Name Key Date: Period

Unit 5 Review - Energy

Essential Skills that will be tested

5-1	Student knows the units and variables for this unit.
5-2	Student knows how to calculate kinetic energy using the formula KE = ½ mv^2
5-3	Student knows how to calculate gravitational potential energy near Earth by using the PE = mgh.
5-4	Student knows how to solve for height or velocity using the principles of conservation of energy
5-5	Student knows that work changes the energy of a system and can calculate this (Work-Energy Theorom).

Other Concepts you need to know:

- Power is the rate of doing work or the rate at which energy is converted from one type to another and can calculate this.
- Total energy remains constant throughout an object's journey.

Questions- (this is only a partial review- use your worksheets, notes, & labs too)

1. Fill in the following table information.

Variable Name	Variable Symbol	Unit Name	Unit Symbol	Formula	On Reference Sheet?
gravitational potential energy	PE	Joule	J	PE = mgh	yes
kinetic energy	KE	Joule	J	KE = $\frac{1}{2}mv^2$	yes
work	W	Joule	J	W = FΔx	yes
power	P	Watt / Joule/sec	W	P = W/t	no!
force	F	Newton	N	n/a	n/a
mass	m	Kilogram	Kg	n/a	n/a
acceleration due to gravity	g	meter per second per second	m/s/s	g = 10m/s/s	yes
weight/force due to gravity	Fg, W, mg	Newton	N	Fg = mg	yes
velocity	V	meter per second	m/s	n/a	n/a
displacement	Δx	meter	m	n/a	n/a

Circle the appropriate choice that makes the statement true.

2. At an object's maximum height, kinetic energy *is zero / maximum* while the potential energy is *zero / maximum.*
3. At an object's lowest point, kinetic energy is *zero / maximum* while potential energy *is zero / maximum.*
4. Mass *affects / does not affect* the amount of total energy.
5. As an object falls under the influence of gravity, kinetic energy *increases / decreases / remains the same.*
6. As an object falls under the influence of gravity, potential energy *increases / decreases / remains the same.*
7. As an object falls under the influence of gravity, total energy *increases / decreases / remains the same.*
8. An object travelling faster and faster while not changing height has a kinetic energy that *increases / decreases / remains the same* and a total mechanical energy that *increases / decreases / remains the same.*
9. As an object falls under the influence of gravity, kinetic energy and potential energy are equal *everywhere / at the halfway point only.*
10. As an object falls under the influence of gravity, potential energy is greater than kinetic energy *after halfway point / before the halfway point.*
11. As an object falls under the influence of gravity, potential energy is less than kinetic energy *after halfway point / before the halfway point.*

Answer the following questions making care to answer every part of the question.

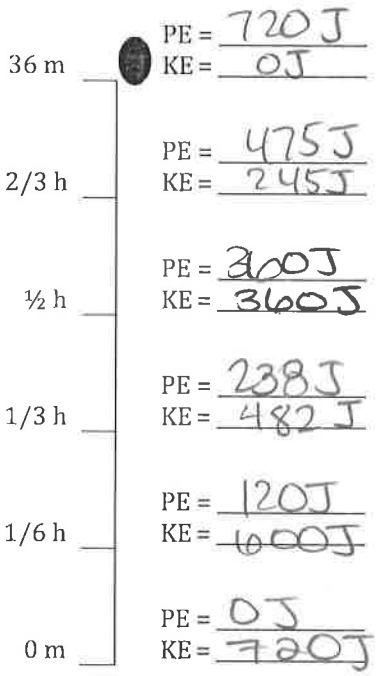
12. A 10 kg object is traveling at 20 m/s while another object who's mass is 15 kg is traveling at 10 m/s. Who has greater a kinetic energy? How do you know?

$KE_1 = \frac{1}{2}(10)(20^2)$
$= 2000\ J$

$KE_2 = \frac{1}{2}(15)(10^2)$
$= 750J$

*the object moving faster because of the v^2 comp. of KE

13. A 2 kg ball is dropped from a height of 36 m as shown below. Fill in the gravitational potential energy and kinetic energy for this journey.



14. Calculate the total mechanical energy of a 3 kg rock that is thrown down with a velocity of 4 m/s from a height of 8 m.

$TME = PE + KE$
$= (3)(10)(8) + \frac{1}{2}(3)(4^2) = 264\ J$

15. The Drop Zone at Great America is approximately 63 m tall and has a mass of 10,000 kg.

a. When riders are dropped from rest from this height, how much potential energy will they have 1/4 of the way down?

4725000J

b. How much kinetic energy do they have at this point?

1575000J

c. How much potential energy will the riders have 2/3 of the way down?

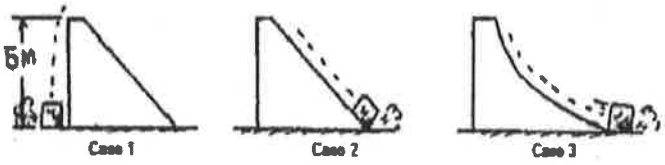
2079000 J

d. How much kinetic energy do they have at this point?

4221000J

16. All of the following ramps are 5 m high. Which block will be moving the fastest when it reaches the bottom? Explain.

Same speed at bottom because all start with same initial energy



17. Calculate the kinetic energy of a 700 kg truck moving at 30 m/s.

KE = 315,000J

18. A typical Boeing 737 has a mass of approximately 60,000 kg. Calculate the gravitational potential energy of the plane when it is 9000 m in the air.

$PE = 5.4 \times 10^9\ J$

19. What is the law of conservation of energy?

energy must not be created or destroyed so total energy at beginning must be equal to total energy at end.

20. A bird is flying 15 m above the water when it spots its prey and dives down towards its prey at 5 m/s. Calculate how fast the bird is going when it snatches its prey at the surface of the water.

$V = 18 \frac{m}{s}$

21. A ball is rolling across the floor at 8 m/s when it starts up a ramp. Calculate the maximum height the ball rolls up the ramp.

$h = 3.2 m$

22. A 63-kg downhill skier is moving with a speed of 13 m/s as he starts his descent from a level plateau at 123-m height to the ground below. What his speed when he is halfway down the hill?

$V = 37 \frac{m}{s}$

23. A 20 kg box is pushed with a force of 75 N up a 3 m long ramp into the back of a truck over the course of 5 seconds.
    a. Calculate the work done on the box.

$W = 225 J$ ← same due to work-energy theorem

    b. How much gravitational potential energy does the box have at the top of the ramp? $PE = 225 J$

    c. Calculate the height of the truck.

$h = 1.1 m$

same due to conservation of Energy

    d. The box is then accidentally pushed off the edge of the truck. How much kinetic energy does the box have right before it hits the ground?

$KE = 225 J$

    e. Calculate the velocity of the box right before it hits the ground.

$V = 4.7 \frac{m}{s}$

    f. Calculate the power exerted in moving the box up the ramp.

$P = 45 W$

Questions from http://www.physicsclassroom.com/reviews/energy/energyprint.cfm:

11. A 1200 kg car and a 2400 kg car are lifted to the same height at a constant speed in a auto service station. Lifting the more massive car requires ___ work.
    a. less b. the same (c. twice as much) d. four times as much e. more than 4 times as much

12. An arrow is drawn back so that 50 Joules of potential energy is stored in the stretched bow and string. When released, the arrow will have a kinetic energy of ___ Joules.
    (a. 50) b. more than 50 c. less than 50