

School of Excellence Secondary School
Physics Work Sheet for Grade 12, Jan, 2016 E.C

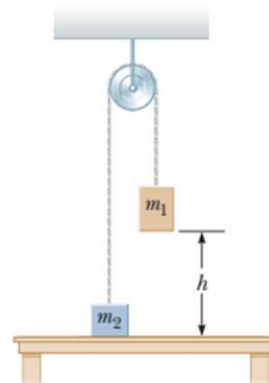
Work, Energy and Power

Attempt the Following Questions Accordingly

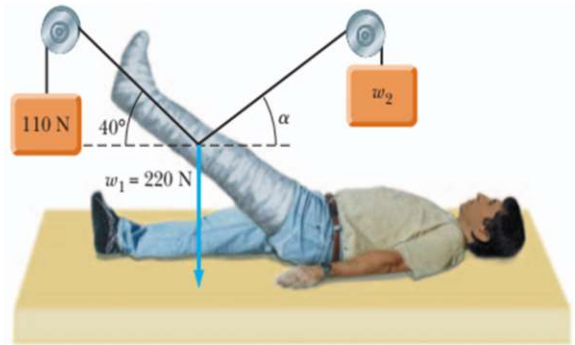
1. Define
 - a. The law of conservation of energy.
 - b. Impulse-momentum theorem
 - c. Work – kinetic energy theorem.
 - d. Power
2. If the net work done by external forces on a particle is zero, which of the following statements about the particle must be true?
 - a. Its velocity is zero.
 - b. Its velocity is decreased.
 - c. Its velocity is unchanged.
 - d. Its speed is unchanged.
 - e. More information is needed.
3. Is the work required to be done by an external force on an object on a frictionless, horizontal surface to accelerate it from a speed v to a speed $2v$
 - a. Equal to the work required to accelerate the object from $v = 0$ to v .
 - b. Twice the work required to accelerate the object from $v = 0$ to v .
 - c. Three times the work required to accelerate the object from $v = 0$ to v .
 - d. four times the work required to accelerate the object from $v = 0$ to v
4. A boy that is released from the top of a tall building reaches the ground after six seconds. What is the ratio of the kinetic energy acquired by it at the end of the three seconds to the increment of in the kinetic energy during the next three seconds?
5. Which of the following is equal to the amount of work required to stop a moving object?
 - A. The mass of the object times its acceleration.
 - B. The kinetic energy of the object.
 - C. The square of the velocity of the object
 - D. The mass of the object times its velocity.
6. What is the necessary and sufficient condition for conservation of linear momentum?
 - A. The presence of more linear than nonlinear forces in the system.
 - B. Net force on the system is zero
 - C. The Prescence of only non-linear forces
 - D. Internal forces exceed external forces
7. An 800-N box is pushed up an inclined plane that is 4.0 m long. It requires 3200 J of work to get the box to the top of the plane, which is 2.0 m above the base. What is the magnitude of the average friction force on the box? (Assume the box starts at rest and ends at rest)
8. A 1500-kg car accelerates from 0 to 25 m/s in 7.0 s. What is the average power delivered by the engine (1 hp = 746 W)?
9. By what percent does the kinetic energy of a body increased, if its speed is increased by 20%?
10. The net external non zero force acts on a particle that is moving along a straight line. Which of the following statement is correct?
 - A. The velocity, but not the kinetic energy, of particle is changing.

School of Excellence Secondary School
Physics Work Sheet for Grade 12, Jan, 2016E.C

- B. Both the velocity and the kinetic energy of the particle are changing.
C. The kinetic energy, but not the velocity, of particle is changing.
D. The momentum is conserved
11. How much work is done when a 75-kg person climbs a flight of stairs 10 m high at constant speed?
12. If the net work done on a particle is zero, what can be said about the particle's speed?
13. A father pulls his son, whose mass is 25.0 kg and who is sitting on a swing with ropes of length 3.00 m, backward until the ropes make an angle of 33.6° with respect to the vertical. He then releases his son from rest. What is the speed of the son at the bottom of the swinging motion?
14. An ideal spring has the spring constant $k = 440 \text{ N/m}$. Calculate the distance this spring must be stretched from its equilibrium position for 25 J of work to be done.
15. A man throws a rock of mass $m = 0.325 \text{ kg}$ straight up into the air. In this process, his arm does a total amount of work $W_{\text{net}} = 115 \text{ J}$ on the rock. Calculate the maximum distance, h , above the man's throwing hand that the rock will travel. Neglect air resistance.
16. A block of mass 5.0 kg slides on a horizontal frictionless surface with a speed of 8.0 m/s. If it brought to rest in compressing a spring in its path. If the force constant of the spring is 400 N/m). How much is the spring will be compressed?
17. A pendulum swings in a vertical plane. At the bottom of the swing, the kinetic energy is 8 J and the gravitational potential energy is 4 J. At the highest position of its swing, the kinetic and gravitational potential energies are
18. A particle moving in the xy plane undergoes a horizontal displacement given by $\Delta x = (2.0\hat{i} + 3.0\hat{j})\text{m}$ as a constant force $\vec{F} = (12.0\hat{i} + 32.0\hat{j})\text{N}$ acts on the particle.
- a. Calculate the work done by $\vec{F}$ on the particle.
- b. the angle between $\vec{F}$ and Δx .
19. A 6.0-kg block initially at rest is pulled to the right along a frictionless, horizontal surface by a constant horizontal force of magnitude 12 N. Find the block's speed after it has moved through a horizontal distance of 3.0 m.
20. Bullet 2 has twice the mass of bullet 1. Both are fired so that they have the same speed. If the kinetic energy of bullet 1 is K , is the kinetic energy of bullet 2 is
21. Two objects are connected by a light string passing over a light, frictionless pulley as shown in the Figure. The object of mass m_1 is released from rest at height h above the table. Using the isolated system model,
- a. determine the speed of m_2 just as m_1 hits the table and
- b. Find the maximum height above the table to which m_2 rises.
22. An object of mass 1kg moving with a speed of 2m/s was acted on by a force that produces an acceleration of 2m/s^2 . What is the change in kinetic energy of the object if the force is exerted on the object for 2 sec in its direction of motion?



23. A 1 kg roller coaster is acted on by a 4 N force over a displacement of 2 m in the direction of force and then set free. The roller is moving on a smooth and horizontal surface towards a free end of a spring of constant k , whose other end is fixed on the wall. If the spring is compressed by 20 cm to bring the roller coaster to rest, then what is the value of the spring constant?
24. In which of the following case is no work done by a dissipative force?
- When a parachute jump from a plane.
 - For a freely falling object
 - On a racing car that moves in a desert
 - When someone slides a box on a horizontal rough surface.
25. Which of the following is correct about a work done for dissipative force?
- Path dependent
 - The same as the loss in kinetic energy.
 - The same as the gain in potential energy.
 - The same as the potential energy stored in spring.
26. A spring with spring constant of 300 N/m is stretched 20 cm in 2 sec . What is the power applied to stretch the spring?
27. What is the necessary and sufficient condition for conservation of linear momentum?
- The presence of more linear than nonlinear forces in the system.
 - Net force on the system is zero
 - The Presence of only non-linear F
 - Internal F exceed external forces
28. A block of mass 1.6 kg is attached to a horizontal spring that has a force constant 0 f 2000 N/m . The spring is compressed 2.0 cm and is then released from rest. At what speed will the block pass through the equilibrium position of a constant friction force of 10.0 N retards its motion from the moment it is released?
29. The leg and cast in Figure below weigh 220 N (w_1). Determine the weight w_2 and the angle α needed so that no force is exerted on the hip joint by the leg plus the cast.



30. A bag of cement of weight F_g hangs from three wires as shown in the Figure below. Two of the wires make angles θ_1 and θ_2 with the horizontal. If the system is in equilibrium, show that the tension in the left-hand wire is

$$T_1 = \frac{mg \cos \theta_2}{\sin(\theta_1 + \theta_2)}$$

