
Energy Review Questions

1. A net force of 90.0 N does 45.0 J of work on a brick. What is the magnitude of the displacement of the brick?
0.50 m
2. How much work is done against gravity in lifting a 3.0 kg object through a distance of 40.0 cm ?
12 J
3. What is the kinetic energy of a 60 kg athlete running 6.0 m/s?
1080 J
4. How would the kinetic energy of a moving object be affected if its velocity were doubled while the mass remains constant.
Ek increases by 4 times
5. How much energy would 1.0 kg of water falling 15 m generate?
147 J
6. When an object is lifted 10 meters it gains a certain amount of potential energy. If the same object is lifted 20 m, its potential energy is
double
7. How much power is produced by a 60.0 kg person running up a 4.5 m high flight of stairs in 3.0 sec?
882 W
8. A 20 kg load of shingles is carried a vertical height of 8.0 m up a ladder in 40 s. ($g = 10 \text{ N/kg}$) The power generated is approximately...
40 W
9. A machine with a power rating of 15.0 kW must complete a job requiring an expenditure of $1.5 \times 10^5 \text{ J}$ of energy. How long will it take to complete the job?
10.0 s

10. A 0.50 kg block is sliding across a table top with an initial velocity of 0.20 m/s. It slides to rest in a distance of 0.70 m. Find the average friction force that slowed its motion.

0.014 N

11. A motorcycle travelling at 45 km/h has 135,000 J of K.E. If a force of 5400 N acts on the motorcycle after the engine is turned off, how far does the motorcycle travel before it stops?

25 m

12. A force of 1.50 N acts on a 0.20 kg cart so as to accelerate it along an air track. How fast is the cart going after acceleration from rest through 30 cm if friction is negligible?

2.1 m/s

13. A force of 35 N accelerates a 2.0 kg object from rest for a distance of 5.0 m along a level frictionless surface, the force then changes to 25 N and acts for an additional 3.0 m.

- a) What is the final kinetic energy of the object?
b) How fast is it moving?

**a) 240 J
b) 15.5 m/s**

14. A pole vaulter of mass 75 kg just clears 5.3 m. How fast was he running the instant before his jump, assuming the height he jumps is due entirely to his kinetic energy?

10.2 m/s

15. How much energy has been lost due to frictional heating by the air when an 0.08 kg object attains a speed of 5.0 m/s while free falling 1.5 m from rest?

0.20 J

16. A biker approaches a hill with a speed of 8.5 m/s. The total mass of the bike and rider is 85 kg.

- a) Find the kinetic energy of the bike and rider.
b) The rider coasts up the hill. Assuming there is no friction, at what height will the bike come to a stop?
c) Does your answer depend on the mass of the bike and rider? Explain.

a) 3070 J b) $h = 3.7$ m c) No

17. Betty weighs 420 N and is sitting on a playground swing seat that hangs 0.40 m above the ground. Tom pulls the swing back and releases it when the seat is 1.00 m above the ground.
- How fast is Betty moving when the swing passes through its lowest position?
 - If Betty moves through the lowest point at 2.0 m/s, how much work was done on the swing by friction?

3.43 m/s, 166 J

18. A truck of mass 4.0×10^3 kg travelling at 20 m/s is brought to a stop by a constant braking force of 5.0×10^3 N. How far does the truck travel while the brakes are applied?

160 m

19. A 1000 kg car travelling at an unknown velocity begins to head down a 30 m high hill. Exactly halfway down the hill a police radar trap clocks the car travelling at 30 m/s. Neglecting friction, how fast was the car travelling at the top of the hill?

24.6 m/s

20. How much heat would be needed to warm 1.6 kg of ice from -15°C up to its melting point of 0.0°C ?

50.4 kJ

21. The specific heat capacity of ice is $2040 \text{ J/kg}^\circ\text{C}$. If 400 kJ of heat energy is applied to 10 kg of -25°C ice what temperature is it raised to?

-5.4°C

22. The diesel engine of an automobile runs at 38% efficiency. If the cars output energy is 76 kJ, how much energy is contained in the gas tank?

200 kJ