

Surname	Centre Number	Candidate Number
Other Names		4



LEVEL 1 / LEVEL 2 AWARD

9793/01



**ENGINEERING – Unit 3
Solving Engineering Problems
(VOCATIONAL)**

MONDAY, 4 JUNE 2018 – AFTERNOON

1 hour 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	24	
2.	16	
3.	20	
Total	60	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. Where the space is not sufficient for your answers, continue at the back of the booklet, taking care to number the continuation correctly.

INFORMATION FOR CANDIDATES

The total number of marks for this paper is 60.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

Answer **all** questions in the spaces provided.

1. The image below shows a modern coffee machine. Coffee pods are inserted into the machine, then hot or cold water is filtered through the coffee pods, and the beverage drips into a cup/mug underneath.



Some parts of the coffee machine have been injection moulded.

- (a) (i) Give **one** advantage of injection moulding the parts. [1]

.....

- (ii) Give **one** disadvantage of injection moulding the parts. [1]

.....

- (b) The handle has been shaped from 1 mm thick aluminium sheet. State **two** reasons why aluminium was chosen to manufacture the handle. [2]

Reason 1:

.....

Reason 2:

.....

(c) Look at the following list of polymers (plastics).

- | | |
|-------------|-------------------|
| Polystyrene | Urea formaldehyde |
| Nylon | Polyester resin |

(i) From the list, give **one** example of a thermoplastic. [1]

.....

(ii) From the list, give **one** example of a thermoset. [1]

.....

(d) The removable water tank has been manufactured from acrylic.

One of the characteristics or properties of acrylic is that it can be easily machined.

State **one** more characteristic or property of acrylic and explain why it is appropriate when manufacturing the removable water tank.

Characteristic or property: [1]

Explanation: [1]

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(e) Explain why the adjustable drip tray has been manufactured from stainless steel. [2]

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- (f) The electronic circuit inside the coffee machine will consist of a number of components. Name **each** component shown, and give a description of its purpose within the circuit.

Electronic component	Component name	Purpose in circuit
	[1]	<p>.....</p> <p>.....</p> <p style="text-align: right;">[1]</p>
	[1]	<p>.....</p> <p>.....</p> <p style="text-align: right;">[1]</p>

- (g) Companies update their products on a regular basis for various reasons.
- (i) Suggest **two** improvements that the design engineer could make to the coffee machine to increase sales. Discuss the benefits of **each** improvement. 4 × [1]

Improvement 1:

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Benefit:

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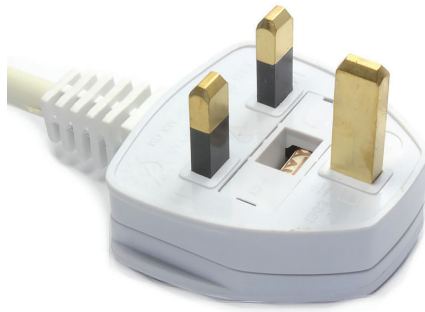
Improvement 2:

.....

Benefit:

.....

(ii) The coffee machine is fitted with a 13 amp fuse plug, as shown.



List **four** key design specification criteria required for the manufacturing of the 13 amp fuse plug. [4]

- 1.
- 2.
- 3.
- 4.

(iii) The plug casing has been made from urea formaldehyde. Give **two** reasons why this material has been used. 2 × [1]

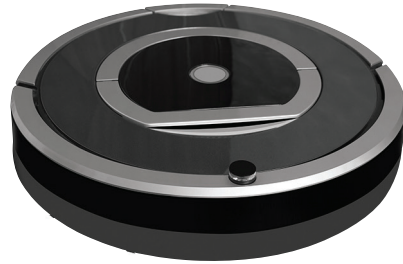
- Reason 1:
- Reason 2:

2. The world of engineering is greatly influenced by developments in technology. One area that has seen many changes is the development of household products.

Below are two vacuum cleaners. The one on the left is a basic vacuum cleaner, from the 1970s. The one on the right is a modern hi-tech vacuum cleaner.



1970s cleaner



Modern hi-tech vacuum cleaner

- (a) Describe **two** ways how modern technology has made the modern hi-tech vacuum cleaner easier to use in the home. [4]

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- (b) Describe **two** disadvantages of the modern hi-tech vacuum cleaner compared to the 1970s cleaner. [4]

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(c) Describe **two** benefits to the manufacturer of the modern hi-tech vacuum cleaner model. [4]

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(d) Discuss why the modern hi-tech vacuum cleaner has been designed to be environmentally friendly. [4]

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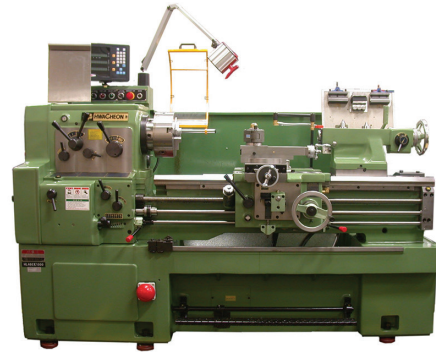
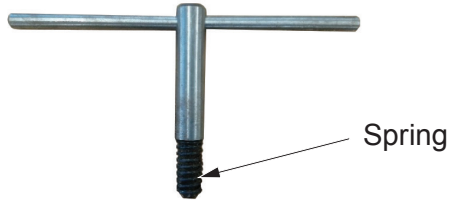
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3. Shown below are two pieces of equipment used in an engineering workshop.

(a) The picture below on the left shows a spring loaded chuck key and is used to tighten the jaws on a centre lathe.



Spring loaded chuck key

Centre lathe

(i) Explain why the chuck key has a spring. [2]

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(ii) State **three** safety precautions you should apply before you use a centre lathe. 3 × [1]

Precaution 1:

Precaution 2:

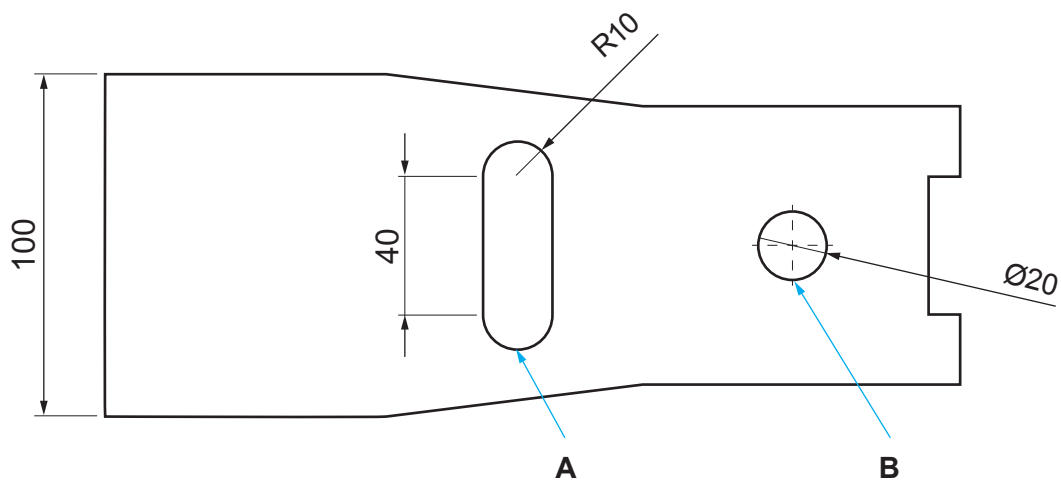
Precaution 3:

- (b) Mobile phones and tablet devices are used daily to watch videos and films. Stands are purchased to hold the device at an angle, so that the user doesn't need to hold it.



A team of pupils have re-designed a new stand, which they will manufacture from 3 mm cast acrylic on a laser cutting machine.

Below is a plan view of the piece of acrylic, before it is heated and shaped.



ALL DIMENSIONS IN mm

Calculate the total volume of waste material removed for the slot labelled **A**.

[5]

Examiner
only

*You must show **all** your calculations.*

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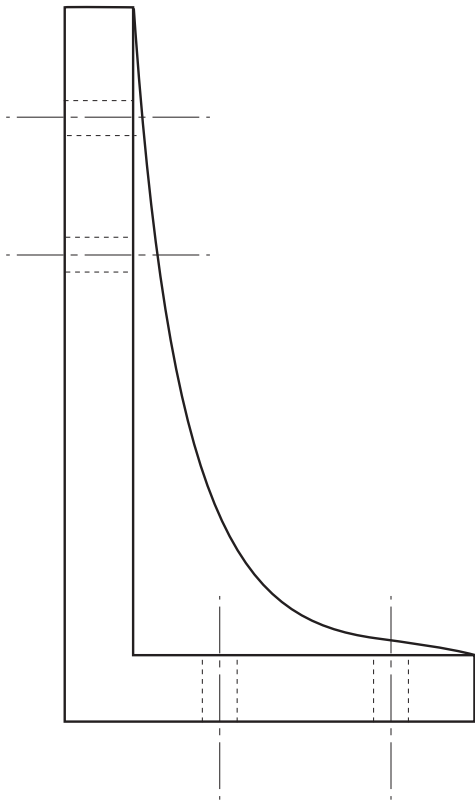
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- (c) This is a picture of a surface angle plate, sometimes used to hold the workpiece square to the table during marking-out operations.

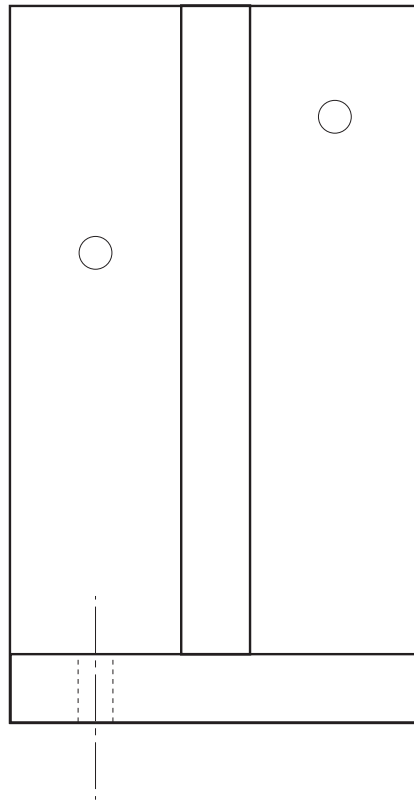


- (i) Complete the orthographic projection on the opposite page. The front view has been completed for you. The **side** and **plan** view both need to be completed. [6]

You must show all features and hidden detail.



FRONT VIEW



- (ii) In the space provided draw the symbol showing that an engineering drawing has been drawn in 3rd angle projection. [2]

- (iii) State **two** pieces of information that should be included in the 'TITLE BLOCK' of an engineering drawing. 2 × [1]

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END OF PAPER

