مدونة المناهج السعودية

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الموقع التعليمي لجميع المراحل الدراسية

في المملكة العربية السعودية

University of Jeddah

PHYS 101

Ch. 7

Potential Energy and Energy Conservation

Chapter 7

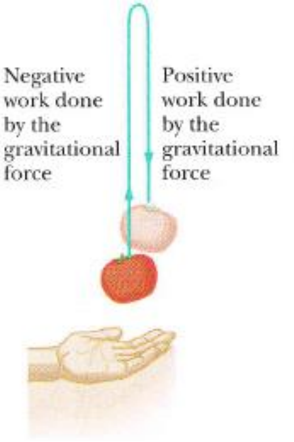
Chapter Seven

Potential Energy and Conservation of Energy

- ***Gravitational Potential Energy***
- ***Elastic Potential Energy***
- ***Conservative and Nonconservative Forces***

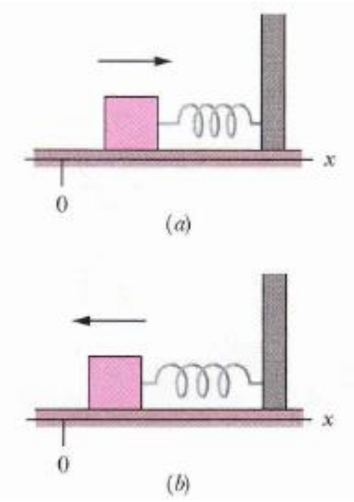
Gravitational Potential Energy

Work and Potential Energy



For either rise or fall, the change ΔU in gravitational potential energy is defined as being equal to the negative of the work done

$$\Delta U = -W.$$



This equation also applies to a block–spring system,

Gravitational Potential Energy

Determining Potential Energy Values

Gravitational Potential Energy

The gravitational potential energy associated with a particle–Earth system depends only on the vertical position y (or height) of the particle relative to the reference position $y = 0$, not on the horizontal position.

$$U(y) = mgy \qquad \text{(gravitational potential energy).}$$

Gravitational Potential Energy

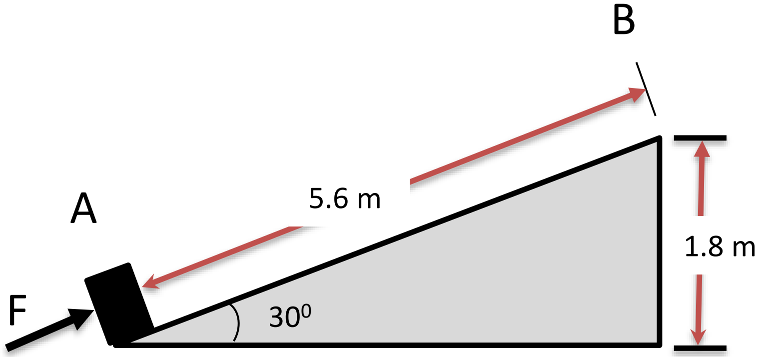
Example 1 :

A force F causes the 2 kg box to slide up from point A to point B. The gravitational potential energy gained by the box is:

Solution:

(A)

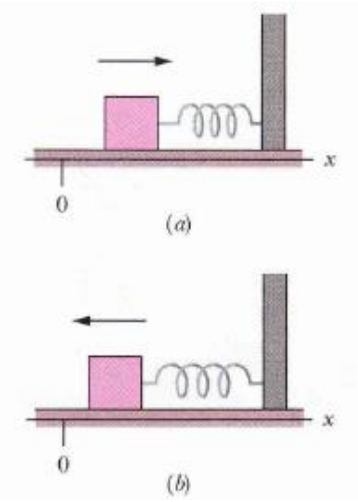
(A) 35.28 J
(B) 28.40 J
(C) 88 J
(D) 270 J



Elastic Potential Energy

Elastic Potential Energy

$$U(x) = \tfrac{1}{2}kx^2 \qquad \text{(elastic potential energy).}$$



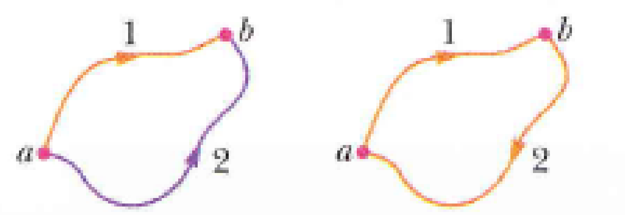
Conserv. and Nonconservative Forces

Conserv. and Nonconservative Forces

Path Independence of Conservative Forces

- The net work done by a conservative force on a particle moving around any closed path is zero.

- The work done by a conservative force on a particle moving between two points does not depend on the path taken by the particle.



Conserv. and Nonconservative Forces

Conservation of Mechanical Energy

The **mechanical energy** E_{mec} of a system is the sum of its potential energy U and the kinetic energy K of the objects within it:

$$E_{mec} = K + U \quad \text{(mechanical energy).}$$

$$\Delta K = W \qquad \Delta U = -W.$$

$$\Delta K = -\Delta U.$$

$$K_2 - K_1 = -(U_2 - U_1).$$

$$K_2 + U_2 = K_1 + U_1 \quad \text{(conservation of mechanical energy).}$$

Conservation of Mech. Energy

Example 2:

In a sliding game at a fun fair, a child train was sliding in different heights. If the train slipped from height A 10 m till height B 7 m. The speed of the train at point B is

Solution:

(C)

(A) 10.3 m/s
(B) 9.87 m/s
(C) 7.67 m/s
(D) 6.42 m/s