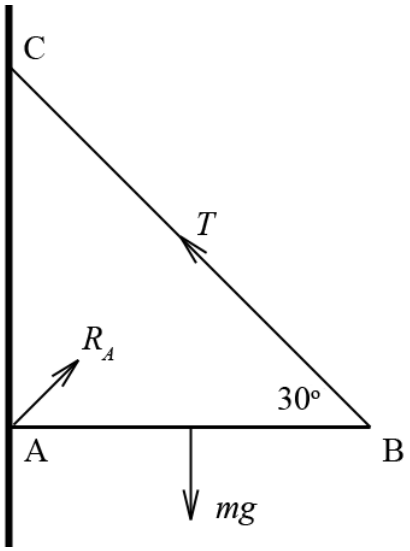
Question #74248, Physics / Mechanics | Relativity

A horizontal rod with a mass of 10kg and length 12m hinged to a wall at one end and supported by a cable which make an angle of 30deg with the rod at its other end. Calculate the tension in the cable and force exerted by hinge .Draw the diagram.

Solution



$\sum M_A = 0$;

$T\sin 30° \times (AB) - mg \times \frac{AB}{2} = 0$;

$T = \frac{mg}{2\sin 30°} = \frac{10 \times 9.81}{2\sin 30°} = 98.1\,\text{N}$

$\sum F_x = 0$;

$R_{Ax} - T\cos 30° = 0$;

$R_{Ax} = T\cos 30° = 98.1 \times \cos 30° = 85.0\,\text{N}$

$\sum F_y = 0$;

$R_{Ay} + T\sin 30° - mg = 0$;

$R_{Ay} = mg - T\sin 30° = 98.1 - 98.1 \times \sin 30° = 49.0\,\text{N}$

$$R_A = \sqrt{R_{Ax}^2 + R_{Ay}^2} = \sqrt{\frac{W^2}{4\tan^2 60°} + \frac{W^2}{4}} = \sqrt{85.0^2 + 49.0^2} = 98.1 \text{ N}$$

Answer: T = 98.1 N; R_A = 98.1 N.