



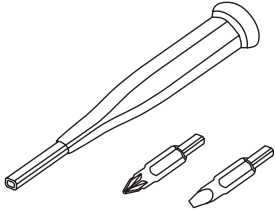


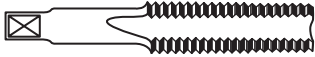
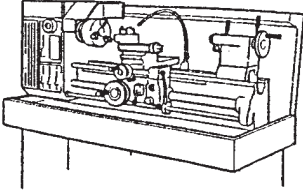

Answer ALL the questions. Write your answers in the spaces provided.

1. The table below shows some tools and equipment.

(a) Complete the table by:

- (i) naming each tool or piece of equipment
- (ii) describing its use.

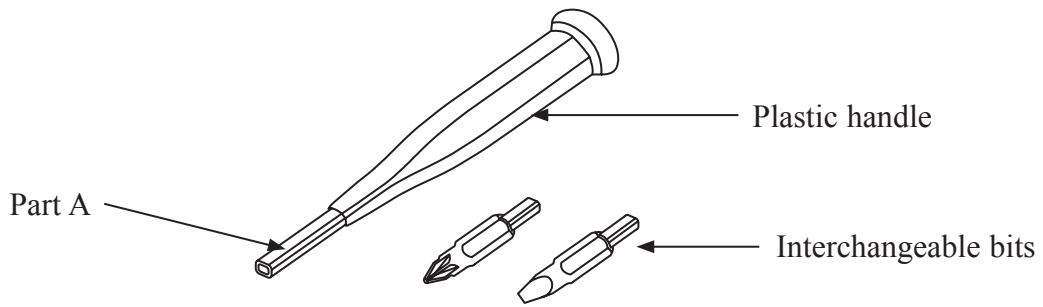
The first one has been done for you.

Tool or Equipment	Name	Use
	Screwdriver	To tighten or loosen screws
		
		
		
		
		

(10)



(b) The drawing below shows a screwdriver with interchangeable bits.



(i) Part A of the screwdriver is made from steel.

Mark with a cross (☒) **one** surface finish that is suitable for steel.

- |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>varnishing</b>        | <b>carbon fibre</b>      | <b>electro-plating</b>   | <b>staining</b>          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
- (1)**

(ii) Part A of the screwdriver and the interchangeable bits have to be made to tolerances.

Give **two** reasons why part A and the interchangeable bits have to be made to tolerances.

- 1 .....
  - 2 .....
- (2)**

(iii) The shape of the screwdriver handle is being redesigned using ICT.

Give **two** ways in which ICT could be used to help generate ideas for the new shape of the handle.

- 1 .....
  - 2 .....
- (2)**



(c) The plastic handle of the screwdriver is made in very large quantities.

(i) Mark with a cross (☒) **one** process suitable to make the plastic handles.

- |                          |                          |                          |                           |
|--------------------------|--------------------------|--------------------------|---------------------------|
| <b>welding</b>           | <b>laminating</b>        | <b>plastic coating</b>   | <b>injection moulding</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>  |
- (1)**

(ii) Mark with a cross (☒) the term that refers to producing items in very large quantities.

- |                               |                           |
|-------------------------------|---------------------------|
| <b>batch production</b>       | <b>production line</b>    |
| <input type="checkbox"/>      | <input type="checkbox"/>  |
| <b>high volume production</b> | <b>one-off production</b> |
| <input type="checkbox"/>      | <input type="checkbox"/>  |
- (1)**

(d) The manufacturer uses ICT to enable easy and fast communication.

Give **two** ways in which the manufacturer could use ICT to enable easy and fast communication.

- 1 .....
- 2 .....
- (2)**

(e) The manufacturer uses CAD/CAM systems to give faster, more flexible manufacturing.

State **three** ways in which CAD/CAM systems could give faster, more flexible manufacturing.

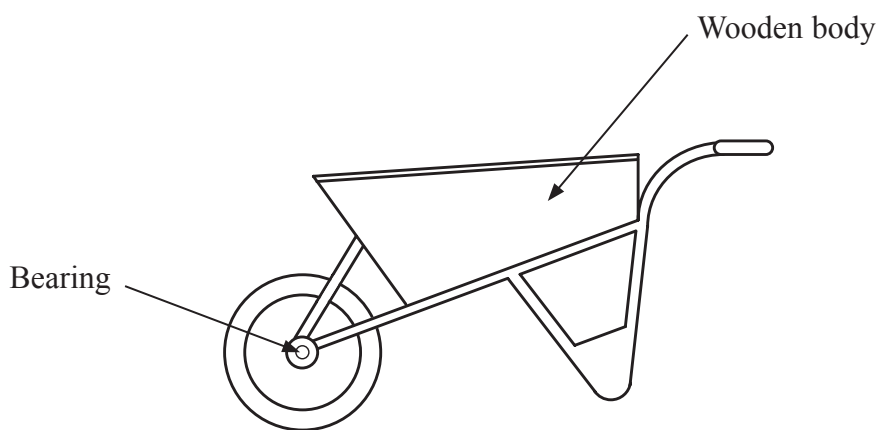
- 1 .....
- 2 .....
- 3 .....
- (3)**

**(Total 22 marks)**

**Q1**

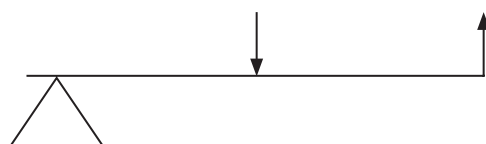


2. The drawing below shows a wheelbarrow. The wheelbarrow is a class 2 lever.



(a) (i) Shown below is a line diagram of a class 2 lever.

Write on the diagram below the positions of the load, effort and fulcrum.



(3)

(ii) When the wheelbarrow is at rest (in equilibrium), the clockwise moment is 10Nm.

State the value of the anticlockwise moment when the wheelbarrow is at rest.

..... (1)

(b) The wheelbarrow has a bearing in the wheel.

Give **two** advantages of using a bearing in the wheel.

1 .....

2 .....

(2)



(c) The wooden parts of the wheelbarrow body are screwed together.

Give **two** reasons why the use of screws is a suitable method of joining the wooden parts of the wheelbarrow body together.

1 .....

2 .....

**(2)**

(d) The manufacturer of the wheelbarrow would like it to be able to withstand knocks.

The list below names some properties of materials.

**ductile      malleable      brittle      tough**

Choose **one** property from the list to complete the sentence below.

To withstand knocks the wheelbarrow needs to be .....

**(1)**

(e) The manufacturer is considering changing the material for the body of the wheelbarrow. Steel and aluminium are materials being considered.

Explain **one** reason for choosing aluminium, instead of steel, for the body of the wheelbarrow.

.....

.....

**(2)**

(f) Product reliability is important to consumers.

Give **two** benefits to the consumer of mechanical products being reliable.

1 .....

2 .....

**(2)**

(g) CAD/CAM is used to manufacture mechanical systems.

Give **two** effects on a company's workforce of changing to CAD/CAM to manufacture mechanical systems.

1 .....

2 .....

**(2)**



(h) A manufacturer of wooden products wishes to use the waste wood for fuel.

Give **three** advantages to the environment of using the waste wood for fuel.

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

(3)

(i) Products which include mechanical systems must meet safety standards.

Explain **one** advantage to the consumer of being able to purchase mechanical systems which meet safety standards.

- .....
- .....

(2)

(j) Some mechanical systems are designed and manufactured to last only a short time. This is called planned product obsolescence.

Give **two** moral issues of planned product obsolescence.

- 1 .....
- 2 .....

(2)

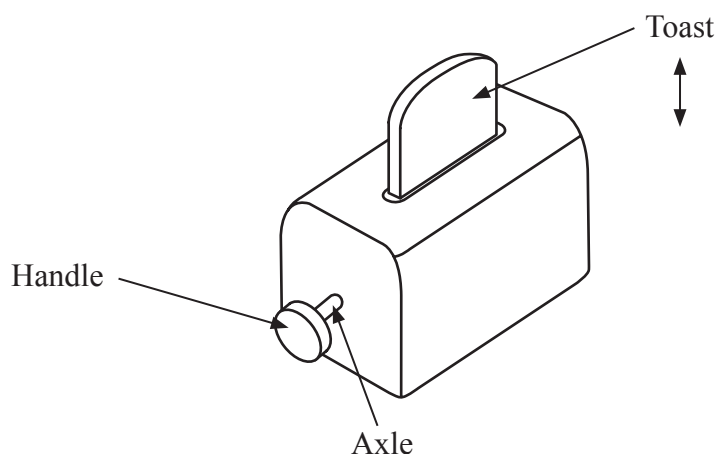
Q2

(Total 22 marks)

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3. A mechanism is required to move the toast in a toy toaster. The mechanism will be operated by a handle.



The specification for the mechanism is that it must:

- move the toast up and down
  - move the toast 50 mm for one-half turn of the handle
  - be fixed securely to the axle
  - be made from materials and processes suitable for a one-off product.
- (a) In the spaces opposite, use sketches and, where necessary, brief notes to show **two different** design ideas for the mechanism that meet this specification.

Do **not** evaluate your designs in part (a).

Candidates are reminded that if pencil is used for diagrams/sketches, it must be dark (HB or B). Coloured pens, pencils and highlighter pens must **not** be used.

**PLEASE DO NOT WRITE OR DRAW IN THIS SPACE.**

**PLEASE USE THE SPACES OPPOSITE FOR YOUR DESIGNS.**





**Design Idea 1**

**(8)**

**Design Idea 2**

**(8)**



(b) Three of the original specification points are repeated below.

Evaluate how **one** of your design ideas succeeds or fails to meet each of these specification points.

Write down the number of your chosen design idea (1 or 2) here: .....

(i) The mechanism must move the toast 50 mm for one-half turn of the handle.

.....  
.....  
.....

(2)

(ii) The mechanism must be fixed securely to the axle.

.....  
.....  
.....

(2)

(iii) The mechanism must be made from materials and processes suitable for a one-off product.

.....  
.....  
.....

(2)

Q3

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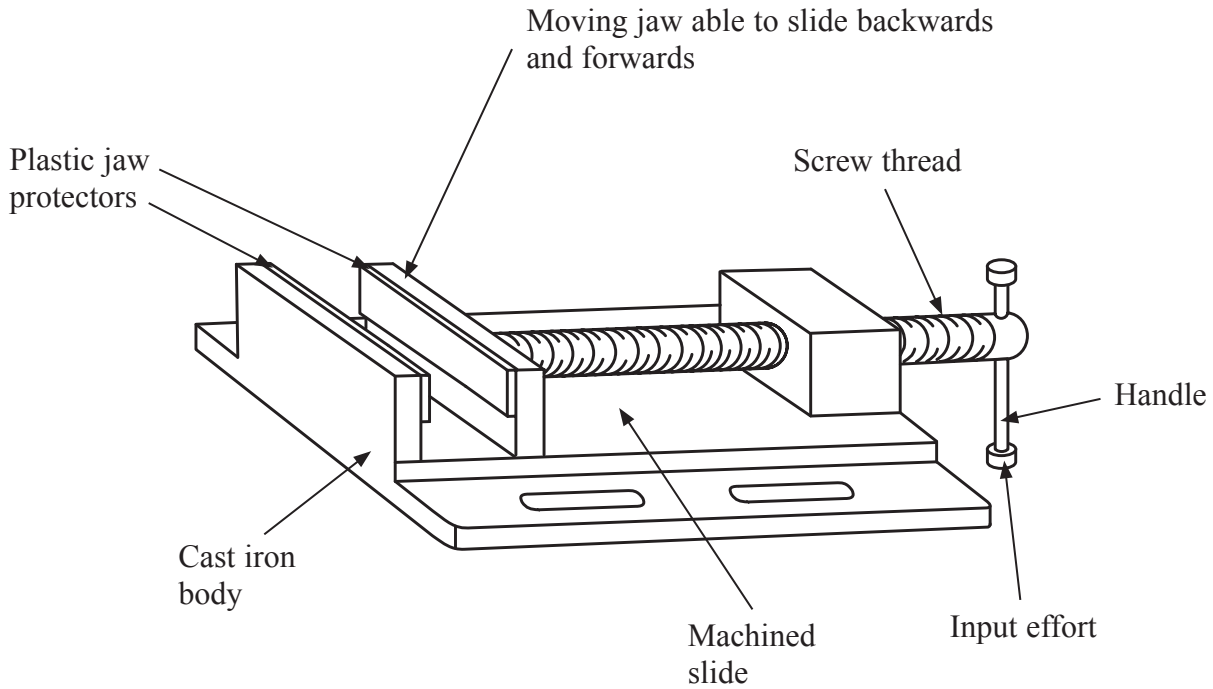
(Total 22 marks)



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4. The drawing below shows a vice.



(a) Two specification points for the vice are that it must have a mechanism that:

- allows the moving jaw to slide backwards and forwards
- allows the effort applied to the screw thread to be increased.

Under each of the following headings, give **one** more point that should be included in the specification for the vice.

For each point, give **one** reason why it should be included.

(i) The needs of the user.

Point .....

Reason .....

.....  
.....

(2)



(ii) Environmental considerations.

Point .....

Reason .....

.....

.....

(2)

(iii) Quality.

Point .....

Reason .....

.....

.....

(2)

(b) The screw thread is made from steel. One reason for using steel is that it is durable.

Give **two** other reasons why steel is a suitable material from which to make the screw thread.

1 .....

2 .....

(2)

(c) The slide of the cast iron vice has been machined.

Give **two** reasons why the slide has been machined.

1 .....

2 .....

(2)



(d) The body of the vice is made from cast iron.

Give **two** properties of cast iron that make it a suitable material for the body of the vice.

For each property give **one** reason why it makes cast iron a suitable material for the body of the vice.

Property 1 .....

Reason .....

.....

Property 2 .....

Reason .....

.....

**(4)**

(e) Quality control checks are carried out at important stages during the manufacture of the screw thread.

Name **two** important quality control checks, other than safety, that should be made during the manufacture of the screw thread.

1 .....

2 .....

**(2)**

(f) The plastic jaw protectors are made in high volume using the injection moulding process.

Describe **one** reason why injection moulding is a suitable process for making the jaw protectors.

.....

.....

**(2)**



(g) Two purposes of the vice are that it must have a mechanism that:

- allows the moving jaw to slide backwards and forwards
- allows the effort applied to the screw thread to be increased.

Explain under the following headings, how the vice achieves these purposes.

(i) Allows the moving jaw to slide backwards and forwards.

.....  
.....  
.....  
.....

(2)

(ii) Allows the effort applied to the screw thread to be increased.

.....  
.....  
.....  
.....

(2)

Q4

(Total 22 marks)

**TOTAL FOR PAPER: 88 MARKS**

**END**



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