


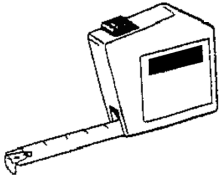
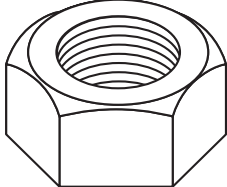
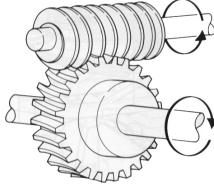
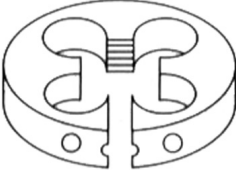
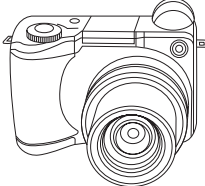
Answer ALL the questions. Write your answers in the spaces provided.

1. The table below shows some tools, components and equipment.

(a) Complete the table by:

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

The first one has been done for you.

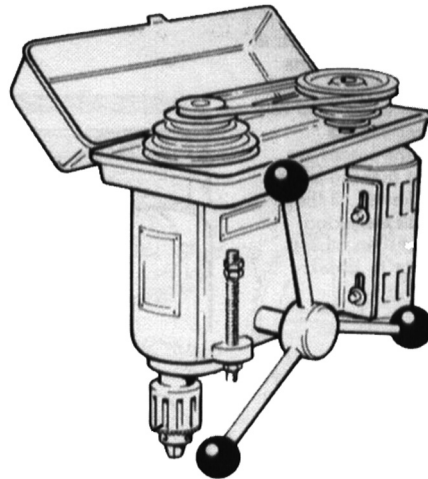
Tool / Component / Equipment	Name	Use
	Pillar drilling machine	For drilling holes
		
		
		
		
		

(10)



(b) The drawing below shows part of the pillar drilling machine.

The chuck rotates when the motor turns.



A mechanical system can be divided into three stages:

INPUT – PROCESS – OUTPUT

Using the terms INPUT, PROCESS and OUTPUT, clearly label on the drawing:

- one INPUT
- one PROCESS
- one OUTPUT.

(3)

(c) Give **two** safety precautions that must be taken when using a pillar drilling machine.

1

2

(2)



(d) The pillar drilling machine was designed and manufactured on a CAD/CAM system.

Choose terms from the following list to complete the statements below about the design and manufacture of the pillar drilling machine:

Each term may be used once or not at all.

- batch**
- CAD/CAM**
- virtual**

- EPOS**
- e-mail**
- high volume**

Statements about the design and manufacture of the pillar drilling machine:

1. The correct term for making 250 identical pillar drilling machines is production.

2. During the design stage of the pillar drilling machine, CAD was used to create a product on screen.

3. When the design was complete, was used to send the file electronically to the manufacturer. **(3)**

(e) A new pulley is to be designed and made using CAD/CAM.

- (i) Give **two** reasons why CAD will be used to design a new pulley.
 - 1
 - 2 **(2)**

- (ii) Explain **one** reason why CAM will be used to manufacture the pulley.

.....

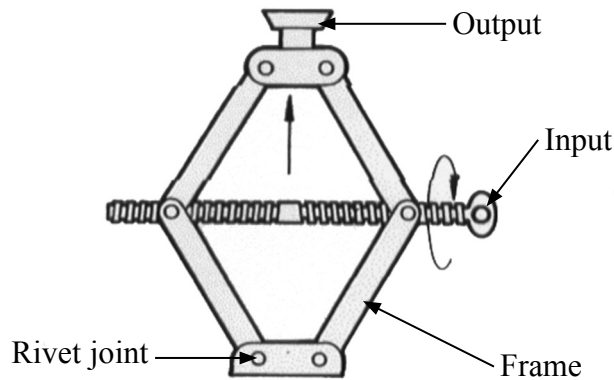
..... **(2)**

(Total 22 marks)

Q1



2. The drawing below shows a car scissor jack.
As the input is turned, the output moves up or down.



- (a) The frame is made from a ferrous metal.

Mark with a cross (☒) **one** ferrous metal which is suitable for the frame.

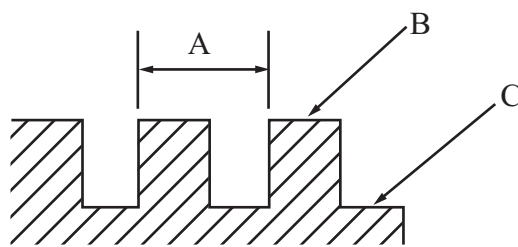
brass ☒ **lead** ☒ **mild steel** ☒ **aluminium** ☒

(1)

- (b) Name the type of motion that is made by the input.

.....
(1)

- (c) The type of screw thread used in the car scissor jack is a square thread.



Name the parts labelled A, B and C.

A

B

C

(3)



(d) Name the type of screw thread shown below.



..... (1)

(e) A lubricant is used on the rivet joint.

Give **two** reasons for using a lubricant on the rivet joint.

1

2 (2)

(f) The table below shows three different methods of fixing components to shafts.

In the table below, mark with a cross (☒) the correct name for the fixing methods shown.

Fixing method	Fixing name
	<p>Keyway <input type="checkbox"/></p> <p>Cotter pin <input type="checkbox"/></p> <p>Splined shaft <input type="checkbox"/></p> <p>Grub screw <input type="checkbox"/></p>
	<p>Keyway <input type="checkbox"/></p> <p>Cotter pin <input type="checkbox"/></p> <p>Splined shaft <input type="checkbox"/></p> <p>Grub screw <input type="checkbox"/></p>
	<p>Keyway <input type="checkbox"/></p> <p>Cotter pin <input type="checkbox"/></p> <p>Splined shaft <input type="checkbox"/></p> <p>Grub screw <input type="checkbox"/></p>

(3)



(g) The car scissor jack must pass safety standard tests.

Give **three** benefits for the consumer of the car scissor jack having to pass safety standard tests.

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

(h) The car scissor jack is manufactured in high volume using CAM.

Give **two** ways in which using CAM to manufacture the car scissor jack will benefit the consumer.

- 1
- 2 **(2)**

(i) The manufacturer has to consider environmental issues when manufacturing the car scissor jacks.

(i) Give **two** advantages for the environment of being able to recycle the waste metal from the manufacture of the car scissor jacks.

- 1
- 2 **(2)**

(ii) Give **two** reasons why the manufacturer should control the fumes given off during the manufacture of the car scissor jacks.

- 1
- 2 **(2)**

(j) Describe **one** way in which the metal from old car scissor jacks could be re-used.

-
- **(2)**

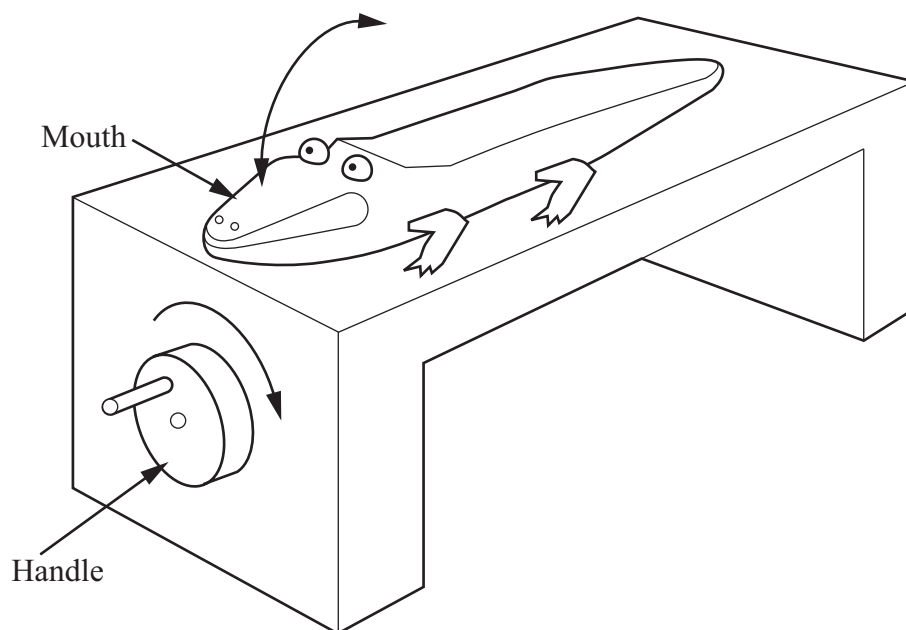
(Total 22 marks)

Q2

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3. A mechanical toy is being designed.



The specification for the mechanical toy is that it must:

- make the crocodile's mouth open and close
 - allow the handle to rotate smoothly
 - be safe and durable
 - be made using materials and processes suitable for one-off production.
- (a) In the spaces opposite, use sketches and, where necessary, brief notes to show **two different** design ideas for the mechanical toy 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 the specification points.

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

(i) The mechanical toy must make the crocodile's mouth open and close.

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

(2)

(ii) The mechanical toy must allow the handle to rotate smoothly.

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

(2)

(iii) The mechanical toy must be safe and durable.

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

(2)

(Total 22 marks)

Q3

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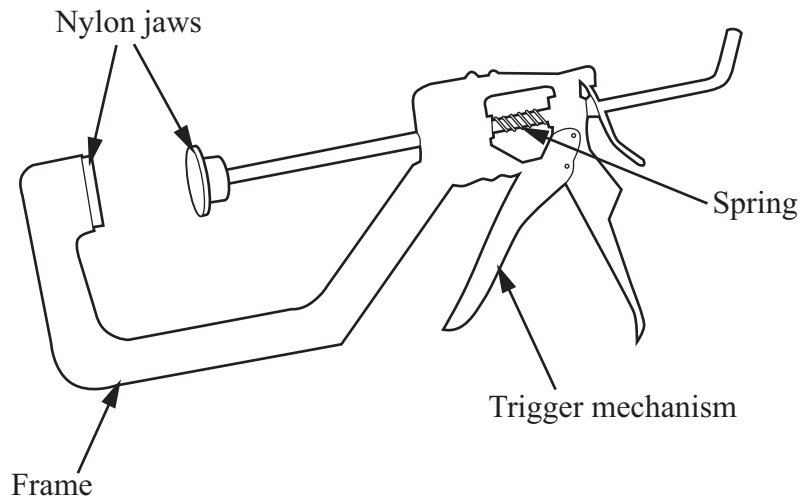


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4. The drawing below shows a workshop clamp.

It is sold in do-it-yourself stores.



(a) Two specification points for the workshop clamp are that it must:

- be able to be used with only one hand
- not cause damage to the work that is being clamped.



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

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

(i) **Quality**

Point

Reason

.....

.....

(2)

(ii) **Environment**

Point

Reason

.....

.....

(2)

(iii) **Safety**

Point

Reason

.....

.....

(2)

(b) The frame is made from mild steel.

One reason for making the frame out of mild steel is that it can be easily joined by welding.

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

1

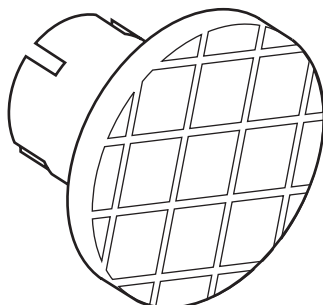
2

(2)



(c) The diagram shows one of the nylon jaws.

The nylon jaws are manufactured using the injection moulding process.



Give **two** reasons why the injection moulding process is suitable for manufacturing the nylon jaws.

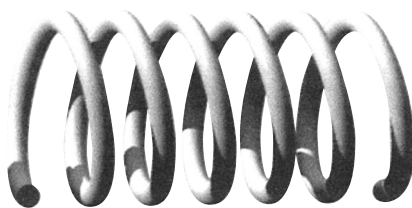
1

2

(2)

(d) The diagram shows a spring.

The spring is made from hardened steel.



Give **two** properties of hardened steel that make it suitable for the spring.

For each property give **one** reason why it makes hardened steel suitable for the spring.

Property 1

Reason

.....

Property 2

Reason

.....

(4)



(e) The manufacturer of the workshop clamp uses sampling during production.

Explain **one** reason for sampling during the manufacture of the workshop clamp.

.....
.....
(2)

(f) The frame is finished by plastic coating.

Explain **one** reason why the frame is finished by using plastic coating.

.....
.....
(2)

(g) Two purposes of the workshop clamp are to:

- be able to be used with only one hand
- not cause damage to the work that is being clamped.

Explain under the following headings, how the workshop clamp achieves these purposes.

(i) Be able to be used with only one hand.

.....
.....
.....
.....
(2)

(ii) Not cause damage to the work that is being clamped.

.....
.....
.....
.....
(2)

Q4

(Total 22 marks)

TOTAL FOR PAPER: 88 MARKS

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