Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number | | | | | |

Candidate Number | | | | |

Engineering

Unit 1: Engineering Materials, Processes and Techniques

Monday 21 May 2018 – 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

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

Some of the questions in this paper relate to a gas barbecue, as shown in **Figure 1**.

Figure 1

1 The materials used to manufacture the gas barbecue can be grouped into classes.

From the materials listed, complete the following table by naming:

- the class of each material
- **one** significant property of each material.

Each answer must be different.

Specific material	**Class of material**	**Significant property of material**
Rubber		
Polyamide (nylon)		
Urea formaldehyde (UF)		
Cast Iron		

(Total for Question 1 = 8 marks)

2 The table below lists four processes used in manufacturing the gas barbecue.

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**
Punching		
Metal pressing		
Manual metal arc welding		
Sawing of metal tube		

(Total for Question 2 = 8 marks)

3 The table below shows the properties of some materials used in the manufacture of the gas barbecue.

Material	Density kg m^{-3}	Electrical resistivity ohm-m	Tensile strength MN m^{-2}
Rubber	1200	$>10^{11}$	30
Copper	8960	1.68×10^{-8}	215
Low carbon steel	7860	10.6×10^{-8}	690
Aluminium	2700	27.0×10^{-8}	82
Brass	8360	9.0×10^{-8}	500

Using the information in the table and your knowledge of materials, select the most appropriate material to use for the following parts of the gas barbecue and explain your choice.

(a) The tube that supplies the gas to the barbecue.

(i) Material

(1)

.....

(ii) Explanation

(2)

.....

.....

.....

.....

(b) The frame that supports the cooking tray.

(i) Material

(1)

.....

(ii) Explanation

(2)

.....

.....

.....

.....

(Total for Question 3 = 6 marks)

4 Spot welding is used in the manufacture of the gas barbecue.

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

(2)

1 .....

.....

2 .....

.....

(b) Describe, using notes and sketches, the spot welding process.

(6)

(c) 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)

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(Total for Question 4 = 11 marks)

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5 Figure 2 shows the handle for the lid of the gas barbecue, which is manufactured using the sand casting process.

The sand casting requires a split pattern.

Figure 2

(a) Describe how a split pattern for the handle could be made in a school workshop.

(3)

(b) Draw a diagram to show how the split pattern would be placed into a moulding box/flask and label the following:

- cope
- drag
- runner
- riser.

(4)

(c) Describe the process of sand casting the handle.

(4)

(d) State how shrinkage is overcome in sand casting.

(1)

(Total for Question 5 = 12 marks)

6 The barbecue handle can also be manufactured using the pressure die casting process.

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

(5)

Advantages

1 .....

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2 .....

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3 .....

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Disadvantages

1 .....

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2 .....

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(b) Describe, using notes and sketches, the pressure die casting process.

(6)

(Total for Question 6 = 11 marks)

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7 Parts of the gas barbecue are machined.

The component in Figure 3 shows a spigot, which is turned off-centre on a centre lathe.

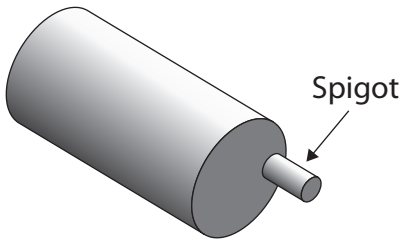

Figure 3

(a) State the name given to this type of turning.

(1)

.....

(b) When machined, this component is held in a four-jaw chuck.

Describe the similarities and operating differences between a three-jaw and a four-jaw chuck.

(3)

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(c) Describe, using notes and sketches, how an operator would set up the centre lathe to manufacture the component shown in Figure 3.

(6)

(d) Describe, using notes and sketches, the procedures for correctly setting the cutting tool height on a centre lathe.

(4)

(Total for Question 7 = 14 marks)

8 Users of the gas barbecue have made comments that there is nowhere to put plates, cooking utensils or the food to be cooked.

Design a device that can be temporarily attached to the gas barbecue.

Your design must include:

- a device suitable to hold plates, cooking utensils and food
- a temporary method of fastening the device to the gas barbecue
- a solution that is safe and fully functional
- identification of materials for each component
- a justified choice of materials used in the device.

(10)

Produce your design on page 18.

Answer page for Question 8

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(Total for Question 8 = 10 marks)

***9** Engineering design requires decisions to be made regarding types of material to be used for individual products. Explain the advantages and disadvantages of using metals and polymers to create products.

Include the following in your answer:

- identification of both a metal and a polymer
- associated costs and manufacturing processes
- density of the materials identified
- suitability for outdoor use of the materials identified.

(Total for Question 9 = 10 marks)

TOTAL FOR PAPER = 90 MARKS

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