

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

Materials and Performance (Foundation Tier)

FRIDAY 25 JANUARY 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)



* C O P / T 4 2 3 5 8 *

Candidate
 Forename

Candidate
 Surname

Centre
 Number

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Candidate
 Number

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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.
- Do **not** write outside the box bordering each page.
- 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**.

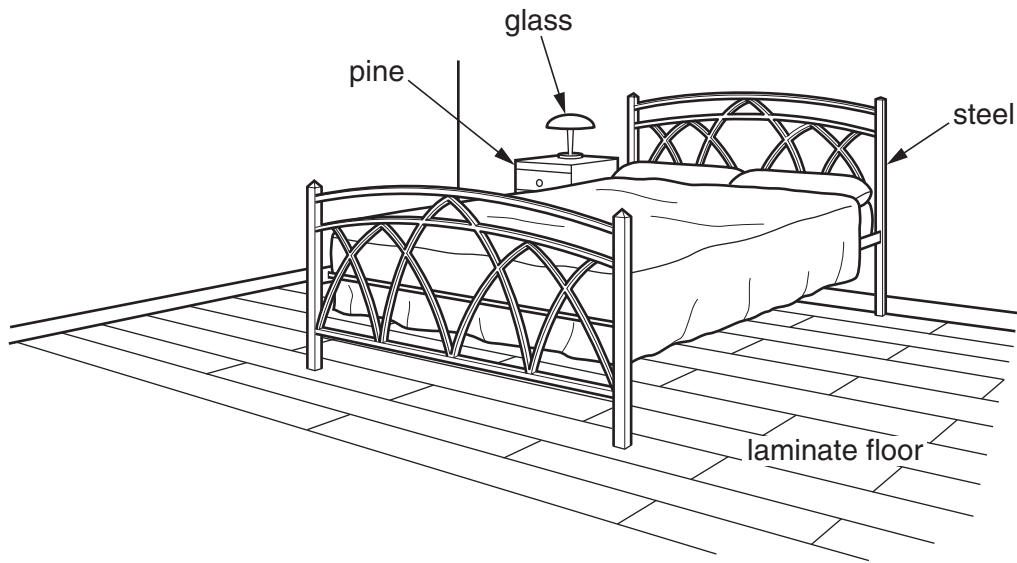
FOR EXAMINER'S USE

Qu.	Max.	Mark
1	7	
2	5	
3	8	
4	4	
5	5	
6	7	
TOTAL	36	

This document consists of **12** printed pages.

Answer **all** the questions.

1 Christine has a guest house.



(a) In each room there are materials of different classes.

Draw a straight line from each **material** to its correct **class**.

One has been done for you.

material	class
pine	alloy
glass	ceramic
laminated floor	composite
steel	wood
	polymer

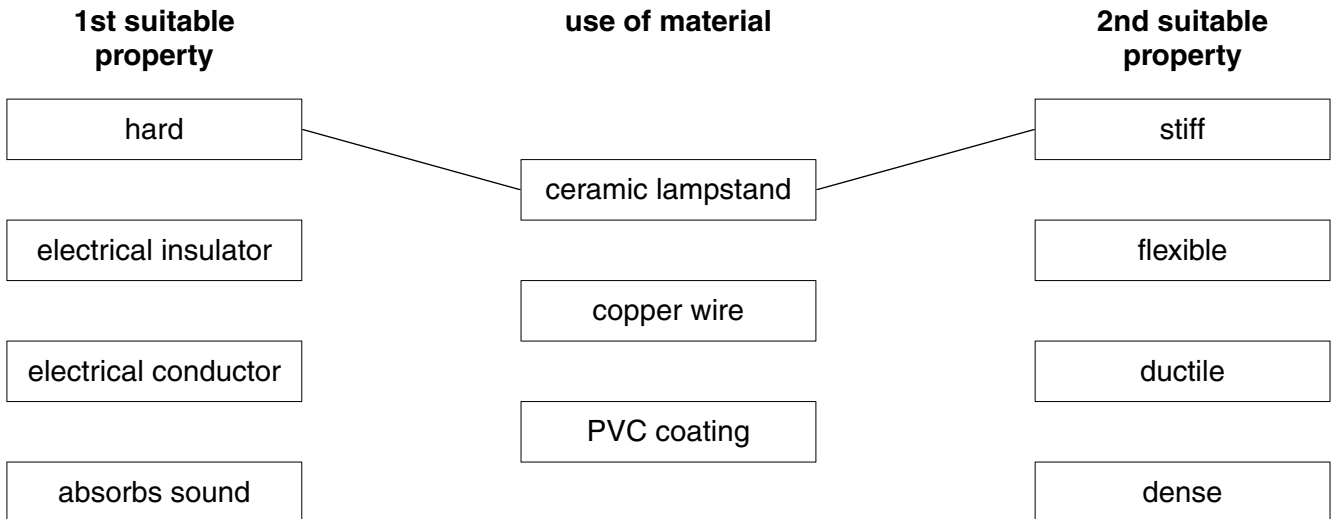
[3]

(b) The lampstand is made of **ceramic**. It has a cable made of **copper** wire, coated with **PVC**.

For each material, there is **one** property in each column which makes it **suitable** for its use.

Draw straight lines to link the use of the material to **both** of its suitable properties.

One has been done for you.



[4]

[Total: 7]

2 John is building a house. He must choose the right materials.

(a) The walls keep heat inside the house.

There is a layer of insulating material inside each wall.

Put a **ring** around the **best** material for this layer.

glass plastic foam steel stone

[1]

(b) Building materials expand when the temperature rises.

The table shows the thermal expansion of equal lengths of different materials for the same temperature rise.

building material	thermal expansion (mm)
steel	12
glass	9
concrete	12
limestone	8
aluminium	24

(i) Which material has the **highest** thermal expansion?

..... [1]

(ii) John uses two materials which expand by the **same** amount for the same change in temperature.

Which materials does he choose?

1.

2. [1]

5

(iii) Samples of the materials are tested to compare their thermal expansion.

The samples are identical in shape and size.

Two quantities are measured.

Put ticks (✓) in the boxes next to the **two** quantities that must be measured.

time for which sample is heated

mass of sample

change in colour of sample

increase in length of sample

increase in temperature of sample

[2]

[Total: 5]

3 A factory makes playframes for children.



(a) The playframes are made of plastic tubes.

The hollow tubes are pushed onto solid plastic connectors. Screws are not used.



Suggest why this is a good method of joining the tubes.

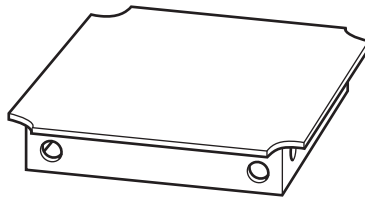
.....
..... [1]

(b) Most of the structure is made of tubes, not solid lengths of plastic.

Suggest why.

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

(c) Flat panels of plastic fit between the tubes.



Each flat panel has a rim. Put a tick (✓) in the box next to the **best** reason why.

- to hold it firmly in place
- to look attractive
- to make it heavier

[1]

(d) (i) Each panel must meet the **product standards** for playframes.

Give reasons why a playframe must have a product standard.

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

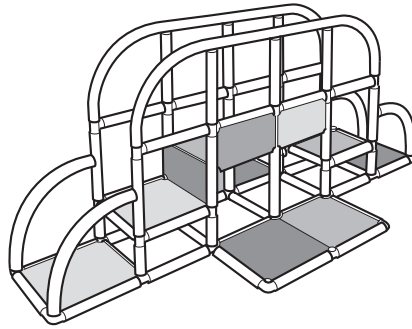
(ii) Give an example of an **organisation** which sets product standards.

..... [1]

(iii) Give an example of a **practitioner** whose job is enforcing standards.

..... [1]

(iv) This small playframe should be used by only one child at a time.



The playframe is designed with a **safety margin** in case two children climb on it.

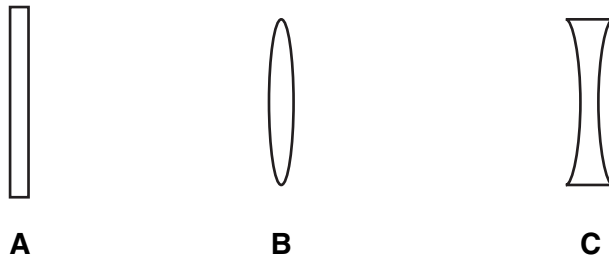
State **another** example of a product that is designed with a safety margin.

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

[Total: 8]

4 Carl is training to be a cameraman. He is learning about lenses.

(a) He learns that the shape of a lens affects its action.

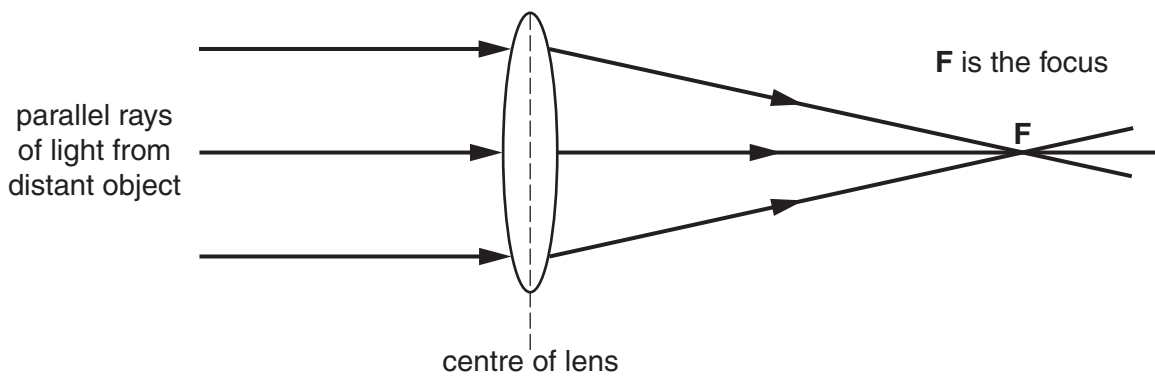


The diagram shows three glass shapes, **A**, **B** and **C**.

Which shape is a diverging lens?

..... [1]

(b) The diagram shows how a lens focuses light from a distant object. It is drawn full size.



(i) On the diagram, measure the focal length of the lens.

focal length = cm [1]

(ii) Which property of the lens depends on its focal length?

Put a **ring** around the correct word.

- diameter** **power** **thickness** **transparency**

[1]

(iii) What are the units for the **power** of a lens?

Put a **ring** around the correct word.

- centimetres** **metres** **decibels** **diopres**

[1]

[Total: 4]

5 Blanca plays in a band.



(a) When Blanca practises alone the sound intensity is 70 dB.

The sound intensity of a normal conversation is about 60 dB.

How loud is Blanca’s music compared with a normal conversation?

Put a **ring** around the **best** answer.

half as loud the same loudness twice as loud ten times as loud [1]

(b) The band practice is very loud. It does not hurt, but Blanca finds it hard to hear for some time afterwards.

Complete the sentence. Choose the **best** value from the list.

(i) The loudness during the practice is about dB.

10 dB 60 dB 90 dB 150 dB

[1]

(ii) Some musicians hear a ringing noise all the time. This condition can be caused by loud music.

Write down the name of this condition. [1]

(c) Blanca needs to soundproof the practice room. Suggest how she could do this.

Your answer should include:

- a suitable **material** for soundproofing
- how Blanca should use the material in the room.

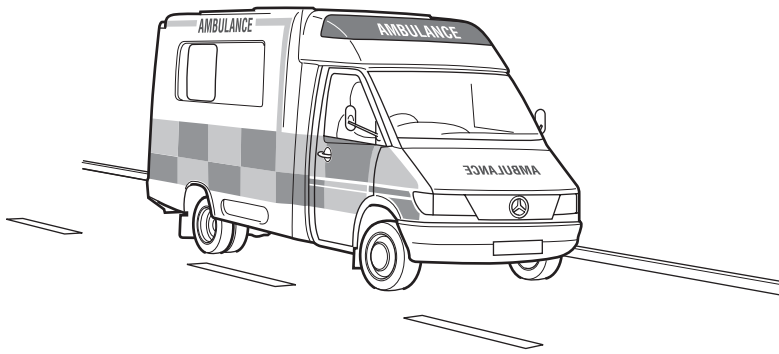
.....

.....

..... [2]

[Total: 5]

6 Some road vehicles, such as ambulances, are made with crumple zones.



(a) (i) Put ticks (✓) in the boxes next to the **two** best reasons for having a crumple zone.

so no one drives a damaged ambulance

so other vehicles are not damaged in a collision

to increase the time it takes to slow down

to decrease the force of any impact

to strengthen the front of the ambulance

[2]

(ii) A crumple zone is made of a metal alloy.

Write down **another** device that improves road safety.

Describe how the mechanical properties of its material help to improve safety.

Device

.....

.....

..... [2]

(b) An ambulance travelling to an emergency sometimes has a high momentum.

What **two** quantities do you need to calculate the momentum?

1.

2.

[2]

(c) The speed of the ambulance changes from 60 mph to 30 mph.

Complete the sentence.

Choose words from this list.

half

twice

three times

four times

The momentum of the ambulance at 60 mph is the momentum at 30 mph.

[1]

[Total: 7]

END OF QUESTION PAPER

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