Write your name here

Surname	Other names

Edexcel GCE

Centre Number	Candidate Number

Engineering

Unit 1: Engineering Materials, Processes and Techniques

Tuesday 15 May 2012 – 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 questions. Write your answers in the space provided.

Some of the questions in this paper relate to a compact disc (CD) player as shown in Figure 1.

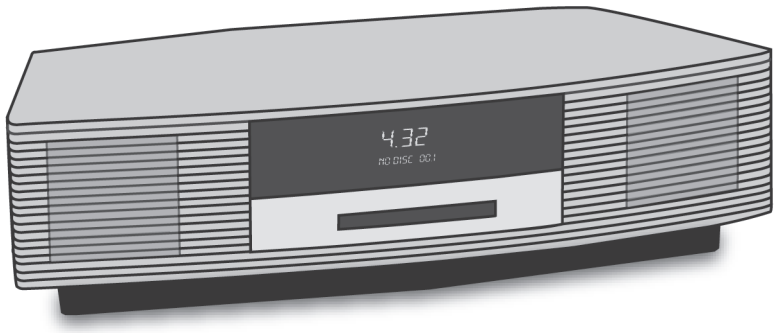

Figure 1

1 The materials used to manufacture the CD player can be grouped into classes.
For each class of material listed, complete the following table by naming:

- one specific material
- one significant property.

Each answer must be different.

Class of material	Specific material	Significant property
Metal		
Alloy		
Elastomer		
Polymer		

(Total for Question 1 = 8 marks)

2 A number of processes are used to manufacture the CD player.

Complete the following table by giving:

- one hazard involved in each process
- one precaution/control measure for each process.

Each answer must be different.

Process	Hazard	Precaution/Control measure
Injection moulding		
Cyanoacrylates adhesive bonding		
Metal pressing		
Oxy acetylene welding		

(Total for Question 2 = 8 marks)

3 The table below shows the properties of some materials used in the manufacture of the CD player.

Material	**Density kg m^{-3}**	**Electrical resistivity ohm-m**	**Tensile strength MN m^{-2}**	**Thermal conductivity $Wm^{-1}K^{-1}$**
Aluminium	2700	27×10^{-8}	82	237
Low carbon steel	7860	10.6×10^{-8}	690	63
Copper	8960	1.68×10^{-8}	215	385
Urea formaldehyde	1250	$> 10^{11}$	70	0.15
Brass	8360	9.0×10^{-8}	500	88
High impact polystyrene	1030	$> 10^{11}$	30	0.13

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

(a) Connecting wire from the CD player to the 13A plug.

(i) Material

(1)

.....

(ii) Explanation

(2)

.....

.....

.....

.....

(b) The body of the 13A plug.

(i) Material

(1)

(ii) Explanation

(2)

(c) Electrical terminals.

(i) Material

(1)

(ii) Explanation

(2)

(d) The casing of the player.

(i) Material

(1)

(ii) Explanation

(2)

(Total for Question 3 = 12 marks)

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4 Crimping and soldering are two methods of making electrical terminations.

(a) Describe each process when used for joining a wire to a connecting lug.

(i) Crimping

(3)

(ii) Soft soldering

(3)

(b) Both of these processes are permanent joining methods.

Give **two** benefits of using permanent joints in electrical connections.

(2)

1 .....

.....

2 .....

.....

(Total for Question 4 = 8 marks)

5 Various components used in the assembly of the CD player require heat treatment.

State the purpose of each of the following heat treatments and describe each process.

(a) Hardening carbon steel

(i) Purpose

(1)

(ii) Process

(3)

(b) Tempering carbon steel

(i) Purpose

(1)

(ii) Process

(3)

(c) Annealing carbon steel

(i) Purpose

(1)

(ii) Process

(3)

(Total for Question 5 = 12 marks)

6 A carrying handle for a CD player can be sand cast from aluminium.

Figure 2 shows a carrying handle for a CD player.

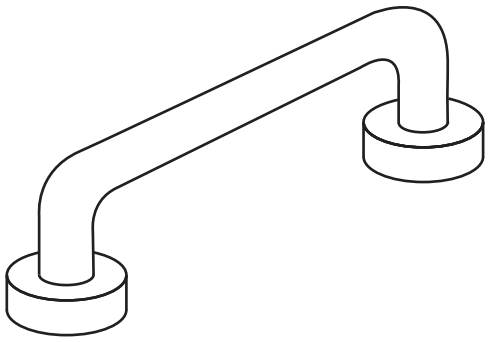


Figure 2

The casting requires a split pattern.

(a) Describe how a split pattern for the handle in Figure 2 would 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 carrying handle.

(4)

(d) When a casting is made it shrinks.

State how this shrinkage is overcome.

(1)

.....

.....

(e) In industrial commercial production the carrying handle would be die cast.

Give **two** advantages of die casting over sand casting.

(2)

1 .....

.....

2 .....

.....

(Total for Question 6 = 14 marks)

7 When a CD player is packaged for distribution it is placed in a vacuum formed tray.

(a) (i) Name a specific material that can be used to vacuum form the packaging for a CD player.

(1)

.....

(ii) Explain why this material is suitable for vacuum forming.

(2)

.....

.....

.....

.....

(b) Using notes and sketches, describe the vacuum forming process.

(6)

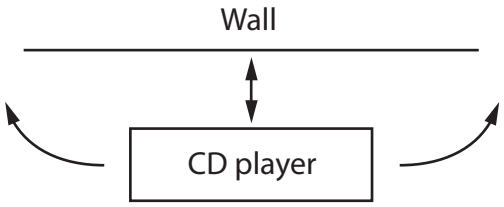
(Total for Question 7 = 9 marks)

8 It is intended to offer an accessory for the CD player which is a wall mounted adjustable device that will hold and support the CD player in various positions without taking up space on furniture.

Design a device that will allow the CD player to move out from the wall it is mounted on and to swing from side to side through an angle of 120°

Your design must include:

- a method of extending forward from and back to the wall
- a method of swinging from side to side through an angle of 120°
- a method of locking the holder once the angle is set
- a method of securing the CD player safely on the device
- a choice of material and a reason for its use in the design.



Produce your design on page 15

(Total for Question 8 = 10 marks)

***9** The following materials were considered for the casing of the CD player:

- aluminium
- ABS

Evaluate the suitability of these materials to determine the most appropriate material for the casing.

(Total for Question 9 = 9 marks)

TOTAL FOR PAPER = 90 MARKS