?
[1 mark]

Tick **one** box.

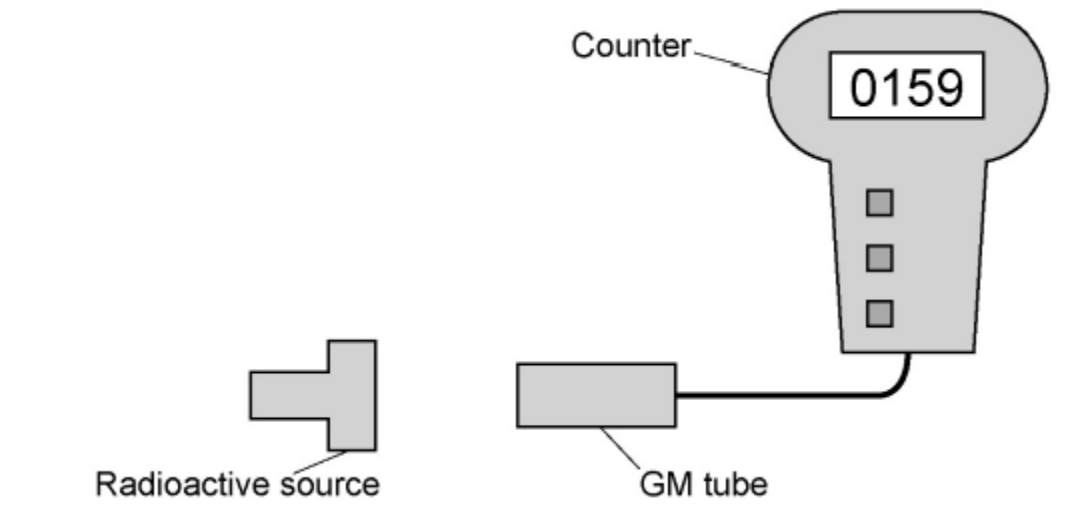
The lead lining absorbs the emitted radiation.	☐
The lead lining reflects the emitted radiation.	☐
The lead lining transmits the emitted radiation.	☐

Q1.4 Figure 15 shows how the teacher used the GM tube and counter to measure the radiation emitted from the radioactive source.

The counter was reset to zero.

The count after one minute was 159.

Figure 15



How should the teacher calculate the counts from the radioactive source?

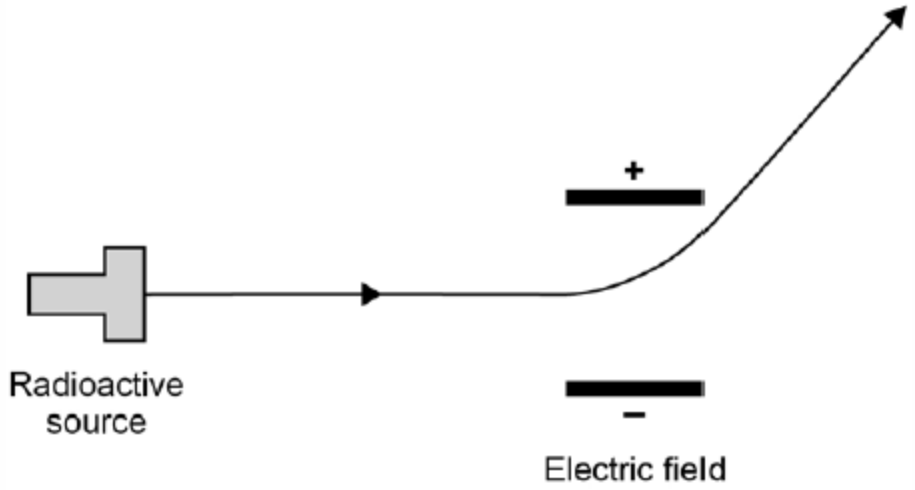
[1 mark]

Tick **one** box.

- Add the background count to 159 ☐
- Divide the background count by 159 ☐
- Multiply the background count by 159 ☐
- Subtract the background count from 159 ☐

Q1.5 The teacher passed the radiation through an electric field.
Figure 16 shows the path that the radiation took through the electric field.

Figure 16



What type of radiation was being emitted by the radioactive source?

[3 marks]

Tick **one** box.

Alpha ☐ Beta ☐ Gamma ☐ Neutron ☐

Explain the reason for your answer.

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SECTION C This will contain questions on content found later in the course

This is a challenge question to extend your understanding.

You should aim to spend **10 minutes** answering this section.

Q1. A student models the random nature of radioactive decay using 100 dice.

He rolls the dice and removes any that land with the number 6 facing upwards.

He rolls the remaining dice again.

The student repeats this process a number of times.

The table below shows his results.

Roll number	Number of dice remaining
0	100
1	84
2	70
3	59
4	46
5	40
6	32
7	27
8	23

Q1.1 Give **two** reasons why this is a good model for the random nature of radioactive decay.

[2 marks]

Reason 1

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Reason 2

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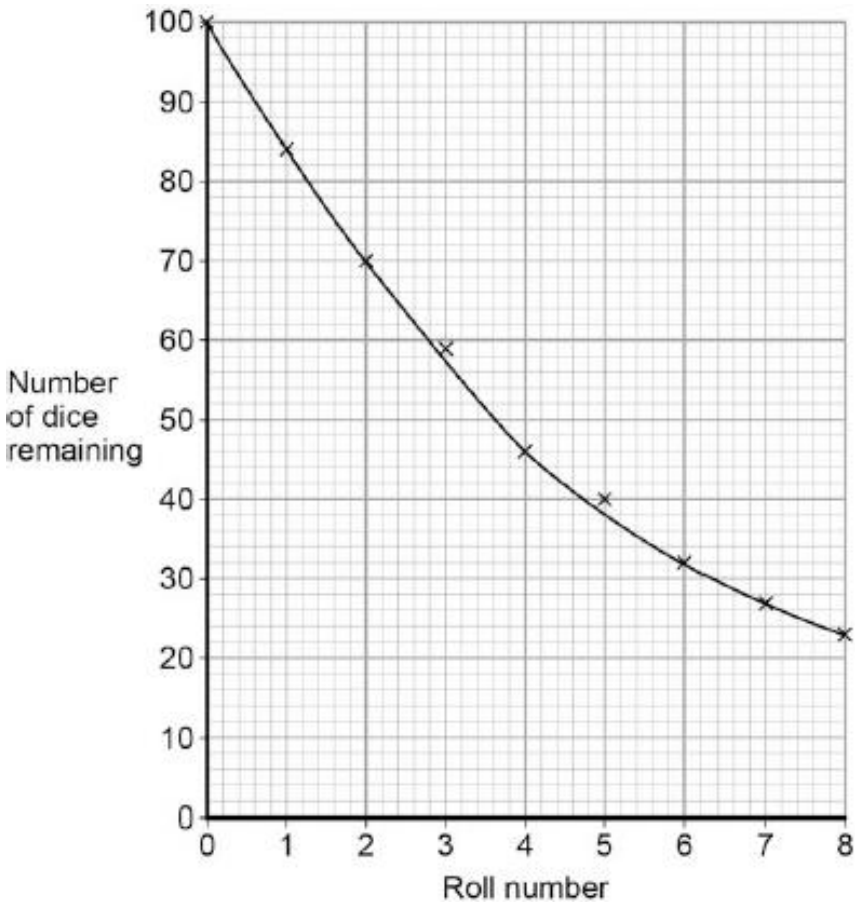
The student's results are shown in **Figure 1**.

Figure 1



Use **Figure 1** to determine the half-life for these dice using this model.

Q1.2 Show on **Figure 1** how you work out your answer.

[2 marks]

Half Life = ... rolls

Q1.3 A teacher uses a protactinium (Pa) generator to produce a sample of radioactive material that has a half-life of 70 seconds.

In the first stage in the protactinium generator, uranium (U) decays into thorium (Th) and alpha (α) radiation is emitted.

The decay can be represented by the equation shown in **Figure 2**.

[1 mark]

Figure 2

$$^{238}_{92}U \longrightarrow \square Th + \alpha$$

Determine the atomic number of thorium (Th) 234.

Atomic Number = ...

Q1.4 When protactinium decays, a new element is formed, and radiation is emitted.

The decay can be represented by the equation shown in **Figure 3**.

Figure 3

$$^{234}_{91}Pa \rightarrow {}^{234}_{92}X + radiation$$

When protactinium decays, a new element, **X**, is formed.

Use information from **Figure 2** and **Figure 3** to determine the name of element **X**.

[1 mark]

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Q1.5 Determine the type of radiation emitted as protactinium decays into a new element.

Give a reason for your answer.

[2 marks]

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Q1.6 The teacher wears polythene gloves as a safety precaution when handling radioactive materials.

The polythene gloves do **not** stop the teacher's hands from being irradiated.

Explain why the teacher wears polythene gloves.

[2 marks]

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FEEDBACK

Overall Mark:	/26
Section A: Mark	/8
Section B: Mark	/8
Section C: Mark	/10

GRADE ACHIEVED:

5	☐	**1**	☐
4	☐	**U**	☐
3	☐		
2	☐		

Knowledge and understanding shown	Unsatisfactory	Satisfactory	Good	Outstanding

Strengths:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving
Areas to Improve:	☐ Basic Knowledge of Concepts ☐ Quality of Written Communication ☐ Working Scientifically ☐ Answering Examination Questions ☐ Analytical Skills **Others** (Topic Specific)	☐ Applications of Concepts ☐ Mathematical Skills ☐ Experimental Technique ☐ Previous Topics ☐ Problem Solving

Progress:	Unsatisfactory	Satisfactory	Good	Outstanding
Working:	Below	In line with	Above	**(your target)**
Effort:	Poor	Inconsistent	Good	Excellent

To improve further you need to:

☐ Carry out **independent** revision. ☐ Complete outstanding work. ☐ Make corrections as indicated by the teacher. ☐ Attend intervention for this topic ☐ Include more information in responses. ☐ Include more key words in responses. ☐ Attend departmental revision sessions. ☐ Read the questions carefully. ☐ Explain your answers in more detail. ☐ Carry out revision on Seneca Learning.	☐ Revise the equations. ☐ Check the units on answers. ☐ Check the correct amount of sig figs on answers. ☐ Check to convert values correctly. ☐ Show your full working out. ☐ Check your calculations. ☐ Revise the science investigative skills. ☐ Revise the key concepts of the topics. ☐ Thoroughly check your work for mistakes. Other:

Student response:

EQUATIONS SHEET

AQA
Realising potential

GCSE Physics Equation Sheet

1	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength (g)**	$p = h \rho g$
2	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2\,a\,s$
3	**force = change in momentum / time taken**	$F = \frac{m\,\Delta v}{\Delta t}$
4	elastic potential energy = 0.5 × spring constant × (extension)^2	$E_e = \frac{1}{2}\,k\,e^2$
5	change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = m\,c\,\Delta\theta$
6	$\text{period} = \frac{1}{\text{frequency}}$	
7	$\text{magnification} = \frac{\text{image height}}{\text{object height}}$	
8	**force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length**	$F = B\,I\,l$
9	thermal energy for a change of state = mass × specific latent heat	$E = m\,L$
10	**potential difference across primary coil / potential difference across secondary coil = number of turns in primary coil / number of turns in secondary coil**	$\frac{V_p}{V_s} = \frac{n_p}{n_s}$
11	**potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil**	$V_s\,I_s = V_p\,I_p$
12	For gases: pressure × volume = constant	$p\,V = constant$

Acknowledgements

This document has been produced by Mr J Turnbull.

All relevant information has been credited in the document.

This document has been produced for educational purposes only.

This document has been produced for the AQA GCSE Physics Specification.