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**Wednesday 1 February 2012 – Afternoon**

**GCSE TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL APPLIED SCIENCE A**

**A336/02** Materials and Performance (Higher Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**Duration:** 45 minutes

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

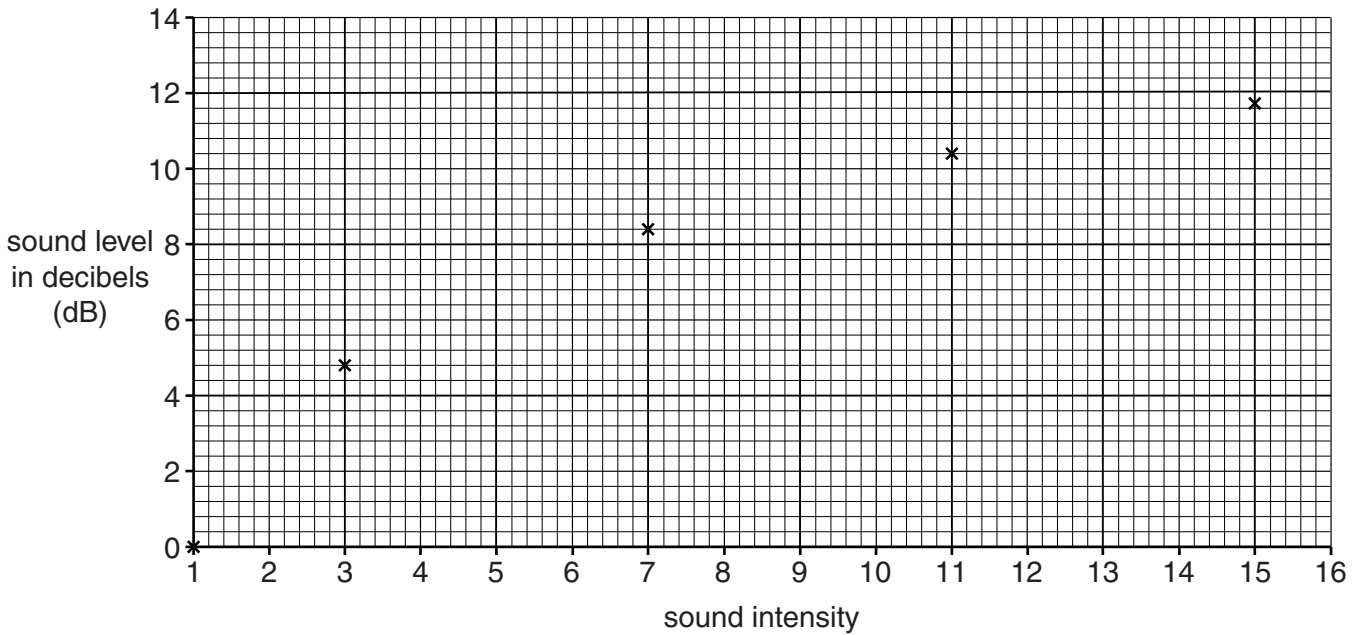
Answer **all** the questions.

1 Jo works for an airport. She measures sound intensity in homes near the airport.

(a) Jo uses the decibel (dB) scale to show sound intensity.

This graph shows sound level in decibels plotted against sound intensity.

Complete the graph by drawing a line of best fit through the points.



[1]

(b) (i) Near the airport, Jo measures a sound level of 90 dB.

She says the sound level should be reduced.

Give a reason why the sound level should be reduced.

.....  
 ..... [1]

(ii) Jo is concerned that the sound level may reach 130 dB.

Why is a sound level of 130 dB unacceptable?

.....  
 ..... [1]

(iii) Prolonged exposure to loud sounds can cause tinnitus.

Describe what tinnitus means.

..... [1]

- (c) Jo says that windows should be double-glazed to increase the reflection of sound from outside the house. This reduces the sound levels inside.

Describe another method of reducing sounds levels inside a house.

Your answer should include

- the material used
- how this material affects sound energy.

.....

.....

..... [2]

[Total: 6]

2 Sam is playing with a toy train. It is moving on a circular track.

(a) Its **speed** is not the same as its **velocity**.

Which sentence, **A**, **B**, **C** or **D**, describes the velocity of the train?

- A The time the train takes to go once round the track.
- B The speed of the train in a particular direction.
- C The distance the train travels in one minute.
- D The maximum speed of the train.

answer ..... [1]

(b) (i) Sam has a red train and a blue train.

The mass of the red train is three times the mass of the blue train.

Choose the words from this list to complete the sentence below.

- one-third**            **half**            **three times**            **four times**            **nine times**

When they go at the **same** speed, the momentum of the red train is .....  
the momentum of the blue train. [1]

(ii) Sam uses a force to change the momentum of the train.

In what direction, **A**, **B**, **C** or **D**, does the momentum change?

- A at right angles to the force
- B downwards
- C in the same direction as the force
- D in the opposite direction to the force

answer ..... [1]

(c) Real trains must have a crumple zone at the front of the train for safety.

Explain how a crumple zone makes a vehicle safer.

Use ideas about time, momentum and force in your answer.

.....  
.....  
..... [2]

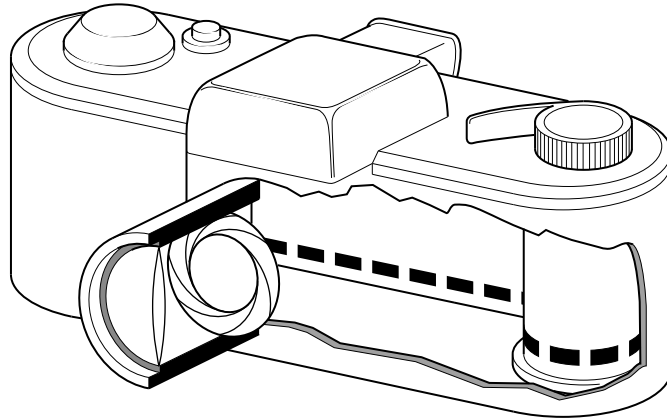
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5  
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3 (a) Chris looks at an old camera which records images onto film. He learns how it works.

(i) Label the **viewfinder** and the **focal plane** on the diagram.



[2]

(ii) The camera lens has a special coating.

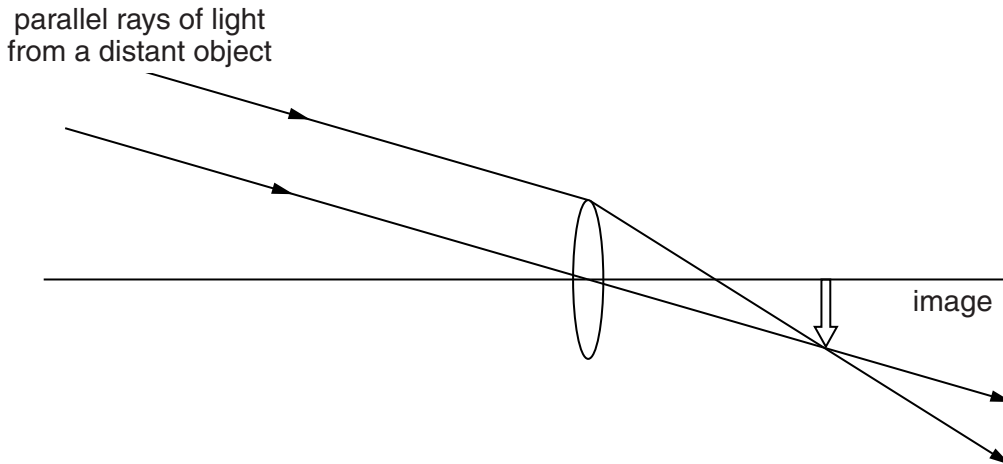
Explain why the lens has a coating.

.....

.....

..... [1]

(b) The diagram shows how the lens in the camera produces an image.



Describe what these words mean. You may use the diagram to help with your answer.

focus .....

.....

focal length .....

.....

power .....

..... [3]

(c) Chris takes two photographs of a car as it approaches him. The first photograph is in focus. He does not have time to adjust his camera as the car approaches.

(i) Describe **two** ways the second photograph is different from the first.

difference 1 .....

.....

difference 2 .....

..... [2]

(ii) Chris adjusts the camera for close-up photographs of the car.

Describe how he should adjust the camera for an object which moves closer to the lens.

.....

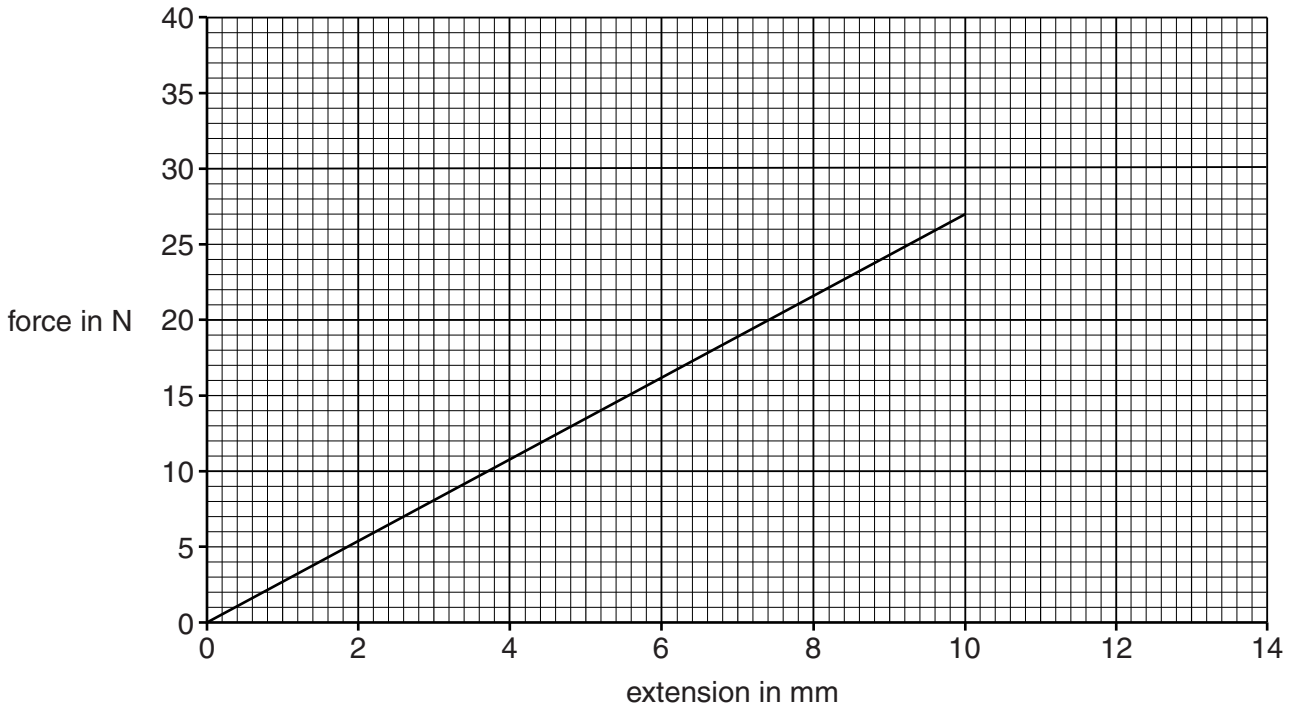
..... [1]

[Total: 9]

Turn over

4 Builders need to understand the mechanical properties of the materials they use.

(a) The graph shows how a narrow strip of uPVC stretches when a force is applied to it.



$F=kx$  links the force and the extension.

(i) Use data from the graph for a force of 20 N to find the value of  $k$  for uPVC.

Include the unit in your answer.

$k = \dots\dots\dots$  unit  $\dots\dots\dots$  [3]

(ii) Predict the extension of the uPVC when a force of 34 N is applied.

answer  $\dots\dots\dots$  mm [1]

(iii) Give a reason why this prediction is not reliable.

.....  
 ..... [1]



(b) In some situations the mechanical behaviour of different materials must be the same.

For example, in a wall, the strength of the bricks and the mortar must be the same.

Give **another** example of a situation in which two materials must be used together and need to have similar mechanical behaviour.

Your answer should include the situation, the materials and the mechanical behaviour.

.....

.....

.....

..... [3]

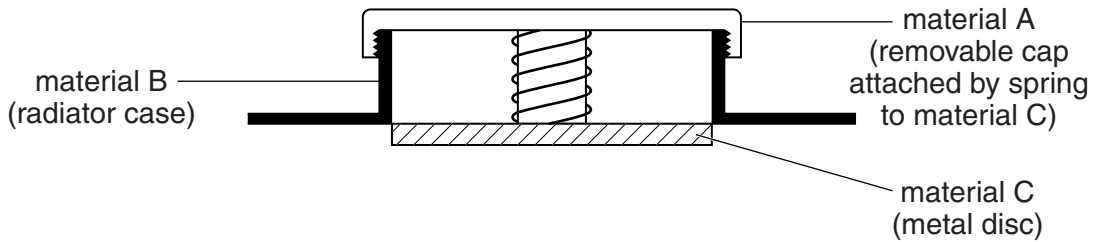
[Total: 8]

5 Byron is designing a cap for the car radiator of a new model of car.

When the car has been running the radiator is full of very hot water and steam.

It is important not to remove the cap when the radiator is very hot.

Below is a diagram of the radiator cap when cold.



Explain the properties required of materials A, B and C to prevent the cap being removed when the radiator is hot but to allow it to be removed when the radiator cools.

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 4]

6 Describe how you would find the **electrical conductance** of a sample.

Your answer should include

- a diagram of the circuit
- how you would make measurements
- how you work out the electrical conductance.

.....

.....

..... [4]

[Total: 4]

**END OF QUESTION PAPER**

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