AP PHYSICS 1 WORK, ENERGY, and POWER TEST REVIEW

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1. A force F at an angle θ above the horizontal is used to pull a heavy suitcase of weight mg a distance d along a

level floor at constant velocity. The coefficient of friction between the floor and the suitcase is µ. The work done by the frictional force is:

(A) –Fd cos θ (B) – µ Fd cos θ (C) -µmgd (D) -µ mgd cos θ

2. A 2 kg ball is attached to a 0.80 m string and whirled in a horizontal circle at a constant speed of 6 m/s. The

work done on the ball during each revolution is:

1. 90 J (B) 72 J (D) 16 J (D) zero



3.. A pendulum bob of mass m on a cord of length L is pulled sideways until the

cord makes an angle θ with the vertical as shown in the figure to the right. The

change in potential energy of the bob during the displacement is:

(A) mgL (1–cos θ) (B) mgL (1–sin θ) (C) mgL sin θ (D) mgL cos θ

4. A softball player catches a ball of mass m, which is moving towards her with horizontal speed V. While

bringing the ball to rest, her hand moved back a distance d. Assuming constant deceleration, the horizontal force exerted on the ball by the hand is

(A) mV2/(2d) (B) mV2/d (C) 2mV/d (D) mV/d

5. A pendulum is pulled to one side and released. It swings freely to the opposite side and stops. Which of the

following might best represent graphs of kinetic energy (Ek), potential energy (Ep ) and total mechanical energy

(ET )



Questions 6-7: A car of mass m slides across a patch of ice at a speed v with its brakes locked. It the hits dry

pavement and skids to a stop in a distance d. The coefficient of kinetic friction between the tires and the dry road is µ.

1. If the car has a mass of 2m, it would have skidded a distance of

(A) 0.5 d (B) d (C) 1.41 d (D) 2 d

1. If the car has a speed of 2v, it would have skidded a distance of

 (A) d (B)1.41 d (C) 2 d (D) 4 d

1. Which of the following is true for a system consisting of a mass oscillating on the end of an ideal spring?

aThe kinetic and potential energies are equal to each other at all times.

bThe maximum potential energy is achieved when the mass passes through its equilibrium position.

cThe maximum kinetic energy and maximum potential energy are equal, but occur at different times.

dThe maximum kinetic energy occurs at maximum displacement of the mass from its equilibrium position

Questions 9-10: A block oscillates without friction on the end of a spring as

shown. The minimum and maximum lengths of the spring as it oscillates are, respectively, xmin and xmax . The graphs below can represent quantities associated with the oscillation as functions of the length x of the spring.





9. Which graph can represent the total mechanical energy of the block-spring system as a function of x ?

(A) A (B) B (C) C (D) D

10. Which graph can represent the kinetic energy of the block as a function of x ?

(A) A (B) B (C) C (D) D

11. The graph shown represents the potential energy *U* as a function of displacement

*x* for an object on the end of a spring moving back and forth with amplitude x0 .

Which of the following graphs represents the kinetic energy *K* of the object

as a function of displacement *x* ?





12. A child pushes horizontally on a box of mass *m* which moves with constant speed *v* across a horizontal floor.

The coefficient of friction between the box and the floor is µ. At what rate does the child do work on the box?

(A) µ*mgv* (B) *mgv* (C) µ*mg/v* (D) µ*mg/v*



13. A pendulum consists of a ball of mass m suspended at the end of a massless cord of length L as shown. The pendulum is drawn aside through an angle of 60° with the vertical and released. At the low point of its swing, the speed of the pendulum ball is

(A) *gL* (B) 2*gL* (C) ½gL (D) gL

**FREE RESPONSE**



A designer is working on a new roller coaster, and she begins by making a scale model. On this

 model, a car of total mass 0.50 kg moves with negligible friction along the track shown in the

figure above. The car is given an initial speed vo = 1.5 m/s at the top of the first hill of height

 2.0 m. Point *A* is located at a height of 1.9 m at the top of the second hill, the upper part of

which is a circular arc of radius 0.95 m.

1. Calculate the speed of the car at point *A*.
2. On the figure of the car below, draw and label vectors to represent the forces on the car at point *A*.
3. In order to stop the car at point *A*, some friction must be introduced. Calculate the work that must be done by the friction force in order to stop the car at point *A*.
4. Explain how to modify the track design to cause the car to lose contact with the track at point *A* before descending down the track. Justify your answer.

**FREE RESPONSE 2**



**1979B1.** From the top of a cliff 80 meters high, a ball of mass 0.4 kilogram is launched horizontally with a velocity of 30 meters per second at time t = 0 as shown above. The potential energy of the ball is zero at the bottom of the cliff. Use g = 10 meters per second squared.

1. Calculate the potential, kinetic, and total energies of the ball at time t = 0.
2. On the axes below, sketch and label graphs of the potential, kinetic, and total energies of the ball as functions of the distance fallen from the top of the cliff



1. On the axes below sketch and label the kinetic and potential energies of the ball as functions of time until the ball hits



 