

# GCSE Physics

29<sup>th</sup> Mar 2021 – Mechanics

Suitable for ALL exam boards



This session looks at gears, moments and forces

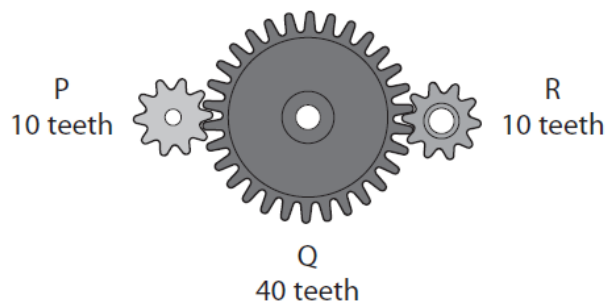
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Question taken from:

**Edexcel GCSE Physics – 2018 - Paper 1H – Question 6 and 7**

6 (a) Figure 10 shows an arrangement of gears.

Each gear turns around a fixed axle.



**Figure 10**

Gear P is turned through one complete revolution per second.

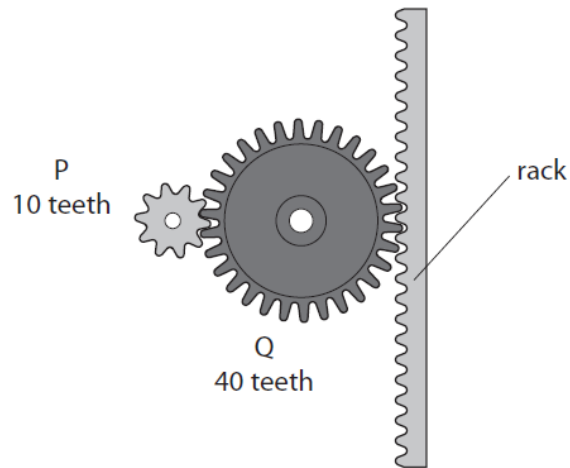
(i) Which of the following describes the motion of gear R?

(1)

	speed (revolutions per second)	direction of rotation
<input type="checkbox"/> A	4	same as P
<input type="checkbox"/> B	1	same as P
<input type="checkbox"/> C	4	opposite to P
<input type="checkbox"/> D	1	opposite to P



(ii) Figure 11 shows the same arrangement with gear R replaced by a rack.



**Figure 11**

The rack can move up or down when the gears turn.

The teeth on the rack are 2 mm apart.

Calculate how far the rack moves when P turns through to one complete revolution.

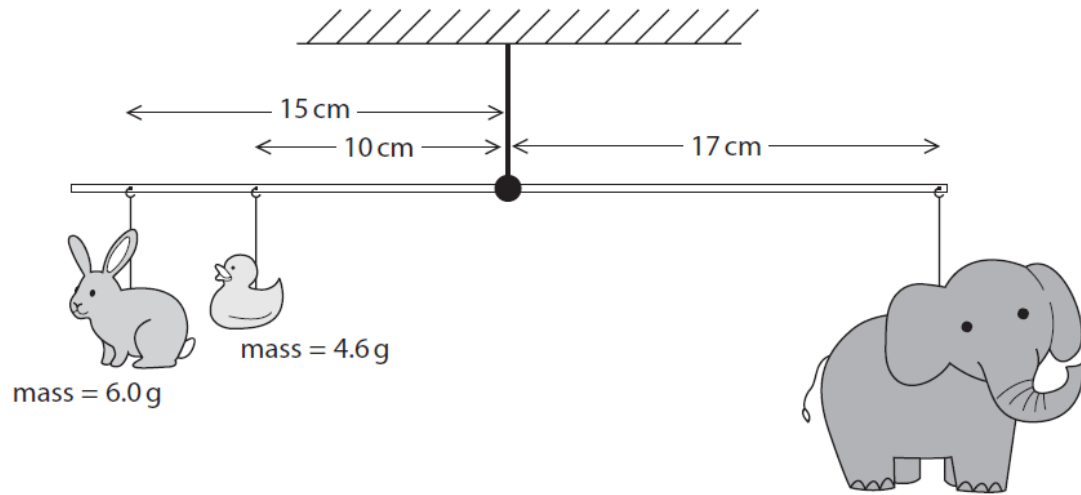
(2)

distance = ..... mm

(b) Figure 12 shows three toy animals hanging from a rod.

The rod hangs from the ceiling by a string tied to the centre of the rod.

The system is in equilibrium.



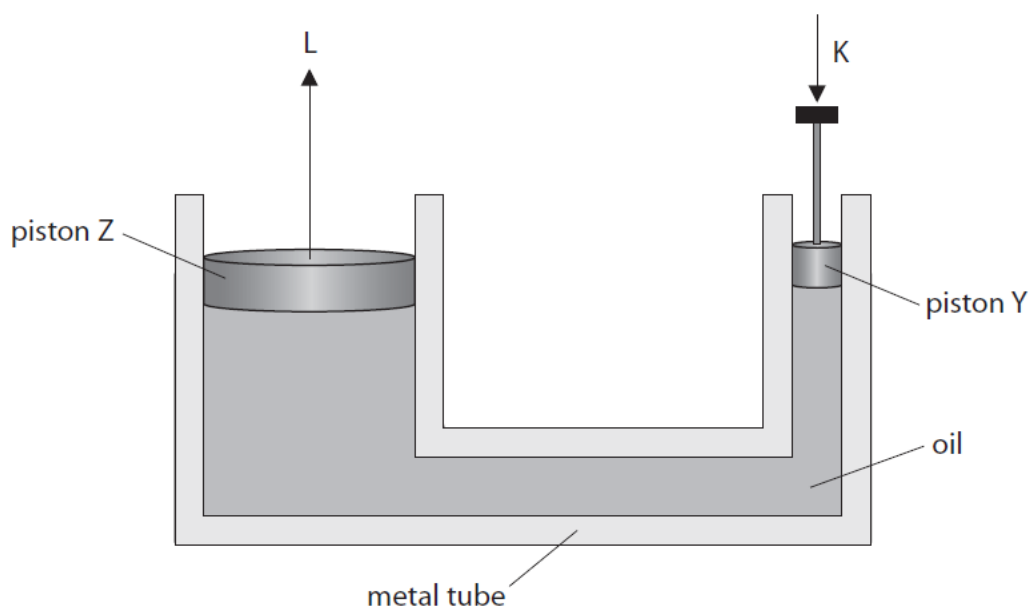
**Figure 12**

Use the principle of moments to calculate the mass of the toy elephant.

(4)

mass = ..... g

(c) Figure 13 shows a diagram of a device for lifting heavy loads.



**Figure 13**

The metal tube is filled with oil.

The piston Y is pushed down with a force K.

This produces a force L on piston Z.

The pressure exerted on the oil by piston Y is the same as the pressure exerted by the oil on piston Z.

Explain the difference between the size of force K and the size of force L.

(3)

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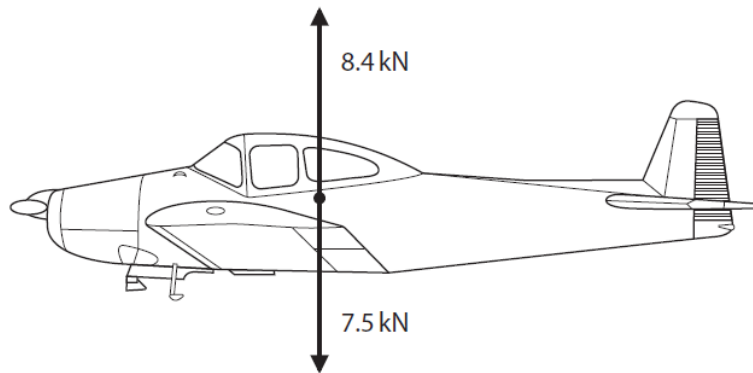
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**(Total for Question 6 = 10 marks)**

7 (a) (i) Figure 14 shows the vertical forces on an aeroplane.



**Figure 14**

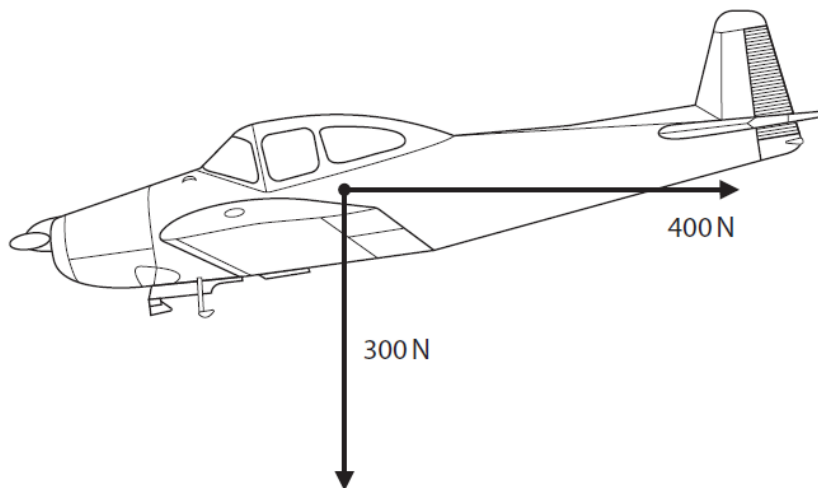
Use information from the diagram to determine the size and direction of the resultant vertical force on the aeroplane.

(2)

size = ..... kN, direction is .....

(ii) The aeroplane is descending.

Figure 15 shows a diagram of the resultant vertical and horizontal forces on the aeroplane as it is descending.



**Figure 15**

Complete the diagram to show the resultant of these two forces.

(1)



(iii) The mass of the aeroplane is 750 kg.

Calculate the change in gravitational potential energy of the aeroplane as it descends from 1300 m to the ground.

Gravitational field strength ( $g$ ) = 10 N/kg

(2)

energy = ..... J



(b) The aeroplane is powered by an engine that burns fuel.  
The fuel supplies a total of 6500 kJ of energy every minute.  
The efficiency of the engine is 0.70 (70%).

(i) Calculate the power output of the engine.

Give your answer in kW.

(4)

power = ..... kW

(ii) Explain why the efficiency of the engine is less than 1 (100%).

(2)

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**(Total for Question 7 = 11 marks)**

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