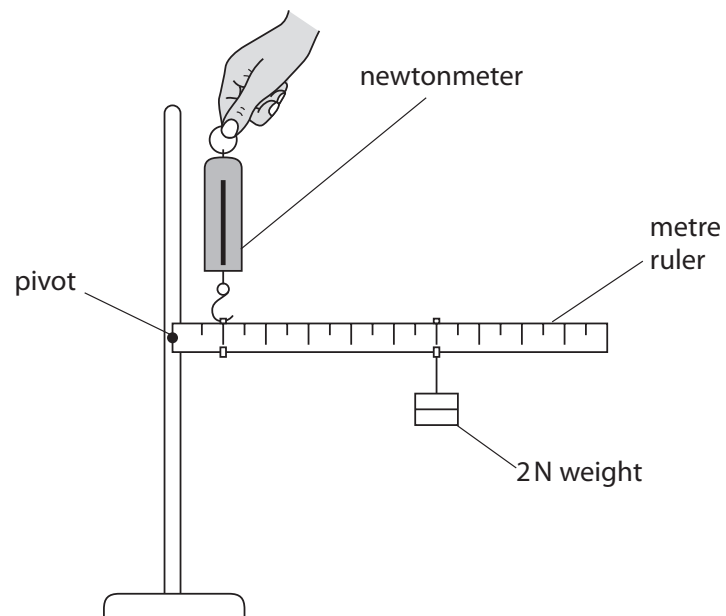


- 4 The diagram shows the apparatus used to investigate moments.



The 2 N weight is placed 60 cm from the pivot.

The newtonmeter is placed 10 cm from the pivot.

- (a) (i) State the equation linking moment, force and perpendicular distance from the pivot.

(1)

- (ii) Calculate the reading on the newtonmeter.

Ignore the weight of the ruler.

(3)

reading = N

(b) The metre rule is replaced by an iron bar.

The iron bar is 1 m long and has a weight of 10 N.

The newtonmeter and the 2 N weight stay in their original position.

Explain how this change affects the reading on the newtonmeter.

(3)

.....

.....

.....

.....

.....

.....

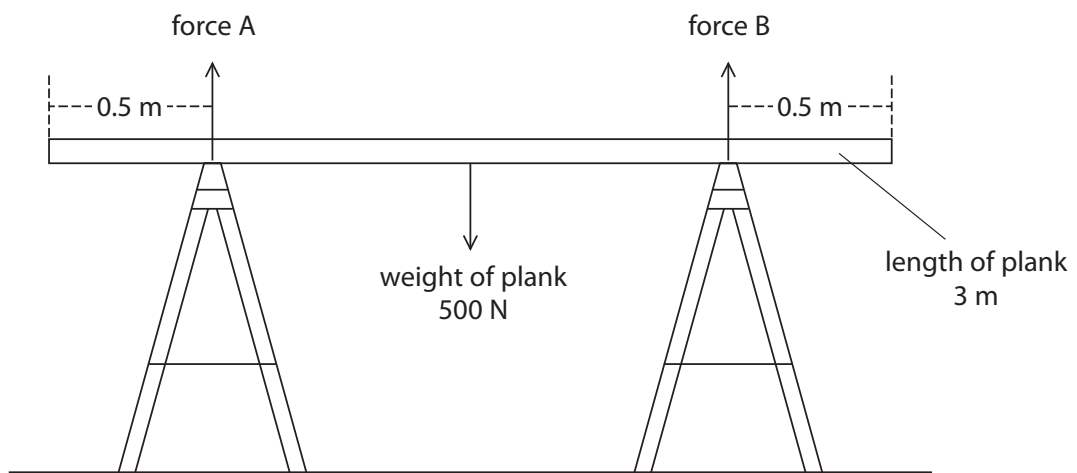
(Total for Question 4 = 7 marks)

5 (a) Which of these is a unit for the moment of a force?

(1)

- ☐ A N
- ☐ B Nm
- ☐ C N/m
- ☐ D N/m²

(b) A painter sets up a uniform plank so he can paint a wall.



The plank is 3 m long and weighs 500 N.

(i) Use the principle of moments to show that the upward force A is 250 N.

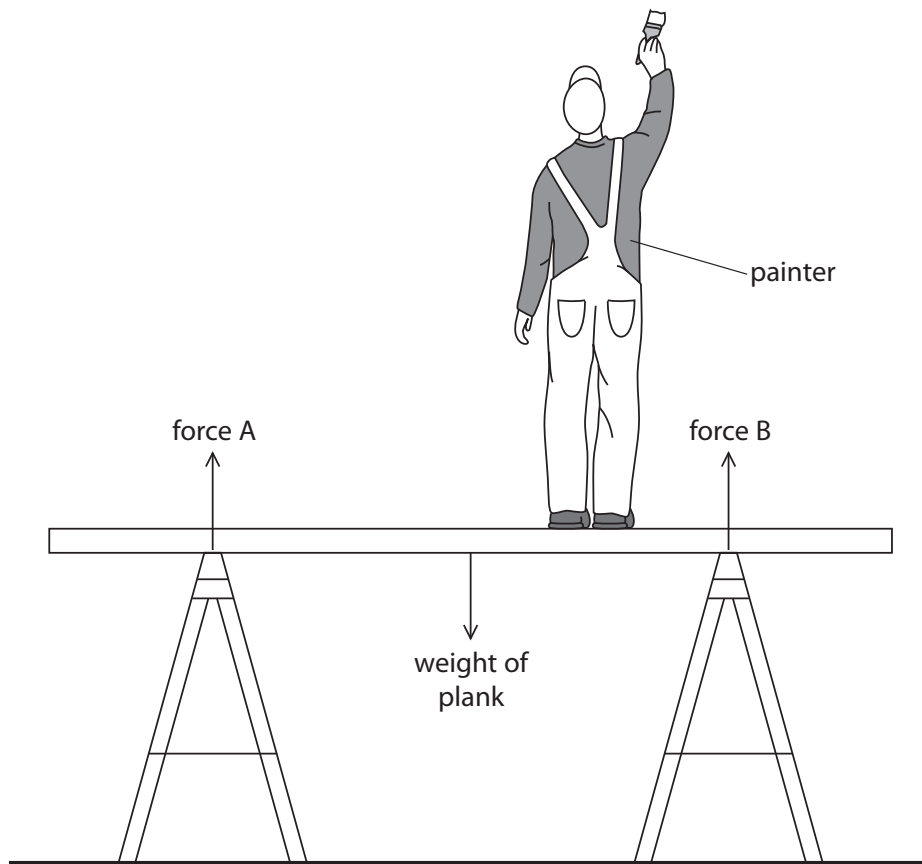
(4)

(ii) State the value of force B.

(1)

force B =N

(c) The painter stands on the plank as shown.



(i) Draw an arrow on the diagram to show the weight of the painter.

(1)

(ii) Describe the changes in forces A and B when the painter stands on the plank.

(2)

.....

.....

.....

.....

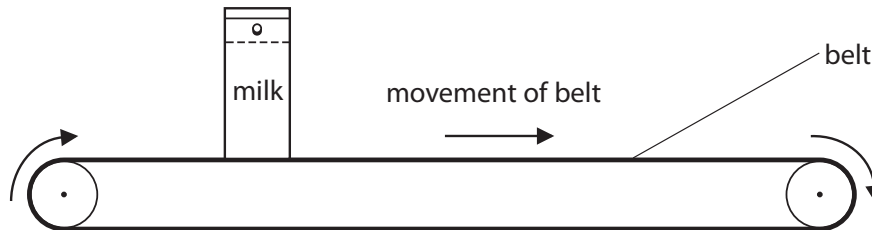
.....

.....

(Total for Question 5 = 9 marks)

- 1 Supermarkets use conveyer belts to move shopping at the till.

The diagram shows a carton of milk being pulled along by a horizontal conveyer belt.



The horizontal force on the carton from the belt is 1.7 N.

The carton moves a distance of 0.46 m.

- (a) (i) State the equation linking work done, force and distance.

(1)

- (ii) Calculate the work done moving the carton.

(2)

Work done = J

- (iii) State how much energy is transferred to the carton.

(1)

Energy transferred = J

(b) The belt stops suddenly and the carton falls over.



(i) How does this affect the kinetic energy of the carton?

(1)

.....

.....

(ii) Why does falling over reduce the gravitational potential energy of the carton?

(1)

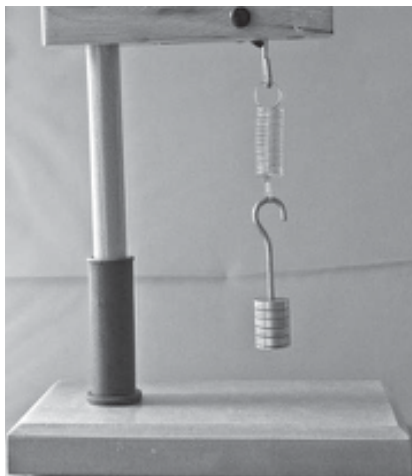
.....

.....

.....

(Total for Question 1 = 6 marks)

- 1 A student investigates whether a spring obeys Hooke's law.
She uses the apparatus shown in the photograph.



- (a) Which additional measuring instrument does the student need for the investigation?

(1)

- (b) Explain how the student can investigate whether the spring obeys Hooke's law.

(5)

(Total for Question 1 = 6 marks)

2 An underground train enters a station.



© Tom Page

(a) The mass of the train and its passengers is 250 000 kg.

The total kinetic energy is 18 MJ.

(i) State the relationship between kinetic energy (KE), mass and velocity.

(1)

(ii) Calculate the velocity of the train as it enters the station.

(3)

velocity = m/s

(iii) The driver applies the brakes to stop the train.

State what happens to the kinetic energy of the train.

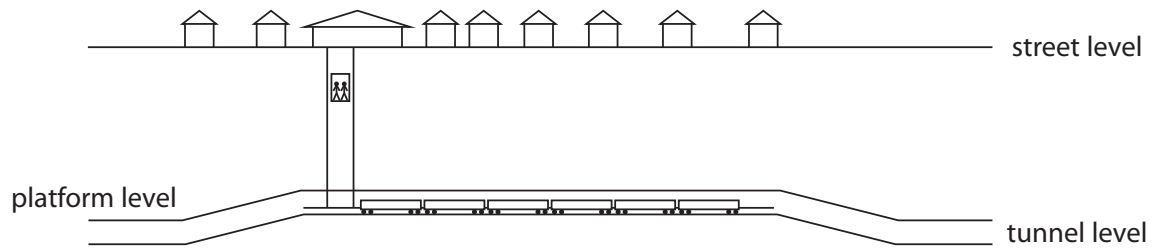
(1)

.....

.....

.....

(b) The diagram shows a section through the station.



- (i) The passengers who use the station are carried from platform level to street level in a lift.

Explain why these passengers gain gravitational potential energy in the lift, even when they are below ground.

(2)

.....

.....

.....

.....

- (ii) The tunnel is designed so that the trains go up a slope as they enter the station and go down a slope as they leave.

The driver uses brakes to stop the train in the station and a motor to make the train move away.

Explain how the sloping parts of the tunnel affect the amount of work that needs to be done on the train by the brakes and by the motor.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 2 = 11 marks)