Write your name here

Surname	Other names

Pearson Edexcel GCE

Centre Number	Candidate Number

Engineering

Unit 1: Engineering Materials, Processes and Techniques

Monday 11 May 2015 – 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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Answer ALL questions. Write your answers in the spaces provided.

Some of the questions in this paper relate to an electrically powered golf trolley and accessories as shown in Figures 1 and 2.

Figure 1

Electrically powered golf trolley

Figure 2

Base of battery casing

1 The materials used to manufacture the electrically powered golf trolley can be grouped into classes.

For each specific material 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
Brass		
Carbon fibre		
Polyvinyl chloride (PVC)		
Neoprene		

(Total for Question 1 = 8 marks)

2 The table below lists four processes used in manufacturing the electrically powered golf trolley.

Complete the table by giving:

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

Each answer must be different.

Process	**Risk or hazard**	**Precaution/Control measure**
Use of epoxy resins		
Chemical etching		
Injection moulding		
Sawing engineering materials		

(Total for Question 2 = 8 marks)

3 The table below shows the properties of some materials used in the manufacture of the electrically powered golf trolley.

Material	**Density kg m^{-3}**	**Electrical resistivity ohm-m**	**Tensile strength MN m^{-2}**
Rubber	1200	$>10^{11}$	30
Low carbon steel	7860	10.6×10^{-8}	690
High impact polystyrene	300	$>10^{11}$	313
Aluminium	2700	27.0×10^{-8}	82
Copper	8960	1.68×10^{-8}	215

Using the information in the table and your knowledge of materials, select the most appropriate material to use for the following parts of the electrically powered golf trolley and explain your choice.

(a) The frame of the electrically powered golf trolley

(i) Material

(1)

.....

(ii) Explanation

(2)

.....

.....

.....

.....

(b) The terminals that connect the battery to the motor

(i) Material

(1)

(ii) Explanation

(2)

(c) The tread on the front wheel of the electrically powered golf trolley

(i) Material

(1)

(ii) Explanation

(2)

(d) The casing that supports the battery

(i) Material

(1)

(ii) Explanation

(2)

(Total for Question 3 = 12 marks)

4 Oxyacetylene welding is used in manufacturing to permanently join metals together.

(a) Explain **one** advantage of using oxyacetylene welding when manufacturing engineering components.

(2)

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(b) Describe, using notes and sketches, the equipment used in the oxyacetylene welding process.

(4)

(c) Explain **two** reasons why MIG welding has largely replaced oxyacetylene welding in the manufacture of engineering components.

(4)

1 .....

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2 .....

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(Total for Question 4 = 10 marks)

5 Some electrical sockets and light fittings are manufactured from urea formaldehyde, using the compression moulding process.

(a) Explain **two** reasons why compression moulding is used to produce electrical sockets and light fittings.

(4)

1 .....

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2 .....

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(b) Explain **two** disadvantages of using compression moulding.

(4)

1 .....

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2 .....

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(c) Describe, using notes and sketches, the compression moulding process.

(6)

(Total for Question 5 = 14 marks)

6 (a) Describe, with the aid of sketches, the operating characteristics of a horizontal **or** vertical milling machine. In your answer you should clearly demonstrate:

- cutter direction and movement
- direction of table movement.

(6)

(b) Describe why coolant is used during the milling process.

(2)

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(Total for Question 6 = 8 marks)

7 Figure 3 is a diagram of a bench vice found in any engineering workshop.

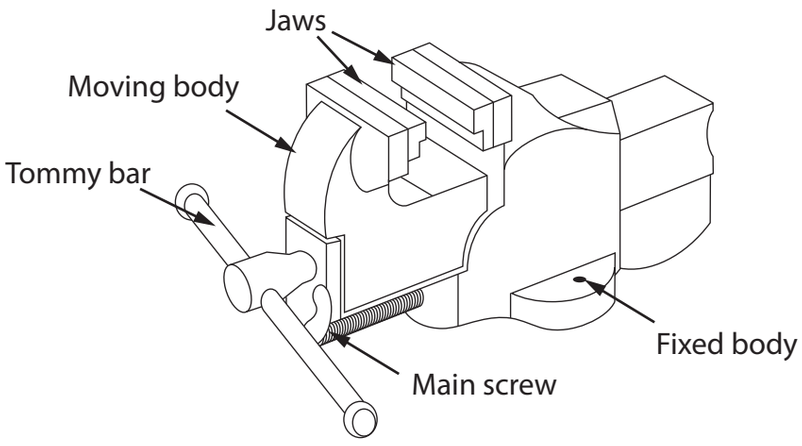

Figure 3

(a) The body of the vice was made using the sand casting process.

Explain **one** reason why this process was used.

(2)

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(b) Describe the process of sand casting the body of the vice.

(4)

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(c) Explain why the jaws of the vice are made from carbon steel.

(2)

(d) Explain **one** reason why the main screw has a buttress thread.

(2)

(Total for Question 7 = 10 marks)

8 It is intended to offer an accessory for the electrically powered golf trolley where the golfer can securely fasten an umbrella to the frame of the golf trolley for use in wet weather.

Design a bracket to hold an umbrella. The bracket must be removable from the golf trolley.

Your design must include:

- a method of fastening onto the golf trolley frame
- a method of securing the umbrella into the bracket
- the ability to be moved in any direction
- the ability to be locked in any position
- suitable materials
- an appropriate reason for material choices.

A close-up of where the bracket should be attached is shown below in figure 4. You must take this into account when designing your bracket.

(10)

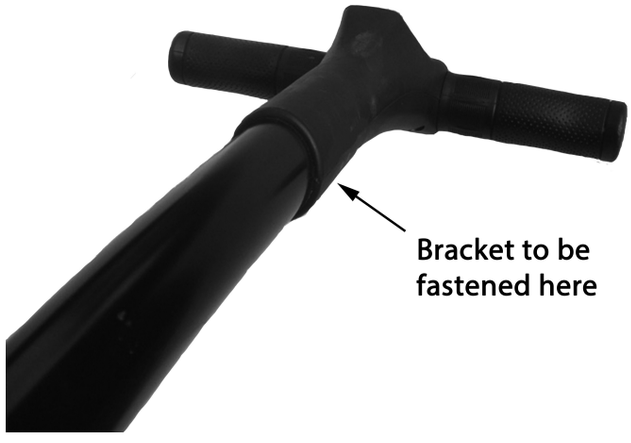

Figure 4

Produce your design on page 16.

Answer page for Question 8

(Total for Question 8 = 10 marks)

***9** The frame of the electrically powered golf trolley is to be manufactured from the following material classes:

- a non-ferrous metal
- a polymer.

Choose a specific material from each class and evaluate its suitability for use in the frame of the golf trolley with reference to properties, performance requirements and manufacturing processes.

(Total for Question 9 = 10 marks)

TOTAL FOR PAPER = 90 MARKS

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