

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

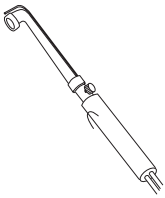
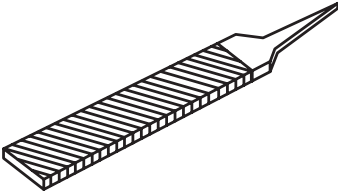
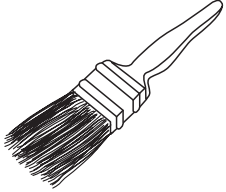
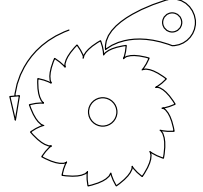
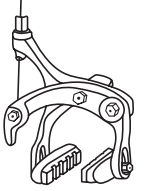
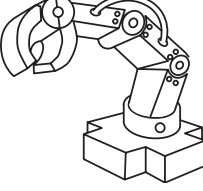
1. The table below shows some tools, equipment and mechanisms.

(a) Complete the table by

(i) naming each tool, piece of equipment or mechanism

(ii) describing its use

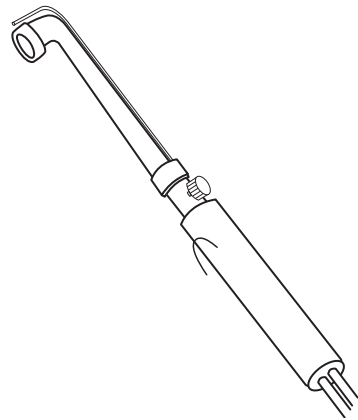
The first one has been done for you.

Tool/Equipment/Mechanism	Name	Use
	Brazing torch	Hard soldering metals together
		
		
		
		
		

(10)



(b) The drawing below shows a brazing torch. It is used for hard soldering or brazing.



One safety precaution when using a brazing torch is 'do not wave the torch around'.

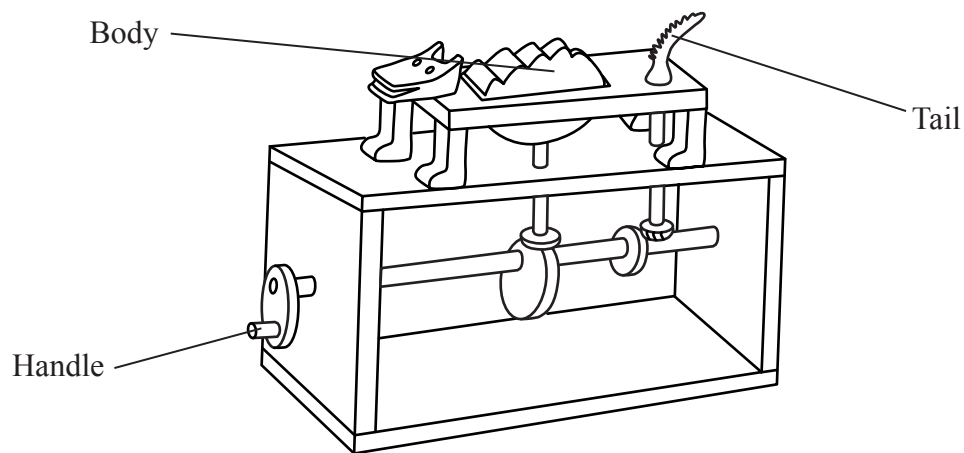
Give **two other** safety precautions when using a brazing torch.

1

2

(2)

(c) The drawing below shows a child's mechanical toy.
The body and tail of the animal move when the handle is turned.



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)



Leave blank

(d) A barcode on the package of a mechanical product stores different pieces of digital information about the product.
An EPOS till is used to read this information.

A barcode is shown below.



Mark with a cross (☒) **three** pieces of information which are stored within a barcode of a mechanical product and can be scanned and read by an EPOS till.

- | | | | | | |
|---------------------|--------------------------|--------------|--------------------------|----------------------|--------------------------|
| Store name | <input type="checkbox"/> | Battery size | <input type="checkbox"/> | Selling price | <input type="checkbox"/> |
| Product description | <input type="checkbox"/> | Components | <input type="checkbox"/> | Stock control number | <input type="checkbox"/> |
- (3)

(e) A prototype of a mechanical product will be made before it is batch produced.

Give **two** reasons for prototyping a mechanical product.

- 1
- 2 (2)

(f) Computer Integrated Manufacture (CIM) is used by manufacturers when making mechanical products.

Describe **one** task carried out using CIM.

.....

.....

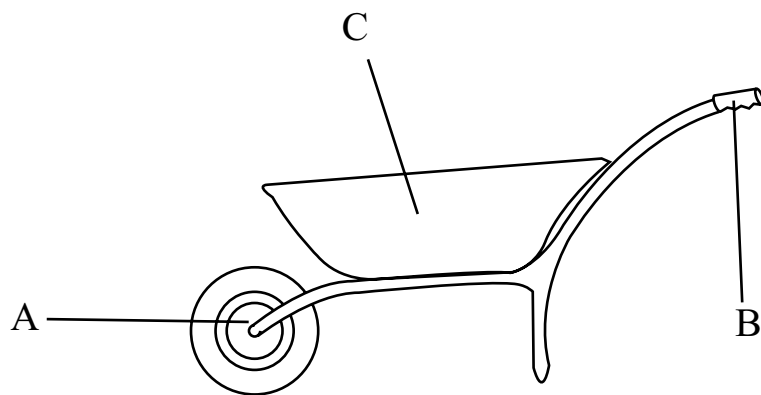
..... (2)

(Total 22 marks)

Q1



2. (a) The drawing below shows a wheelbarrow.



(i) In the table below, mark with a cross (☒) the correct term for parts A, B and C.

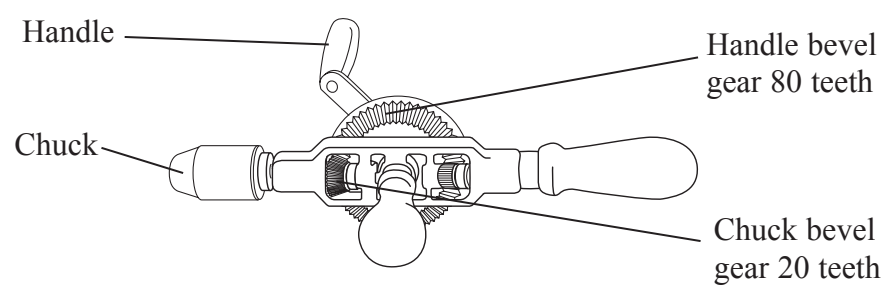
Part	Term					
A	Effort	<input type="checkbox"/>	Load	<input type="checkbox"/>	Fulcrum	<input type="checkbox"/>
B	Effort	<input type="checkbox"/>	Load	<input type="checkbox"/>	Fulcrum	<input type="checkbox"/>
C	Effort	<input type="checkbox"/>	Load	<input type="checkbox"/>	Fulcrum	<input type="checkbox"/>

(3)

(ii) Identify the class of lever used in the wheelbarrow.

.....
(1)

(b) The drawing below shows a hand drill.



(i) The hand drill uses bevel gears to drive the chuck.

Describe how the bevel gears drive the chuck when the handle is turned.

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



- (ii) Calculate the speed of the chuck gear if the handle is turned at 100 rpm. There are 80 teeth on the handle gear and 20 teeth on the chuck gear.

Use the formula

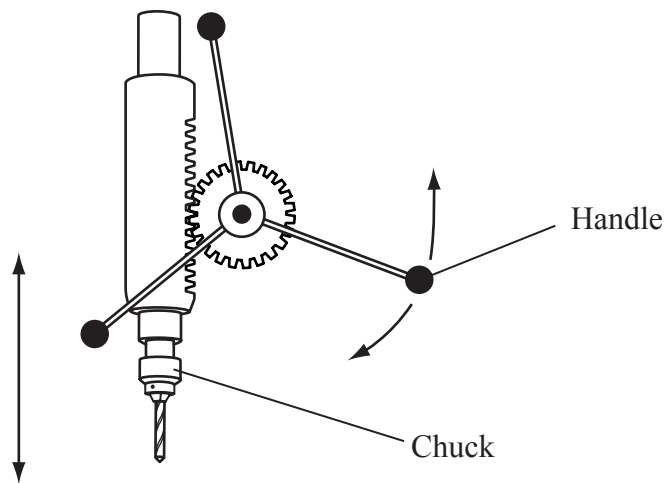
$$\text{chuck speed} = \text{handle speed} \times \frac{\text{number of teeth on handle gear}}{\text{number of teeth on chuck gear}}$$

.....

Chuck speed = Number Unit

(2)

- (c) The drawing below shows a gear system used in a pillar drill. The gear system is used to move the chuck up and down.



- (i) Name the gear system used to move the chuck up and down.

.....

(1)

- (ii) The handle is used to give the input to the gear system.

Give the technical term for this motion.

.....

(1)

- (iii) The up and down movement of the chuck is the output of this gear system.

Give the technical term for this motion.

.....

(1)



(d) Product reliability and safety are important for mechanical toys.

(i) Not being able to over-wind a clockwork toy is an example of where product reliability is important.

Give **one** reason why not being able to over-wind a clockwork toy is important for the user.

.....
(1)

(ii) Safety must be considered when designing a clockwork toy.

Give **one** function of a clockwork toy where safety is important for the user.

Function

Give **one** reason why the safety of this function is important for the user.

Reason

(2)

(e) Using fibreglass to make the cases for mechanical toys has many advantages.

Give **three** advantages of using fibreglass to make cases for mechanical toys.

1

2

3

(3)



BLANK PAGE



3. A company makes pull-along toys for children.

A new design is needed.

The specification for the new pull-along toy is that it must:

- have axles that rotate smoothly
- have a figure that moves up and down when the toy is pulled along
- have wheels fixed securely to the axles
- be made from 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 new pull-along 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

Leave
blank

(8)

Design Idea 2

(8)



Leave blank

(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 pull-along toy must have axles that rotate smoothly.

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

(2)

(ii) The pull-along toy must have wheels fixed securely to the axles.

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

(2)

(iii) The pull-along toy must be made from materials and processes suitable for one-off production.

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

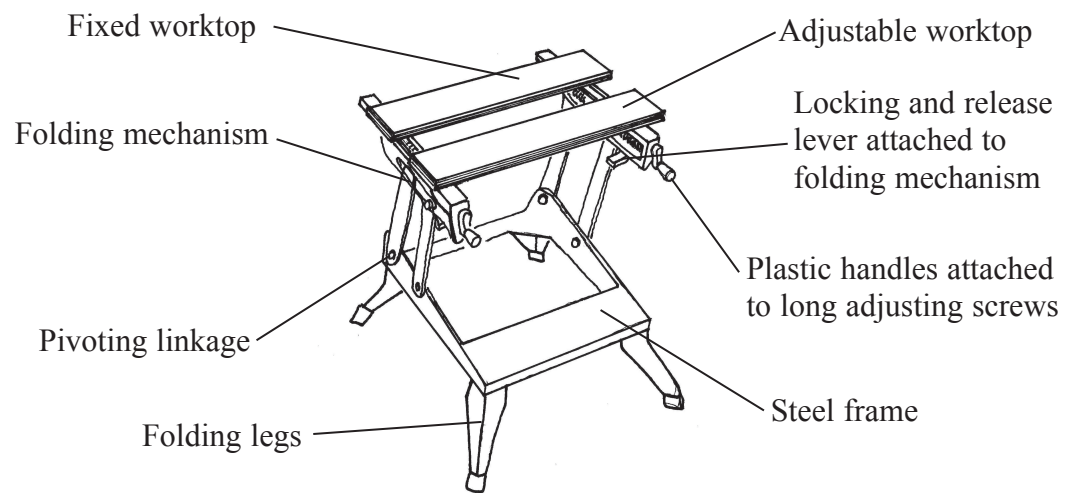
(2)

(Total 22 marks)

Q3



4. The drawing below shows details of a DIY workbench.



(a) Two specification points for the DIY workbench are that it must:

- fold for storage
- be able to clamp different sizes of material

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

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

(i) **Market**

Point

Reason

(2)

(ii) **Quality**

Point

Reason

(2)

(iii) **Environment**

Point

Reason

(2)



(b) The frame of the workbench is made from steel.
One reason for using steel is that it can be finished using a plastic coating.

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

1

2

(2)

(ii) Give **two** reasons why plastic coating is a suitable finish for the frame.

1

2

(2)

(c) The worktops are made from 20 mm thick plywood. Plywood is made from several layers of wood glued together.

Give **two** properties of plywood that make it more suitable for the worktops than a single piece of solid wood.

For each property, give **one** reason why it makes plywood suitable.

Property

Reason

Property

Reason

(4)

(d) Quality control checks are carried out at important stages during the manufacture of the DIY workbench.

Name **two** important quality control checks that should be carried out during the manufacture of the DIY workbench.

1

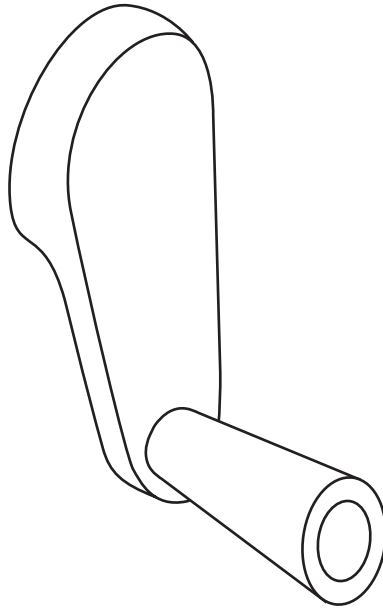
2

(2)



- (e) The plastic handles are made in high volume from a thermoplastic using the injection moulding process.
The shape of the handles makes them suitable to be made from a thermoplastic.

The drawing below shows a thermoplastic handle.



Describe **one** way in which the shape of the handle makes it suitable to be made from a thermoplastic.

.....
.....

(2)

TURN OVER FOR QUESTION 4(f)



Leave blank

(f) Two purposes of the DIY workbench are that it must:

- fold for storage
- be able to clamp different sizes of material

Explain, under the following headings, how the DIY workbench achieves these purposes.

(i) Fold for storage.

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

(2)

(ii) Be able to clamp different sizes of material.

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

(2)

Q4

(Total 22 marks)

TOTAL FOR PAPER: 88 MARKS

END

