

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

A336/01

Unit 6: Materials and Performance (Foundation Tier)

**Tuesday 22 June 2010
Morning**

Duration: 45 minutes

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)



| | | | |
|--------------------|--|-------------------|--|
| Candidate Forename | | Candidate Surname | |
|--------------------|--|-------------------|--|

| | | | | | | | | | | |
|---------------|--|--|--|--|--|------------------|--|--|--|--|
| Centre Number | | | | | | Candidate Number | | | | |
|---------------|--|--|--|--|--|------------------|--|--|--|--|

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

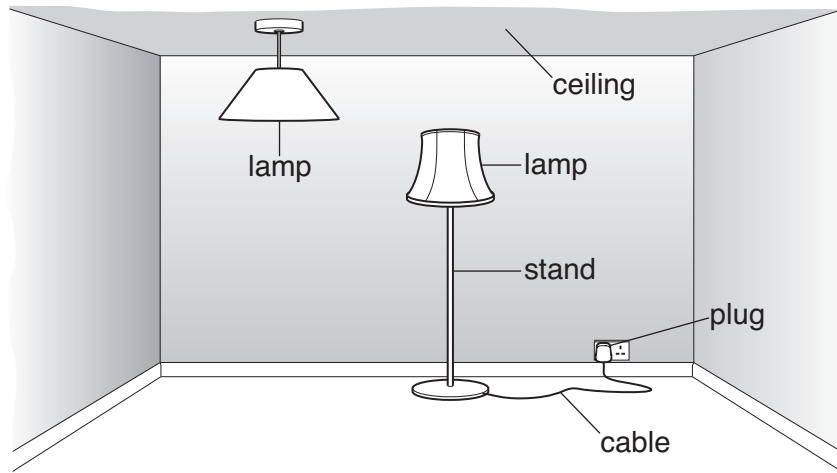
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- 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**.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Miriam designs two lamps.



(a) She chooses materials for the lamps.

Each part of the lamps must have the correct **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]

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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 correct 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 **another** 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 **safety margin**.

Give an example of **another** 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 **ceramics** and **polymers**.

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

brittle **flexible** **stiff** **plastic**

| properties of ceramics | properties of polymers |
|------------------------|------------------------|
| | |

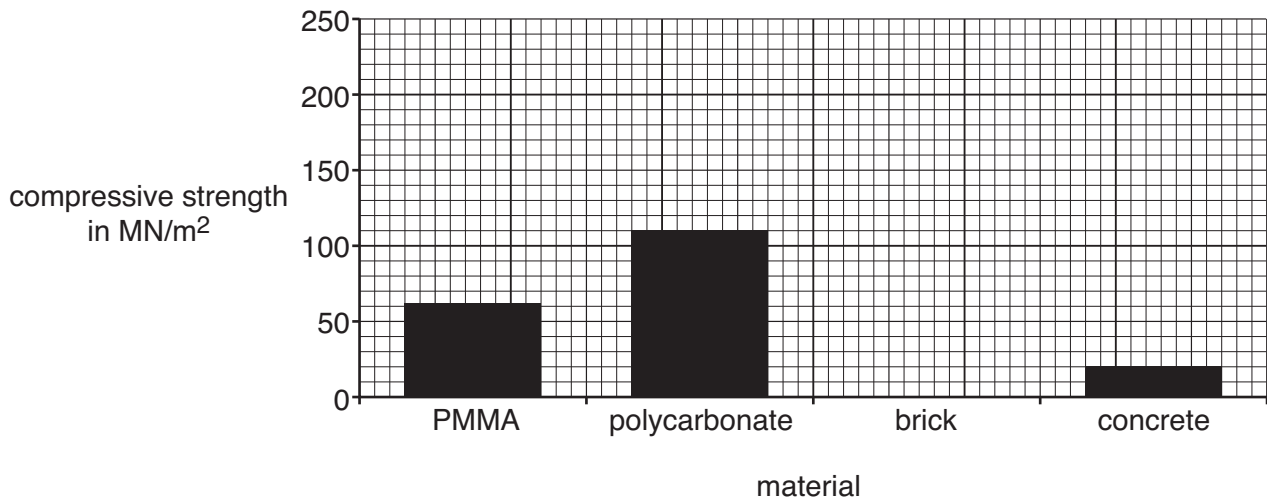
[2]

(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 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 **two** 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]

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

(a) (i) Sean needs the values of **two** 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 **best** sentence.

| | | |
|------------------|--------------------------------------|-------------------------|
| | ... is the division of ... | |
| | ... is inversely proportional to ... | |
| The momentum ... | ... is proportional to ... | ... the two quantities. |
| | ... 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 **another** example of a device used for improving road safety.

Describe how its **mechanical** 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 **best** sentence.

An alloy is ...

... a composite material.

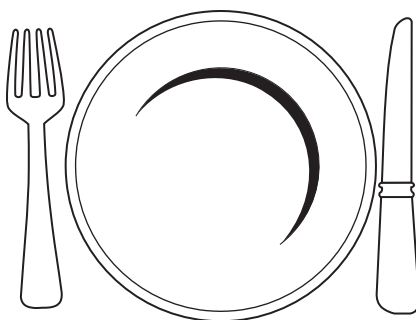
... a complementary material.

... 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 **another** 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 **thermal expansion** of a metal sample.

Include a labelled diagram in your answer.

.....

.....

.....

..... [3]

[Total: 7]

END OF QUESTION PAPER



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