Centre No.						Paper Reference (complete below)								Surname	Initial(s)
Candidate No.										H	/	1	H	Signature	

Paper Reference(s)

5020H/1H 5048H/1H

Edexcel GCSE

Additional Science (5020H)

Physics (5048H)

P2 – Topics 9 to 12

Higher Tier

Wednesday 16 June 2010 – Morning

Time: 30 minutes

Materials required for examination	Items included with question papers
Calculator	Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature, and complete the paper reference.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.
Show all stages in any calculations and state the units. Calculators may be used.
Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 5 questions in this question paper. The total mark for this paper is 30.
There are 12 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.

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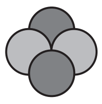
FORMULAE

You may find the following formulae useful.

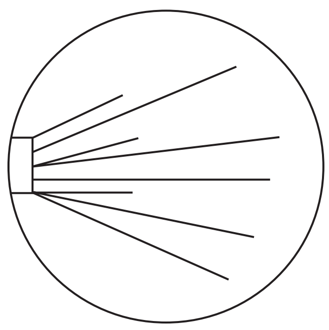
average velocity = $\frac{\text{displacement}}{\text{time}}$	$v = \frac{s}{t}$
acceleration = $\frac{\text{change in velocity}}{\text{time}}$	$a = \frac{(v-u)}{t}$
force = mass × acceleration	$F = m \times a$
momentum = mass × velocity	$p = m \times v$
change in potential energy = mass × gravitational field strength × change in height	$PE = m \times g \times h$
kinetic energy = ½ × mass × $(\text{velocity})^2$	$KE = \frac{1}{2} \times m \times v^2$
electrical energy = voltage × current × time	$E = V \times I \times t$
power = $\frac{\text{work done}}{\text{time taken}}$	$P = \frac{W}{t}$
work done = force × distance moved in the direction of the force	$W = F \times s$

1. (a) Ben has made some fact cards to help him revise for a test on radioactivity.
Complete his fact cards correctly.

		
....	**beta**	**gamma**
charge = ...	charge = –1	charge = ...
ionising ability = high	ionising ability = ...	ionising ability = low
range in air = a few cm	range in air = ...	range in air = ...

(3)

(b) Ben's teacher showed him a cloud chamber.
A cloud chamber displays the tracks produced by ionising radiation.
The tracks are formed along the paths of the ionising radiation.



cloud chamber facts

size – 10 cm diameter

contains – alcohol vapour

how it works – the alcohol vapour condenses on the ionised air particles

Ben thinks that the tracks shown have been caused by alpha particles.

Suggest **two** reasons to support Ben's statement.

1 ....

....

2 ....

....

(2)

(Total 5 marks)

Leave blank

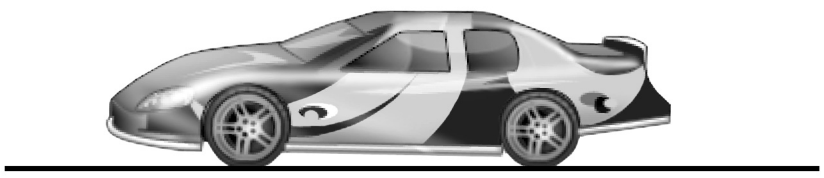
Q1

H 3 6 8 0 1 A 0 3 1 2

Turn over

Leave blank

2.



The diagram shows a racing car accelerating from rest along a straight road.

The acceleration of the car is 8.4 m/s^2.
The mass of the car is 620 kg.

(a) Calculate the force needed to produce this acceleration.
State the unit.

Force = ...
(3)

(b) Explain why the force produced by the engine must be greater than the force calculated in (a).

....

....

....
(1)

Leave blank

(c) The car accelerates at 8.4 m/s^2 from 0 m/s to a velocity of 54 m/s.
Calculate the time taken.

Time = ... s
(3)

(d) At a later time the car again travels at a velocity of 54 m/s.
Its kinetic energy is 860 000 J.

(i) Show that the mass of the car is now less than 600 kg.

(2)

(ii) Suggest why this is less than the initial mass of the car.

....

....
(1)

Q2

(Total 10 marks)

H 3 6 8 0 1 A 0 5 1 2

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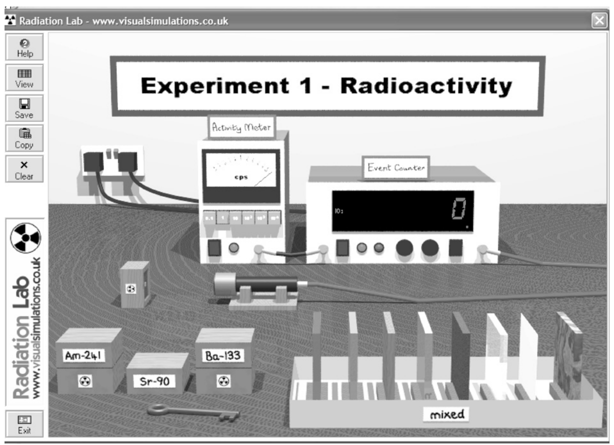
Leave blank

3. Ben used a computer simulation to investigate half-life.
The photograph shows a screenshot of the simulation he used.



(a) Suggest an advantage of using a computer simulation to investigate half-life rather than watching a demonstration.

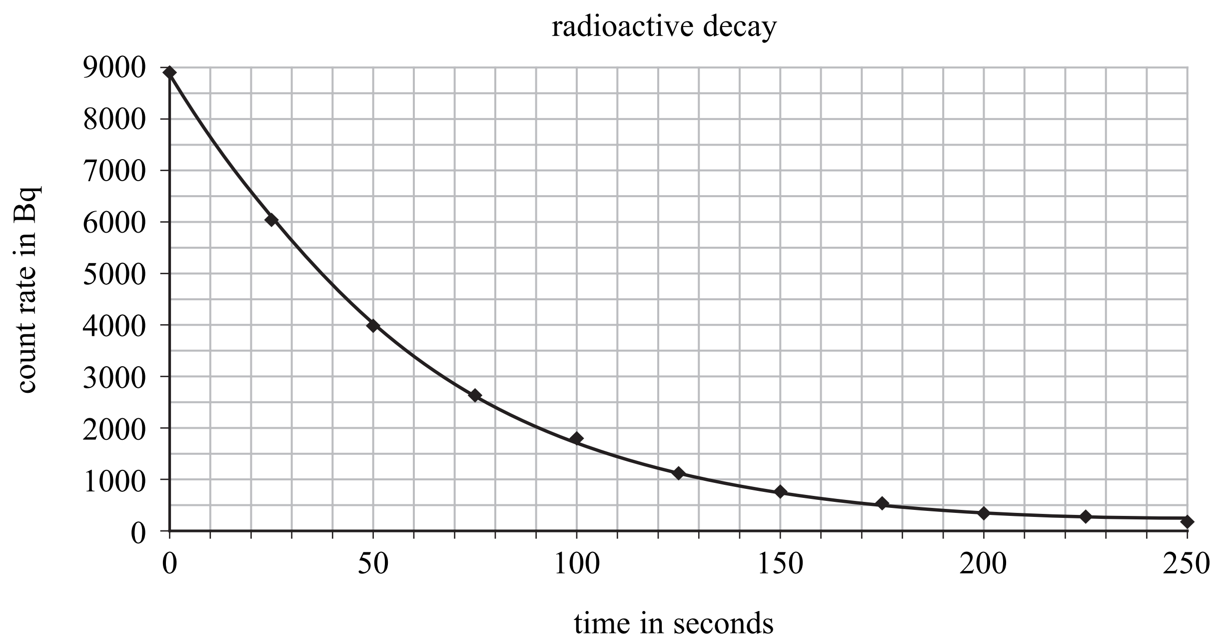
....

....

....
(1)

Leave blank

(b) Using data from the simulation, Ben produced the following graph.
He can use it to calculate the half-life.



(i) Explain what is meant by **half-life**.

....

....

....
(1)

(ii) Use Ben's graph to estimate the half-life.

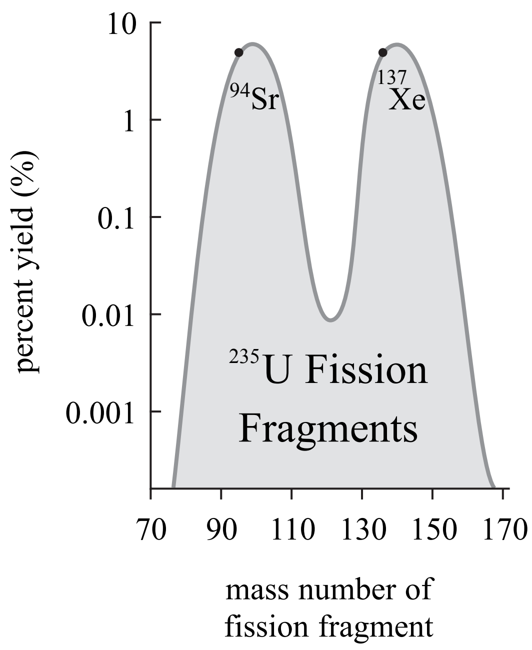
half-life = ... seconds
(1)

Q3

(Total 3 marks)

Leave blank

4. (a) Many different pairs of isotopes can be produced by the fission of uranium-235. The graph shows the percentage yields of different isotopes. The positions of strontium-94 and xenon-137 are shown.



(i) The symbol for a nucleus of uranium-235 is $^{235}_{92}U$.

Calculate the number of neutrons in a nucleus of this isotope.

number of neutrons = ...
(1)

(ii) Explain why uranium-235 cannot produce two xenon-137 fragments in the same fission reaction.

....

....

....
(1)

(iii) Calculate how many neutrons are produced when uranium-235 fissions into xenon-137 and strontium-94.

number of neutrons = ...
(1)

H 3 6 8 0 1 A 0 8 1 2

Leave blank

(b) Spent fuel rods contain uranium-235 and its fission products such as xenon-137 and krypton-94.

Uranium-235 is an alpha emitter with a half life of over 700 million years.

Xenon-137 and krypton-94 decay as shown in the tables.

isotope	decays into	with a half-life of	emits
xenon-137	caesium-137	3.8 min	beta
caesium-137	barium-137	30 years	beta
barium-137	stable		

isotope	decays into	with a half-life of	emits
krypton-94	rubidium-94	0.2 s	beta
rubidium-94	strontium-94	2.7 s	beta
strontium-94	yttrium-94	75.3 s	beta
yttrium-94	zirconium-94	18.7 min	beta
zirconium-94	stable		

Use the information in the tables to discuss the issues in the storage and the disposal of spent fuel rods.

....

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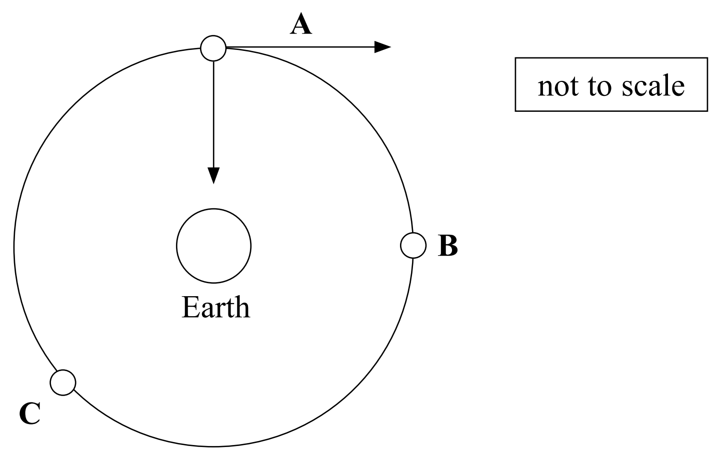
(3)

Q4

(Total 6 marks)

5. The diagram shows three positions **A**, **B** and **C** of a satellite in orbit around the Earth.



(a) The arrows at **A** show the direction of velocity of the satellite and the gravitational force acting on it.

(i) Draw an arrow on the satellite at **B** to show the direction of the velocity at this point.

(1)

(ii) Draw an arrow on the satellite at **C** to show the direction of the gravitational force of the satellite.

(1)

(b) The satellite travels at a constant speed.

Using the connection between acceleration and velocity, explain why the satellite must be accelerating as it moves around its orbit.

....

....

....

....

(2)

H 3 6 8 0 1 A 0 1 0 1 2

Leave blank

(c) Using the connection between work and force, explain why the satellite does not need fuel to stay in orbit.

....

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....

(2) **Q5**

(Total 6 marks)

(TOTAL FOR PAPER = 30 MARKS)

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