EST Inclined Plane, Work and Energy

Name: Answer Key

Date: November 3rd 2016

All Questions 4 marks each! Pace Yourself!!

1. Energy can be present in several different forms in nature.

What is the name given to the form of energy linked exclusively to the position of the object?

A) kinetic energy

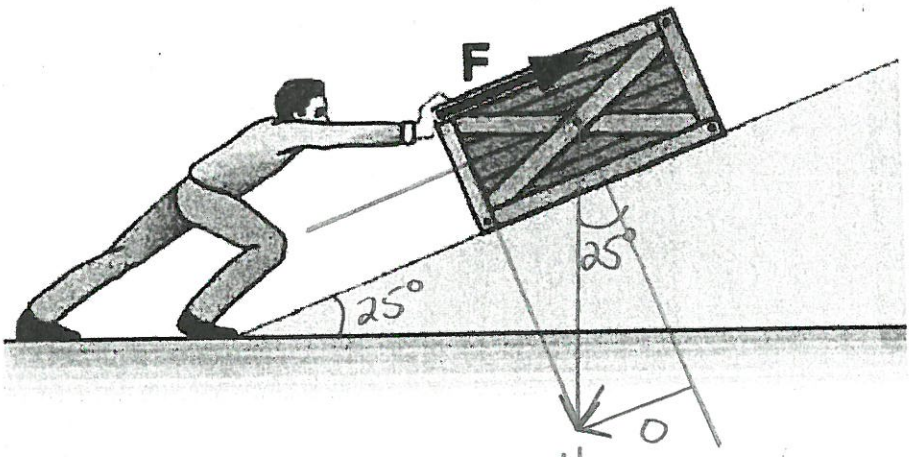
B) potential energy

C) mechanical energy

D) electrical energy

$13 \times 4 = 52$

2. A 10. kg crate is to be pushed up the following 25 ° ramp.



$H = F_g = mg = 10\,kg \times 9.8\,\frac{m}{s^2} = 98\,N$

What is the effective force must the man use to push the block up the frictionless ramp at a constant speed?

$N \times \sin\theta = \frac{O}{H} \times H$

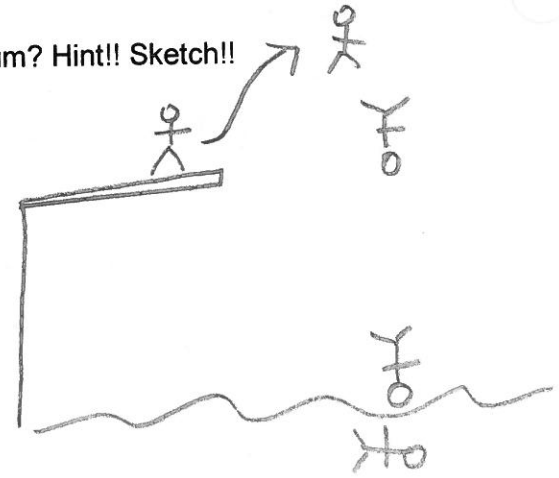
Show all work clearly!

$98N \sin 25° = O =$

Answer: 41.4 N F_{eff}

3. An Olympic diver in Rio this past summer runs along a 3 m high diving board, jumps into the air and dives into the pool below.

At which point is her gravitational energy at its maximum? Hint!! Sketch!!



A) While she is running along the diving board.

B) When she jumps in the air.

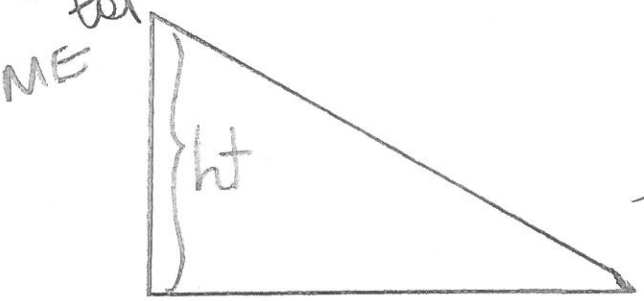
C) Just before she hits the water.

D) When she is under water.

4. A 70. kg woman at an amusement park slid down from the top of a water slide and reached the bottom at a speed of 8.0 m/s.

What height was the slide? It is highly advised to sketch!!

all GP top
ME



bottom all EK
$E_p = 0$
$v = 8.0\ m/s$
ME

$E_K = \frac{1}{2}mv^2$

$= \frac{1}{2}(70kg)(8.0\frac{m}{s})^2$

$= 2240\ J$

bottom $ME = E_p^{\nearrow 0} + E_K$

top $ME = E_p + E_K^{\nearrow 0}$

$\frac{E_p}{mg} = \frac{mgh}{mg}$

Answer: 3.27 m

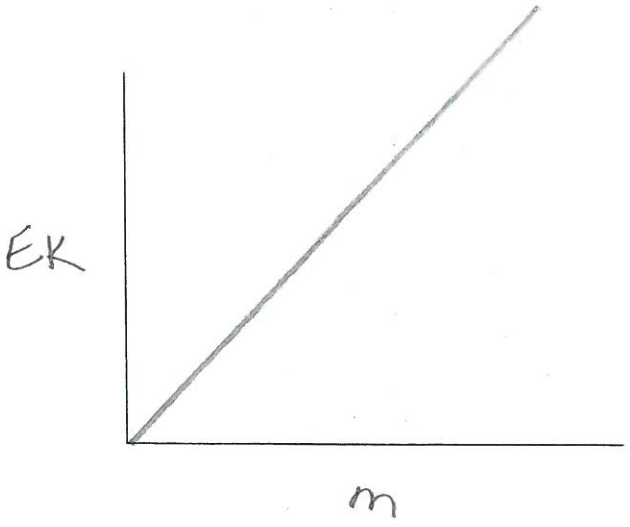
$\frac{2240\ J}{(70kg)(9.8\frac{m}{s^2})} = 3.27\ m$

8. Indicate whether work is being done in the following circumstances:

Example	Direction of force	Direction of motion	Doing work?
			✓
			✗
			✓
			✗

direct variation btw the 2

9. Sketch a graph of the relationship between kinetic energy versus mass of an object:



$E_K = \frac{1}{2}mv^2$

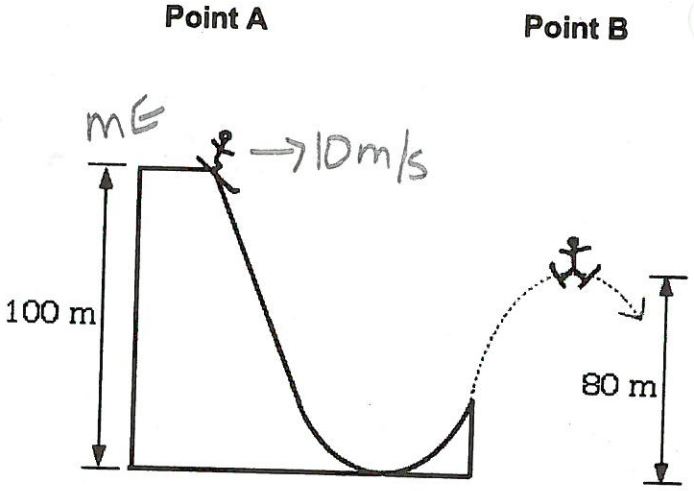
↑m = ↑E_K

direct

Ø mass = Ø E_K

5. A 70. kg skier moving at 10 m/s at Point A skis down the jump and rises to a height of 80. m at Point B.

What is her speed at Point B?



A) $ME = Ep + Ek$

$= mgh + \frac{1}{2}mv^2$

$= (70kg)(9.8\frac{m}{s^2})(100m) + (\frac{1}{2})(70kg)(10m/s)^2$

$= 68600J + 3500J$

$= 72100\,J$

B) $ME = Ep + Ek - Ep$

$Ek = ME - Ep = 72100J - (70kg)(9.8m/s^2)(80m)$

$- 54880\,0J$

$= 17220J$

$V = \sqrt{\frac{2Ek}{m}}$

$= \sqrt{\frac{2(17220J)}{70.kg}}$

Answer: $\frac{22\ m}{s}$

6. Define the following:

Mechanical Energy the sum of Ep plus Ek

Work the difference btw the Eks of an obj
the force x distance

7. The potential energy of a box on a shelf, relative to the floor, is a measure of:

A) The work done putting the box on the shelf from the floor. ✓

B) The weight of the box times the distance above the floor. ✓

C) The energy the box has because of its position above the floor. ✓

D) All of the above.

10. If the speed of an object is tripled then its kinetic energy is?

Use math to back up your answer.

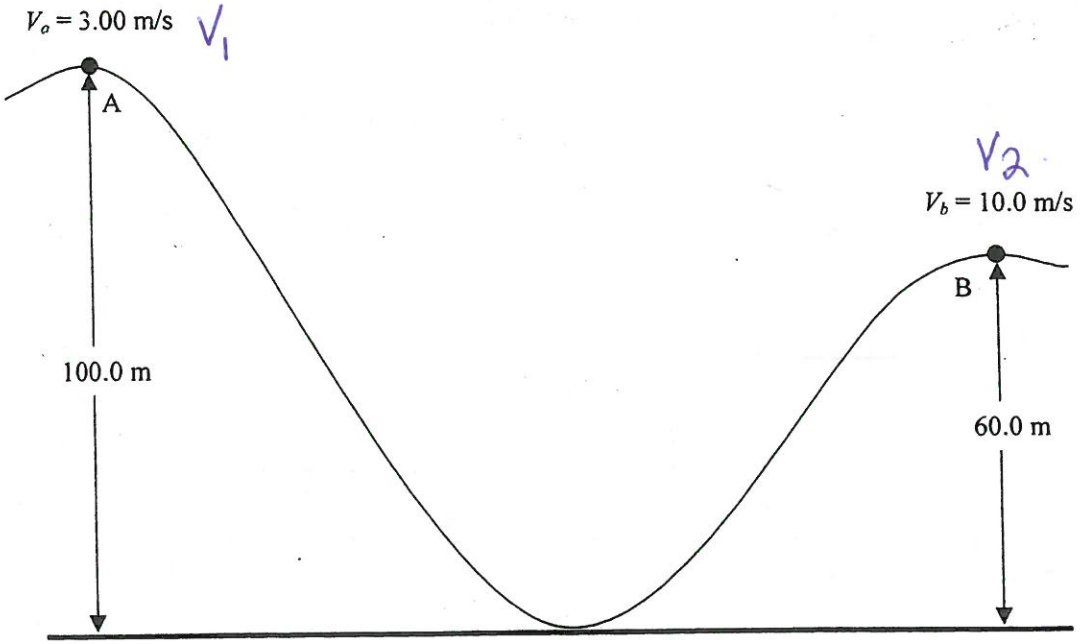
$$E_K = \frac{1}{2}mv^2$$
$$= \frac{1}{2}(1)(3)^2$$
$$= 9\times \text{ what it was}$$

Answer: 9x

m

11. A 2.0 kg ball slides down a slope from point A to point B.

How much work is done on the ball?



$$\text{work} = \Delta E_K = E_{K_2} - E_{K_1}$$
$$= \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2$$
$$= \frac{1}{2}(2\,kg)(10\,m/s)^2 - \frac{1}{2}(2)(3\,\tfrac{m}{s})^2$$
$$= +91\,J$$

Answer: +91 J

12. A scientist hypothesizes that the temperature at which an alligator's egg is incubated will determine whether the alligator will be male or female.

How would you set up the experiment?

- divide a large (OR very many) # of alligators into 2 groups
- change the T for each gp

Independent Variable: temperature

Dependent Variable: sex = male or female

Constants

- # alligators in each gp
- type of alligator
- same water type
- same HE

13. Calculate the specific heat capacity of a new alloy if a 15.4 g sample absorbs 393 J when it is heated from 0.0 °C to 37.6 °C.

$$Q = mc\Delta T$$

$$\frac{Q}{m\Delta T} = \frac{mc\Delta T}{m\Delta T}$$

$$\frac{393\ J}{(15.4\ g)(37.6\ ^\circ C - 0.0\ ^\circ C)} = c = 0.68\ \frac{J}{g \cdot C}$$

Answer: $0.68\ \frac{J}{g \cdot C}$

14. A 40.0 g sample of ethanol releases 2952 J as it cools from 50.0 °C. $c_{eth} = \frac{2.46\ J}{g \cdot C}$

Calculate the final temperature of the ethanol.

$c = \frac{2.46\ J}{g \cdot C}$

$\frac{Q}{mc} = \frac{mc\Delta T}{mc}$

$\frac{-2952\ J}{(40.0\ g)\left(2.46 \frac{J}{g \cdot C}\right)} = \Delta T = -30 \cdot C$

$\Delta T = T_2 - T_1 + T_1$

$+T_1 = -30 \cdot C + 50.0 \cdot C$

$T_2 = 20 \cdot C$

Answer: $20 \cdot C = T_2$

15) BCE for photosyn

sunlight $E + 6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$