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

Monday 2 March 2009 – Morning

Time: 30 minutes

Materials required for examination
Calculator

Items included with question papers
Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
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 4 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.

$$\text{average velocity} = \frac{\text{displacement}}{\text{time}} \qquad v = \frac{s}{t}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}} \qquad a = \frac{(v-u)}{t}$$

$$\text{force} = \text{mass} \times \text{acceleration} \qquad F = m \times a$$

$$\text{momentum} = \text{mass} \times \text{velocity} \qquad p = m \times v$$

$$\text{change in potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{change in height} \qquad PE = m \times g \times h$$

$$\text{kinetic energy} = \tfrac{1}{2} \times \text{mass} \times (\text{velocity})^2 \qquad KE = \tfrac{1}{2} \times m \times v^2$$

$$\text{electrical energy} = \text{voltage} \times \text{current} \times \text{time} \qquad E = V \times I \times t$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{work done} = \text{force} \times \text{distance moved in the direction of the force} \qquad W = F \times s$$

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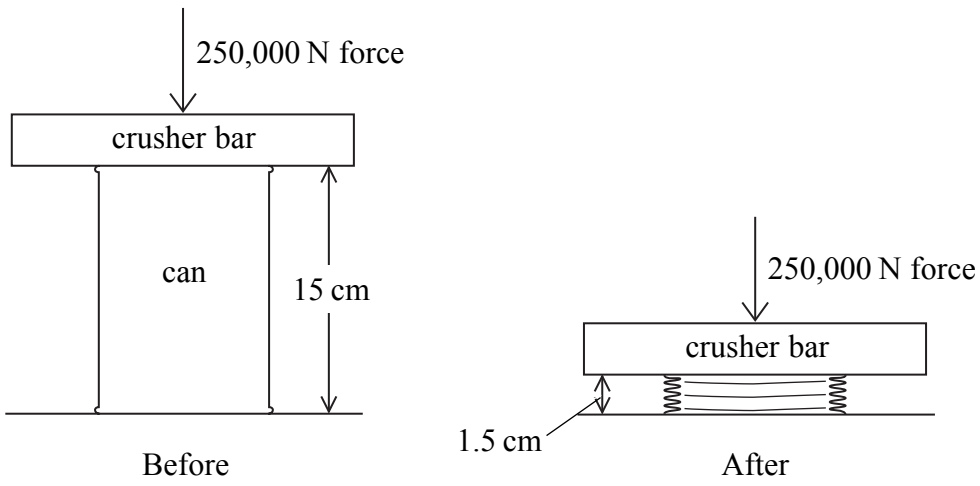
1.

Russ uses an electric can-crusher at his local recycling centre.

The diagram shows a can before and after crushing.



(a) Calculate the distance, in m, that the force has moved.

Distance = ... m
(1)

(b) Calculate the work done by the force.
State the units in your answer.

Work done .....
(3)

(c) State the maximum energy transferred to the can by the force.

.....
(1)

Leave blank

(d) The motor of the can crusher works at 230 V and 21 A.
It takes 12 s to crush the can.
Calculate the electrical energy transferred by the motor.

Electrical energy transferred .....

(2)

(e) Not all the energy supplied to the motor is used to crush the can.
Explain what happens to the energy that is not used to crush the can.

.....

.....

.....

(1)

Q1

(Total 8 marks)

Leave blank

2.

Babs and Sunita are investigating the physics of ten-pin bowling.

Babs measures the time taken for the ball to travel down the bowling alley.

The length of the alley is 18 m.
The time taken for the ball to travel down the alley is 2.4 s.

(a) Calculate the average velocity of the ball.

average velocity = ... m/s
(2)

(b) Explain why this is an **average** velocity.

.....

.....
(1)

(c) The mass of each pin is 1.5 kg.
The ball hits just one pin with a force of 90 N.
Calculate the initial acceleration of the pin.

acceleration = ... m/s^2
(2)

Q2

(Total 5 marks)

Leave blank

3. (a) Complete the table to show the charge sign and the charge size on an alpha particle and a beta particle.

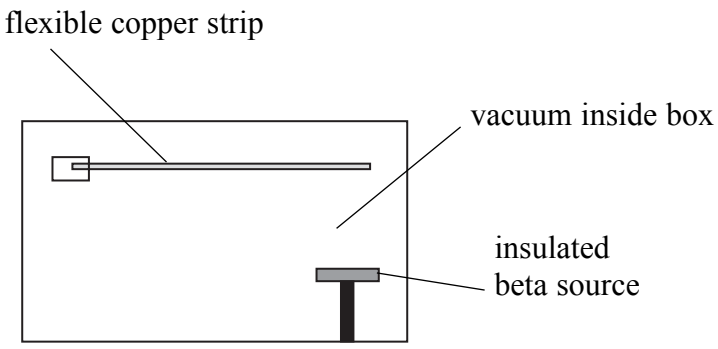
particle	charge sign	charge size
alpha		
beta	–	1

(1)

(b) 

In 2002 Amit Lal invented a new form of 'atomic' battery.

The diagram below shows the main parts.



(i) The source emits beta particles.

What happens to the sign of the charge of the insulated beta source as it emits beta particles?

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(1)

Leave blank

(ii) After a while the copper strip bends down towards the beta source. Explain why this happens.

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(2)

(iii) When the copper strip touches the source, there is a small current between them.

- As a result the copper strip returns to its original position.
- These movements then repeat until the activity of the source falls to below 80% of its original level.

1. The gap between the strip and the source is increased.

   This does not affect the lifespan of the battery. Explain why.

   .....

   .....

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   .....

   (1)

2. The beta source is replaced by an alpha source with the **same** activity.

   State and explain what would happen to the time taken for the copper strip to touch the source.

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   .....

   (2)

Leave blank

(iv) This battery is very small.
It could be used to power a pacemaker.
A pacemaker is used to regulate the beating of a patient's heart.
The pacemaker is placed inside the body of a patient.

Use the data from the table about different isotopes to answer the questions below.

All the isotopes emit beta radiation.

isotope	maximum energy emitted by each beta particle in MeV	half-life
cobalt-60	2.82	5 years
hydrogen-3	0.02	12 years
nickel-63	0.07	100 years
strontium-89	1.50	50 days

1. State and explain which isotope will need the least shielding to protect the patient.

Isotope = ...

Reason = ...

.....

(1)

2. Give two reasons why strontium-89 would not be suitable to power a pacemaker.

.....

.....

.....

(2)

3. Which isotope would be the most suitable to power a pacemaker in a 25 year old man?
Explain your reasoning.

Isotope = ...

Reason = ...

.....

(1)

Q3

(Total 11 marks)

Leave blank

4. (a) (i) A star, such as the Sun, generates its own energy by nuclear fusion.
Explain how this is different to nuclear fission.
State the conditions required for fusion.

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(3)

(ii) Why is such a method of producing energy not yet possible on the Earth?

.....

.....

(1)

(b) In 1989, Martin Fleischmann and Stanley Pons published the results of their experiment on 'Cold Fusion' (low energy nuclear reactions).

Suggest why
(i) many scientists were very interested in these results.

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(1)

Leave blank

(ii) cold fusion is not yet widely accepted by the scientific community.

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(1) **Q4**

(Total 6 marks)

TOTAL FOR PAPER: 30 MARKS

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