A 370 N force is pulling an 85.1-kg refrigerator across a horizontal surface. The force acts at an angle of 22.0 ° above the surface. The coefficient of kinetic friction is 0.237, and the refrigerator moves a distance of 9.44 m. Find (a) the work done by the pulling force, and (b) the work done by the kinetic frictional force.

Solution

Here we have

$m = 85.1kg$
$F = 370N$
$\alpha = 22.0°$
$\mu = 0.237$
$S = 9.44m$

We choose the x-axis parallel to horizontal surface, y-axis orthogonal to horizontal surface.

In y-axis we have second Newton's equation law $P + F \sin \alpha - mg = 0$, where P is reaction of surface. From hence $P = mg - F \sin \alpha = 695.4N$,

We have friction force $F_f = \mu P$.

The pulling force done work $A = \vec{F}\vec{S} = FS \cos \alpha = 3239J$ (here α is angel between pulling force and translation).

The friction forces done work $A_F = F_f S = \mu PS = 1556J$ (because friction force is antiparallel to translation).

Answer:

a) The pulling force done work $A = 3239J$.

b) The friction forces done work $A_F = 1556J$