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Wednesday 20 June 2012 – Morning

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

A336/01 Materials and Performance (Foundation 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

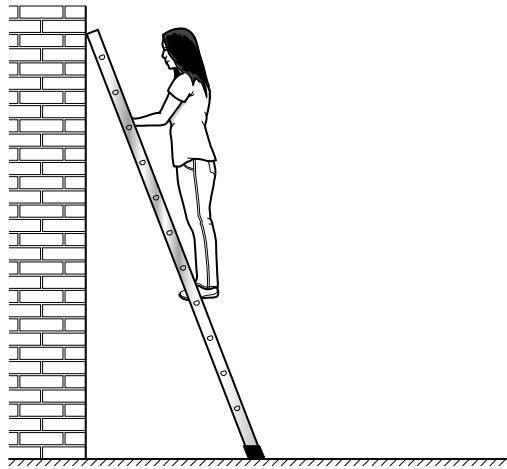
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting 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 Freya wants to buy a ladder.



(a) (i) Freya looks for a ladder with this mark 'BS2037'.

Why should Freya choose a ladder with a product standard mark?

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

(ii) BS is an organisation which sets standards for products.

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

..... [1]

(b) (i) A trading standards inspector checks that the ladders meet the product standard.

Write down **another** example of a job which involves enforcing standards.

..... [1]

(ii) A trading standards inspector needs to know whether materials have the correct properties.

Write down an example of **another** job which requires a good knowledge of material properties.

Explain why the job requires this knowledge.

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

(c) Freya chooses the material for the ladder.

She compares the suitability of **aluminium alloy** with **steel**.

material	stiffness in GPa	density in kg/m ³	strength in MPa	toughness in J/m ²	hardness in MPa
aluminium alloy	77	2700	120	9300	420
steel	240	8300	1600	2000	5800

Compare aluminium alloy with steel.

(i) Write down two reasons why aluminium is **better** than steel for a ladder.

Use data from the table.

1

2 [2]

(ii) Using data from the table, write down one **property** of aluminium which is **worse** for a ladder.

Give a **reason** why this property is important for a ladder.

.....

 [2]

(d) Freya's ladder has a safety margin.

Its label states that it should only hold up to 150 kg.

Freya knows it can hold more than 150 kg without breaking if accidentally overloaded.

Write down **another** example of an object which is designed with a safety margin.

Describe why it has a safety margin.

.....
 [1]

[Total: 10]

2 Bradley is a science teacher. He prepares a lesson about materials.

(a) Bradley builds a circuit for testing the **electrical conductance** of some materials.

Put ticks (✓) in the boxes next to the **two** best electrical conductors.

gold	<input type="checkbox"/>
wood	<input type="checkbox"/>
glass	<input type="checkbox"/>
paper	<input type="checkbox"/>
copper	<input type="checkbox"/>

[2]

(b) Bradley shows the class some **metal** objects.

Put a **ring** around **two** words which describe metals.

soft

shiny

brittle

ductile

transparent

[2]

(c) Bradley gives out tin cans and polystyrene cups to the class.

The metal cans feel cold.

The polystyrene cups feel warm.

Explain this by completing the table.

For each **material**, put a tick (✓) in the correct box.

material	good conductor of heat	bad conductor of heat
polystyrene		
tin		

[1]

5

(d) Bradley gives the students this list of materials.

milk

iron

pine

brick

polythene

Each of these materials belongs to a different **class**.

Complete the table using materials from the list.

class	material
wood	
metal	
polymer	
ceramic	

[3]

[Total: 8]

3 Anita is improving her house.

(a) Anita places a large mirror on a wall.

(i) Complete the sentence.

Choose a word from this list.

- virtual
- reflective
- conductive
- translucent

The mirror is [1]

(ii) The mirror is used to make the room lighter.

Describe **another** example of how people might use a mirror.

..... [1]

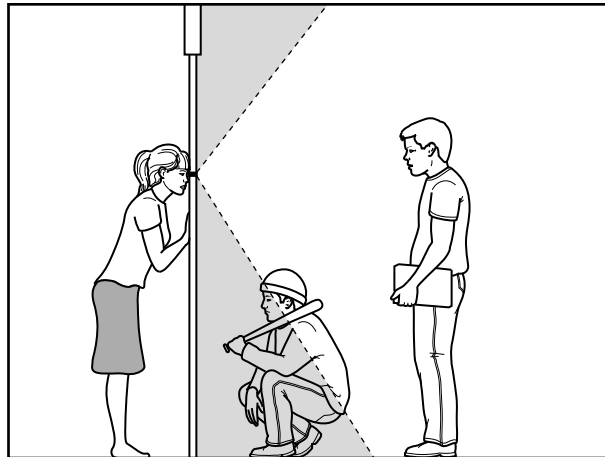
(b) The glass in the windows prevents heat from escaping from the room. It reflects infra-red.

Give **another** example of a specialised glass.

State the **use** for the glass and its **special property**.

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

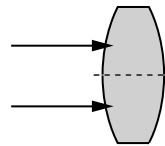
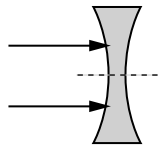
(c) Anita fits a peep-hole into her front door. It improves security.



(i) The peep-hole has a lens which forms an image. It refracts rays of light.

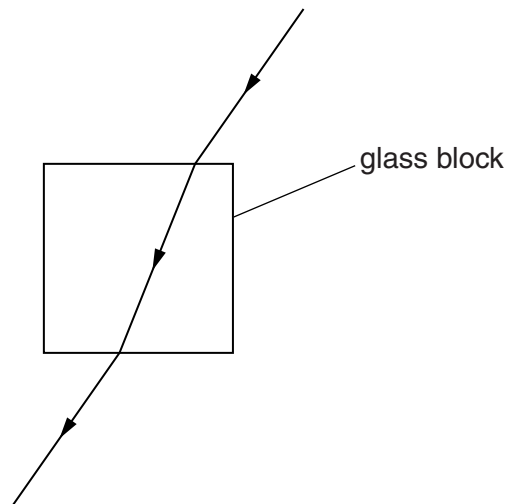
Complete each diagram to show how each lens refracts rays of light.

Draw the path of each ray as it leaves the lens.



[2]

(ii) The diagram shows how a glass block refracts a ray of light.



Put a ring around **one** place at which the ray of light is refracted.

[1]

[Total: 7]

4 Sometimes materials are combined to improve their properties.

(a) A composite is made of more than one material.

Put a tick (✓) in the box next to the best description of a composite material.

a material with improved properties

one material embedded in another material

one material dissolved in another material

different materials used for different parts of a structure

[1]

(b) Write down the name of a composite material.

State what it is used for and what materials it is made from.

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

(c) A pure metal can be improved by adding substances to make an alloy.

(i) What is a metal alloy?

..... [1]

(ii) Aluminium 6061 is an alloy, which is used for bicycle frames.

It is made according to a product standard.

Suggest why this alloy is made according to a product standard.

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

(iii) Suggest why aluminium alloy is better than pure aluminium for a bicycle frame.

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

[Total: 6]

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Question 5 begins on page 10

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5 Clothing designers need to know about the properties of the fabrics they use.

(a) (i) When clothes are worn, they stretch as the wearer moves.

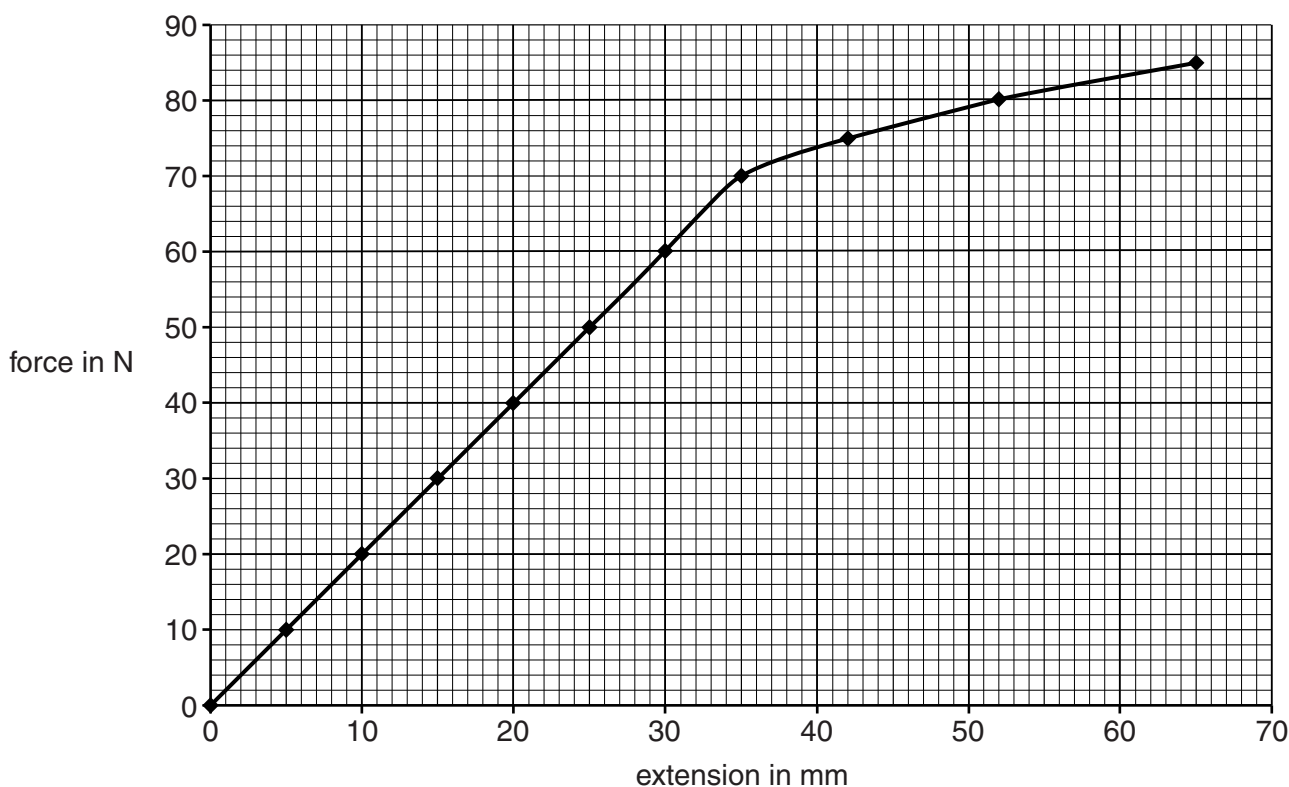
Sometimes, clothes stretch too much and do not return to their original shape.

We call this behaviour [1]

(ii) Usually they return to their original shape.

We call this behaviour [1]

(b) The graph shows the extension of a fabric thread when a force is applied to it.



(i) The graph suggests that higher values of the force stretch the thread so that it does **not** return to its original length.

State the **smallest** value of the force which has this effect. N [1]

- (ii) The graph shows the effect of a force applied to one single thread.

This formula shows how to calculate the extension when the force is applied to a number of threads.

Calculate the extension due to a force of 60 N applied to a one-centimetre width of fabric.

There are 30 threads in each centimetre width of fabric.

$$\text{extension in mm} = \frac{\text{force in N}}{4.0 \times \text{number of threads}}$$

answer = mm [2]

[Total: 5]

END OF QUESTION PAPER

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