$KE = \frac{1}{2} m v^2$ (moving E; mass in kg, velocity in $\frac{m}{s}$)

$GPE = m\,g\,h$ (stored E; mass in kg, 9.8 $\frac{m}{s^2}$, height in m)

$PE_s = \frac{1}{2} k x^2$ (spring konst, distance in m)

Force = ma; $F_{wt} = mg$; Newtons

Work = Fd; $W = \Delta E$; work/E theorem; in Joules

Power = $\frac{W}{t} = \frac{Fd}{t}$; in Watts

$\boxed{ME = KE + PE}$ mechanical, not include thermal, light, nuclear, etc., solar

Unit 6 Comprehensive Quiz

Name ______________________________ Period _____ Date ____________________

1. Increasing the Force increases — $F = ma$ → KE moving → $W = Fd$
   a. ~~Energy of the Spring~~ PE_s
   b. ~~Gravitational Potential Energy~~
   c. ~~Radiant Energy~~
   d. Kinetic Energy

   Force

2. What is the velocity of a go cart prior to stopping when the brakes do 3,000J of work to stop the 843kg go cart. ($W = \Delta E$, KE)
   a. 2.67 m/s
   b. 7.12 m/s ← forgot $\sqrt{\ }$
   c. 1.26×10^6 m/s
   d. 1.07×10^9 m/s

   KE

   $KE = \frac{1}{2} m v^2$

   $3000 = \frac{1}{2}(843) v^2$

   $\frac{3000}{421.5} = \frac{421.5 v^2}{421.5}$

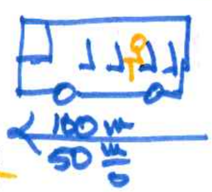
   $\sqrt{v^2} = \sqrt{7.117}$

3. How much work is done when an object is moved 30m in the same direction as the 15N Force that is acted upon it? (d, F)
   a. 5J
   b. 45J
   c. 450J
   d. 4500J

   W

   $W = Fd$

4. How much work is done by a 640N student as she rides a 9,730N bus at a steady 50 m/s for 100m. (F, F, v, d)
   a. 0 J ← W done by student
   b. 640 J
   c. 64,000 J ← W done to student
   d. 973,000 J ← W by Bus



	F	d	W
Bus	9730N	× 100	973000J
Student	640N	× 0	0
		student is sitting	student did NO work

5. What value does **not** directly affect the potential energy of an object
   a. ~~50kg~~ ← m in GPE
   b. ~~15m~~ ← h in GPE
   c. 60m/s — v in KE
   d. ~~9.8m/s²~~ ← g in GPE

   PE

   $GPE = mgh$

   $PE_s = \frac{1}{2} k x^2$

6. What is the power output of a warehouse lifter that raises a 2,749N weight 3.2meters in .8 seconds? (F, d, t)
   a. 3,436W
   b. 7,037W
   c. 8,797W
   d. 10,996W

   P

   $P = \frac{W}{t} = \frac{Fd}{t}$

$\boxed{4}\ KE = \frac{1}{2} m \underline{2}^2 v^2$

$\times 2$

7. A 5 kg ball is moving at 20m/s and is increased to 40m/s. What happens to the balls energy.
   a. The balls gravitational potential energy is increased by a factor of 2
   b. The balls kinetic energy is increased by a factor of 2 ← forgot v^2
   c. The balls gravitational potential energy is increased by a factor of 4
   d. The balls kinetic energy is increased by a factor of 4

KE

KE due to v moving

8. Sketch a graph of height on x axis vs potential energy on the y axis. What does the slope of the line indicate?

$GPE = m g h$ ↑ = + linear

$slope = \frac{rise}{run} = \frac{PE}{h}$

$\frac{GPE}{h} = \frac{mgh}{h}$

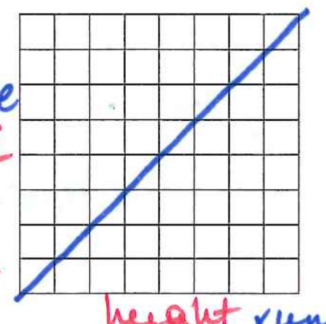
$\frac{GPE}{h} = mg$

$mg = F_{wt}$

   a. Mass
   b. Weight
   c. ~~Velocity~~
   d. ~~Spring constant~~

PE

PE



9. What is the potential energy of a 18kg disco ball hung 7m above the roller rink floor.
   a. 126 J
   b. 441 J
   c. 1,234 J
   d. 8,643 J

PE

$GPE = m g h$

10. How much elastic energy is stored in a spring that is compressed to be .16m and is able to impart 10,000J of kinetic energy to shoot a .8kg objects that was at rest.
   a. 0 J
   b. 78.1 J
   c. 1,250 J
   d. 10,000 J

PEs

↑ transformed 100%

$PE_s = \frac{1}{2} k x^2$

compressed x

logic

11. According to the work energy theorem, work done is equal to
   a. Change in gravitational potential energy
   b. Change in elastic potential energy
   c. Change in kinetic energy
   d. All of the above

W/E

$W = \Delta E$

W = Change in Energy

12. Calculate the spring constant of an automatic baseball pitcher that imparts 20,000J of kinetic energy to a 1.1kg baseball from rest after the spring has been compressed to .14m.
   a. 2.04×10^6
   b. 2.9×10^5
   c. 5600
   d. 784

PEs all transformed

$PE_s = \frac{1}{2} k x^2$ ← only on x

$20{,}000 = \frac{1}{2} k (.14)^2$ ← dont forget

$20{,}000 = \frac{1}{2} k\ .0195$

$\frac{20{,}000}{.0098} = \frac{.0098k}{.0098}$

$K = 2040816$

moving still has h

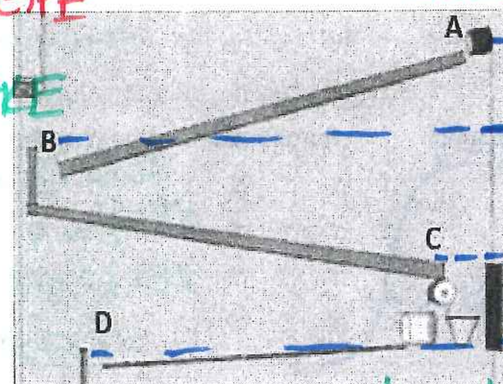
$ME = KE + PE$

13. Which ~~is~~ NOT associate with mechanical energy
    a. Compressed spring moon shoes PE_s
    b. A skier falling down a steep black diamond snow trail $KE + GPE$
    c. Bearded dragons warming lamp
    d. A bungie jumper waiting (still) to jump from the top of a cliff has h GPE

14. Select the best example of kinetic energy transformed into potential energy.
    a. A bicycle road up a mountain
    b. Opening a scissors
    c. sliding down a snow slope on a sled
    d. turning on a lawn mower

KE → PE
moving to still with h

The next 4 questions refer to the marble on the Rube Goldberg Machine pictured



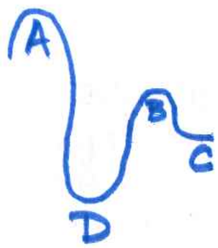
highest = Greatest GPE

15. Where will the marble have the greatest potential energy? highest = ↑GPE

A B C D

16. Where will the marble have the greatest kinetic energy? lowest = ↓GPE = ↑KE

A B C D



17. Where will the marble have the greatest mechanical energy? $ME = KE + PE$

A B C D

ME is always const

18. Where will the marble have the greatest velocity? KE

A B C D

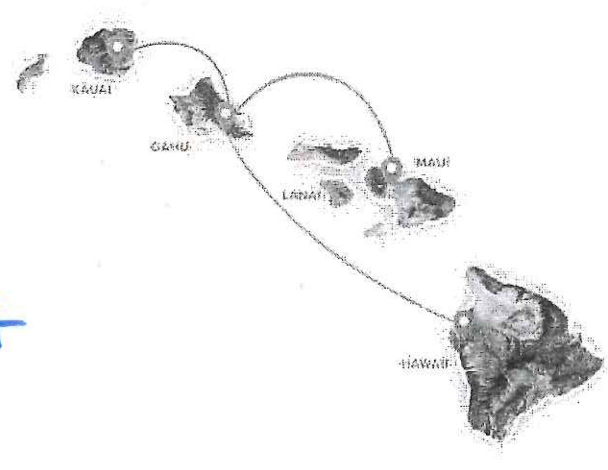
highest KE = lowest GPE
lowest h

lowest
lowest GPE
highest KE

19. Which of the following properly discusses the change of Solar energy to electricity?
    a. Energy is created from the sun's rays
    b. Energy from the sun's rays are destroyed and electrical energy is created
    c. Energy from the sun's rays is transformed into electrical energy
    d. Electrical energy has always been there

20. Lilo, Maui and Moana are all traveling to Oahu from different islands. Lilo takes Stitch's rocket from Hawaii and gets there in 20 minutes. Maui transforms into a hawk and flies for 40 minutes from Maui. Moana sails across the sea from Kauai, but experiences a difficult wind, finishing her voyage 1 hour later. Which is the most powerful?

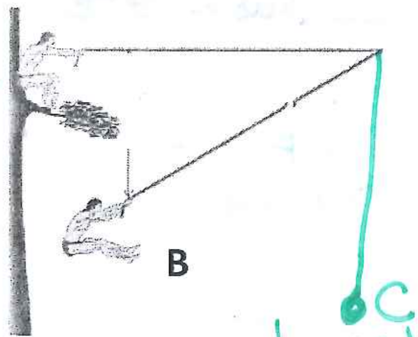
    a. Lilo
    b. Maui
    c. Moana
    d. All teams were equally powerful



$P = \frac{W}{t} = \frac{Fd}{t}$ = most P

21. Explain the relationship between Kinetic, Gravitational Potential, and Mechanical Energy as Tarzan waits motionless on the branch at point A then swings off to point B. Explain which type of energy (if any) increases, decreases, or is constant.

highest ~~greatest GPE~~



lowest
lowest GPE = Greatest KE

from A ↓GPE
to
B ↑KE
ME is const

22. Glitter the elf is skiing down a ski jump of a certain height. Her velocity at 1 m away from the jump is 18 m/s and with her skis on, her mass is 48 kg. How high is the top of the ski jump?

h = ?
18 m/s = v @ 1 m

find KE @ 1 m
$KE = \frac{1}{2} m v^2$
$KE = \frac{1}{2}(48)(18)^2$
$= 7776 J$

find GPE @ 1 m
GPE = 48(9.8) 1
= 470.4 J

ME @ 1 m = 100% = all GPE at top to find h
ME = KE + GPE
ME = 7776 + 470.4
ME = 8246.4 J → 8246.4 = 48(9.8) h
GPE = mgh
$\frac{8246.4}{470.4} = \frac{470.4\,h}{470.4}$
h = 17.53

23. List at least types of energy that do not contribute to mechanical energy

ME = KE + PE not thermal (front)

24. What does Conservation of Energy mean?

E not created or ~~transfo~~ destroyed only transformed

25. List all possible scenarios when W=0 (Hint: use the equation)

W = F d
0 0
0 0

W = ΔE
0 0

W = F d
W = m a d
0 0
0 0
0 0