Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	9	3	1	/	0	1	Signature	

Paper Reference(s)

6931/01

Edexcel GCE

Engineering

Advanced Subsidiary

Unit 1: Engineering Materials, Processes and Techniques

Thursday 15 May 2008 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination
Pencil, pen

Items included with question papers
Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 9 questions in this question paper. The total mark for this paper is 90.
There are 12 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.
Include diagrams in your answers where these are helpful.

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Turn over

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

The questions in this paper relate to a petrol powered motorcycle, shown below in Figure 1.

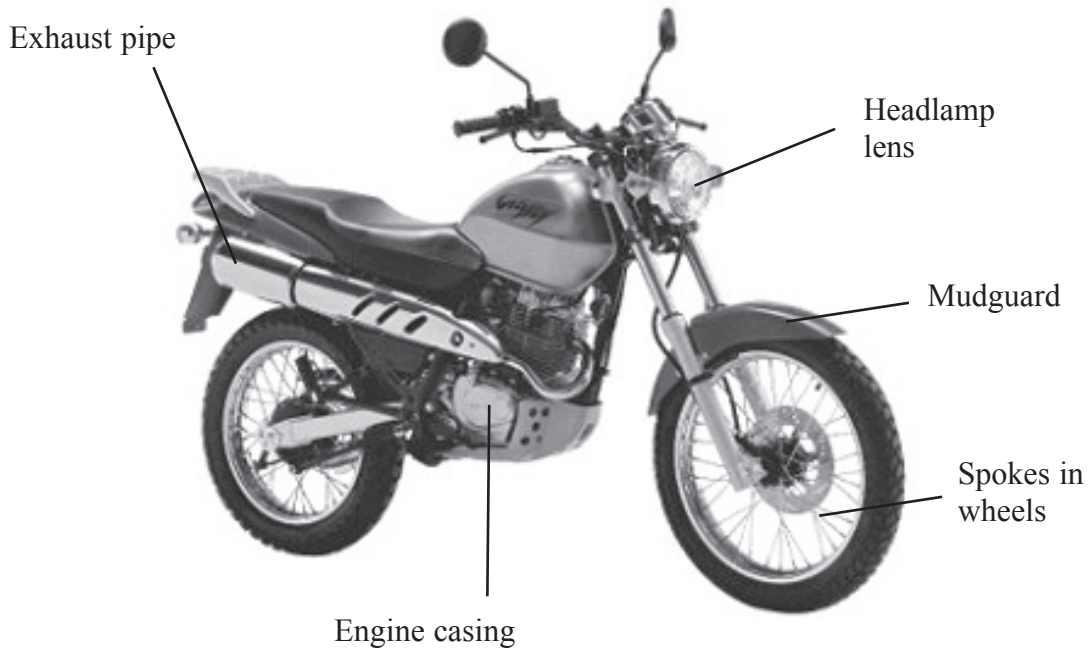

Figure 1

Leave blank

1. A number of different processes are used to manufacture the motorcycle.

Complete the following table by giving

- **one** hazard/risk involved in each process
- **one** precaution/control measure which will prevent this risk resulting in an injury

Each answer **must** be different.

The first line of the table has been completed for you.

Process	**Hazard/Risk**	**Precaution/Control Measure**
Testing exhaust pipe	Inhalation of exhaust gases	Work in a ventilated area
Spot welding		
Use of epoxy adhesives		
Soldering		
Milling		

Q1

(Total 8 marks)

2. Engineering materials can be grouped into classes.

Complete the following table by giving

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

Class of material	**Specific material**	**Significant property of material**
Non-ferrous metal		
Ferrous metal		
Composite		
Ceramic		

Q2

(Total 8 marks)

Leave blank

3. Some parts of the motorcycle are galvanised or electroplated.

(a) (i) Describe how galvanising is carried out.

.....

.....

.....

.....

(3)

(ii) Describe how electroplating is carried out.

.....

.....

.....

.....

(3)

(b) State **one** reason for using these processes.

.....

.....

(1)

Q3

(Total 7 marks)

Leave blank

4. (a) (i) Identify a suitable material to use for the spokes of the motorcycle wheels.

.....

(1)

(ii) Explain why your chosen material is suitable.

.....

.....

.....

.....

(2)

(b) (i) Identify **two** materials that could be used for the headlight lens of the motorcycle.

Material 1: .....

(1)

Material 2: .....

(1)

(ii) Compare, using advantages and disadvantages, the properties of your chosen materials.

.....

.....

.....

.....

.....

.....

(4)

Q4

(Total 9 marks)

Leave blank

5. The following table lists properties for some of the materials that were considered for use in the manufacture of the motorcycle.

Material	**Density kg m^{-3}**	**Electrical resistivity Ω m**	**Tensile strength MN m^{-2}**	**Thermal conductivity W m^{-1} K^{-1}**	**Material cost, relative to aluminium alloy**
Low carbon steel	7860	10.6×10^{-8}	690	63	0.2
Copper	8960	1.68×10^{-8}	215	385	0.95
Aluminium alloy	2800	2.85×10^{-8}	500	180	1.0
Nickel alloy	7990	85.5×10^{-8}	350	29	3.0
Stainless steel	7930	72.3×10^{-8}	570	70	1.1

(a) For each of the following applications, identify an appropriate material from the table above and explain the reason for your choice.

(i) The handlebars.

Material: .....

(1)

Reason: .....

.....

.....

(2)

(ii) The electrical wiring.

Material: .....

(1)

Reason: .....

.....

.....

(2)

Leave blank

(iii) The lightest motorcycle frame.

Material: .....

(1)

Reason: .....

.....

.....

(2)

(iv) The lowest cost material for the mudguard.

Material: .....

(1)

Reason: .....

.....

.....

(2)

(b) The engine casing is manufactured using gravity die casting.

(i) Name a suitable material for the engine casing.

.....

(1)

(ii) Describe the process of gravity die casting.

.....

.....

.....

.....

(4)

(c) Explain **two** benefits of using stainless steel for the exhaust pipe.

.....

.....

.....

.....

(4)

Q5

(Total 21 marks)

Leave blank

6. The mudguard is manufactured from carbon fibre reinforced plastic.

(a) Describe the process of making the mudguard using carbon fibre reinforced plastic.

.....

.....

.....

.....

.....

.....

(5)

(b) Give **one** advantage of using carbon fibre reinforced plastic to make the mudguard.

.....

(1)

Q6

(Total 6 marks)

Leave blank

7. Inside the headlamp an insulated copper wire is connected to a terminal.

(a) Describe **two** suitable methods of joining the copper wire to the terminal so that a good electrical connection is made.

Method 1: .....

.....

.....

Method 2: .....

.....

.....

(4)

(b) Compare these **two** methods and justify your choice of the most appropriate one.

.....

.....

.....

.....

.....

.....

(6)

Q7

(Total 10 marks)

Leave blank

8. Testing the hardness of materials requires special equipment and techniques.

(a) (i) Name a standard test used to measure the hardness of metals.

.....

(1)

(ii) In the space below, draw and label a diagram showing how the hardness of a metal is measured using your chosen standard test.

(3)

(iii) Describe how your chosen standard test is carried out.

.....

.....

.....

.....

(4)

(b) Name the unit of hardness or the hardness scale for your chosen standard test.

.....

(1)

Q8

(Total 9 marks)

Leave blank

9. (a) A tensile test is to be carried out on the steel used for the frame of the motorcycle.

(i) Sketch the shape of the steel sample that would be used for this test.

(2)

(ii) Explain how the following quantities could be obtained from a Load – Extension tensile test.

Stress .....

.....

(2)

Strain .....

.....

(2)

Leave blank

(b) The results of a tensile test on two different materials are shown in Figure 2. The specimen sizes are identical for the two materials.

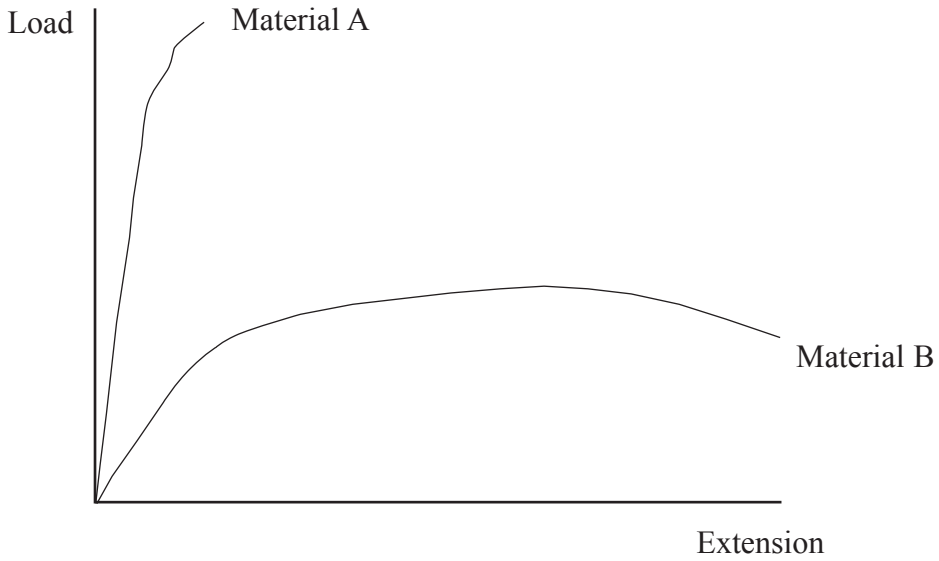

Figure 2

(i) State which of these two materials is more ductile.

.....

(1)

(ii) Explain why this material is more ductile.

.....

.....

(2)

(iii) State which of these two materials has the greater stiffness.

.....

(1)

(iv) Explain why this material has the greater stiffness.

.....

.....

(2)

(Total 12 marks)

Q9

TOTAL FOR PAPER: 90 MARKS

END