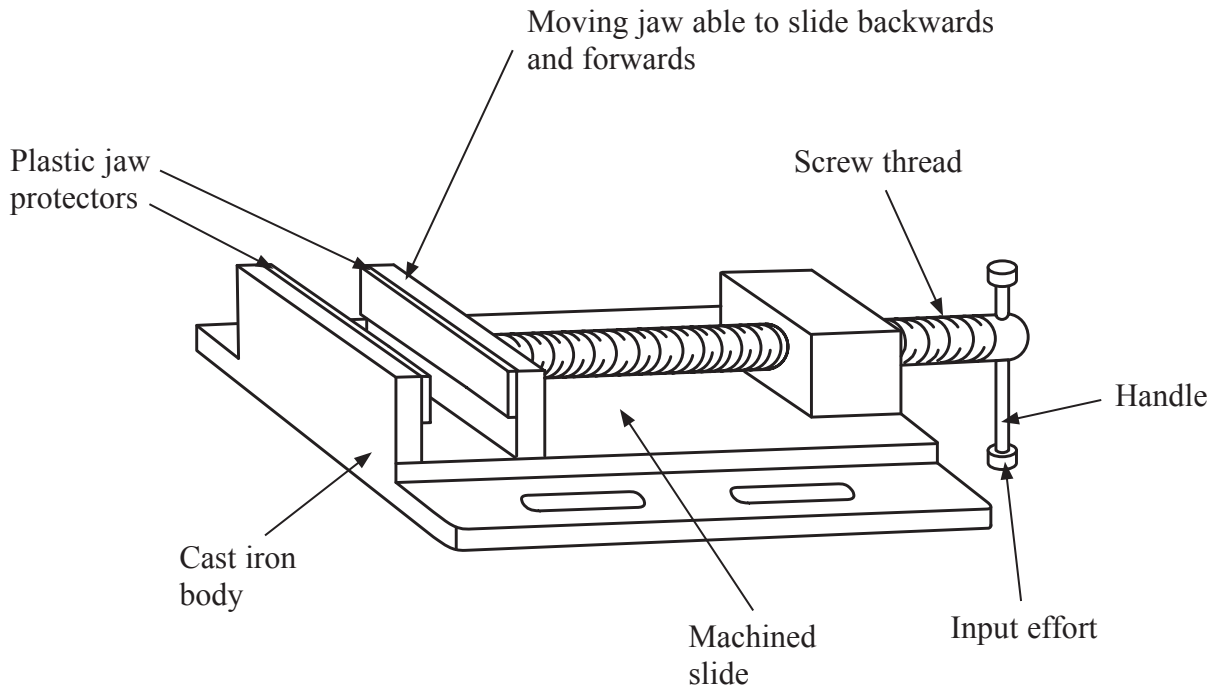




Answer ALL the questions. Write your answers in the spaces provided.

1. 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)

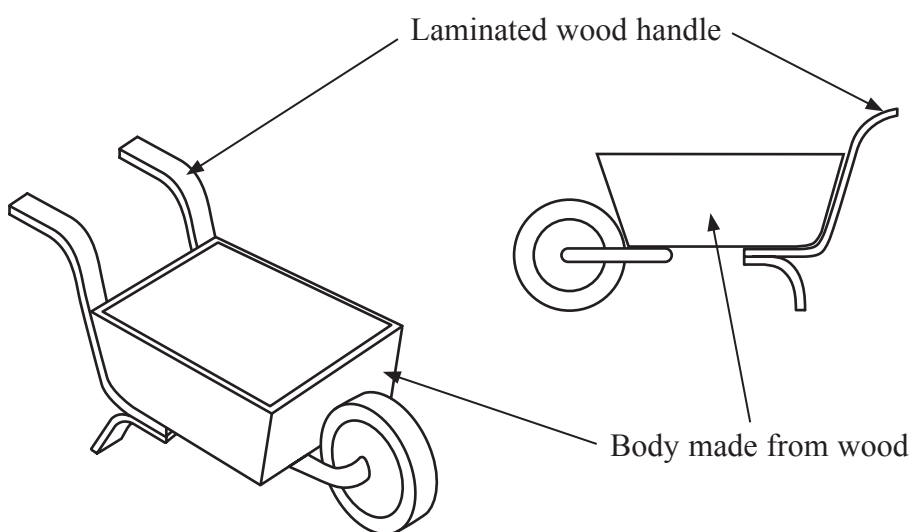
**(Total 22 marks)**

Q1

|  |  |
|--|--|
|  |  |
|--|--|



2. The drawings below show a wheelbarrow.



(a) (i) Each handle is made from laminated wood.

Give **two** reasons for using laminated wood to make each handle rather than a single piece of wood.

1 .....

2 .....

(2)

(ii) Name **two** finishing processes that could be applied to the laminated wood handles.

1 .....

2 .....

(2)

(b) State **one** mechanical effect lengthening the handles would have upon the use of the wheelbarrow.

.....

(1)

(c) The wheel of the wheelbarrow has a steel axle which turns on a bearing.

Name **two** materials from which it is suitable to make the bearing.

1 .....

2 .....

(2)



(d) The manufacturer of the wheelbarrow is considering using steel or glass reinforced plastic (GRP) for the body instead of wood.

(i) Give **one** advantage and **one** disadvantage of using steel for the body of the wheelbarrow instead of wood.

Advantage of steel .....

Disadvantage of steel .....

**(2)**

(ii) Give **one** advantage and **one** disadvantage of using GRP for the body of the wheelbarrow instead of wood.

Advantage of GRP .....

Disadvantage of GRP .....

**(2)**

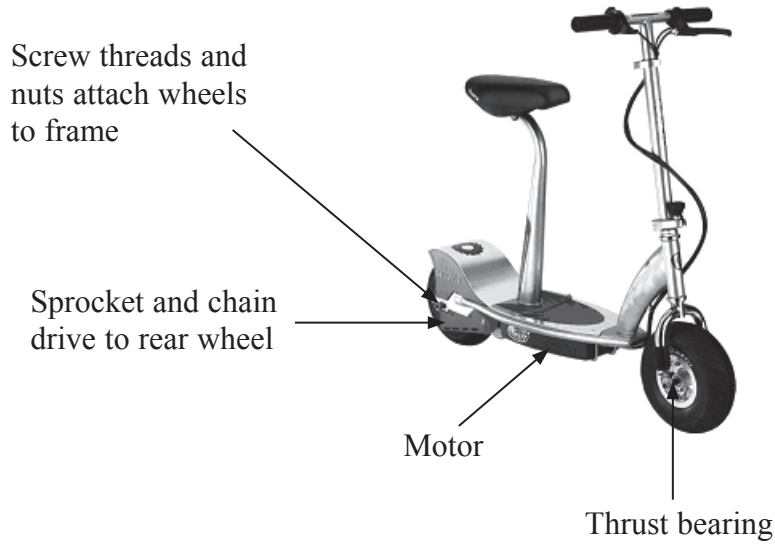
**Q2**

**(Total 11 marks)**

|  |  |
|--|--|
|  |  |
|--|--|



3. The drawing below shows an electric scooter.



(a) The front wheel of the scooter is fitted with a thrust bearing.

Give **two** reasons why the front wheel of the scooter is fitted with a thrust bearing.

1 .....

2 .....

**(2)**

(b) Screw threads and nuts are used to attach the wheels to the frame.

Explain **one** reason why screw threads and nuts are used to attach the wheels to the frame.

.....

.....

.....

**(2)**





(c) A sprocket and chain mechanism is used to drive the rear wheel from the motor.

(i) Explain **two** reasons why a sprocket and chain is used in preference to a pulley and V belt drive between the motor and rear wheel.

1 .....

.....

2 .....

.....

(4)

(ii) A key and keyway are used to fix the sprocket to the drive shaft.

Give **one** reason why a key and keyway is a suitable method of fixing the sprocket to the drive shaft.

.....

(1)

(d) The motor sprocket has 18 teeth and the rear wheel sprocket has 54 teeth.

Use the following formula to calculate the velocity ratio of this arrangement.  
(Show all working out.)

$$\text{Velocity ratio} = \frac{\text{Number of teeth on driven sprocket}}{\text{Number of teeth on driver sprocket}}$$

.....

.....

.....

(2)

Q3

(Total 11 marks)

**TOTAL FOR PAPER: 44 MARKS**

**END**



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