ST MARY'S SCIENCE DEPARTMENT:

PHYSICS

H

GCSE PHYSICS **HOMEWORK BOOK**
TOPIC 4: ATOMIC STRUCTURE
PART 2: NUCLEAR PHYSICS
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 Half Life			
Task 2 Uses of Radiation			
Task 3 Nuclear Fission			
Task 4 Nuclear Fusion			

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

IMPORTANT NOTE

All sections in each task must be **FULLY ATTEMPTED.**

If students fail to achieve an acceptable mark on each task, they will be made to carry out supervised intervention the following week.

Each week, intervention sessions will be provided to help assist with answering the questions in the homework booklet if students are struggling with the difficulty of the problems.

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: HALF LIFE

SPEC CHECK

Content	Achieved?
Radioactive decay is random. The half-life of a radioactive isotope is the time it takes for the number of nuclei of the isotope in a sample to halve, or the time it takes for the count rate (or activity) from a sample containing the isotope to fall to half its initial level. Students should be able to explain the concept of half-life and how it is related to the random nature of radioactive decay. Students should be able to determine the half-life of a radioactive isotope from given information. (HT only) Students should be able to calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives.	

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

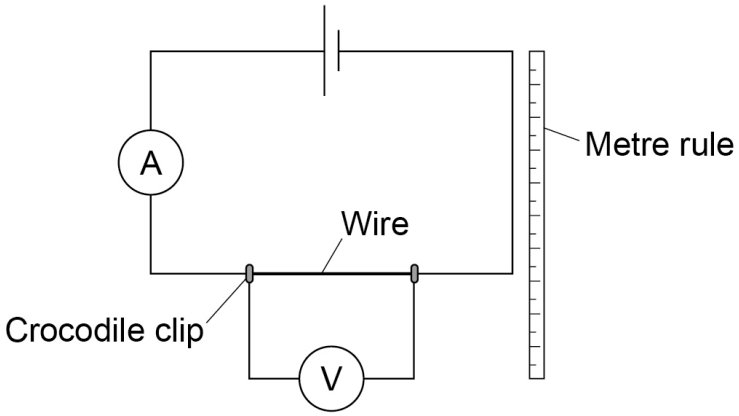
This is a revision question on a previous topic.

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

1. A student investigated how the resistance of a wire varies with the length of the wire.

Figure 5 shows the circuit the student used. The student also had a metre rule.

Figure 5



1.1 Plan an experiment to investigate how the resistance of a wire varies with the length of the wire.

[6 marks]

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Another student investigated how the current in a resistor varied with the potential difference across it.

Table 2 shows the student's results.

Table 2

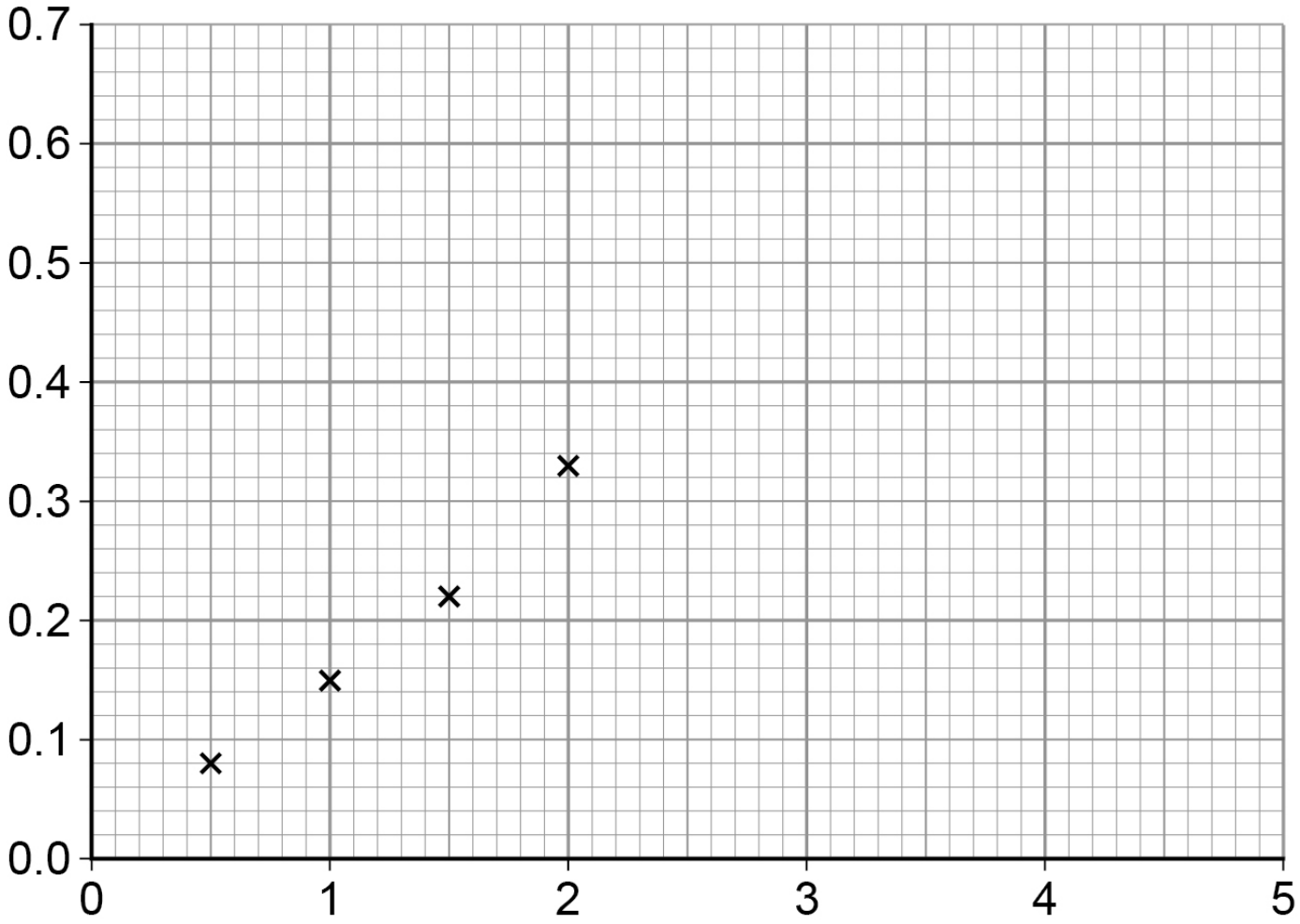
Potential difference in volts	Current in amps
0.50	0.08
1.0	0.15
1.5	0.22
2.0	0.33
2.5	0.43
3.0	0.48
3.5	0.54
4.0	0.62
4.5	0.66

1.2 Complete **Figure 6**. You should:

- Label the x-axis and the y-axis
- Plot the remaining five points
- Add a line of best fit.

[4 marks]

Figure 6



SECTION B

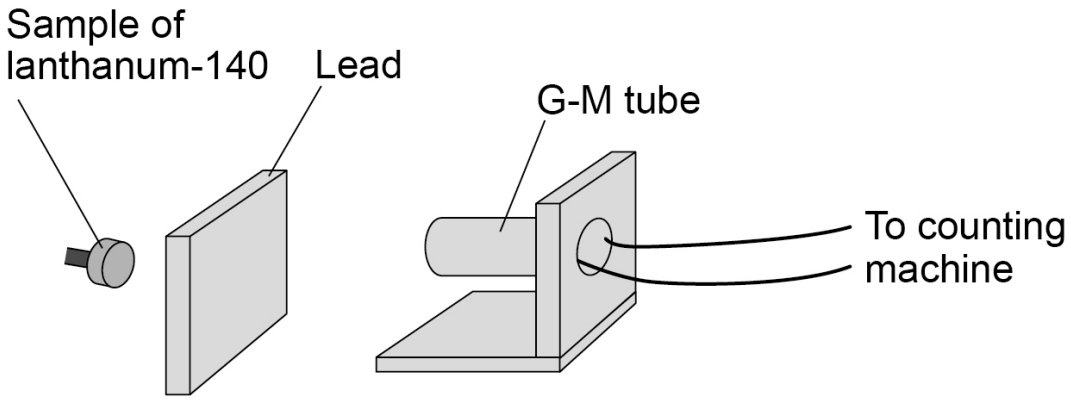
This is a question to revise understanding carried out in lesson.

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

1. The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it.

Figure 6 shows the apparatus.

Figure 6



1.1 Explain why the teacher stood as far away from the apparatus as possible.

[2 marks]

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Table 1 shows the results.

Table 1

Thickness of lead in cm	Count rate in counts per second
0.5	110
1.0	60
1.5	33
2.0	18
2.5	10

1.2 The teacher concluded that the count rate was not inversely proportional to the thickness of lead.

Explain why the teacher was correct.

Use the data in **Table 1**.

[3 marks]

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1.3 Lanthanum-140 can also emit beta radiation and change into cerium.

Complete the equation showing the decay of lanthanum (La) 140 into cerium (Ce).

[2 marks]

$$^{140}_{57}La \longrightarrow {}^{\quad}_{\quad}e + {}^{\quad}_{\quad}Ce$$

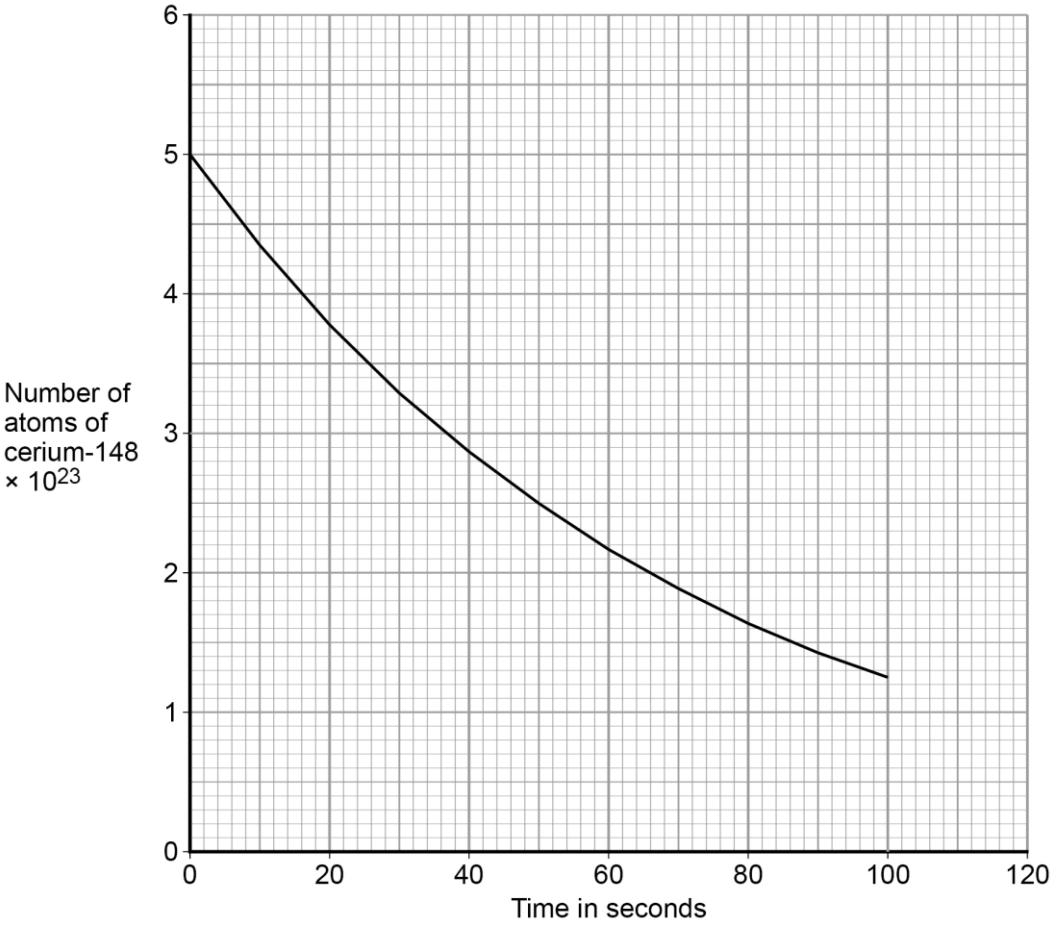
There are other isotopes of cerium which are radioactive.

Different isotopes of cerium have different half-lives.

The half-life of an isotope can be found by studying how the number of atoms changes over time.

Figure 7 shows how the number of atoms of cerium-148 in a 120 g sample changes over time.

Figure 7



1.4 Determine the ratio of the number of cerium atoms in the sample when it was 100 seconds old compared with when the sample was 350 seconds old.

Use data from **Figure 7.**

[4 marks]

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Ratio = ...

1.6 Determine the activity of the sample of cerium when the sample was 20 seconds old.

Use **Figure 7.**

[3 marks]

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Activity =..... Bq

This will contain questions on content found later in the course

SECTION C

This is a challenge question to extend your understanding.

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

A teacher carried out a demonstration using a radiation detector and count rate meter.
The teacher first measured the count rate from background radiation several times.

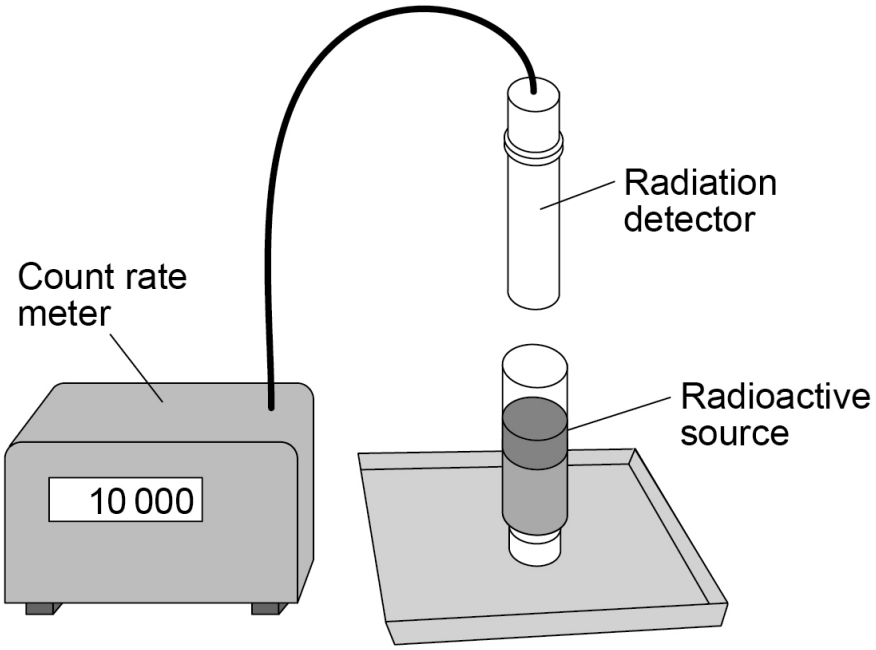
1.1 Which of the following is a man-made source of background radiation?
Tick **one** box.

[1 mark]

- Cosmic rays ☐
- Nuclear weapons tests ☐
- Radon gas ☐
- Uranium from rocks ☐

The teacher then put the radiation detector close to a radioactive source as shown in *Figure 11.*

Figure 11



1.2 The teacher recorded the count rate.
Describe how the teacher should determine the count rate from the radioactive source.

[2 marks]

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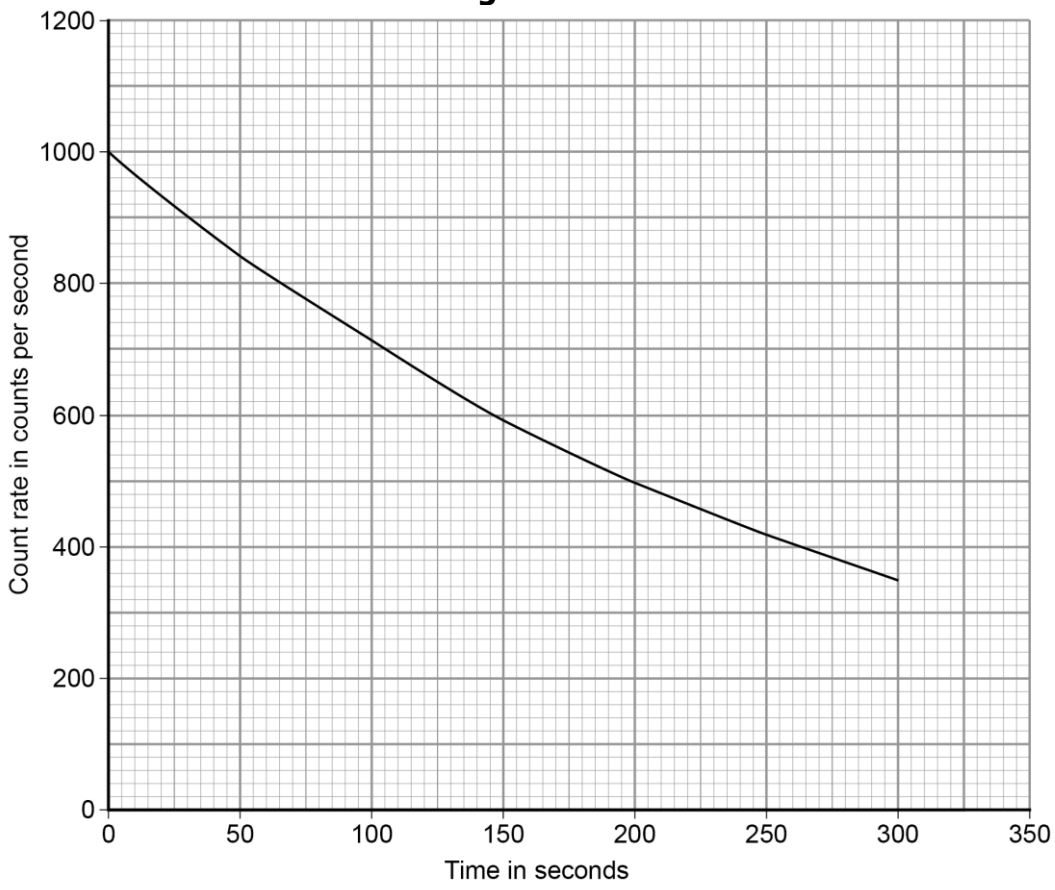
1.3 The teacher made measurements and plotted a graph to show how the count rate from the radioactive source changed over time.
The graph is shown in **Figure 12.**

Figure 12



Determine the expected count rate from the radioactive source after 10 minutes.

[4 marks]

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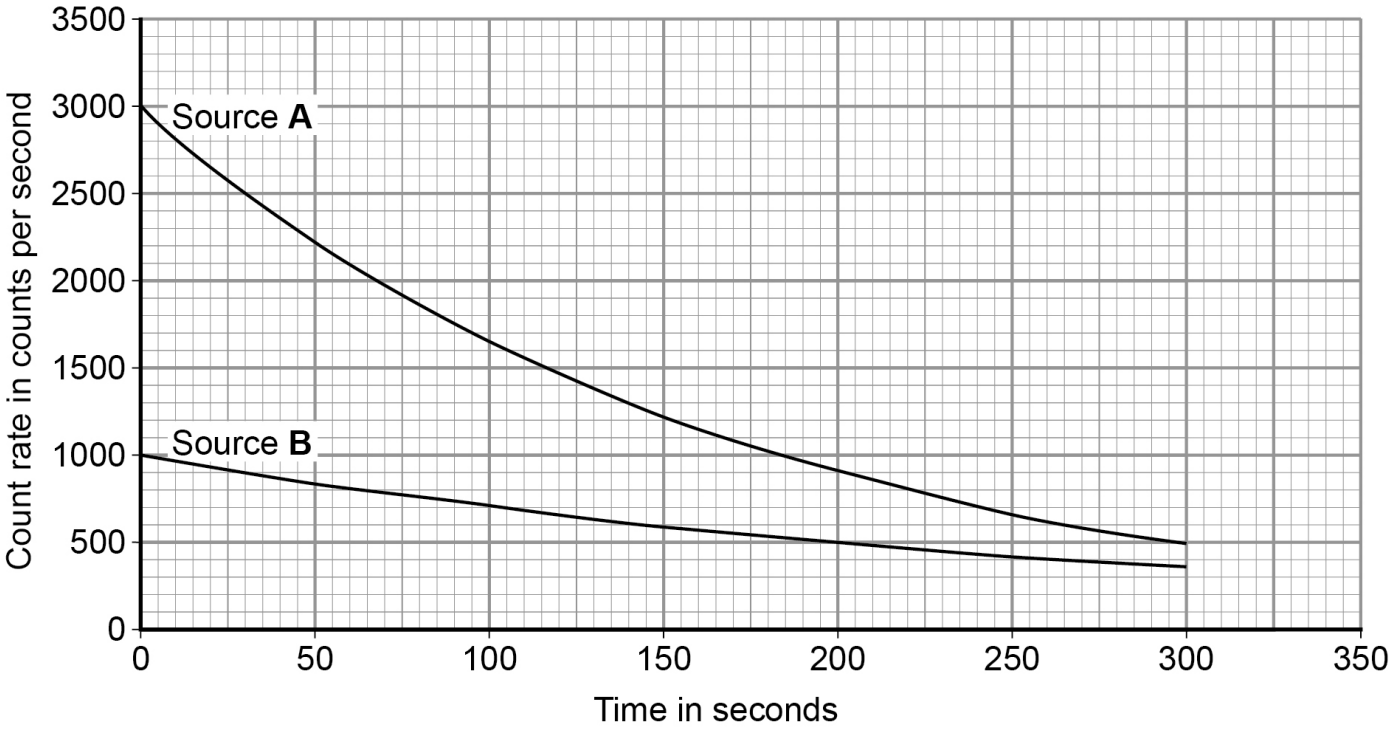
Count rate after 10 minutes =..... counts per second

1.4 The teacher carried out the demonstration with two radioactive sources, **A** and **B**. **Figure 13** shows the results.

Figure 13



Explain how the stability of the nuclei in Source **A** compares with the stability of the nuclei in Source **B**.

[2 marks]

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1.5 The teacher measured the count rate from background radiation again.
Explain how the teacher could use the measurements of count rate from background radiation to check that the radioactive sources had not contaminated the surroundings.

[2 marks]

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FEEDBACK SHEET

Overall Mark:	**/35**	**GRADE ACHIEVED:**	
Section A:	/10	**9** ☐	**5** ☐
Section B:	/14	**8** ☐	**4** ☐
Section C:	/11	**7** ☐	**3** ☐
		6 ☐	**U** ☐

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:

TASK 2: USES OF RADIATION

SPEC CHECK

Content	Achieved?
Radioactive isotopes have a very wide range of half-life values. Students should be able to explain why the hazards associated with radioactive material differ per the half-life involved.	
Radioactive isotopes have a very wide range of half-life values. Students should be able to explain why the hazards associated with radioactive material differ per the half-life involved.	
Background radiation is around us all of the time. It comes from: Natural sources such as rocks and cosmic rays from space Man-made sources such as the fallout from nuclear weapons testing and nuclear accidents. The level of background radiation and radiation dose may be affected by occupation and/or location. Radiation dose is measured in Sieverts (Sv) 1000 millisieverts (mSv) = 1 Sievert (Sv)	

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

Energy Revision

This is a revision question on a previous topic.

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

1. Figure 8 shows a geothermal power station.

Figure 8

1.1 Explain **one** drawback of geothermal power.

[2 marks]

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1.2 In the power station, steam at 100 ^{oC} is condensed to water at 100 ^{oC} and generates 6.9 MW of electrical power.

The specific latent heat of vaporisation of water is 2.3 MJ/kg.

The power station has an efficiency of 12%.

Calculate the mass of steam condensed each second.

Use the Physics Equations Sheet.

[5 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.

1. The Voyager 2 space probe was launched in 1977.

It is powered by the energy released when the radioactive isotope plutonium-238 decays.

1.1 Plutonium-238 (Pu) decays into uranium-234 (U) by emitting an alpha particle.

Complete the nuclear equation for the decay of plutonium-238.

[2 marks]

$$^{238}_{94}Pu \longrightarrow \underline{\quad}^{234}U + \frac{\quad}{\quad}\alpha$$

1.2 The space probe contains a lot of very sensitive equipment that would be damaged by nuclear radiation.

Explain why a radiation source that emits alpha particles is suitable for the space probe.

[2 marks]

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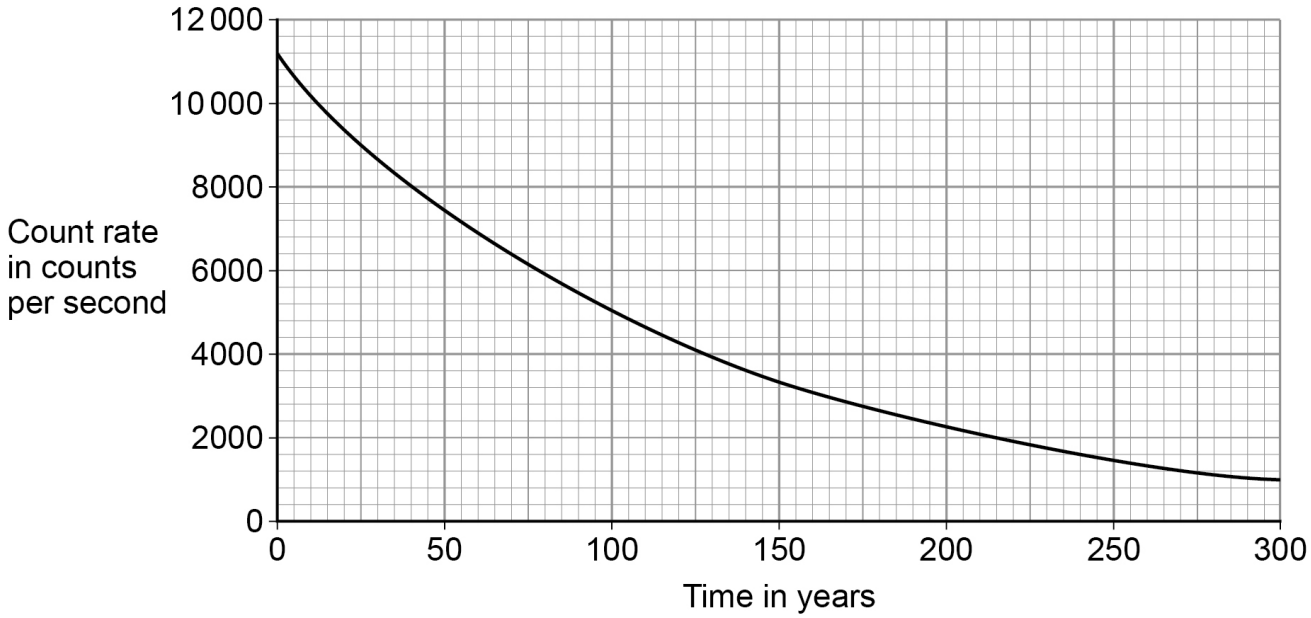
Figure 11 shows how the count rate of a sample of plutonium-238 varies with time.

Figure 11



1.3 Determine the half-life of plutonium-238.

[2 marks]

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Half-life = ... years

1.4 The space probe is still operating in space today.

When the space probe was launched in 1977 the power source had an output of 158 W.

Determine the power output of the power source today.

Use information from **Figure 11**.

[3 marks]

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Power Output = ... W

1.5 Explain why an isotope with a longer half-life than plutonium was not chosen to power the space probe.

[2 marks]

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1.6 The space probe is currently at the edge of our solar system. Scientists use a unit called the astronomical unit (AU) to measure the large distances in the solar system.

1 AU = 1.5×10^{11} m

The signals that the space probe sends back to Earth travel at a speed of 3.0×10^{8} m/s.

The space probe is currently 120 AU from Earth.

Calculate the time it takes for a signal from the space probe to reach Earth.

Give your answer in hours.

[4 marks]

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Time =..... hours

This will contain questions on content found later in the course

SECTION C

This is a challenge question to extend your understanding.

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

1. Electricity is generated in a nuclear power station.
Fission is the process by which energy is released in the nuclear reactor.
1.1 Figure 14 shows the first part of the nuclear fission reaction.
Complete **Figure 14** to show how the fission process starts a chain reaction.

[3 marks]

Figure 14

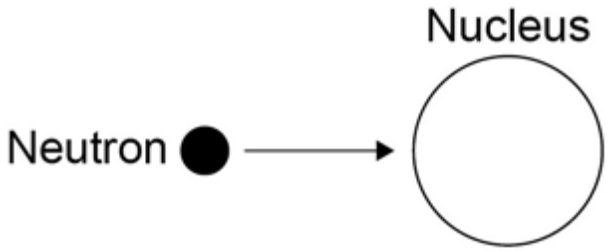
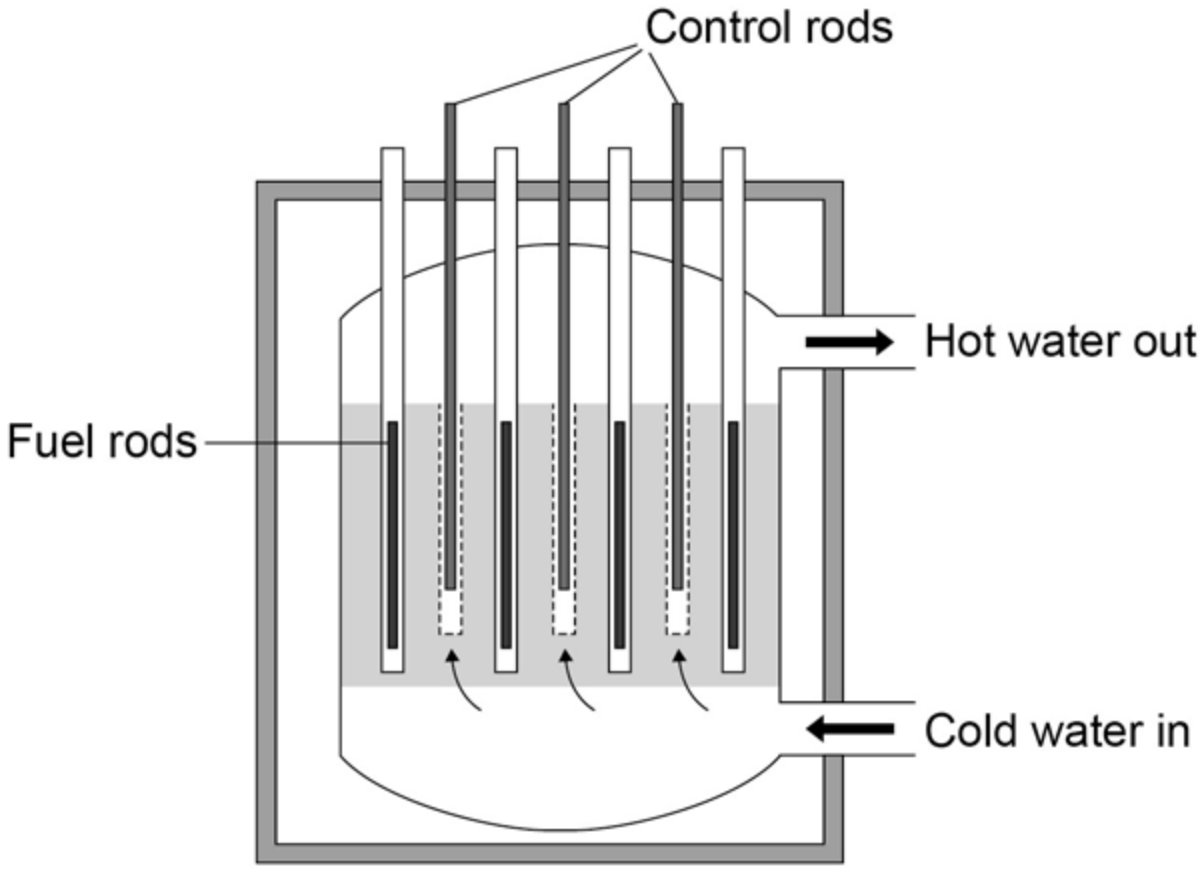


Figure 15 shows the inside of a nuclear reactor in a nuclear power station.

Figure 15



1.2 In a nuclear reactor a chain reaction occurs, which causes neutrons to be released.
The control rods absorb neutrons.
The control rods can be moved up and down.
Explain how the energy released by the chain reaction is affected by moving the control rods.

[2 marks]

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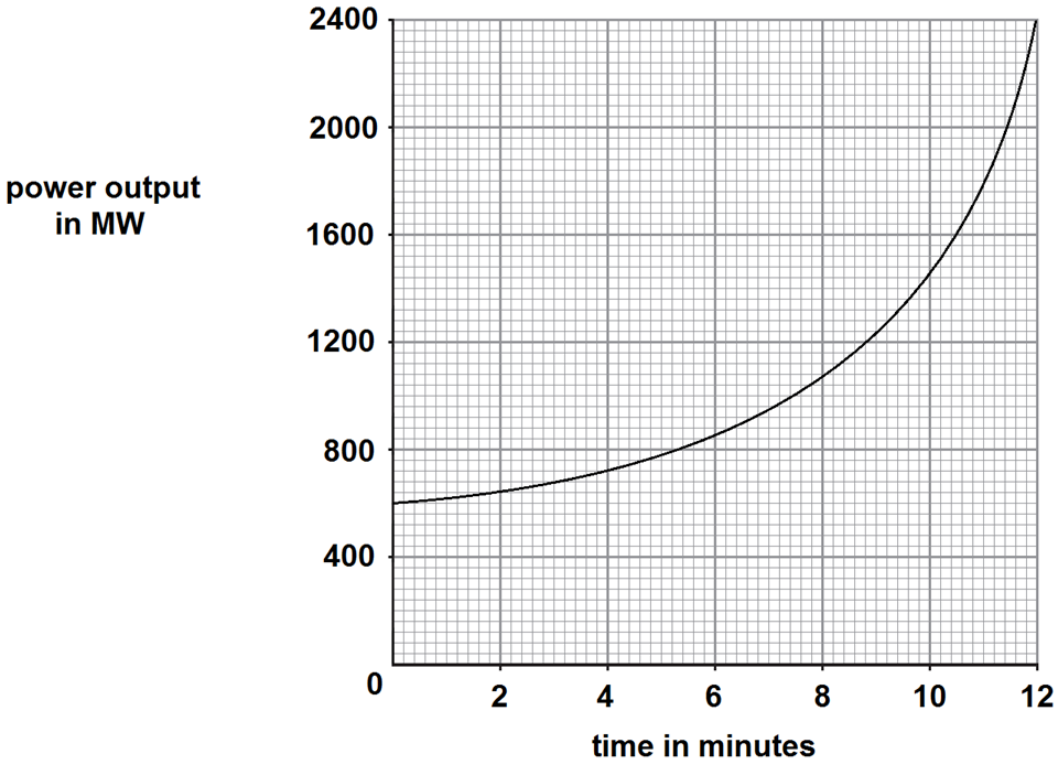
Figure 16 shows how the power output of the nuclear reactor would change if the control rods were removed.

Figure 16



1.3 Calculate the rate of increase of power output at 10 minutes.

[2 marks]

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Rate of increase of power output =..... MW / minute

FEEDBACK SHEET

Overall Mark:	**/29**	**GRADE ACHIEVED:**	
Section A:	/7	**9** ☐	**5** ☐
Section B:	/15	**8** ☐	**4** ☐
Section C:	/7	**7** ☐	**3** ☐
		6 ☐	**U** ☐

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:

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TASK 3: NUCLEAR FISSION

SPEC CHECK

Content	Achieved?
Nuclear fission is the splitting of a large and unstable nucleus (e.g. uranium or plutonium). Spontaneous fission is rare. Usually, for fission to occur the unstable nucleus must first absorb a neutron. The nucleus undergoing fission splits into two smaller nuclei, roughly equal in size, and emits two or three neutrons plus gamma rays. Energy is released by the fission reaction. All of the fission products have kinetic energy. The neutrons may go on to start a chain reaction. The chain reaction is controlled in a nuclear reactor to control the energy released. The explosion caused by a nuclear weapon is caused by an uncontrolled chain reaction. Students should be able to draw/interpret diagrams representing nuclear fission and how a chain reaction may occur.	

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

Energy Revision

This is a revision question on a previous topic.

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

1. Solar panels produce electricity from sunlight.

Figure 1

1.1 Sunlight is a renewable energy resource.

What is meant by renewable energy resource?

[1 mark]

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1.2 Using electricity from solar panels means less electricity is generated by burning fuels such as coal.

Explain why this is less harmful to the environment.

[2 marks]

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1.3 The efficiency of the solar panels is low.

What is another disadvantage of solar panels?

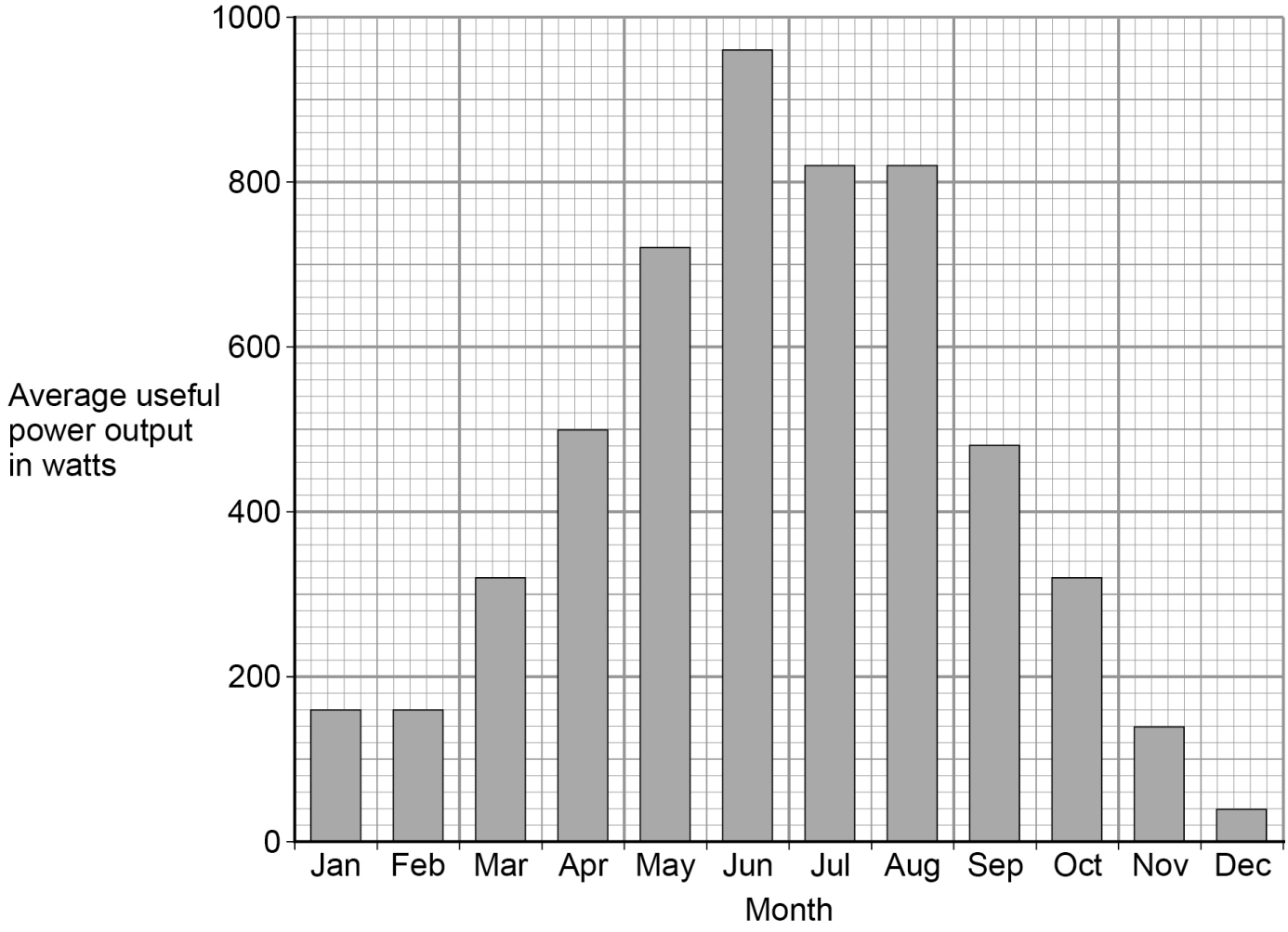
Tick **one** box.

[1 mark]

Make lots of noise	☐
Need to be replaced often	☐
Only produce power during the day	☐
Produce atmospheric pollution	☐

1.4 Figure 2 shows the average useful power output from the solar panels each month.

Figure 2



For how many months was the average useful power output less than 350 W?

Tick **one** box.

[1 mark]

1 ☐

4 ☐

6 ☐

8 ☐

1.5 The average power input to the solar panels in June was 8000 W.

The average useful power output from the solar panels was 960 W.

Calculate the efficiency of the solar panels.

[2 marks]

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Efficiency = ...

SECTION B

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

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

1. Nuclear fission and nuclear fusion are two processes that release energy.

1.1 Use the correct answer from the box to complete each sentence.

[2 marks]

Geiger counter	**nuclear reactor**	**star**

Nuclear fission takes place within a _____.

Nuclear fusion takes place within a _____.

1.2 State **one** way in which the process of nuclear fusion differs from the process of nuclear fission.

[1 mark]

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The following nuclear equation represents the fission of uranium-235 (U-235).

$$^{1}_{0}n + {}^{235}_{92}U \longrightarrow {}^{236}_{92}U \longrightarrow {}^{141}_{56}Ba + {}^{92}_{36}Kr + 3\,{}^{1}_{0}n + \text{energy}$$

Chemical symbols:

Ba - barium

Kr - krypton

1.3 Use the information in the equation to describe the process of nuclear fission.

[4 marks]

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1.4 An isotope of barium is Ba-139.
Ba-139 decays by beta decay to lanthanum-139 (La-139).

Complete the nuclear equation that represents the decay of Ba-139 to La-139.

[3 marks]

$$^{139}Ba \longrightarrow {}^{139}La + \quad .....$$

This will contain questions on content found later in the course

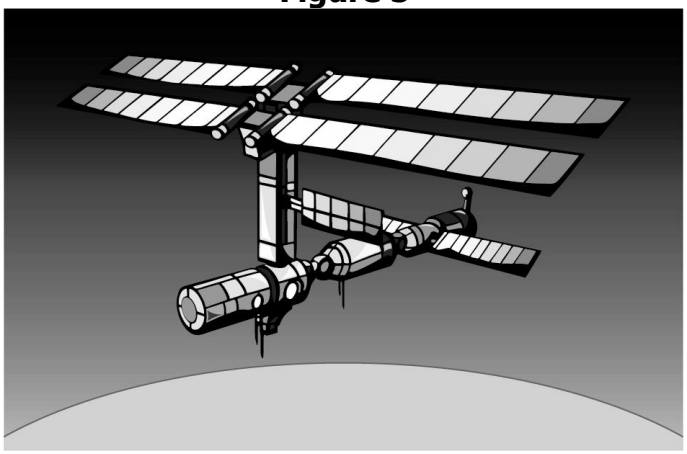
SECTION C

This is a challenge question to extend your understanding.

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

1. Figure 5 shows the International Space Station. People from several countries work on the space station.

Figure 5



1.1 The space station is powered using solar panels.
Suggest **one** advantage of using this method to generate electricity for the space station.

[1 mark]

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1.2 The space station can also be powered using the energy released from the decay of radioactive sources.
Table 3 gives information about two radioactive sources that can be used as nuclear fuel.

Table 3

Radioactive source	Symbol	Type of radiation emitted
Curium-244	Cm-244	Alpha
Strontium-90	Sr-90	Beta

What is the advantage of using Cm-244 as a power supply on the space station rather than Sr-90? Use **Table 3.**

[2 marks]

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1.3 Cm-244 decays into plutonium and emits an alpha particle.
Complete the nuclear equation for the decay of Cm-244.

[2 marks]

$$^{244}_{96}\mathrm{Cm} \longrightarrow \; ^{\quad}_{\quad}\alpha \; + \; ^{\quad}_{\quad}\mathrm{Pu}$$

1.4 A mass of 6 kg of Cm-244 is used as a source in a spacecraft for a mission.
The power output of Cm-244 is 200 W/kg.
The efficiency of the system is 8%.
Calculate the useful power output from the Cm-244 source when the spacecraft is first launched.

[3 marks]

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Useful Power Output =..... W

1.5 The mission lasts many years.
Explain why the power output from the source will **not** remain constant during the mission.

[2 marks]

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FEEDBACK SHEET

Overall Mark:	/27	**GRADE ACHIEVED:**	
Section A:	/7	**9** ☐	**5** ☐
Section B:	/10	**8** ☐	**4** ☐
Section C:	/10	**7** ☐	**3** ☐
		6 ☐	**U** ☐

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:

TASK 4: NUCLEAR FUSION

SPEC CHECK

Content	Achieved?
Nuclear fusion is the joining of two light nuclei to form a heavier nucleus. In this process, some of the mass may be converted into the energy of radiation.	

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

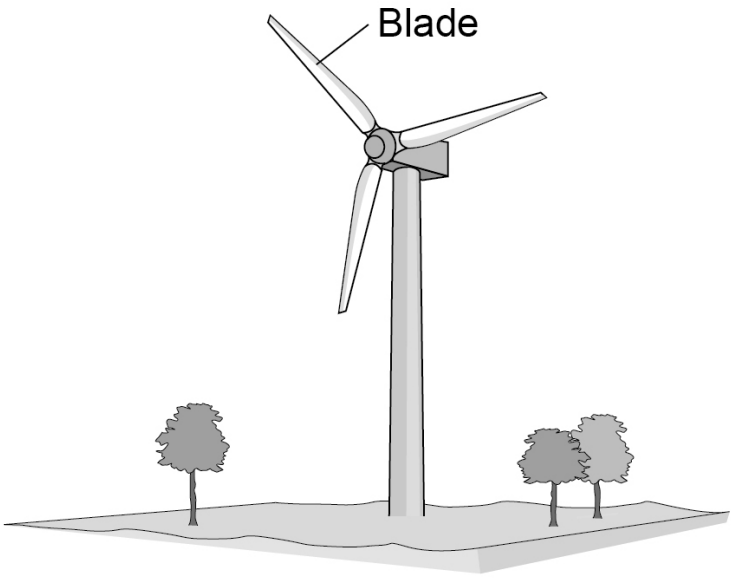
Electricity Revision

This is a revision question on a previous topic.

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

1. Figure 7 shows a wind turbine.

Figure 7



1.1 Which of the following statements about using wind turbines to generate electricity are true?

Tick **two** boxes.

[2 marks]

Wind turbines are a reliable source of energy. ☐

Wind turbines are silent when working. ☐

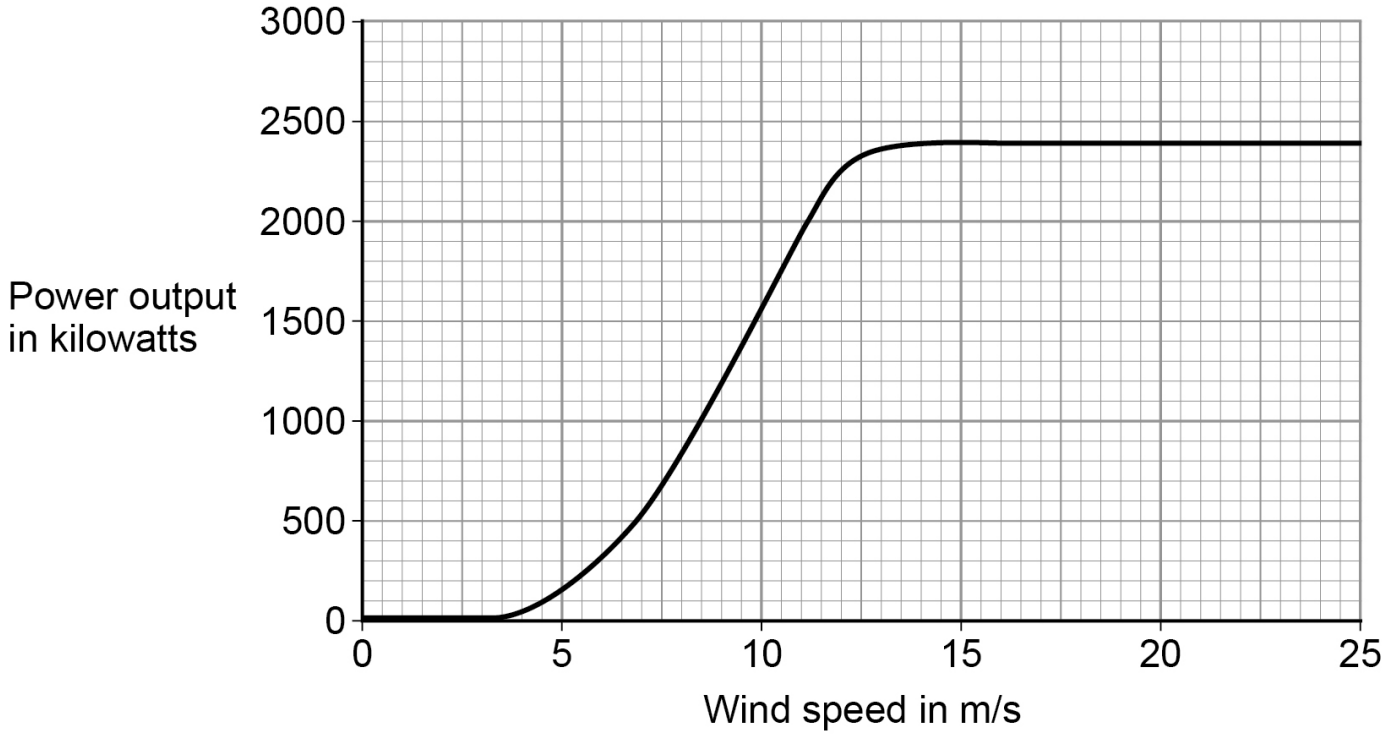
Wind turbines do not emit greenhouse gases. ☐

Wind turbines have no fuel costs when working. ☐

Wind turbines have no impact on the environment. ☐

Figure 8 shows how the power output from a wind turbine varies with wind speed.

Figure 8



1.2 Describe how the wind speed affects the power output from the wind turbine.

Your answer should include data from **Figure 8**.

[3 marks]

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1.3 During 1 hour, the average power output for the wind turbine was 2.0×10^6 W.

Calculate the electrical energy generated by the wind turbine during this hour.

[4 marks]

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Energy Generated =..... J

SECTION B

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

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

The process of nuclear fusion releases energy.

1.1 Describe the process of nuclear fusion.

[2 marks]

.....

.....

.....

.....

1.2 Why is energy released in a fusion reaction?

[1 mark]

.....

.....

1.3 Where does nuclear fusion occur naturally?

[1 mark]

.....

.....

1.4 Nuclear fusion reactors use two isotopes of hydrogen as fuel.

Complete **Table 1.**

[2 marks]

Table 1

Isotope	Number of protons	Number of neutrons
$^{2}_{1}H$	1	1
$^{3}_{1}H$		

1.5 Explain why fusion reactions can only happen if the temperature is very high.

[2 marks]

.....

.....

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.....

Some countries are building experimental nuclear fusion reactors.

1.6 Give **two** reasons why these countries may work together.

[2 marks]

1

.....

.....

2

.....

.....

1.7 Working nuclear fusion reactors could provide an almost limitless supply of energy.

All commercial nuclear power stations currently use a different process called nuclear fission.

This process produces waste.

Explain why the waste produced is a problem.

[3 marks]

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This will contain questions on content found later in the course

SECTION C

This is a challenge question to extend your understanding.

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

1. Many countries use nuclear power stations to generate electricity.
Nuclear power stations use the process of nuclear fission to release energy.
1.1 What is nuclear fission?

[1 mark]

.....

.....

1.2 Plutonium-239 is one substance used as a fuel in a nuclear reactor. For nuclear fission to happen, the nucleus must absorb a particle.
What type of particle must be absorbed?

[1 mark]

.....

.....

Nuclear fusion also releases energy.
Nuclear fusion happens at very high temperatures. A high temperature is needed to overcome the repulsion force between the nuclei.
1.3 Why is there a repulsion force between the nuclei of atoms?

[1 mark]

.....

.....

1.4 Where does nuclear fusion happen naturally?

[1 mark]

.....

.....

In 1991, scientists produced the first controlled release of energy from an experimental nuclear fusion reactor. This was achieved by fusing the hydrogen isotopes, deuterium and tritium.

Deuterium is naturally occurring and can easily be extracted from seawater.

Tritium can be produced from lithium. Lithium is also found in seawater.

The table gives the energy released from 1 kg of fusion fuel and from 1 kg of fission fuel.

Type of fuel	**Energy released from1 kg of fuel in joules**
Fusion fuel	3.4×10^{14}
Fission fuel	8.8×10^{13}

1.5 Suggest **two** advantages of the fuel used in a fusion reactor compared with plutonium and the other substances used as fuel in a fission reactor.

[2 marks]

1.

.....

.....

2.

.....

.....

1.6 Some scientists think that by the year 2050 a nuclear fusion power station capable of generating electricity on a large scale will have been developed.
Suggest **one** important consequence of developing nuclear fusion power stations to generate electricity.

[1 mark]

.....

.....

1.7 Tritium is radioactive.
After 36 years, only 10 g of tritium remains from an original sample of 80 g.
Calculate the half-life of tritium.
Show clearly how you work out your answer.

[2 marks]

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Half-life = _____ years

FEEDBACK SHEET

Overall Mark:	**/31**	**GRADE ACHIEVED:**	
Section A:	/9	**9** ☐	**5** ☐
Section B:	/13	**8** ☐	**4** ☐
Section C:	/9	**7** ☐	**3** ☐
		6 ☐	**U** ☐

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

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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	period = 1 / frequency	
7	magnification = image height / 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.