Materials – A2 Physics P1

1. No.5

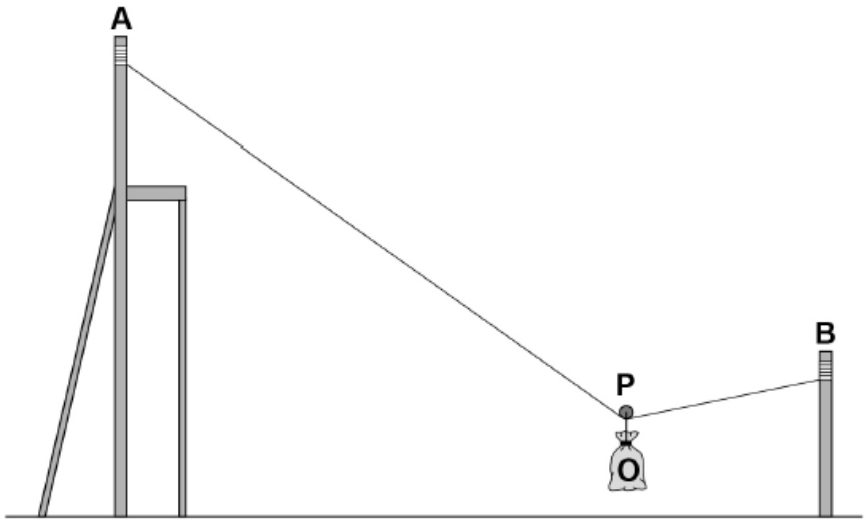
0	5

A cable system is to be used to transfer supplies across a river. A model of the proposed system is built in order to test its performance.

The model consists of a cable attached to two vertical posts **A** and **B**, as shown in **Figure 3**.
A pulley **P** of negligible mass is attached to the cable.

In this question the length of the cable does not change and the weight of the cable can be ignored.

Figure 3



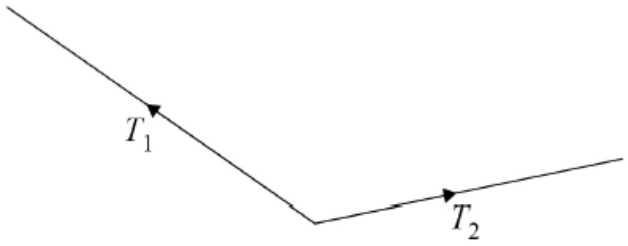
An object **O** is attached to **P**. In one test, **O** and **P** are at rest in the position shown in **Figure 3**.
The weight of **O** is 350 N.

0 5 . 1 **Figure 4** is a force diagram drawn to scale. It represents the magnitudes and directions of the tensions T_1 and T_2 in the cable when **O** is at rest in the position shown in **Figure 3**. At this position, resistive forces are zero.

Complete the force diagram.
Go on to determine, using your diagram, the magnitudes of T_1 and T_2.

[4 marks]

Figure 4



$T_1 =$ _____ N

$T_2 =$ _____ N

0 5 . 2 In a second test, pulley **P** with **O** attached is released from **A**.
P and **O** move along the cable to **B**.

The change in height of the centre of mass of **O** between **A** and **B** is $4.5\ \text{m}$.
The distance travelled along the cable is $18\ \text{m}$.

The speed of **O** when it reaches **B** is $6.5\ \text{m s}^{-1}$.

Calculate the average resistive force on **O** and **P** as they move from **A** to **B**.

[5 marks]

average resistive force = _____ N

0 5 . 3 **O** contains a fragile item packed in suitable material.

Explain how the material can prevent damage to the fragile item when **O** stops suddenly at **B**.

[3 marks]

2. No.25

A uniform wire is stretched by a load F.
The elastic strain energy stored in the wire is E.

The load is increased from F to $2F$.
The wire obeys Hooke's law.

What is the increase in the elastic strain energy stored in the wire?

[1 mark]

A E ⬭

B $2E$ ⬭

C $3E$ ⬭

D $4E$ ⬭

3. No.26

A spring is compressed by a force F. The spring has stiffness k and its length changes by ΔL during the compression. When the force is removed the spring returns to its original length in time t.

What is the average power developed by the spring as it returns to its original length?

[1 mark]

A $\frac{k\Delta L}{2t}$ ⬭

B $\frac{k\Delta L}{t}$ ⬭

C $\frac{k(\Delta L)^2}{2t}$ ⬭

D $\frac{k(\Delta L)^2}{t}$ ⬭