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

Materials and Performance (Foundation Tier)

WEDNESDAY 27 JANUARY 2010: Afternoon
DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SW) MEP10060 23026/1

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, however additional paper may be used if necessary.**

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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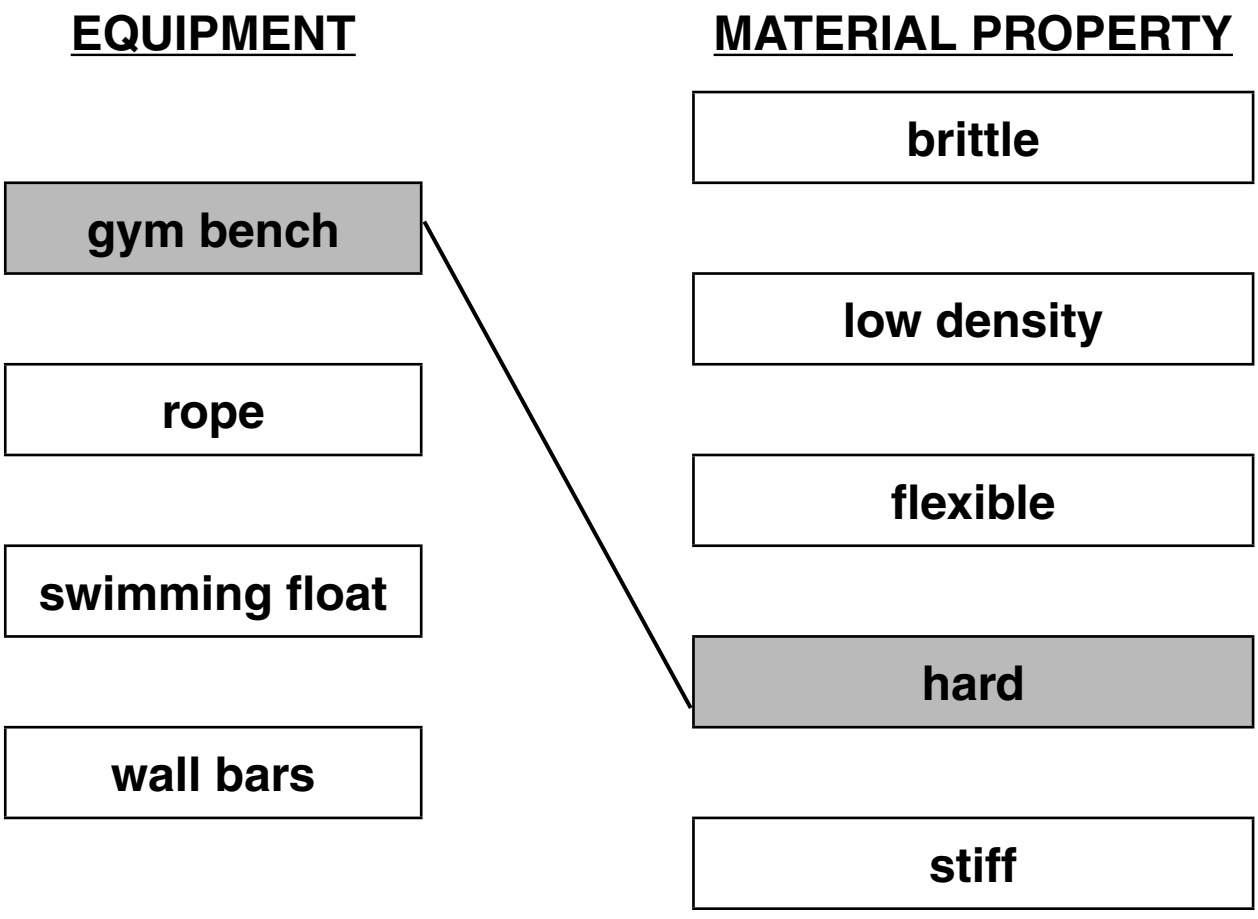
Answer ALL the questions.

1 (a) Ted is a science teacher. He uses PE equipment to explain the physical properties of materials.

Draw a straight line from each piece of EQUIPMENT to the MATERIAL PROPERTY it needs.

One is done for you.



[3]

(b) Ted explains the CLASSES of materials used to make games equipment.

Draw a straight line from each piece of EQUIPMENT to the correct CLASS of its material.

EQUIPMENT	CLASS
cricket bat	alloy
nylon strings of tennis racquet	ceramic
vaulting pole made of two materials	composite
metal trampoline frame	polymer
	wood

[4]

(c) The stiffness of a tennis racquet frame affects its performance.
Describe an experiment to compare the stiffness of tennis racquet frames.
Your answer must include:

- **how to clamp the frame firmly**
- **how to apply a force to the frame**
- **how to measure the change in the shape of the frame.**

Use a diagram to help your answer.

_____

_____

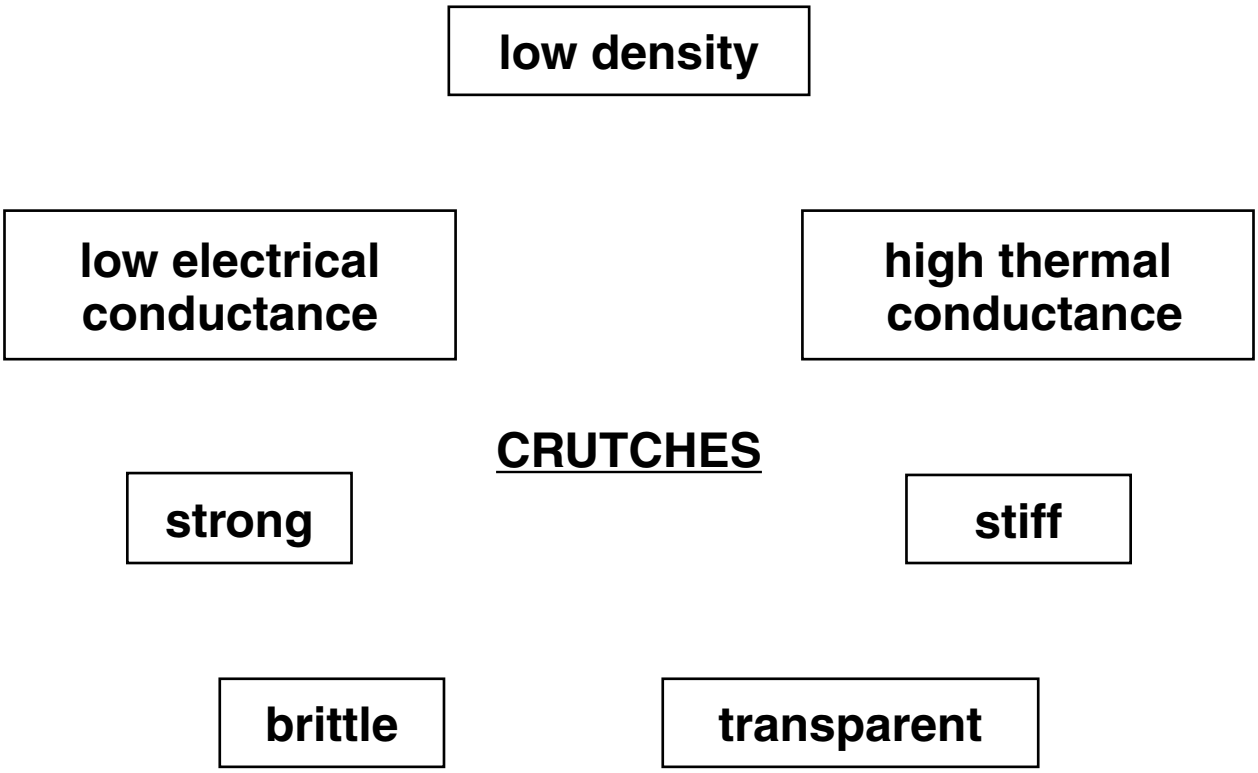
_____ **[3]**

[Total: 10]

2 Diane is a physiotherapist. She wants some metal crutches for her patients.

The crutches must be easy to lift and must not be damaged easily.
Which THREE material properties should they have?

Draw straight lines from the word CRUTCHES to each required material property.



[3]

[Total: 3]

3 George works in a dance hall.

(a) (i) He chooses a decoration for the dance hall. There are shiny mirrors on the decoration.

Complete the sentence.

Choose a word from this list.

OPAQUE REFLECTIVE TRANSPARENT

The mirrors are shiny because they

are _____ . [1]

(ii) Mirrors have many uses in buildings other than decoration.

Describe ANOTHER use of a mirror in a building.

_____

_____ [1]

(b) When a band plays in the dance hall, the sound may be very loud.

(i) A very loud sound may cause pain.
Here is a list of sound intensities.

Put a (ring) around ALL of the sound intensities in the list which would cause pain.

Intensity in dB: 0 50 100 150 200

[1]

(ii) George has tinnitus due to hearing too much loud music.

Suggest ANOTHER hearing problem caused by high sound intensities.

_____ [1]

(iii) What is the FULL NAME of the scale used to describe sound intensity?

The _____ scale. [1]

(iv) The windows of the dance hall are double glazed to prevent noise pollution.

Other materials are used in buildings to prevent noise pollution.

Complete this sentence.

Choose words from this list.

ABSORB AMPLIFY REFLECT

Carpet on the floor is used to

_____ sound. [1]

(c) There are electrical cables for the loudspeakers in the dance hall.

(i) The core of the cable is made of copper.

Put a tick (✓) in the box next to the <u>BEST</u> reason for using copper inside the cable.

copper is cheap	☐
copper can be recycled	☐
copper has a low reactivity	☐
copper has a high electrical conductance	☐

[1]

(ii) The outer layer is made of PVC. This needs to be an insulator.

Put a tick (✓) in the box next to the <u>BEST</u> reason for using PVC for the outer layer.

PVC has a low density	☐
PVC can be recycled	☐
PVC can be made in different colours	☐
PVC has a low electrical conductance	☐

[1]

[Total: 8]

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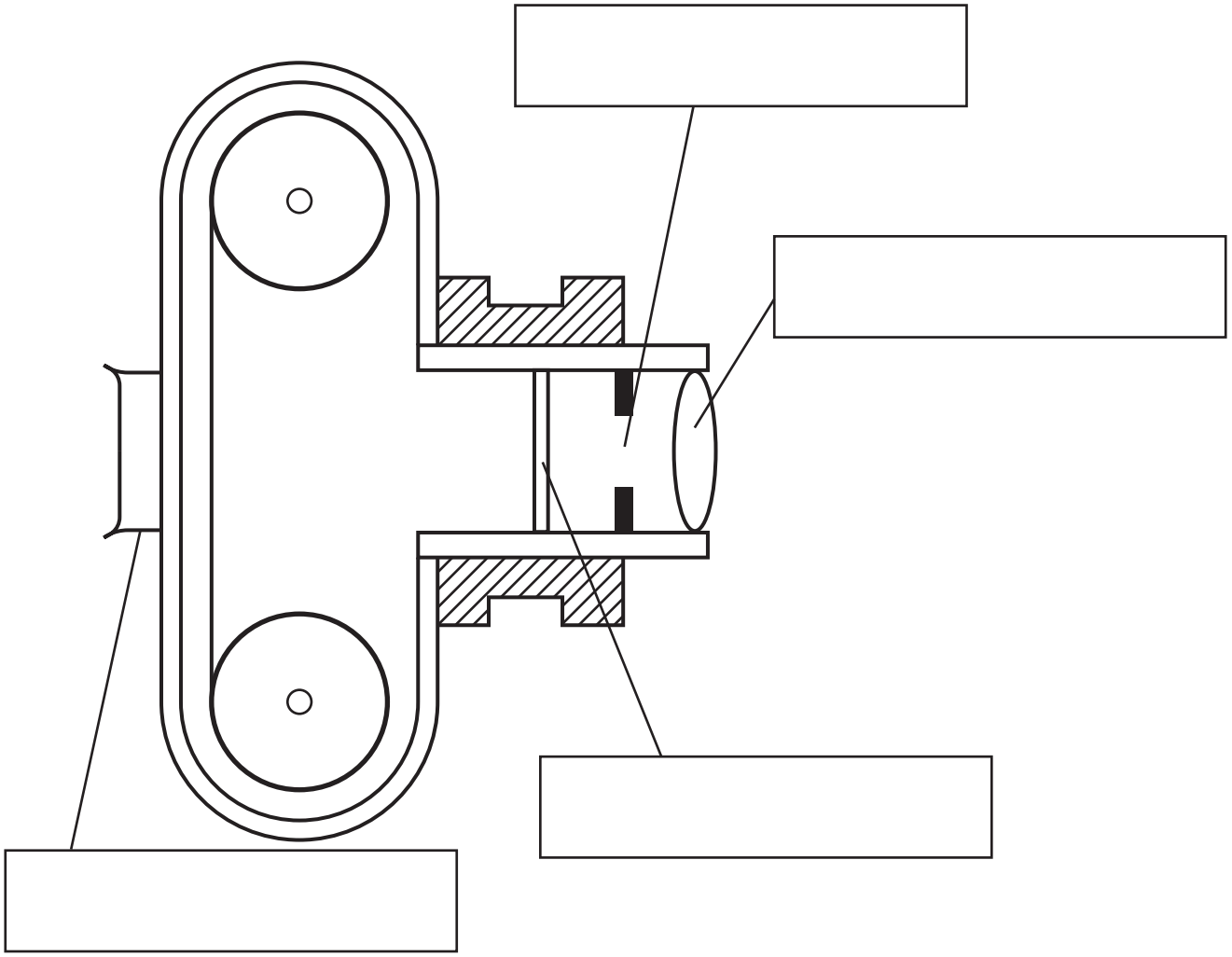
4 Robert is a cameraman.

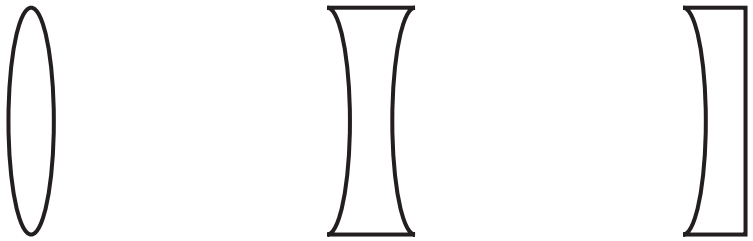
(a) This diagram shows Robert's camera.
Label the <u>LENS</u>, <u>SHUTTER</u>, <u>APERTURE</u>, and <u>VIEWFINDER</u>.



[4]

(b) There is a converging lens in his camera.

(i) Which shape of lens, A, B or C, is a converging lens?



A **B** **C**

answer _____ [1]

(ii) Robert explains how the camera lens produces an image.

Complete these sentences. Choose words from this list.

CIRCLE ECLIPSE FOCUS IMAGE INVERTED

LINE OBJECT REAL REFLECTED

UPRIGHT VIRTUAL

'Parallel rays of light from a distant object are brought to a _____ on the film. This makes an _____ which is smaller than the object. It is _____ and _____.'

[4]

(iii) The material of the lens makes the light rays change direction.

Give the name of this effect.

answer _____ **[1]**

(iv) The surface of the lens has a coating.

Describe the purpose of this coating.

_____

_____ **[1]**

[Total: 11]

5 Stefan is a science teacher. He wants his class to compare the expansion of some metal bars.

(a) He first estimates how much a steel bar will expand.
The bar is 1.5 m long and Stefan expects its temperature to rise by 400 °C.
The expansion index of mild steel is 15.

Use the formula below to predict the expansion of the bar.

Show your working.

$$\text{EXPANSION (mm)} = \frac{\text{LENGTH OF BAR (m)} \times \text{TEMPERATURE RISE (°C)} \times \text{EXPANSION INDEX}}{1000}$$

expansion = _____ mm [2]

(b) Stefan carries out the same experiment with different metals.

He gets these results.

	EXPANSION OF METAL BAR IN MM		
METAL	**TEST 1**	**TEST 2**	**TEST 3**
aluminium	**10**	**20**	**12**
iron	**6.0**	**7.0**	**6.5**
copper	**9.0**	**10**	**10**
steel	**8.0**	**9.0**	**10**

(i) The students notice an outlier in the data.

Put a (ring) around the outlier. **[1]**

(ii) Stefan asks his students to write down the metals in order of expansion.

Use the data in the table to write down the metals in order of expansion.

Start with the highest expansion.

HIGHEST EXPANSION

LOWEST EXPANSION

[1]

[Total: 4]

END OF QUESTION PAPER

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