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Energy Review

- 1. Work is required to lift a barbell. How many times more work is required to lift the barbell three times as high?
- 2. Which requires more work lifting a 10-kg sack a height of 2 meters, or lifting a 5-kg sack a height of 4 meters?
- 3. How many Joules of work are done on an object when a force of 10 N pushes it a distance of 10 m?
- 4. a. How much power is required to do 100 J of work in a time of 2 seconds?
 - b. How much power is required to do 100 J of work in a time of 4 seconds?
 - c. How much power is required to do 100 J of work in a time of 0.5 seconds?
- 5. If you do 100 J of work to lift a bucket of water, how much potential energy do you give the bucket?
- 6. A 1 kg rock is held above the ground and has 250 J of potential energy. It is then dropped.a. What is its kinetic energy while it is still being held?
 - a. What is its kinetic energy while it is still being he
 - b. What is the total energy of the rock?
 - c. What is its potential energy just as it hits the ground?
 - d. What is its kinetic energy just as it hits the ground?
 - e. While it is falling, if it has only 100 J of potential energy at some point, how much kinetic energy does it have?
 - f. How high above the ground is the rock when it has 100 J of PE?
 - g. How fast is the rock moving when it has 100 J of PE?
 - h. While it is falling, if it has only 50 J of kinetic energy at some point, what is its potential energy?

- 7. Suppose a car has a kinetic energy of 2000 J.
 - a. If it moves with twice the speed, what will be its kinetic energy?
 - b. If it moves with three times the speed, what will be its kinetic energy?
- 8. A certain engine can make a car go from 0 to 100 km/h in 10 seconds. All other things being equal, if the engine has twice the power, how many seconds would it take to go from 0 to 100 km/h?

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- 9. A car traveling at 60 km/h skids 20 m when its brakes are locked. How far will it skid if it is traveling at 120 km/h?
- 10. A hammer falls off a roof and hits the ground with 75 J of kinetic energy. If it fell from a roof twice as high, how much kinetic energy would it have when it hit the ground?
- 11. Does a car use more gas when the air conditioner is on? How about the headlights or radio?
- 12. A car has 2500 J of kinetic energy and it skids to a stop, losing all its kinetic energy. Where did this energy go?
- 13. Peter, Paul and Mary are lifting weights. Peter lifts 135 kg 0.8 m in 1 second. Paul lifts 150 kg 1.3 m in 1.4 seconds. Mary lifts 124 kg 0.9 m in 1.3 seconds.
 - a. Who does the most work?
 - b. Who is most powerful?

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- 14. A 25 g bullet with a horizontal velocity of 500 m/s, comes to a stop 12 cm within a solid wall.
 - a. What is the initial KE of the bullet?
 - b. What is the final KE of the bullet?
 - c. What was the average force stopping the bullet?
- 15. An apple falls 3.5 m from the branch of a tree to the ground below.
 - a. How fast is the apple moving when it hits the ground? Use conservation of energy.
 - b. At what point is KE = PE?
 - c. How fast is the apple moving when it is 1 m off the ground?
- 16. A frictionless roller coaster with a mass of 200 kg is at rest at point A. What is speed of the cart at point B and point C?



- 17. A force of 200 N is applied to a 50 kg crate to slide it across the floor a distance of 70 m.
 - a. How much work is required to slide the crate along the floor?
 - b. How much work would be required to lift the crate to a height of 70 m?

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- 18. An applied force of 20 N is required to push a 5 kg object up an incline that is 13 m long and 4 m high.
 - a. How much work is done by the applied force?
 - b. How much work would be needed to lift the 5kg object straight up to a height of 4 m?
 - c. Why does it take more work to use the incline?

| Answers: 1) 3x | 2) samel | 3) 100 .1 | | 4 a) 50 W | b) 25 W | c) 200 W |
|------------------------|-----------------------|-------------------|----------|----------------------|-------------------|----------------|
| | | b) 100 0 | | -) 0 1 | -1) 050 / | -) 150 / |
| 5) 100 J | 6. a) 0 J | b) 250 J | | c) U J | a) 250 J | e) 150 J |
| f) 10 m | g) 17.3 m/s | h) 200 J | | 7. a) 8000 J | b) 18,000 J | 8) 5 s |
| 9) 80 m | 10) 150 J | 11) Yes, yes, yes | 3 | 12) brakes are hot | tter (KE became t | hermal energy) |
| 13. a) Peter = 1080 J, | Paul = 1950 J, Mary = | 1116 J | | b) Peter = 1080 W | /, Paul = 1393 W, | Mary = 858 W |
| 14. a) 3125 J | b) 0 J | c) 26,000 N | HINT: | 25 g = 0.025 kg & | 12 cm = 0.12 m | |
| 15. a) 8.4 m/s | b) 1/2 way down | c) 7.1 m/s | | 16) B = 14.1 m/s a | & C = 24.5 m/s | |
| 17. a) 14,000 J | b) 35,000 J | HINT: how much | h force | does it take to lift | up? | |
| 18. a) 260 J | b) 200 J | c) because there | e is (pr | obably) friction or | n the incline | |