Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A336/01

TWENTY FIRST CENTURY SCIENCE ADDITIONAL APPLIED SCIENCE A

Unit 6: Materials and Performance (Foundation Tier)

TUESDAY 22 JUNE 2010: Morning
DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper

A calculator may be used for this paper

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (SLM/SW) MEP60150 28338/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use 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.**
- **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).**

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.**

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Answer ALL the questions.

1 Miriam designs two lamps.

One of the lamps hangs by a cable from the ceiling.

The other lamp stands on the floor and plugs into the wall.

(a) She chooses materials for the lamps.

Each part of the lamps must have the right ELECTRICAL and MECHANICAL PROPERTIES.

Draw straight lines to link each PART OF THE LAMP to its ELECTRICAL PROPERTY.

Draw straight lines to link each PART OF THE LAMP to its MECHANICAL PROPERTY.

ELECTRICAL PROPERTY	PART OF THE LAMP	MECHANICAL PROPERTY
good electrical conductance		flexible
	pins on plug	
good thermal conductance		rigid
	outer covering of cable	
poor electrical conductance		brittle

[4]

(b) The weight of the lamp produces a load in the supports for each lamp.

Put a (ring) around the best word to complete each of the sentences.

The cable holding the lamp to the ceiling is in COMPRESSION / SUCTION / TENSION.

The stand holding the lamp above the floor is in COMPRESSION / SUCTION / TENSION. [2]

(c) The material for the lamp shade hides the light bulb. It allows light to pass through.

Complete the sentence. Choose the BEST word from this list.

OPAQUE

REFLECTIVE

REFRACTIVE

TRANSLUCENT

The lamp shade is _____ . [1]

[Total: 7]

2 Nita lives in a high-rise flat.

It has large windows made of a specialised glass.

(a) The glass for the windows needs the right properties.

Put a (ring) around TWO properties needed for the glass in a high-rise flat.

BRITTLE

HEAVY

SELF-CLEANING

SHINY

TEXTURED

TOUGH

[2]

(b) Write down ANOTHER use of a specialised glass and the property it needs.

use: _____

property needed: _____ [2]

[Total: 4]

3 Liam is training to be a Building Inspector.

He must know about the compressive strength of mortar so that walls do not collapse.

(a) Give <u>ANOTHER</u> example of a job which requires a good knowledge of material properties.

Name the job.

What does the person doing the job need to know about the properties of the material used?

job: _____

knowledge: _____

_____ **[2]**

(b) (i) Liam learns the PRODUCT STANDARDS for building materials. Product standards are used to improve safety in buildings.

Put ticks (✓) in the boxes next to the TWO correct reasons for using product standards.

so workers can use new tools	☐
so manufacturers can sell more	☐
so the product always has the same properties	☐
so the product is cheaper	☐
so the product is suitable for its purpose	☐

[2]

(ii) Liam checks that mortar used for a wall meets the product standards.

Give ANOTHER example of an inspector who enforces product standards.

_____ **[1]**

(iii) Liam sees this writing on a concrete block:

BS EN 12664

What do the letters 'BS' stand for?

_____ **[1]**

(iv) **Bridges are built stronger than needed for the weight they normally carry.**

This is an example of a <u>SAFETY MARGIN</u>.

Give an example of <u>ANOTHER</u> product with a safety margin.

product: _____

safety margin: _____ **[1]**

[Total: 7]

4 Materials are divided into classes which have different properties.

(a) Complete the table to show the usual properties of <u>CERAMICS</u> and <u>POLYMERS</u>.

Choose words from this list. Use each word only once.

<u>BRITTLE</u> <u>FLEXIBLE</u> <u>STIFF</u> <u>PLASTIC</u>

PROPERTIES OF CERAMICS	PROPERTIES OF POLYMERS

[2]

(b) Here is some data about polymers and ceramics.

CLASS	MATERIAL	COMPRESSIVE STRENGTH IN MN/m^2	TOUGHNESS IN J/m^3	HARDNESS IN MPa
polymer	PMMA	62	370	150
	polycarbonate	110	3300	160
ceramic	brick	200	20	600
	concrete	20	6.7	61

(i) The chart opposite shows the compressive strength of three of the materials.

Complete the chart to show the compressive strength of brick. [1]

(ii) Walls are often made of brick.

Give <u>TWO</u> reasons why.

Use data from the table to help you.

1 _____

2 _____ **[2]**

(iii) A cycle helmet is often made of polycarbonate.

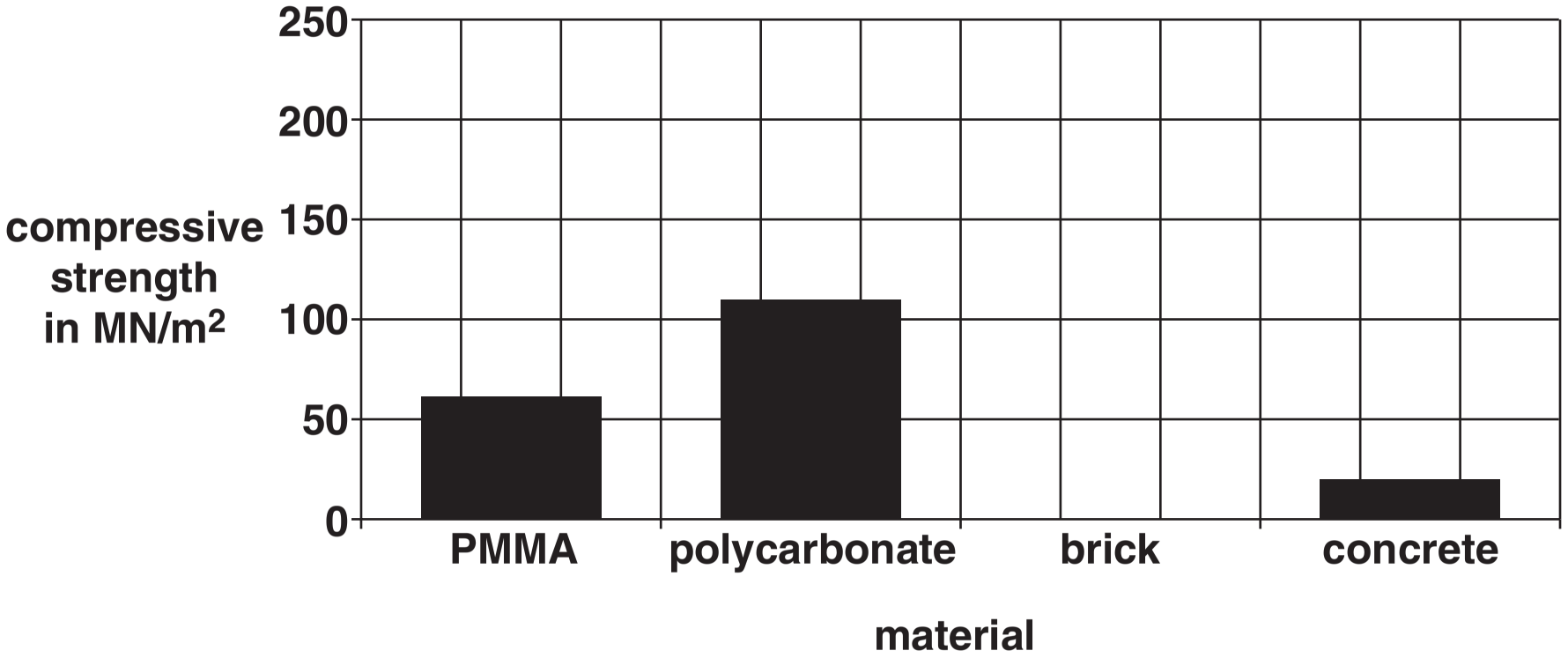
Suggest a reason for using polycarbonate.

Use data from the table to help you.

_____

_____ **[1]**

[Total: 6]


250
200
150
100
50
0
compressive strength in MN/m2
PMMA
polycarbonate
brick
concrete
material

5 Sean designs cars. He knows how the momentum of a moving car affects safety.

(a) (i) Sean needs the values of <u>TWO</u> quantities to calculate the momentum.

Write down these quantities.

1 _____

2 _____ **[2]**

(ii) Sean knows how each quantity affects the momentum.

Describe how each quantity affects momentum.

Draw straight lines to link the boxes to make the <u>BEST</u> sentence.

	… is the division of …	
The momentum …	… is inversely proportional to …	… the two quantities.
	… is proportional to …	
	… is the addition of …	

[1]

(b) Sean includes a steel frame in the car design. The frame protects people in the car because steel is stiff.

Give <u>ANOTHER</u> example of a device used for improving road safety.

Describe how its <u>MECHANICAL</u> properties are important for safety.

device: _____

how its mechanical properties improve safety:

_____

_____

_____ **[2]**

[Total: 5]

6 Metals used in a kitchen are often alloys.

(a) What do we mean by an alloy?

Draw a straight line to link the boxes to make the <u>BEST</u> sentence.

An alloy is …	**… a composite material.**
	… a complementary material.
	… a solid solution of elements in a metal.
	… the same as a pure metal.

[1]

(b) Knives and forks are often made of stainless steel.

Stainless steel is an alloy of iron. It corrodes less than pure iron.

Suggest <u>ANOTHER</u> property of stainless steel which makes it better than pure iron for knives and forks.

Give a reason why this property is important.

property: _____

reason: _____

_____ **[2]**

(c) Good quality knives and forks are rigid.

Suggest how stainless steel knives and forks can be made more rigid.

_____

_____

_____ **[1]**

(d) The metal shelves in an oven expand when the oven is hot.

Describe an experiment to measure the <u>THERMAL EXPANSION</u> of a metal sample.

You may include a diagram in your answer.

_____

_____

_____

_____ **[3]**

[Total: 7]

END OF QUESTION PAPER