Write your name here

Surname	Other names

Edexcel GCE

Centre Number	Candidate Number

Engineering

Unit 1: Engineering Materials, Processes and Techniques

Tuesday 14 May 2013 – Morning **Time: 1 hour 30 minutes**	Paper Reference **6931/01**

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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PEARSON

Answer ALL the questions. Write your answers in the space provided.

Some of the questions in this paper relate to a gas cooker such as the one shown in Figure 1.

Figure 1

1 The table below lists five processes used in manufacturing the gas cooker.

Complete the table by giving:

- **one** risk involved in each process
- **one** different precaution/control measure to prevent injury.

Each answer must be different.

Process	Risk	Precaution/Control measure
Handling sheet metal		
Punching		
Painting		
Electric arc welding		
Drilling		

(Total for Question 1 = 10 marks)

2 The materials used to manufacture the gas cooker can be grouped into classes.

Complete the following table by stating:

- **one** specific material for each class of material listed
- **one** significant property of that material.

Each answer must be different.

Class of material	**Specific material**	**Significant property of material**
Ferrous metal		
Non-ferrous metal		
Thermoplastic polymer		
Thermosetting polymer		
Elastomer		

(Total for Question 2 = 10 marks)

3 The aluminium gas burner shown in Figure 2 is produced using the pressure die-casting process.

Figure 2

(a) Give **two** advantages and **two** disadvantages of using pressure die-casting.

(4)

Advantages

1 .....

.....

2 .....

.....

Disadvantages

1 .....

.....

2 .....

.....

(b) Using notes and/or sketches, describe the pressure die-casting process.

(6)

(Total for Question 3 = 10 marks)

4 (a) The materials used in manufacturing a gas cooker are selected for their specific properties.

Give the meaning of each of the following material terms.

(i) Ductility

(1)

(ii) Elasticity

(1)

(iii) Malleability

(1)

(iv) Hardness

(1)

(v) Toughness

(1)

(b) Figure 3 represents a load extension graph for a test piece of low carbon steel.

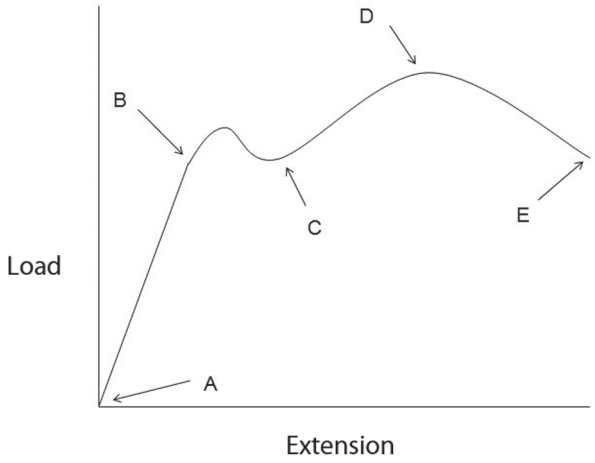

Figure 3

With reference to the graph:

(i) State the effect on the test piece of removing the load between points 'A' and 'B'.

(1)

.....

(ii) State the **two** letters shown which indicate the extent of the plastic range.

(2)

.....

(iii) State what happens to the test piece at point 'E'.

(1)

.....

(iv) Name the critical point labelled 'D'.

(1)

.....

(Total for Question 4 = 10 marks)

5 State the purpose of each of the following heat treatments used in manufacturing and describe each process.

(a) Normalising carbon steel

(i) Purpose

(1)

(ii) Process

(3)

(b) Case hardening low carbon steel (mild steel)

(i) Purpose

(1)

(ii) Process

(3)

(Total for Question 5 = 8 marks)

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6 Spot welding is one type of electric resistance welding that can be used to join two pieces of thin sheet steel.

(a) (i) State **two** applications of spot welding in manufacturing.

(2)

1 .....

.....

2 .....

.....

(ii) Using notes and sketches describe the spot welding process.

(6)

(b) Spot welding is a permanent method of joining.

Describe how two pieces of sheet steel could be temporarily joined together ensuring that the joint is vibration proof.

(3)

(Total for Question 6 = 11 marks)

7 Electroplating is a surface treatment process that allows manufacturers to provide a protective coating to mild steel.

(a) (i) Name **two** materials that can be 'electroplated' onto mild steel.

(2)

1 .....

.....

2 .....

.....

(ii) Explain why it is important to provide a protective coating to mild steel.

(2)

.....

.....

.....

.....

(b) Describe using notes and sketches the electroplating process.

(6)

(Total for Question 7 = 10 marks)

8 Gas cookers are usually transported in a delivery vehicle and transferred to a customer's home manually.

Design a trolley for use in moving gas cookers from a delivery vehicle into a customer's home. Your design should include details of:

- the ability to steer the trolley
- materials that are lightweight but strong enough to perform the task
- a fastening device to secure the gas cooker to the trolley
- a device to lock wheels when stationary
- an ability to accommodate different sizes of cooker.

Produce your design on page 15

(Total for Question 8 = 12 marks)

***9** Mild steel and stainless steel were two materials considered for use in manufacturing the outer casing of the gas cooker.

Evaluate these materials to determine the one most suitable for the outer casing.

(Total for Question 9 = 9 marks)

TOTAL FOR PAPER = 90 MARKS