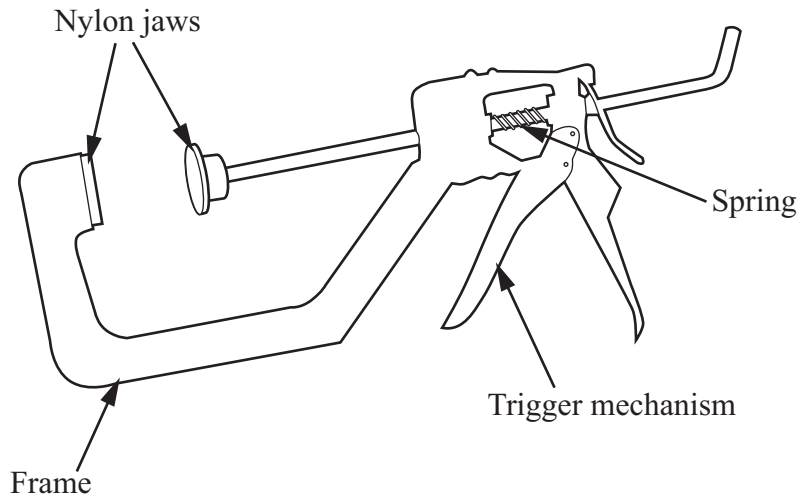




Answer ALL the questions. Write your answers in the spaces provided.

1. 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 .....

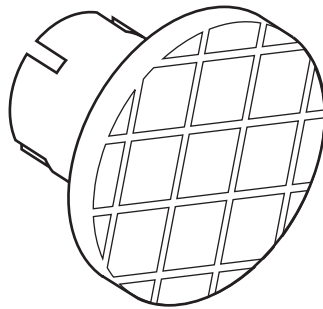
2 .....

**(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.

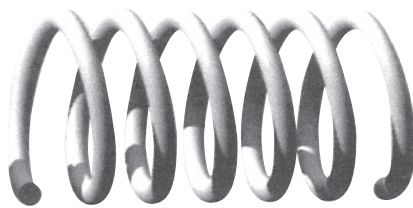
1 .....

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)

(Total 22 marks)

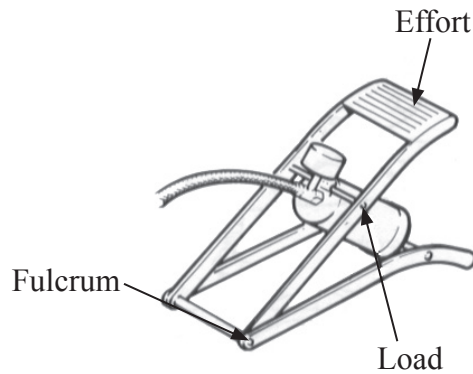
Q1

--	--



2. The drawing below shows a foot pump.

The foot pump is an example of a lever.



(a) Name this class of lever.

..... (1)

(b) The fulcrum of the foot pump is made from brass.

Give **two** properties of brass that make it suitable for the fulcrum.

1 .....  
2 ..... (2)

(c) The frame of the foot pump is made from mild steel.

(i) Other than plastic dip coating, name **two** suitable finishes that can be applied to the mild steel frame.

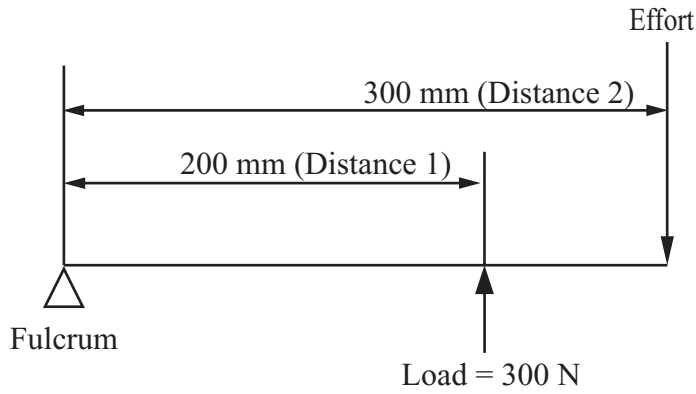
1 .....  
2 ..... (2)

(ii) Give **three** reasons for applying a finish to the mild steel frame.

1 .....  
2 .....  
3 ..... (3)



(d) A line diagram of the foot pump is shown below.



The load on the foot pump is 300 N.

Calculate the effort required to balance the 300 N load using the formula:

$$\text{Effort} = \frac{\text{Load} \times \text{Distance 1}}{\text{Distance 2}}$$

Show your working out.

.....

.....

.....

.....

.....

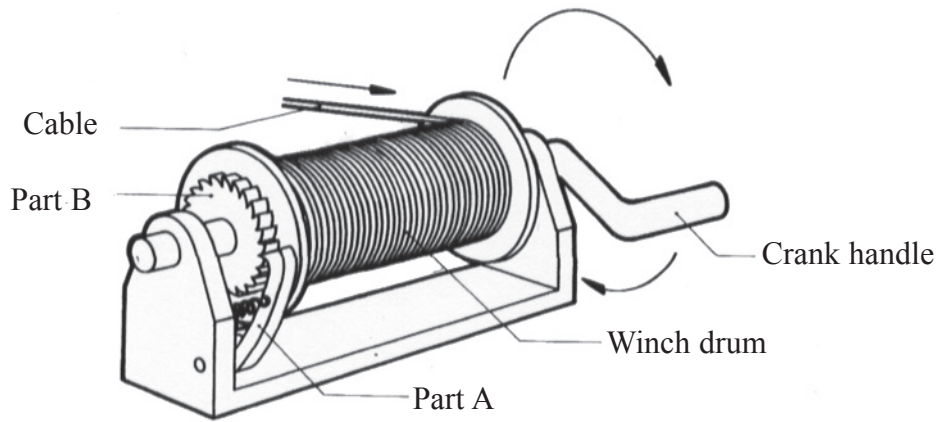
(3)

Q2

(Total 11 marks)



3. The drawing below shows a winch mechanism.



(a) Name the type of motion made by the crank handle.

..... (1)

(b) (i) Name the parts labelled A and B on the winch.

Part A .....

Part B ..... (2)

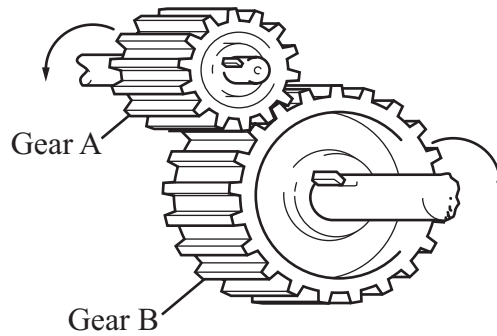
(ii) Describe the working action of parts A and B as the crank handle is rotated.

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





- (c) A second mechanism, shown below, could be added to the winch in order to increase the velocity ratio (V.R.).



- (i) Name the type of mechanism shown above.

..... (1)

- (ii) Gear A, the driver gear, has 14 teeth. Gear B, the driven gear, has 21 teeth.

Calculate the velocity ratio (V.R.)

$$\text{V.R.} = \frac{\text{number of teeth on driven}}{\text{number of teeth on driver}}$$

..... (2)

- (iii) A new gearing system is introduced which has a V.R. of 5:2. The input rotational speed is 125 rpm.

Calculate the output speed of the new gearing system.

..... (2)

- (iv) Name **one** other type of mechanism that could be used to increase the V.R.

..... (1)

Q3

(Total 11 marks)

TOTAL FOR PAPER: 44 MARKS

END



**BLANK PAGE**



**BLANK PAGE**



**BLANK PAGE**

