OCR
RECOGNISING ACHIEVEMENT

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A336/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A

Materials and Performance (Higher Tier)

FRIDAY 20 JUNE 2008

Morning
Time: 45 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
                            Ruler (cm/mm)

Candidate Forename		Candidate Surname	

Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 36.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	7	
2	7	
3	5	
4	9	
5	8	
TOTAL	**36**	

This document consists of **10** printed pages and **2** blank pages.

[Turn over

2

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3

Answer **all** the questions.

1 A technology park is being built near a noisy motorway. The offices must be quiet.

(a) The average sound level by the motorway during the day is 85 dB. At peak traffic times the sound level rises to 95 dB.

How much louder is the sound level at peak traffic times?

Put a ⟨ring⟩ around the correct answer.

twice as loud   **half as loud**   **ten times as loud**   **five times as loud**

[1]

(b) The hard surface of the office windows reflects sound.

Give the name of **another** material used for controlling sound in buildings. Describe how it is used to reflect or absorb sound.

name of material ....

how it is used ....

....[2]

(c) (i) How does the loudness of a sound you hear depend on the vibration causing it?

....

....

....[2]

(ii) Heavy lorries on the motorway make the buildings shake.

This can affect some equipment in the buildings.

Explain how this equipment can be protected.

....

....

....[2]

[Total: 7]

2 Ted receives a complaint about some duvets used for bedding.

Ted takes samples of the duvets for testing. He compares the results with **product standards**.
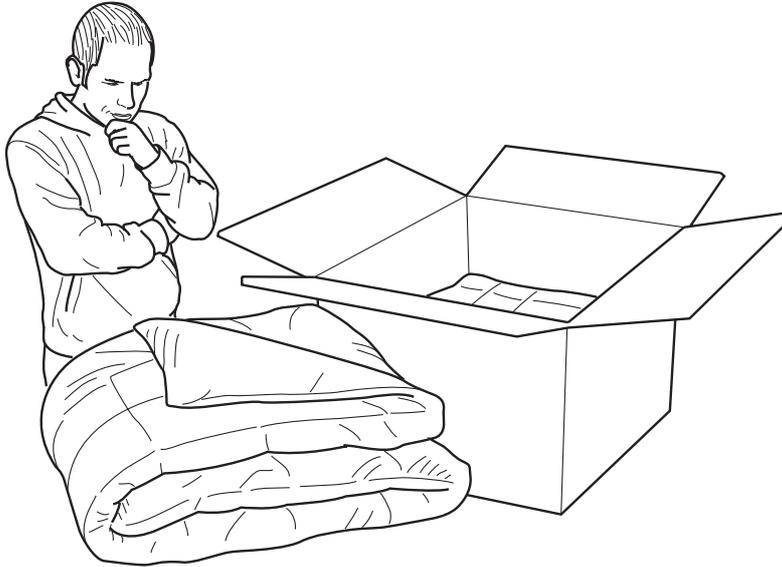
(a) (i) Explain why product standards are necessary.

....

....

....[2]

(ii) Standard Procedures are used for carrying out the tests.

Give a reason why Standard Procedures are used.

....

....[1]

(iii) ISO is an organisation that sets product standards.

Give an example of **another** organisation which sets product standards.

....[1]

(iv) Ted is a trading standards officer. His job is to enforce product standards.

Give an example of **another** job that involves enforcing product standards.

....[1]

(b) Ted tests the duvets using a Standard Procedure.

The procedure compares the heat flow through a duvet sample with the heat flow through a sample of polystyrene.

He obtains these results:

sample	temperature difference in degrees centigrade		insulation value (togs)
	across polystyrene	**across duvet sample**	
sample **A**	6.1	8.9	13.1
sample **B**	6.6	8.4	11.5
sample **C**	6.0	9.0	

Ted uses this formula to calculate the insulation value of the duvet samples:

insulation value (in togs) = 9.0 x temperature difference across duvet sample
temperature difference across polystyrene

Use the formula to calculate the insulation value for sample **C**.

insulation value = ...togs

[2]

[Total: 7]

[Turn over

3 Ronnie is arranging the lights and speakers for a school theatre production.

He tests the conductance of a cable.

He finds that when the voltage across the cable is 12V, the current in it is 0.6A.

(a) Calculate the conductance of the cable.

$$G = \frac{I}{V}$$

conductance = ... S [2]

(b) Describe how he does this test.

Use a diagram to show how he obtains the measurements for the calculation.

....

....

....

....[3]
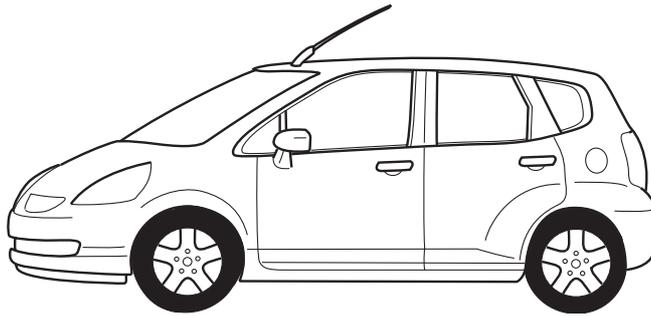
[Total: 5]

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4 Jen chooses a new car. It must have good safety features.

(a) The car has seat belts. If the car stops suddenly, the seat belts increase the time taken to stop the passenger moving.

Explain why this improves safety for the passenger.

Use **Ft = change in momentum**.

....

....

....[2]

(b) (i) Jen travels at the motorway speed limit of 30 m/s.

What other information is needed to describe her velocity? .... [1]

(ii) Jen's mass is 65 kg.
The mass of Jen's car is 1100 kg.
Show that the total momentum is about 35 000 kg m/s
Use **momentum = mv**.

momentum = ... kg m/s
[2]

(iii) Jen makes an emergency stop. It takes 4 seconds for the car to stop.

Calculate the force that acts to make the car stop.

force = ... N
[3]

(iv) The emergency stop changes the momentum of the car.

Put a tick (✓) in the box next to the correct statement.

The momentum change is in the same direction as the braking force.

The momentum change is at right angles to the braking force.

The momentum change is in the opposite direction to the braking force.

[1]

[Total: 9]

5 This question is about composite materials.

(a) The photograph shows people making bricks from mud and straw.

mud added to straw

straw

© Rick D'Elia/Corbis.

These bricks combine the useful properties of mud and straw.

- Dried mud has high compressive strength, but low tensile strength.
- Straw has low compressive strength, but high tensile strength.

Describe **another** example of a composite material.

In your answer:

- name the material for the matrix, and the material for the fibres
- state the useful properties of each material
- give the drawbacks of each material
- explain why the composite is better than either material alone.

....

....

....

....

....

....

....[4]

(b) Modern composites have several properties to make them suitable for a particular job.

For example, the blades of a wind turbine must be strong, light and resistant to corrosion.

Describe **another** example of a material which has a combination of properties to make it suitable for a particular job.

In your answer:

- name the particular job and the material used for it
- give **two** relevant properties of the material
- explain the reason each property is needed for the job.

....

....

....

....

....[4]

[Total: 8]

END OF QUESTION PAPER

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