



**Coimisiún na Scrúduithe Stáit  
State Examinations Commission**

**JUNIOR CERTIFICATE EXAMINATION, 2012**

**METALWORK  
MATERIALS AND TECHNOLOGY**

**Higher Level - 100 Marks**

**Tuesday, 19 June      Afternoon 2:00 – 4:00**

**INSTRUCTIONS**

1. Answer Question 1, Section A and Section B, and three other questions.
2. All answers must be written in ink on the answer book supplied.  
Diagrams should be drawn in pencil.
3. Squared paper is supplied for diagrams as required.
4. Please label and number carefully each question attempted.

SECTION A – 20 MARKS  
COMPULSORY

Answer **any five** questions.

The diagrams in Fig. 1 show some of the main parts of a basic four-stroke engine.

Questions (a) to (c) relate to these diagrams.

- (a) (i) Name part A.
- (ii) Explain the purpose of part A.

(4 marks)

- (b) (i) Name part B.
- (ii) Describe the function of part B in the operation of the engine.

(4 marks)

- (c) Outline the function of the Gudgeon Pin in the engine.

(4 marks)

- (d) List **any two** environmental problems caused by the incorrect disposal of engine oil.

(4 marks)

- (e) Briefly describe the contribution made to technology by **one** of the following:

- (i) Robert Boyle, or
- (ii) James Dyson, or
- (iii) Mark Zuckerberg.

(4 marks)

- (f) (i) Name **one** suitable plastic material which could be used to make the menu holder shown.
- (ii) Describe how the menu holder is bent to form the shape shown.

(4 marks)

- (g) (i) Identify **each** of the electronic components shown.
- (ii) Outline the function of **one** of the electronic components shown.

(4 marks)

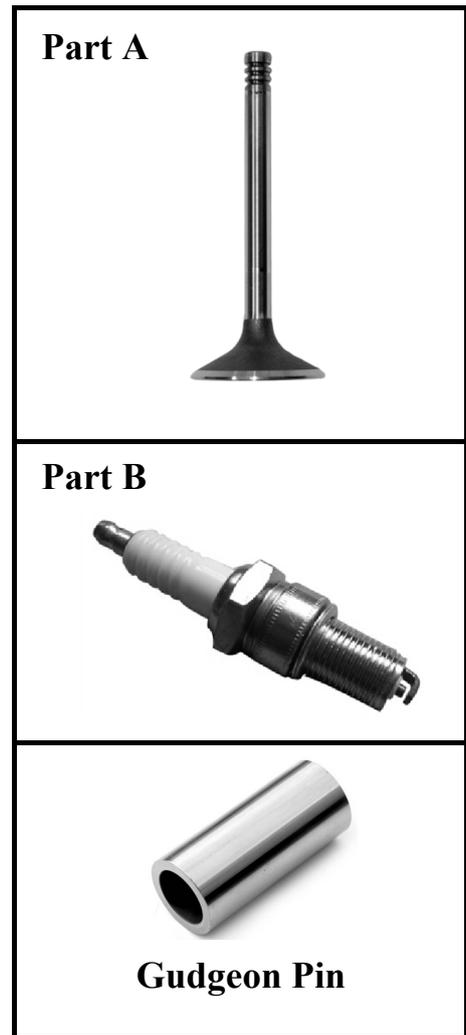
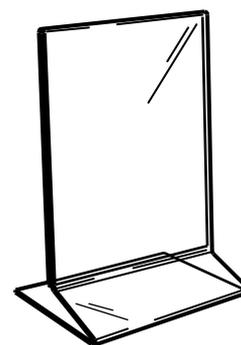


Fig. 1



Menu holder

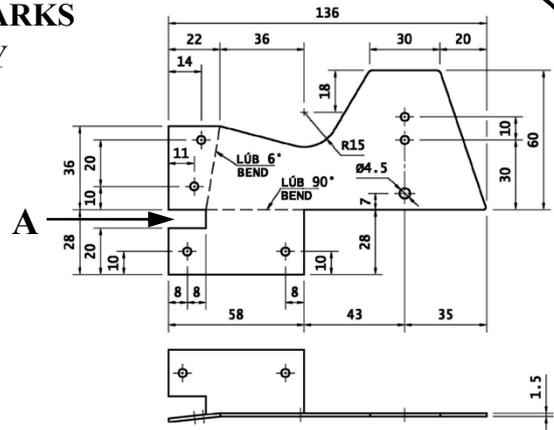


Electronic Components

**SECTION B – 20 MARKS  
COMPULSORY**

Answer **any five** questions.

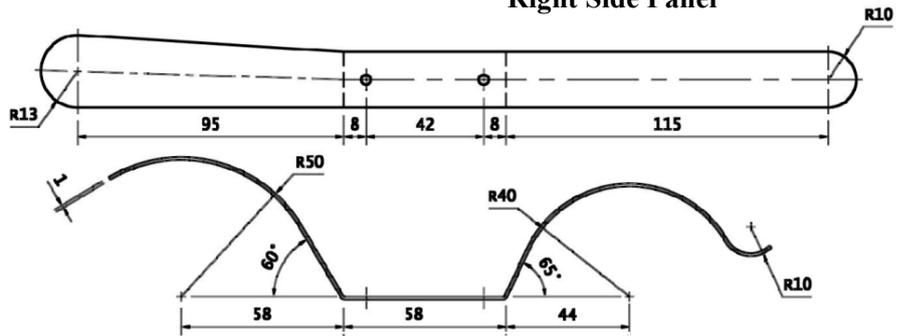
The drawings show the **Right Side Panel, Right Mudguard, Windscreen, Embellisher** and an assembly drawing of the **2012 Metalwork Higher Level Project - Model Vintage Car**.



**Right Side Panel**

- (a) (i) Describe **any one** method used to produce the slot A, shown in the Right Side Panel.
- (ii) Identify **any two** steps required to ensure the Right Side Panel is drilled safely.

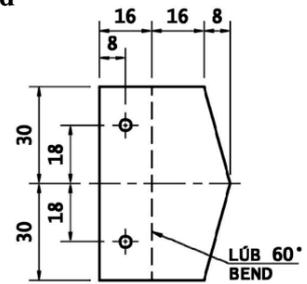
(4 marks)



**Right Mudguard**

- (b) (i) Describe how the R13 and R10 ends of the Right Mudguard are shaped before bending.
- (ii) Outline **any two** methods used to produce a high quality finish on the brass used to make the Right Mudguard.

(4 marks)



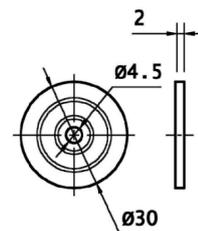
**Windscreen**

- (c) Describe how the Right Mudguard is bent to shape with particular reference to:
- (i) the 60° and 65° bends;
- (ii) the R50, R40 and R10 arcs.

(4 marks)

- (d) (i) Describe how a high quality finish is achieved on the Windscreen before it is bent to shape.
- (ii) Explain how the Windscreen is accurately bent to shape.

(4 marks)



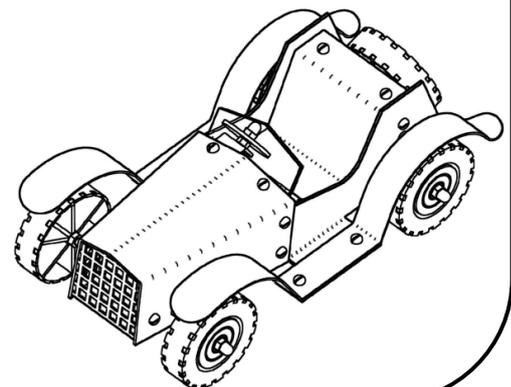
**Embellisher**

- (e) (i) Draw a diagram of the Embellisher showing a *groove effect*.
- (ii) Explain **any one** method used to produce the *groove effect* on the Embellisher using the lathe.

(4 marks)

- (f) Design, using a diagram, a Transmission Unit to drive the model. The unit should be controlled by an on/off switch.

(4 marks)



A simple model of a design process is shown opposite.

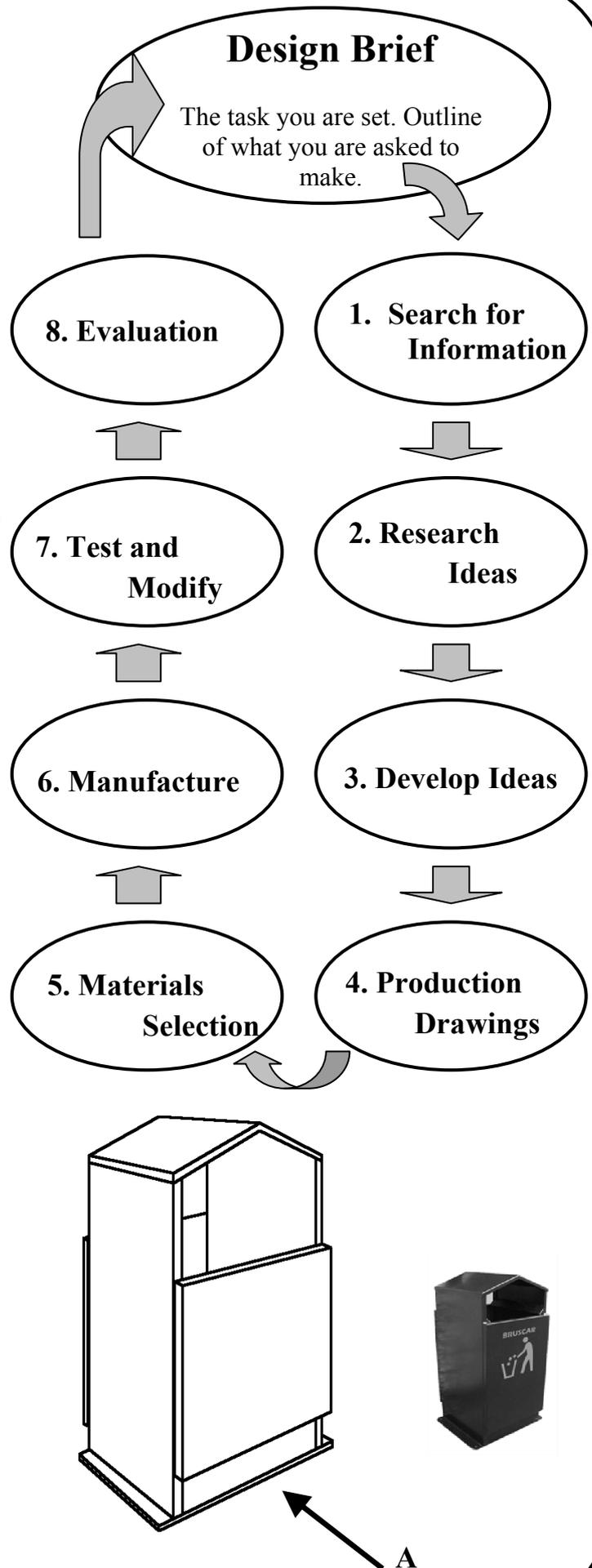
- (a) (i) Outline **any two** ways in which ideas could be developed following the 'Research Ideas' stage.
- (ii) Suggest **any three** items of information which may be contained in the 'Production Drawings'.

(7 marks)

A Street Rubbish Bin made from metal is shown.

- (b) (i) Draw in proper proportion, an elevation of the bin looking in the direction of arrow A.
- (ii) Design, using a diagram, a more environmentally friendly metal bin, which has separate sections for cans, paper, plastics and general rubbish.
- (iii) Illustrate how the bin you designed in (b) (ii) above, could be opened to allow easy access for the disposal of the waste materials.
- (iv) Suggest **one** suitable metal for the manufacture of the bin and outline **one** reason for your selection.

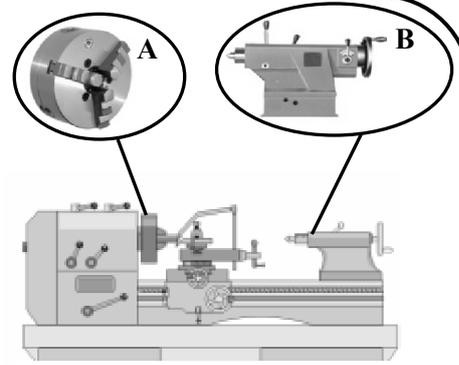
(13 marks)



### Question 3

20 Marks

- (a) (i) Name the parts **A** and **B** of the centre lathe shown.
- (ii) Outline **any two** operations which may be performed using part **B**.
- (iii) Describe **one** method used to correctly position a cutting tool in a tool post.
- (iv) Identify the turning operation shown below and explain how this process is carried out.



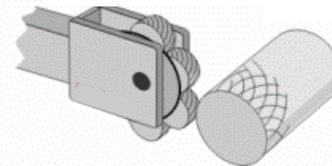
Centre Lathe

(10 marks)

- (b) A 15 mm diameter bar is to be turned on the lathe. The material has a surface cutting speed of 126 m/min. Using the given formula calculate the speed in RPM. (Take  $\pi$  as 3)

$$N = \frac{S \times 1000}{\pi \times D}$$

(4 marks)



(iv) Turning Operation

- (c) (i) Name **both** of the tools **C** and **D** shown opposite.
- (ii) Explain the purpose of **one** of the tools shown.

(6 marks)



Tool C

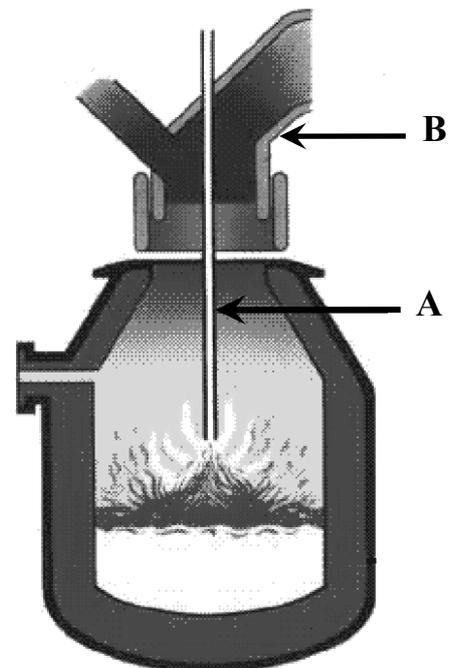
Tool D

### Question 4

20 Marks

- (a) (i) Identify the type of furnace shown.
- (ii) List the materials in the charge.
- (iii) Name part **A** and explain what prevents part **A** from melting.
- (iv) Outline the purpose of part **B**.
- (v) Name the metal produced by this furnace and explain how it is removed from the furnace.

(11 marks)



- (b) (i) Suggest **any two** reasons why metals may need to be heat treated.
- (ii) Name **any three** heat treatment processes which may be applied to metal.
- (iii) Describe how **one** of the named heat treatment processes is carried out.
- (iv) Give **one** example of a product which must be heat treated before it is ready for use.

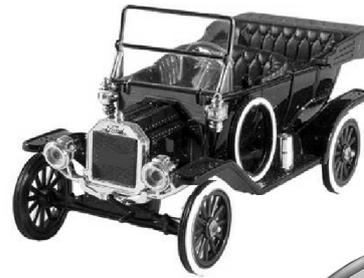
(9 marks)

### Question 5

20 Marks

A vintage car, a modern car and a drive mechanism are shown.

- (a) Compare the vintage car and the modern car under the following headings:
- (i) Safety features;
  - (ii) Tyres and wheels;
  - (iii) Design features;
  - (iv) Environmental impact.



Vintage Car

(10 marks)



Modern Car

- (b) (i) Identify the drive mechanism shown.  
(ii) If the driver ( $\text{Ø}40 \text{ mm}$ ) turns at 100 RPM, how fast is the driven ( $\text{Ø}20 \text{ mm}$ ) turning in RPM?  
(iii) Explain, using a diagram, how the direction of rotation of the driven may be reversed.  
(iv) Outline **any two** disadvantages of the drive mechanism shown.



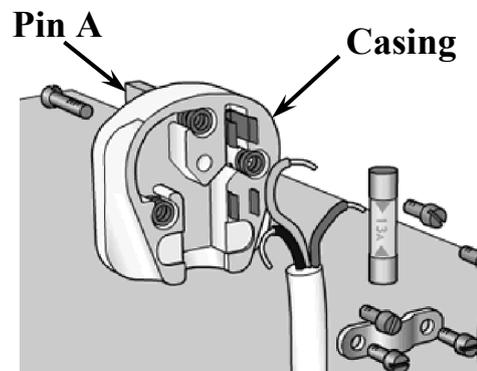
Drive Mechanism

(10 marks)

### Question 6

20 Marks

- (a) (i) Suggest a suitable metal for Pin A of the plug shown and outline **one** reason for your choice.  
(ii) Identify **one** property of the material used to make the plug casing.  
(iii) Show, using a labelled diagram, how the plug is wired correctly, making reference to the colour coding of the wires.  
(iv) Explain the purpose of the fuse shown.



(10 marks)

- (b) (i) Identify the type of soldering iron shown.  
(ii) State **any two** properties of soft solder.  
(iii) Name **any two** metals used to make soft solder.  
(iv) Outline the main differences between a passive flux and an active flux.  
(v) What is silver solder?



Fuse



Soldering Iron

(10 marks)

(a) (i) Define the term ‘Computer Hardware’ and name **one** computer hardware device.



VDU

(ii) Outline **one** way in which personal information, stored on a computer, would remain protected in the event of the computer being stolen.



Scanner

(iii) Explain **any two** of the following computer terms:

- USB;
- RAM;
- Modem;
- Skype.



Keyboard

(iv) Redraw the given table in your answer book. Complete the table by filling in the missing input/output and application boxes.

| Name     | Input/Output | Application        |
|----------|--------------|--------------------|
| VDU      | Output       |                    |
| Scanner  | Input        |                    |
| Keyboard |              | Typing information |

(v) Suggest **one** positive and **one** negative impact of computer technology on the environment.

(14 marks)

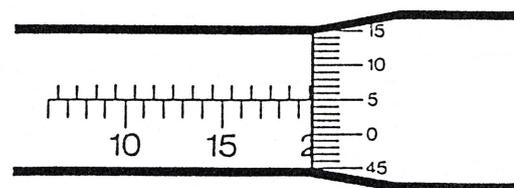
(b) (i) Identify **any two** ways in which the measuring instrument shown may be used to obtain measurements from a component.



Measuring Instrument

(ii) Outline **one** advantage of the measuring instrument shown.

(iii) State the value of the measurement shown on the micrometer opposite.



(6 marks)

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