Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

241/01

ADDITIONAL SCIENCE
FOUNDATION TIER
PHYSICS 2

A.M. FRIDAY, 27 May 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark awarded**
1.	**3**	
2.	**5**	
3.	**6**	
4.	**5**	
5.	**5**	
6.	**4**	
7.	**10**	
8.	**7**	
9.	**5**	
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

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

$$\text{Power} = \text{current} \times \text{voltage}$$

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

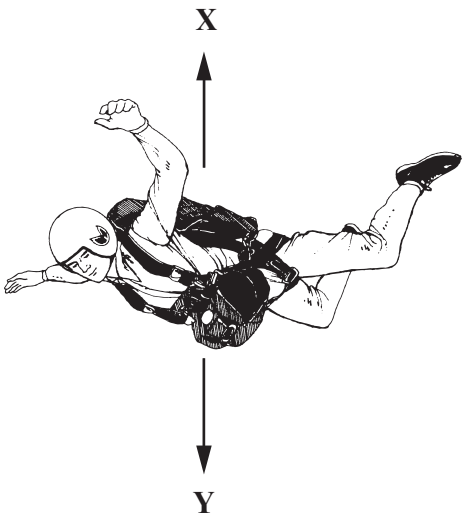
$$\text{Resultant force} = \text{mass} \times \text{acceleration}$$

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

$$\text{Force} = \frac{\text{work done}}{\text{distance}}$$

Answer **all** *questions in the spaces provided.*

1. The statements below describe what happens during a parachute jump.



A	Drag force X becomes equal to the weight Y
B	Speed increases and drag increases
C	Sky diver jumps from plane and falls
D	Speed decreases
E	Falls with a constant speed
F	Parachute opens increasing drag

Place the statements in the correct order in the boxes below. Two have already been done for you. [3]

C	.....	.....	.....	F	.....

3

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2. *(a)* There are three insulated wires connected to plugs. One of the wires is connected to a fuse. Draw a line from each item to its job. One has already been done for you. [3]

Item	Job
Neutral wire →	To complete the circuit to the appliance
Live wire	To protect user from shock
Earth wire	To carry high voltage
Fuse	To prevent short circuits
Insulation	To protect circuit from overheating

(b) It is recommended that residual current devices (RCD) be fitted to protect circuits. Tick (✓) the boxes next to the reasons why an RCD will provide greater protection to a user than a fuse. [2]

Can be reset	
Quicker acting	
Stops overheating	
Detects small changes in current	

5

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3. Read the following information and answer the questions that follow.

> Radon is a naturally occurring radioactive gas produced by the decay of uranium 238, which is present throughout the Earth's crust. It is concentrated in parts of the country rich in granite, such as Devon and Cornwall.
>
> Radon decays by emitting alpha radiation. We all breathe in radon throughout our lives and it accounts for half of our total annual radiation dosage of 400 units.
>
> It can seep into buildings through cracks and holes in the foundations, where it can build up to dangerous levels.

(a) (i) How is radon produced? [1]

.....

.....

(ii) Give a reason why radon levels are not constant over Britain. [1]

.....

.....

(iii) Name another source of background radiation. [1]

.....

(b) (i) What is our annual radiation dose from radon? [1]

.....

(ii) Describe **one** method taken to prevent the build up of radon in buildings. [1]

.....

.....

.....

(iii) Explain why breathing in large amounts of radon is dangerous to our health. [1]

.....

.....

.....

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6

Turn over.

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4. The table shows some properties of isotopes of plutonium (Pu).

Isotope	Half Life (years)	Activity (units)	Radiation emitted
Pu-238	88	20	α
Pu-240	6 500	0.23	α
Pu-241	14	100	β
Pu-242	380 000	0.0040	α

(a) (i) Which isotope has the greatest activity? ..... [1]

(ii) Which isotope will stay active for longest? ..... [1]

(iii) Which isotope will emit the most penetrating radiation? ..... [1]

(b) (i) A sample of Pu-238 has an activity of 20.

How long will it take to drop to 10? ..... years [1]

(ii) A sample of Pu-241 has an activity of 100.

What will the activity be after 28 years? ..... units [1]

5

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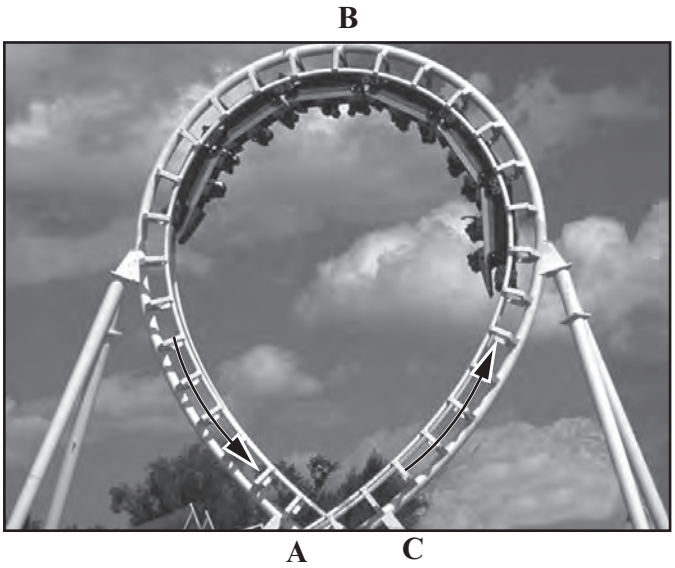
5. A fairground ride has a loop in part of the track.



The cars enter the loop at **A** with a kinetic energy of 250 000 J.

At **B**, the total energy of the car is 230 000 J.

The car leaves the loop with a kinetic energy of 190 000 J at **C**.

(a) (i) How much energy is lost between **A** and **B**? [1]

Energy lost = ...J

(ii) At **B**, the car has less kinetic energy than it does at **A**.
Explain why. [1]

.....

.....

(iii) How much work is done against friction between **A** and **C**? [1]

Work done against friction = ...J

(b) Towards the end of the ride, the car has 60 000 J of kinetic energy. A braking force stops the car over a distance of 20 m.
Use the equation

$$\text{Force} = \frac{\text{work done}}{\text{distance}}$$

to calculate the braking force. [2]

Braking force = ...N

5

Examiner only

6. *(a)* Radioactive waste has to be stored carefully for long periods of time. Give a reason why. [1]

.....

.....

(b) Give a **disadvantage** for each of the following methods that are used for getting rid of radioactive waste. [3]

(i) Store in barrels at the bottom of the sea.

Disadvantage: .....

.....

(ii) Send by rockets into space.

Disadvantage: .....

.....

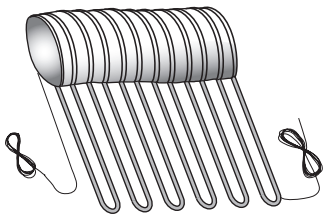
(iii) Store in containers on the surface of the Earth.

Disadvantage: .....

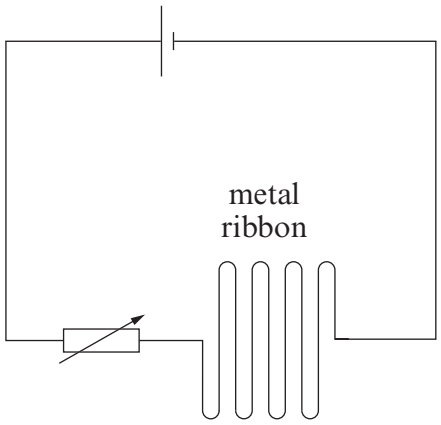
.....

4

7. Homes can now be heated using metal ribbons laid under carpets.



The circuit on the next page is used to find the resistance of the metal ribbons and the power developed in them.



(a) (i) **Add meters to the circuit** that allow you to calculate the resistance of the metal ribbon. [2]

(ii) What is the purpose of the variable resistor? [1]

.....

.....

(b) When in use the voltage across the ribbons is 230 V and a current of 0.5 A flows through them.

(i) Write down in words an equation from page 2, and use it to calculate the resistance of the ribbons. [3]

Equation: .....

.....

Calculation:

Resistance = ... Ω

(ii) Write down in words an equation from page 2, and use it to calculate the power developed in the ribbons. [3]

Equation: .....

.....

Calculation:

Power = ... W

(c) The metal ribbons are all protected by a miniature circuit breaker (mcb). When they are all in use, the total current is 24 amps.
Circle the mcb rating in the list which should be used to protect this circuit. [1]

15 A 24 A 30 A

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8. A car travels at 30 m/s.

(a) Use the equation

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

to find the deceleration when the car stops in 0.2 s. [2]

deceleration = ... m/s^2

(b) During an accident, the force on a passenger will depend on how long the car takes to stop as shown in the table below.

Time to stop (s)	Force (N)
0.2	12 000
0.4	6 000
0.6	4 000
0.8	3 000

(i) Describe what happens to the force as the stopping time increases. [1]

.....

(ii) Use the information in the table and your answer to *(a)* to find the mass of the passenger. [2]

$$\text{mass} = \frac{\text{force}}{\text{deceleration}}$$

Mass of passenger = ... kg

(c) Explain how crumple zones in cars protect passengers. [2]

.....

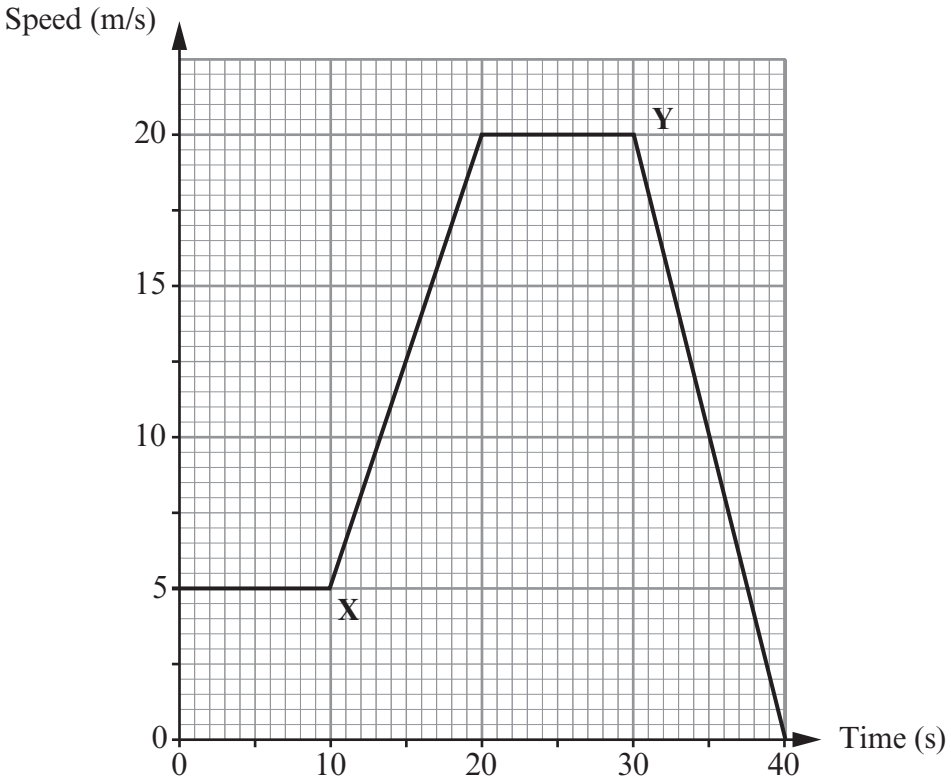
.....

.....

.....

Examiner only

9. The graph shows the motion of a van for 40s.



(i) State the initial speed of the van. ..... m/s [1]

(ii) Describe carefully, giving numerical values, how the van moves between X and Y. [4]

.....

.....

.....

.....

.....

.....

.....

.....

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