testbase

KS3 Pressure

Question Paper

Name: _____

Class: _____

Date: _____

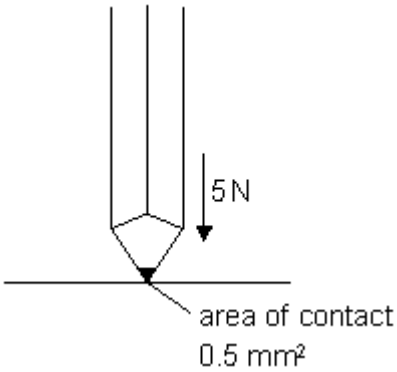
Time: **36 minutes**

Marks: **47 marks**

Comments:

1. Jenny is doing her homework.

(a) When Jenny writes, the pencil exerts a force of 5N on the paper.



not to scale

The area of the pencil in contact with the paper is 0.5 mm^2.

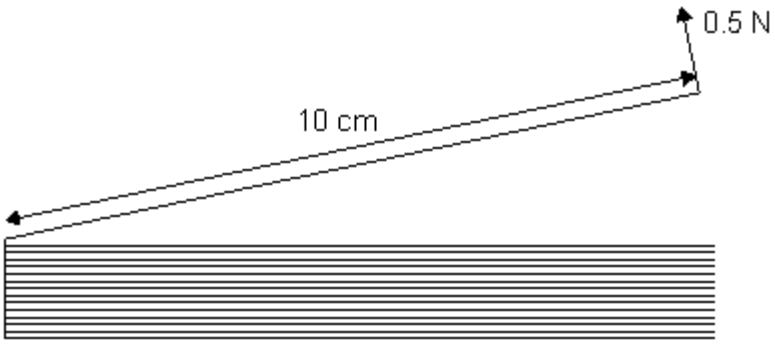
Calculate the pressure of the pencil on the paper.
Give the unit.

.....

.....

2 marks

(b) Jenny puts a book on her desk.
She lifts the cover up with her finger, using a force of 0.5 N.
The cover is 10 cm wide.



Calculate the turning moment on the cover of the book.
Give the unit.

.....

.....

2 marks

(c) Jenny's book has an area of 200 cm ^{2}.
It exerts a pressure of 0.05 N/cm^2 on the desk.

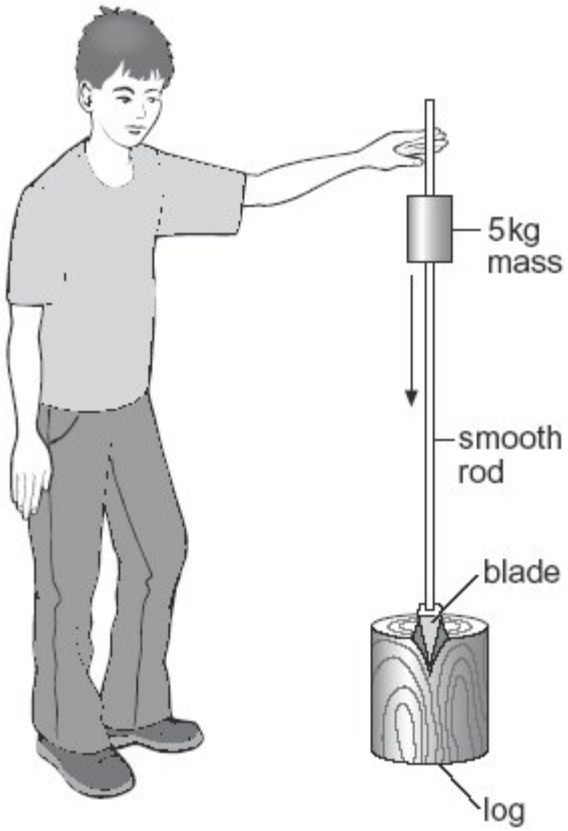
What is the weight of the book?
Use the space below to show your working.

_____ N

2 marks
maximum 6 marks

2. David uses a falling mass to split wooden logs.

The 5 kg mass slides down the rod and hits the metal blade.
The force on the blade splits the log.



(a) To lift the mass David uses energy stored in his muscles.

What energy transfer occurs when David's muscles lift the mass?

from ..... energy in his muscles to

gravitational potential energy of the mass

1 mark

(b) David lifts the mass. The mass gains 50 J of gravitational potential energy. The falling mass changes this energy into kinetic energy.

(i) As it falls, what is the maximum amount of energy the mass can change from gravitational potential energy to kinetic energy?

..... J

1 mark

(ii) Not all the gravitational potential energy is transferred to kinetic energy as the mass falls.
Give one reason for this.

.....

.....

1 mark

(c) Give **two** ways David can increase the kinetic energy of the mass just before it hits the blade.

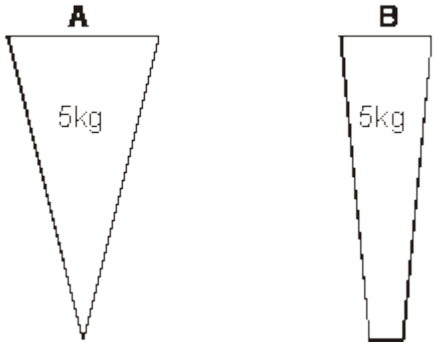
1. .....

1 mark

2. .....

1 mark

(d) David can use a different blade to split the logs.
The diagram below shows two different blades **A** and **B**.



The formula for pressure is: $\text{pressure} = \frac{\text{force}}{\text{area}}$

Which blade puts more pressure on the log?
Write the letter.

.....

Explain your answer in terms of area. Use the formula to help you.

.....

.....

1 mark
maximum 6 marks

3. Diagram **A** represents a gas in a container.
The gas can be compressed by moving the piston to the right.

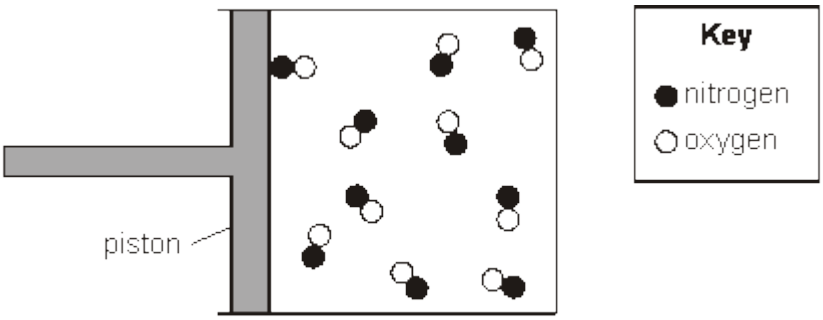


diagram A

(a) (i) How can you tell that the substance in the container is a gas?

.....

.....

1 mark

(ii) How can you tell from the diagram that the gas is pure?

.....

.....

1 mark

(b) The piston is moved to the right as shown in diagram **B**.

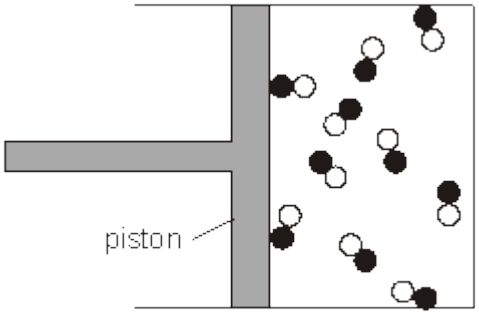


diagram B

How can you tell, from diagram **B**, that the pressure of the gas has increased?

.....

.....

1 mark

(c) Diagram **C** shows what happened to the molecules after the gas was compressed more.

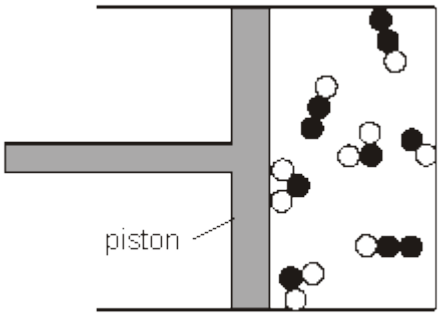


diagram C

(i) How can you tell that a chemical reaction happened when the gas was compressed?

.....

.....

1 mark

(ii) The mass of the gas in both diagrams **B** and **C** was 0.3 g.

Why did the mass of the gas **not** change when it was compressed?

.....

.....

1 mark

(iii) Complete the table below with the correct chemical formula of each substance. Use the key to help you.

substance	formula
●○	
●●○	
	

Key
● nitrogen
○ oxygen

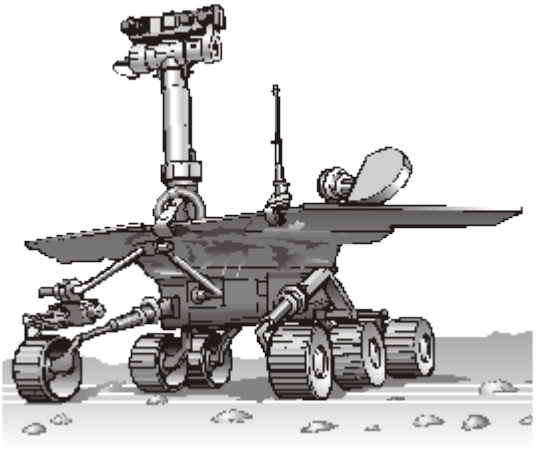
1 mark

(iv) What is the **name** of the substance represented by the symbol ●○?

.....

1 mark
maximum 7 marks

4. The drawing below shows a space buggy on the surface of Mars.



(a) The distance between Earth and Mars is 192 000 000 km.

It took a spacecraft 200 days to take the buggy from Earth to Mars.

Calculate the speed at which the spacecraft travelled.

Give the unit.

.....

.....

2 marks

(b) The weight of the buggy was 105 N on Earth and 40 N on Mars.

Why was the weight of the buggy less on Mars than on Earth?

.....

.....

1 mark

(c) The buggy uses solar panels to generate electrical energy.

The solar panels generate less electrical energy on Mars than on Earth.

Give a reason why.

.....

.....

1 mark

(d) The weight of the buggy was 40 N on Mars.
When the buggy landed on Mars it rested on an area of 0.025 m^2.

Calculate the pressure exerted by the buggy on the surface of Mars.

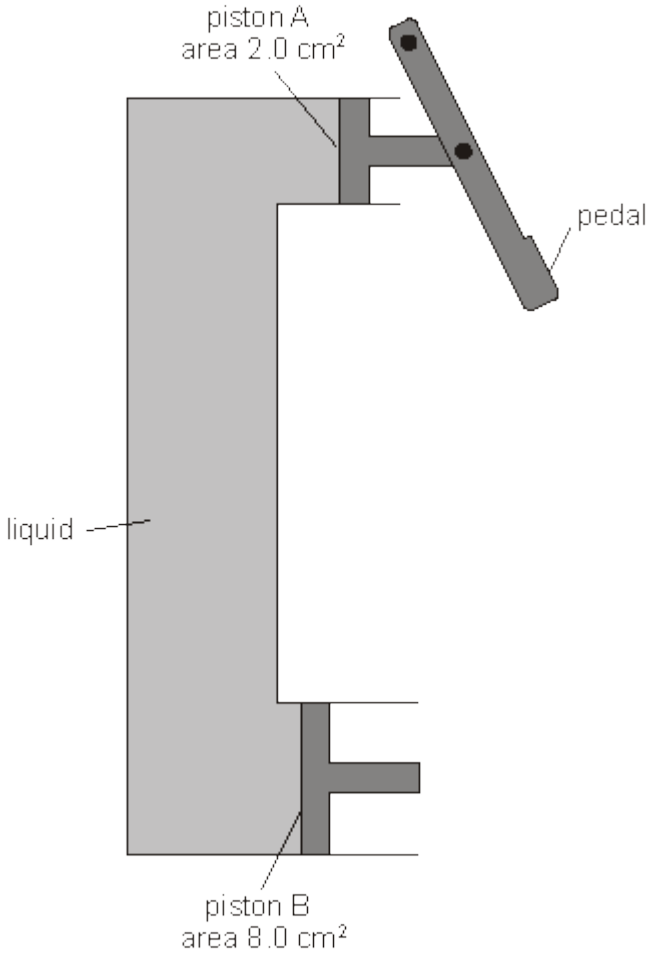
Give the unit.

.....

.....

2 marks
maximum 6 marks

5. The diagram below shows a container filled with a liquid.



At each end of the container there is a piston.
Piston A has a smaller area than piston B.

(a) (i) Rebekah pushes on the pedal. This produces a force of 200 N on piston A.

Calculate the pressure that piston A exerts on the liquid.
Give the unit.

.....

.....

2 marks

(ii) The liquid in the container exerts the same pressure on piston B.

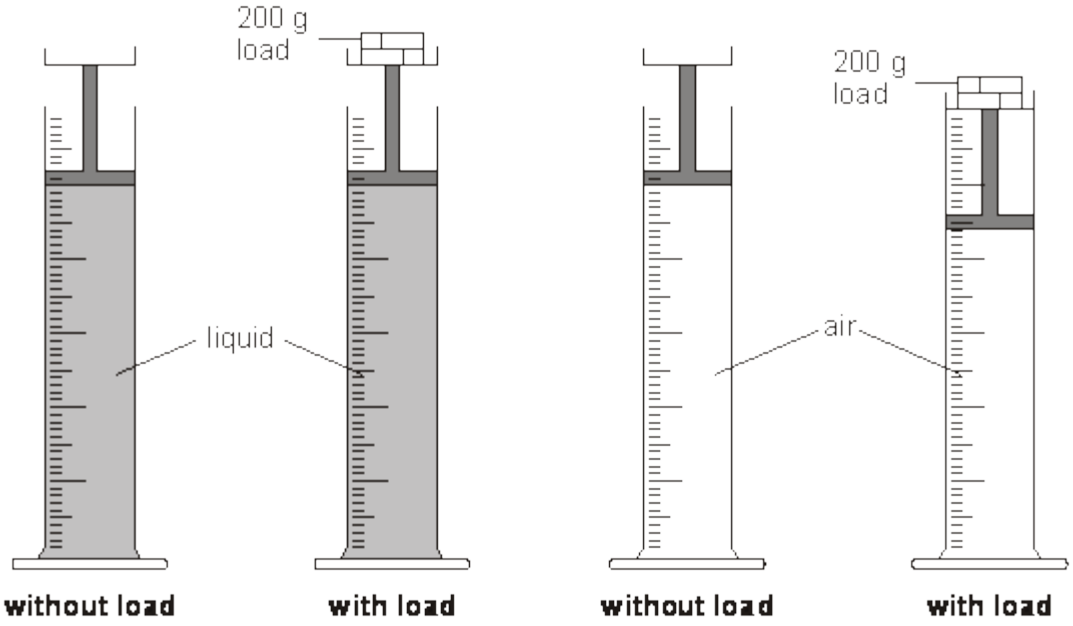
Use this pressure to calculate the force on piston B.

.....

..... N

1 mark

(b) Rebekah set up a different experiment as shown below.
She measured the volume of the liquid and the air in the cylinders before and after a 200 g load was added to the piston.



(i) When the loads were added to the pistons, the volume of the liquid did **not** change but the volume of the air decreased.

Explain why this happened.

.....

.....

1 mark

(ii) The diagram on the opposite page represents the way the brake system of a car works.
The brake pedal pushes piston A.
Piston B pushes the brakes on.

If air bubbles get into the liquid, the brakes do **not** work properly.
Explain why.
Use the diagrams above to help you.

.....

.....

1 mark
maximum 5 marks

6. Tom tries on four types of footwear in a sports shop.

ski boot

trainer

ice skate

walking boot

(a) (i) When Tom tries on the footwear, which one sinks into the carpet the most?

.....

1 mark

(ii) When Tom tries on the footwear, what is the same for each type of footwear? Tick the correct box.

the area of the footwear	☐
Tom's weight on the footwear	☐
the material of the footwear	☐
the weight of the footwear	☐

1 mark

(b) The drawing below shows a snowshoe.

How do snowshoes help people to walk in deep snow?

.....

.....

1 mark

(c) Choose the correct word from the list to complete the sentence below.

air resistance **friction** **gravity** **magnetism**

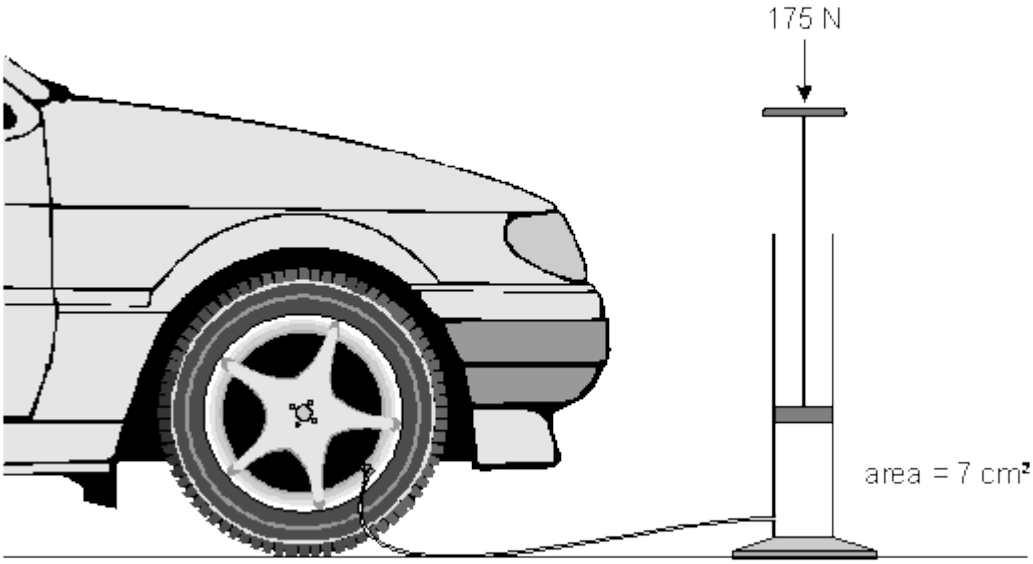
When Tom is ice skating the force of .....

between the skate and the ice is less than when he is walking on a carpet.

1 mark

Maximum 4 marks

7. Karen wants to pump up her car tyre.
Her pump has a piston with an area of 7 cm^2.



Karen pushes the handle down with a force of 175 N.

(a) What pressure does she exert on the air in the pump?

.....

..... N/cm^2

1 mark

(b) The air pressure in the tyre is 27 N/cm^2.
What pressure would be needed **in the pump** in order to pump more air into the tyre?

.....

.....

1 mark

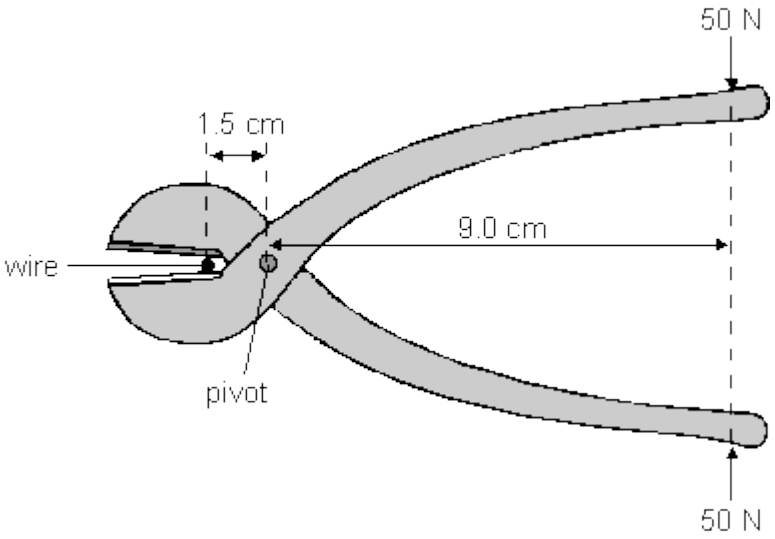
(c) Another of Karen's car tyres exerts a pressure of 30 N/cm^2 on the road. The area of the tyre in contact with the road is 95 cm^2
What is the force exerted by the tyre on the road?

..... N

1 mark

Maximum 3 marks

8. (a) James is cutting a piece of wire with a pair of wire cutters.



James exerts a force of 50 N on each of the handles.

(i) What is the turning moment about the pivot, on **each** handle?
Give the unit.

.....

.....

2 marks

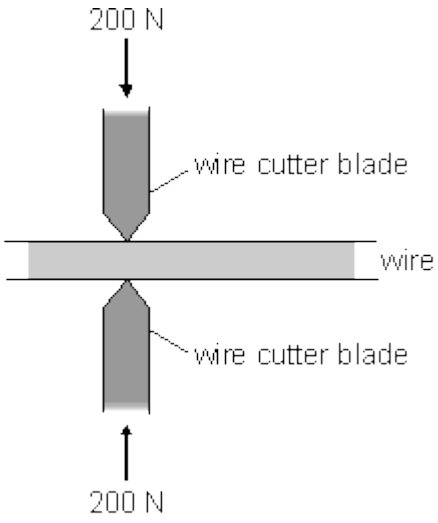
(ii) What force is applied, by **each** blade, on the wire?

.....

..... N

1 mark

(b) Stephanie uses the same pair of wire cutters. The diagram below is an end-on view of the blades as they begin to cut the wire.



Stephanie exerts a force of 200 N on the wire with each blade.
The area of contact of each blade on the wire is 0.0005 cm^2.

(i) What is the pressure of **each** blade on the wire? Give the unit.

.....

.....

2 marks

(ii) As the blades sink deeper into the wire, the pressure of the blades on the wire decreases.
Explain why the pressure on the wire decreases.

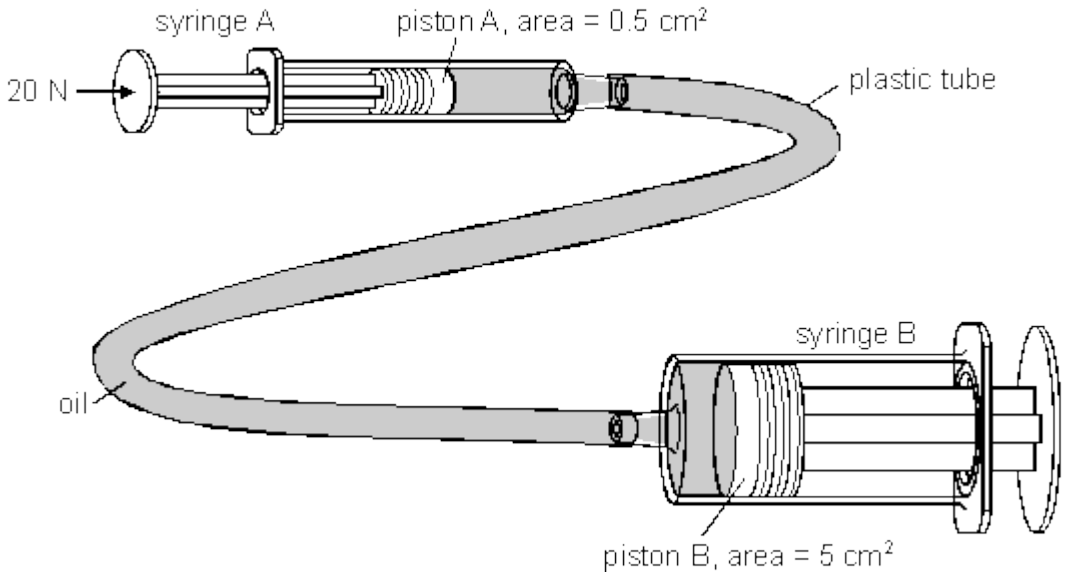
.....

.....

1 mark

Maximum 6 marks

9. (a) Two syringes are connected together as shown in the diagram below.



A force of 20 N is applied to the piston in syringe A.

(i) Calculate the pressure that the piston in syringe A exerts on the oil. Give the units.

… .

… .

1 mark

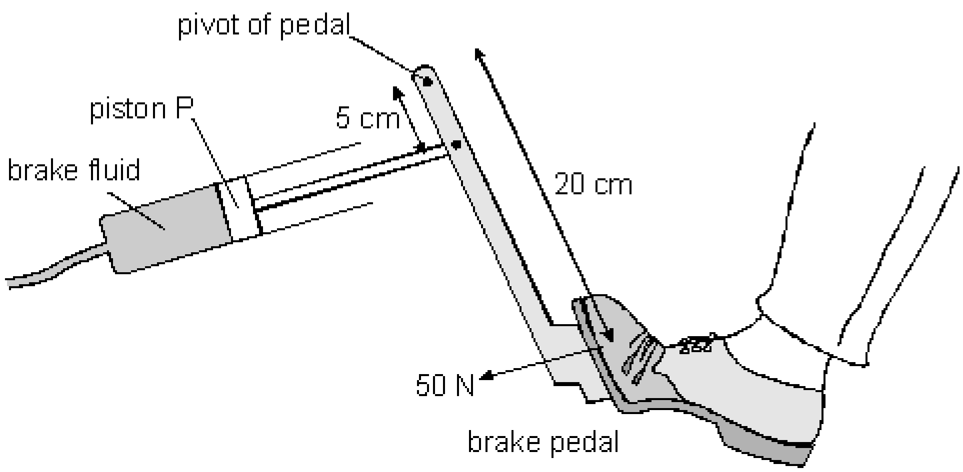
(ii) Calculate the force needed to just prevent the piston in syringe B from moving out. Give the unit.

… .

… .

1 mark

(b) The diagram below shows the brake pedal used to operate the brakes in a car. The foot applies a force of 50 N.



(i) Calculate the force applied to the piston P. Give the unit.

… .

… .

1 mark

(ii) The brake fluid pushes another piston, Q, which is attached to the car's brakes. Piston Q has an area which is eight times larger than piston P.

Calculate the force on the car's brakes. Give the unit.

… .

… .

1 mark

Maximum 4 marks