Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0241/01

ADDITIONAL SCIENCE
FOUNDATION TIER
PHYSICS 2

A.M. WEDNESDAY, 30 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**3**	
3.	**5**	
4.	**4**	
5.	**2**	
6.	**4**	
7.	**5**	
8.	**4**	
9.	**5**	
10.	**4**	
11.	**5**	
12.	**6**	
Total	**50**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

A list of equations is printed on page 2 of the examination paper. In calculations you should show all your working.

EQUATIONS

$$\text{Resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\text{Current} = \frac{\text{power}}{\text{voltage}}$$

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Acceleration (or deceleration)} = \frac{\text{resultant force}}{\text{mass}}$$

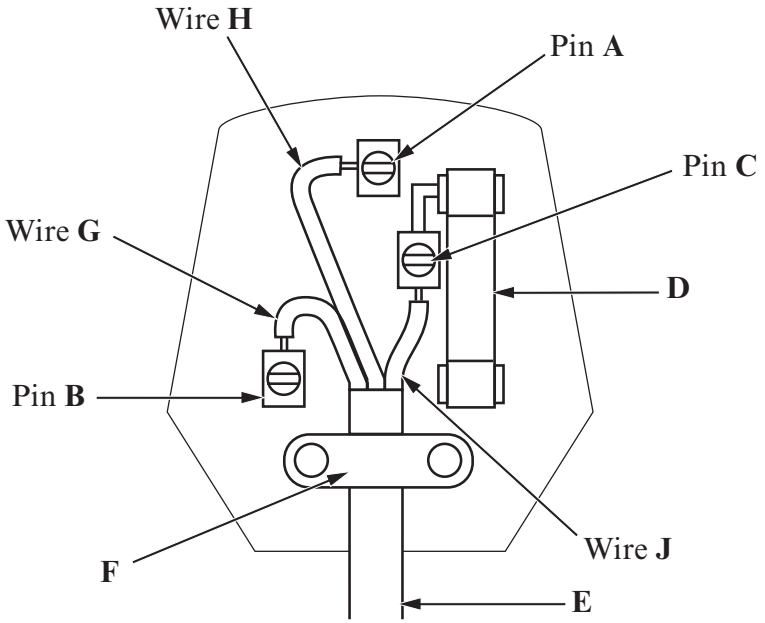
$$\text{Acceleration} = \frac{\text{change in speed}}{\text{time}}$$

$$\text{Work done} = \text{force} \times \text{distance}$$

Examiner only

Answer **all** *questions.*

1.



The diagram shows the inside of an electric plug.

(a) Complete the following sentences by inserting the correct letter from the diagram in the boxes provided.

(i) The earth wire ☐ is connected to the earth pin ☐ . [1]

(ii) The blue wire ☐ is connected to the pin ☐ . [1]

(b) Explain why 3-pin plugs are made of plastic or rubber. [1]

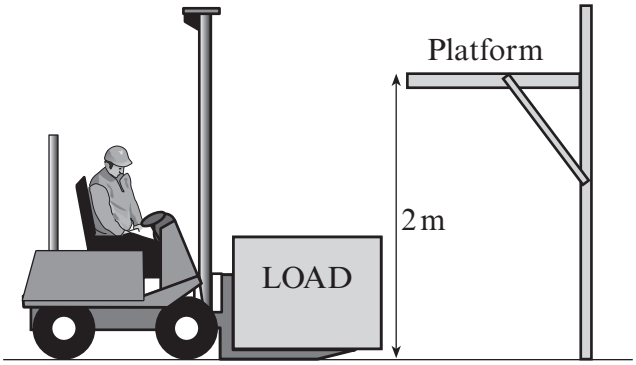
.....

.....

3

Examiner only

2. A forklift truck lifts a load of 150 N and places it onto a 2 m high platform.



(a) Use the equation

work done = force × distance

to calculate the work done in lifting the load to the platform. [2]

Work done = ... J

(b) Give **one** reason why the forklift truck uses more energy than that required to lift the load. [1]

.....

.....

3

Examiner only

3. *(a)* Background radiation is all around us

- Some rocks on Earth are radioactive.
- Radioactive rays shower down upon us from space.
- Nuclear power stations add a small amount to nature's radioactivity.

Explain, giving a clear reason for your answer, which **one** of the following statements below contains the most truth. [2]

(i) Background radiation is completely harmless.

(ii) Background radiation can cause harm but very few people are affected by it.

(iii) Background radiation will kill us.

.....

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.....

(b) The table shows readings of background radiation, taken using a Geiger counter. The readings are all taken in the same place.

Counts in one minute	27	20	28	18	15

(i) Calculate the mean background count in one minute. [2]

Mean count = ... counts per minute

(ii) Why do you think the numbers are different?

Put a **tick** (✓) in the box next to the statement which best explains why the numbers are different. [1]

Experimental error. ☐

Different numbers of radioactive particles are being produced each minute. ☐

The readings were taken at different times of day. ☐

5

Examiner only

4. The power ratings of parts of an electric cooker are given below.

Cooker part	Rating (W)
Oven	3000
Grill	2000
Rings	1400

(a) All parts of the cooker are being used at the same time.

Calculate the total power required in W. [1]

Power = ... W

(b) The cooker is connected to the 230 V mains.

Use the equation

$$\text{current} = \frac{\text{power}}{\text{voltage}}$$

to find the current in the cooker circuit when all parts of the cooker are being used. [2]

Current = ... A

(c) The cooker circuit is connected to its own circuit breaker.
Give a reason why a 20 A miniature circuit breaker (m.c.b.) would not be used to protect the whole circuit. [1]

.....

.....

4

Examiner only

5. Explain why radioactive waste is expensive to dispose of safely. [2]

.....

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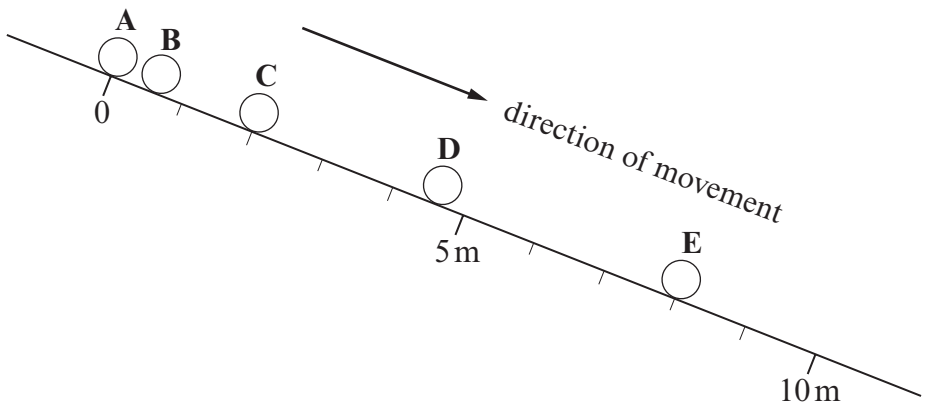
.....

2

6.



The diagram shows the position of a ball as it rolled down a track. The ball took 0.5 s to roll from one position to the next. For example, it rolled from **A** to **B** in 0.5 s and from **B** to **C** in 0.5 s and so on.

(a) (i) Write down the distance travelled by the ball from **A** to **E**. ..... m [1]

(ii) Write down the time taken by the ball to reach **E**. ..... s [1]

(b) Use the equation

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

to calculate the mean speed of the ball rolling from **A** to **E**. [2]

Mean speed = ... m/s

4

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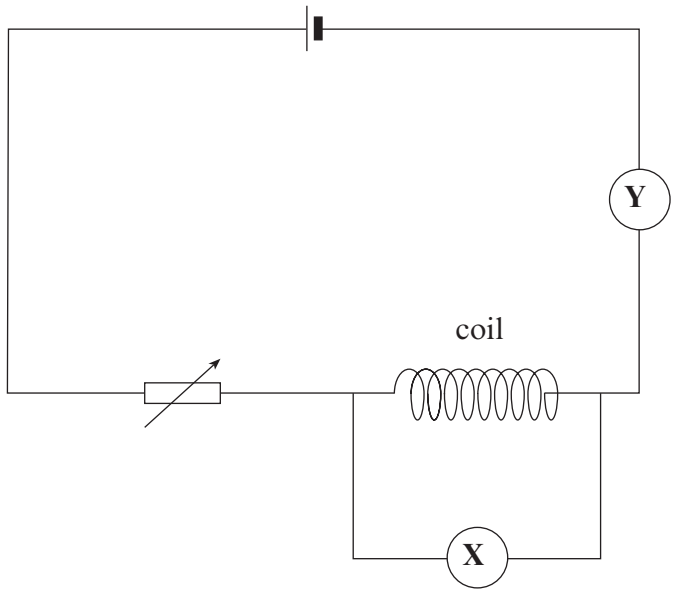
Turn over.

Examiner only

7. The circuit below may be used to find the resistance of a coil of wire.



(a) What are the following used for in the circuit?

(i) Meter **X** .....

(ii) Meter **Y** .....

(iii) The variable resistor .....

.....

[3]

(b) Use the equation

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

to calculate the resistance of the coil if its voltage is 6 V and the current is 1·5 A. [2]

Resistance =..... Ω

5

Examiner only

8. Read the information in the box before answering the questions that follow.

> Nuclear medicine uses radioactive tracers to find out what is wrong with a patient. Gamma emitting radioactive materials, with a short half-life, are used as tracers to examine blood flow in a patient's body.
> One tracer used is technetium-99 (Tc-99). It has a half-life of 6 hours. It only emits low energy gamma rays, which easily escape the body to be detected by gamma ray cameras. These cameras feed information to a computer which builds up a picture of the path taken by the tracer through the patient's body.
> Tc-99 can be given to a patient by mouth or by injection. It produces no discomfort and after a few days there is no sign that the test was ever done.

(a) State how a picture of the path taken by the radioactive tracer is produced. [1]

.....

.....

(b) Give **one** reason why Tc-99 is a suitable material to use as a radioactive tracer. [1]

.....

.....

(c) The patient was given an injection, part of which contained 1 280 undecayed atoms of Tc-99.

(i) How many of these atoms will have decayed after 6 hours? **Circle** the correct answer. [1]

1 280 640 320 160 80

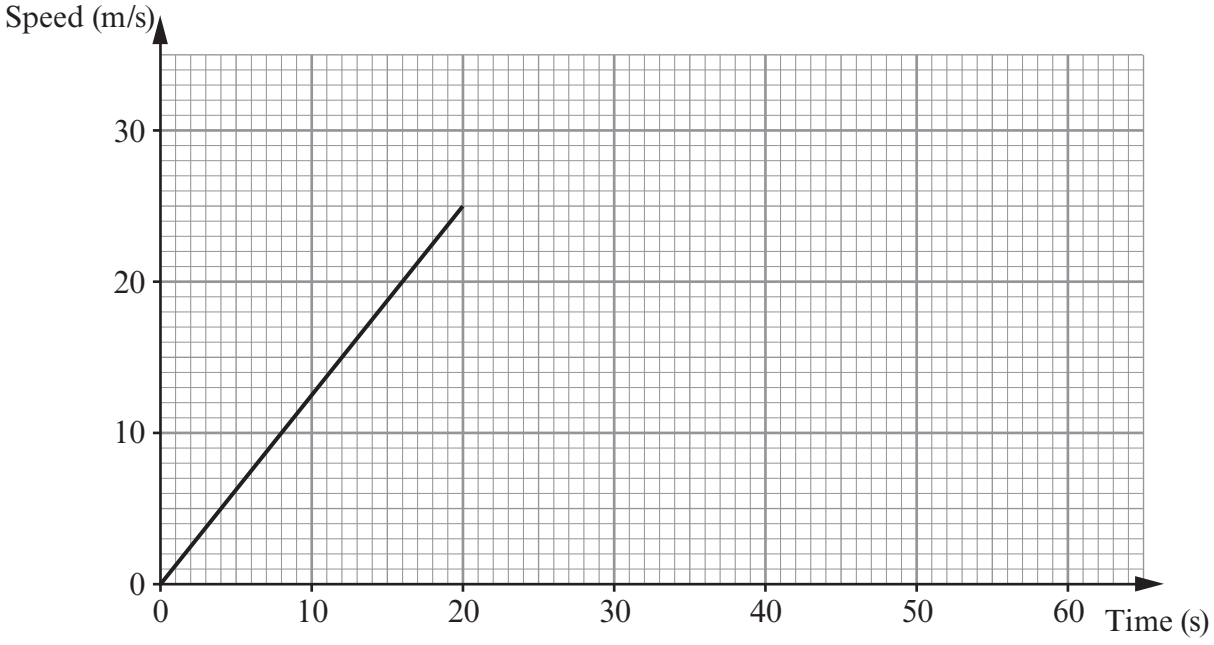
(ii) How long will it take for only 80 undecayed atoms to remain in the patient? [1]

Time =..... hours

4

Examiner only

9. The graph shows part of the motion of an underground train as it travels from one station to the next. It takes 60 s to travel between the two stations. After 20 s the train travels at a constant speed of 25 m/s for 30 s before decelerating steadily to rest under the action of its brakes.



(a) **Complete the graph** to show the motion of the train between the two stations. [2]

(b) Describe the motion of the train in the first 20 s. [1]

.....

.....

(c) Use the equation

$$\text{acceleration or deceleration} = \frac{\text{change in speed}}{\text{time}}$$

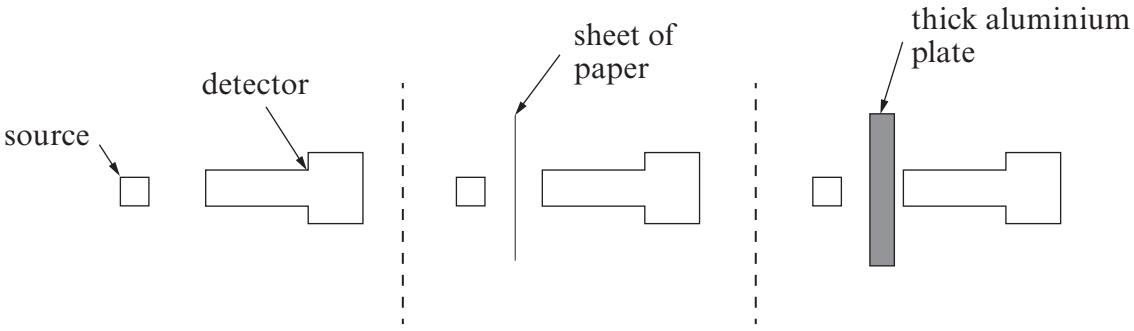
together with information from the graph to calculate the **deceleration** of the train. [2]

deceleration =..... m/s^2

5

Examiner only

10. A radioactive source emitting alpha, beta and gamma radiations was placed in front of a detector. The three diagrams show how the count rate in counts per minute (cpm) changed when different absorbers were placed between the source and the detector.



count rate = 300 counts per minute

count rate = 250 counts per minute

count rate = 120 counts per minute

(a) (i) How much of the original count rate was due to gamma radiation?

..... cpm

(ii) Calculate the count rate due to alpha radiation.

..... cpm
[2]

(b) By referring to the diagram explain why the count rate due to beta radiation was 130 cpm. [2]

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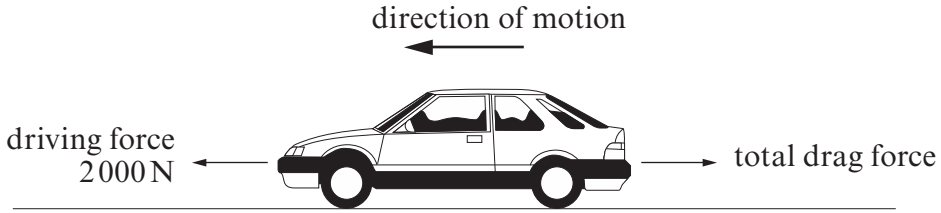
4

Turn over.

Examiner only

11. The diagram below shows some of the forces acting on a car of mass 800 kg.



(a) The car is travelling at **constant speed**. State the size of the total drag force. [1]

..... N

(b) The driving force is now **increased** to 3200 N.

(i) Find the resultant force on the car at this instant. [1]

.....

.....

(ii) Select and write down an equation from page 2 and use it to calculate the initial acceleration of the car.

Equation .....

.....

[1]

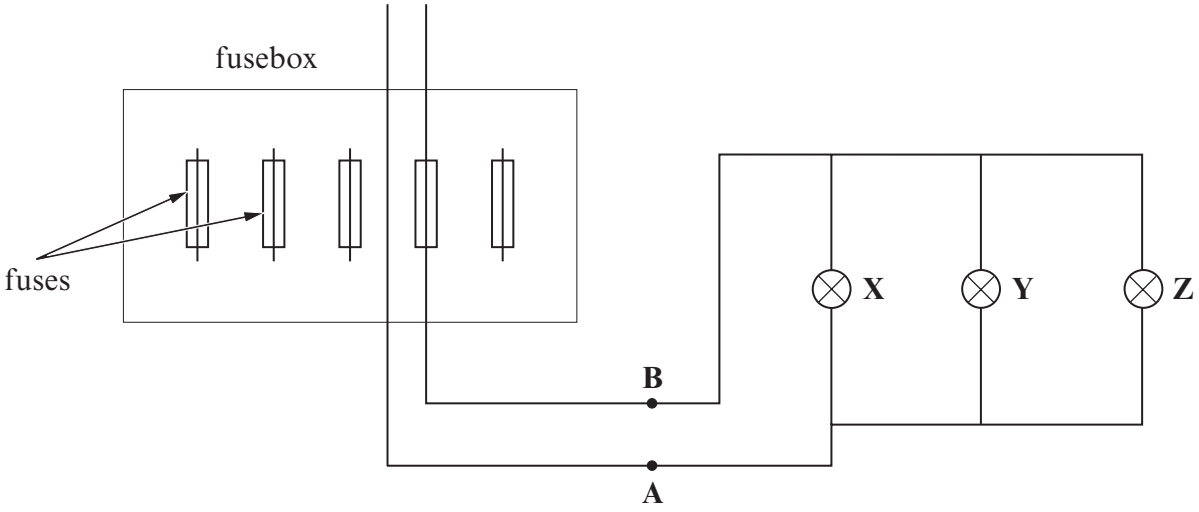
Acceleration = ... m/s^2

[2]

5

Examiner only

12. The diagram shows part of the household lighting circuit joined into the fusebox.



(a) How can you tell from the diagram that **B** is the live wire? [1]

.....

.....

(b) **Add to the circuit** in a safe position:

(i) a switch S_1 which controls lamp **X** only,

(ii) a switch S_2 which controls both lamps **Y** and **Z**. [3]

(c) The fuse wire rating for a normal household lighting circuit is 5 A. By describing the purpose of a fuse, explain what a 5 A fuse rating means. [2]

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6

END OF PAPER