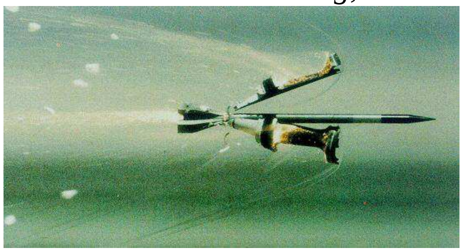
Name_______________________________

Period__________

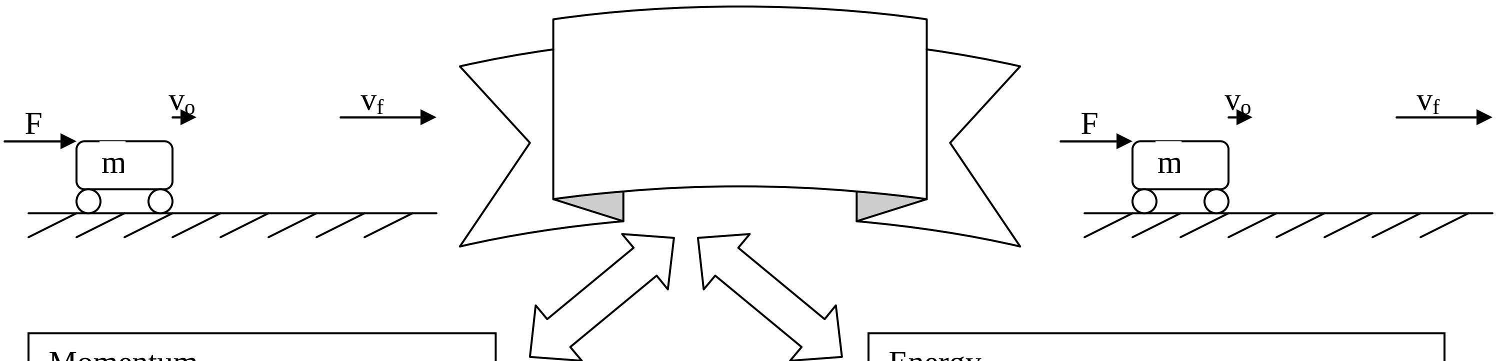
Work and Energy

The 120mm M829 Armor Piercing, Fin Stabilized, Discarding Sabot-Tracer(APFSDS-T),

http://www.fas.org/man/dod-101/sys/land/120.htm



Introduction: **Work and Kinetic Energy of Particles**

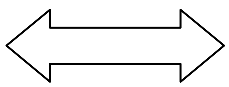


Momentum
Force and_______

1) Impulse momentum
$J = F\Delta t = mv_f - mv_o$

2) F vs. T graphs

3) $\Sigma P_o = \Sigma P_f$



Energy
Force and________

1)

2)

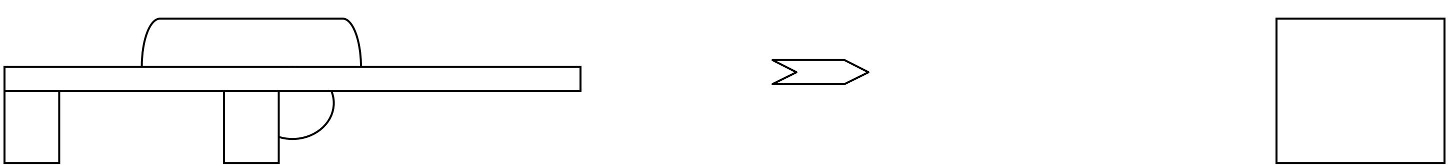
3)

What is energy?

Kinetic Energy(KE):

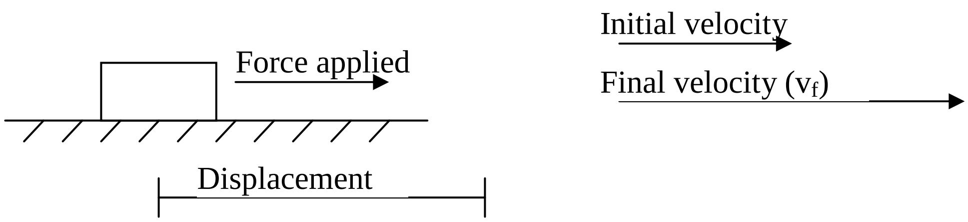
Potential Energy(PE=U=V)

Work(W=U) **I) effect** **II) calculation**



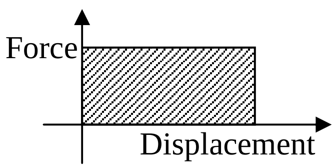
Work: is the transfer of Energy $\Leftrightarrow$ Energy: is the capacity of a body to do work.

Work is energy transferred to or from a Body by a means of a force acting over a parallel displacement. Note: Those forces that are perpendicular to the displacement do no work.



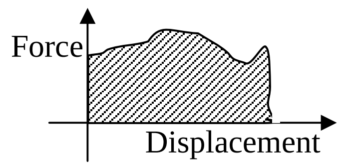
This is how we calculate the amount of work done. (ex: The force that did 50 J of work.)

I) (F is constant) Work = $F \cdot d = Fd\cos\theta$ (d = $r_f - r_o$ the change in position while the force acts)



Work = $F \cdot d$ = area under the curve

II) (F varies) Work = $\int_{r_o}^{r_f} F \cdot dr$



Warning: In both cases I and II the force is assumed to be the net force applied to the body. Therefore Work = $Work_{net}$

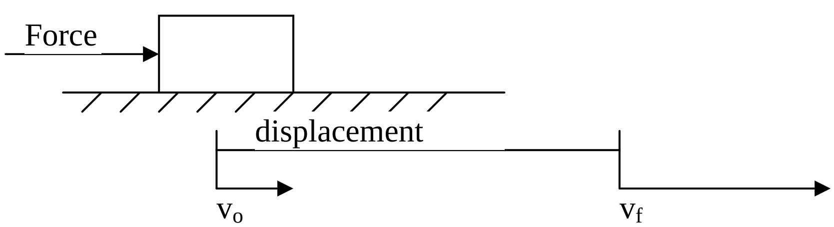
This is how we calculate the effect of the work done: (The work changed the KE of the body by 50 J, it increased the speed from 5 m/s to 15 m/s.)

$Work_{net} = (\Delta KE) = KE_f - KE_o = \frac{1}{2} mv_f^2 - \frac{1}{2} mv_o^2$

How do we know the sign of work? Two ways: math, concepts

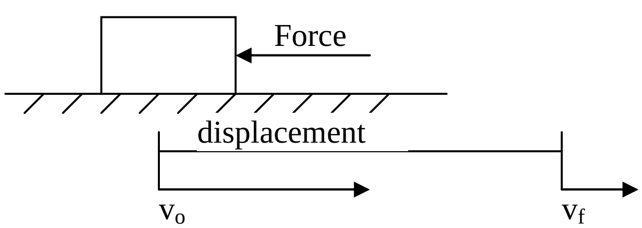
A) Work performed on a system by an **outside force**: Work from an outside $force_{net}$ in the direction of motion, changes the total amount of energy in the system. Work that increases the total amount of KE is Positive Work. Work that decreases the total amount of KE is Negative Work.

I) Ex: an Applied force adding KE (doing positive work)

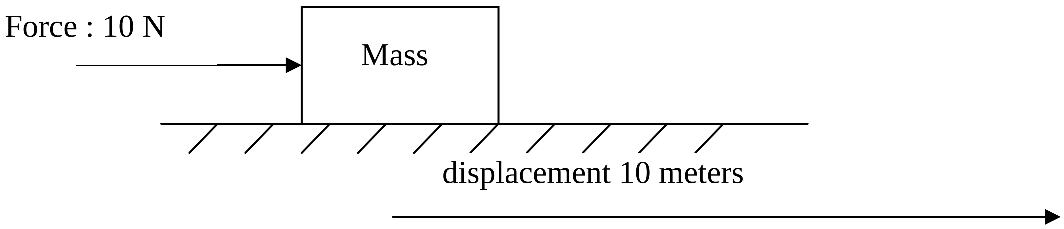


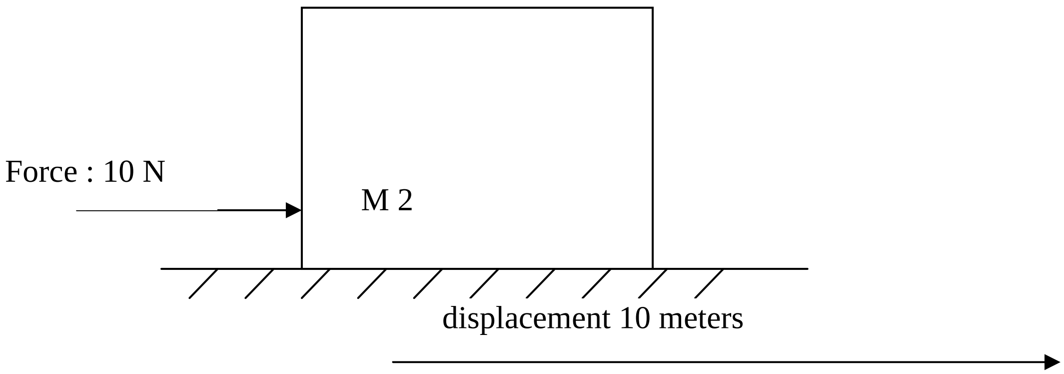
$W_{net} = KE_f - KE_o$ (clearly; KE_f is larger than KE_o, thus a positive (increase) ΔKE)

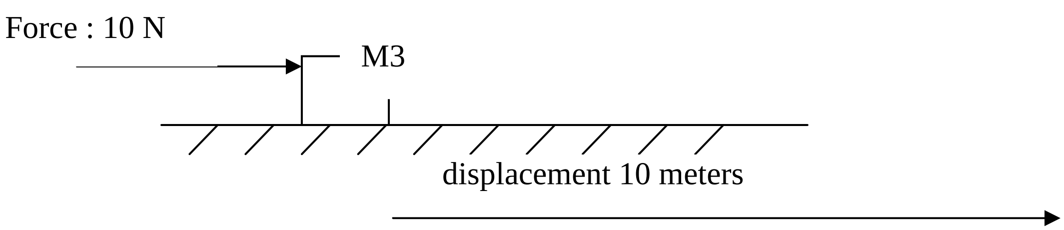
II)
III) Ex: Friction decreasing the KE (doing negative work)

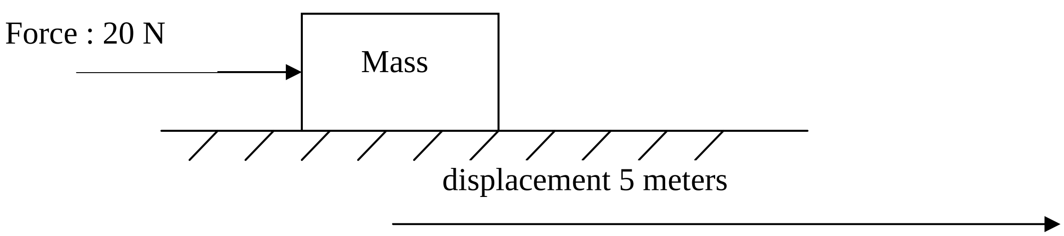


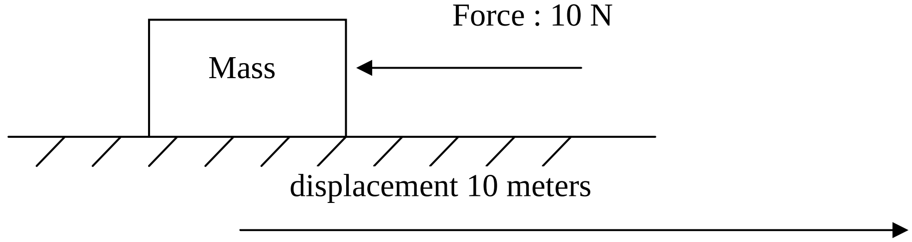
Calculating work done

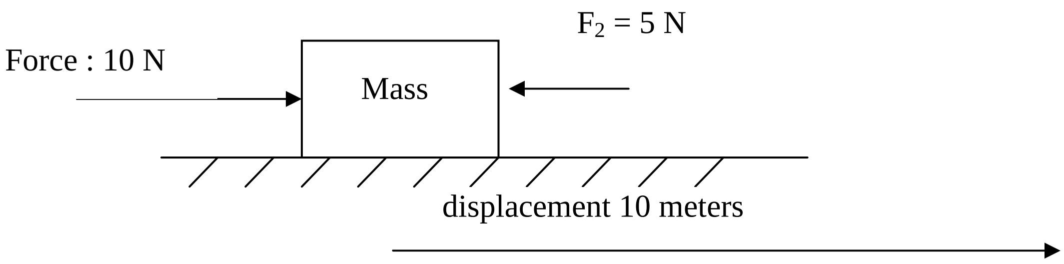


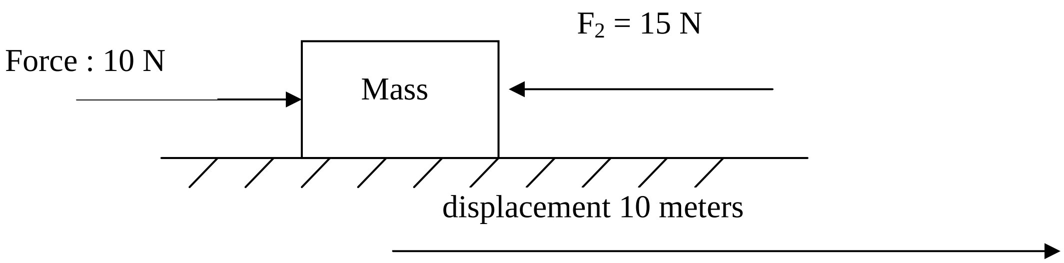


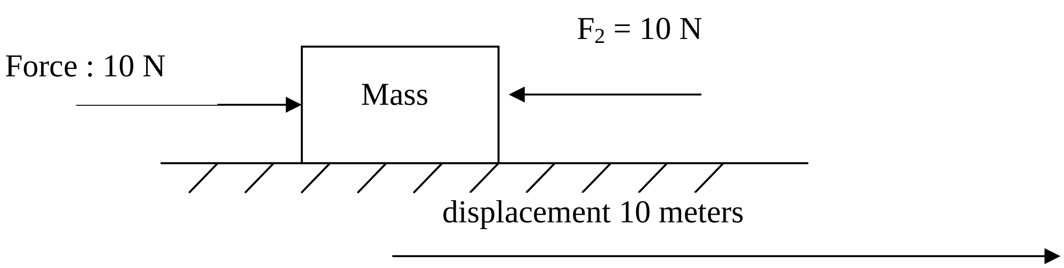


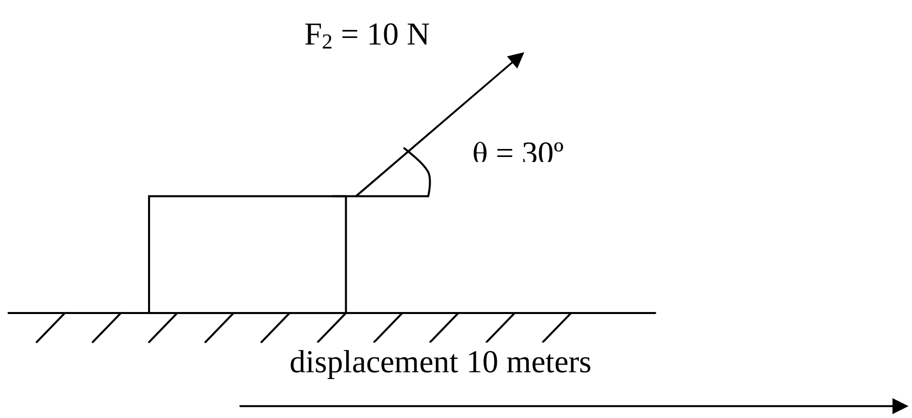





Force : 10 N
Mass
F2 = 5 N
displacement 10 meters

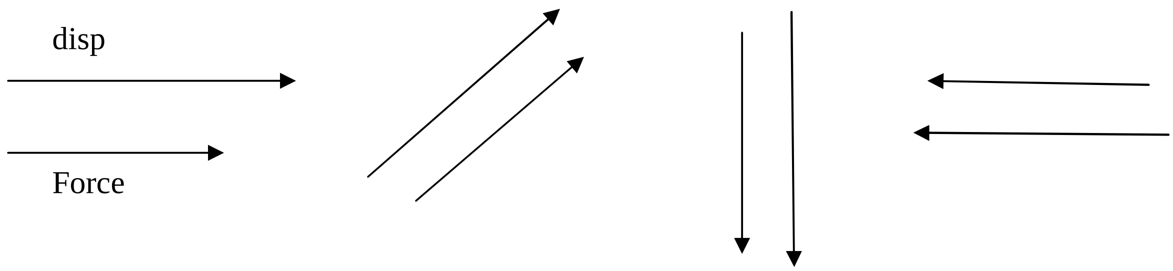

Force : 10 N
Mass
F2 = 15 N
displacement 10 meters


Force : 10 N
Mass
F2 = 10 N
displacement 10 meters

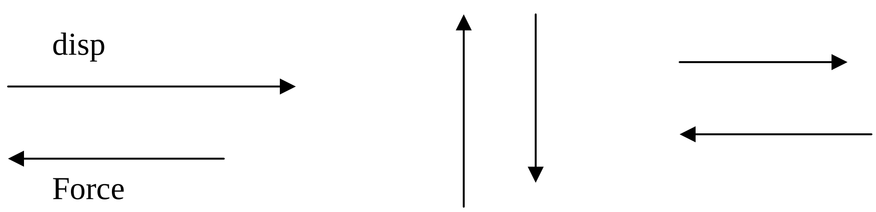

F2 = 10 N
θ = 30º
displacement 10 meters

Reviewing the dot $W = F \cdot d$

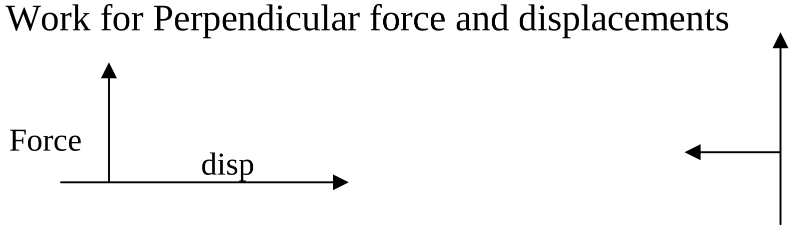
1) Work for Parallel force and displacements: Work



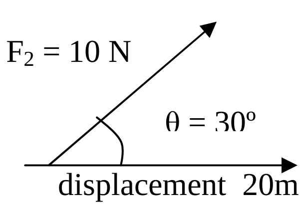
2) Work for Antiparallel force and displacements: Work

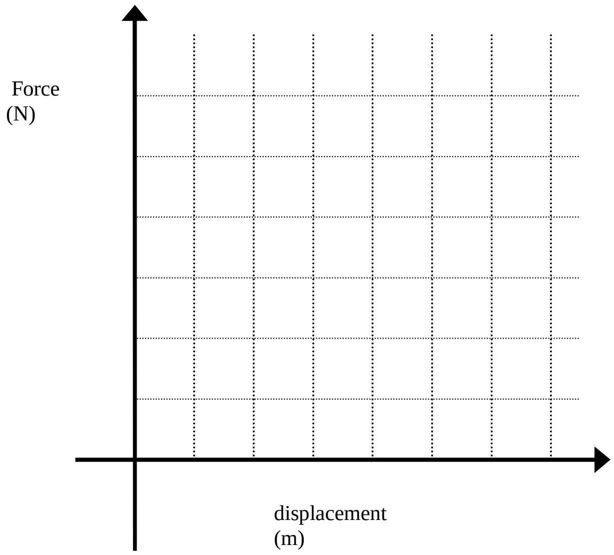


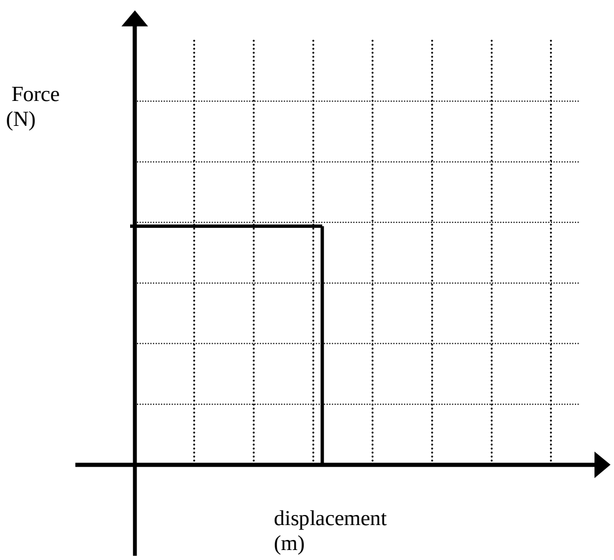
3) Work for Perpendicular force and displacements

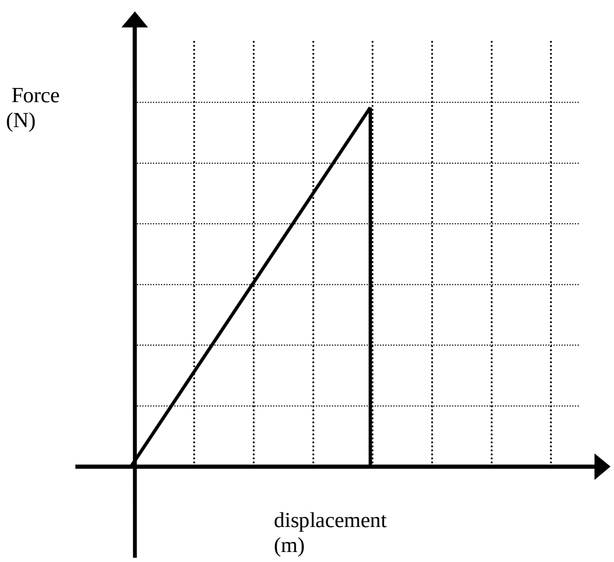


4) Work for a force and displacement at an angle




Force
(N)
displacement
(m)


Force
(N)
displacement
(m)


Force
(N)
displacement
(m)

Name ________________________________ Date __________

CONCEPTUAL **Physical Science** PRACTICE SHEET

Chapter 3: Momentum and Energy
Work and Energy

1. How much work (energy) is needed to lift an object that weighs 200 N to a height of 4 m?

____

2. How much power is needed to lift the 200-N object to a height of 4 m in 4 s?

____

3. What is the power output of an engine that does 60 000 J of work in 10 s?

____

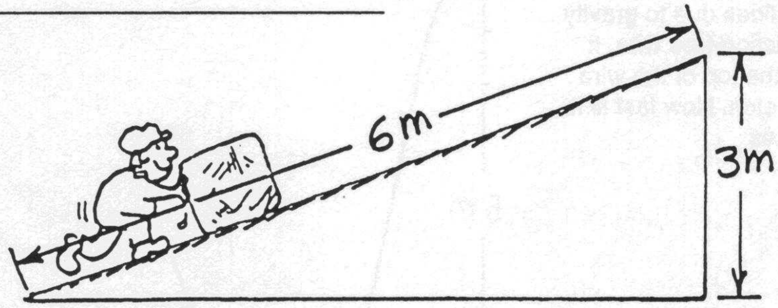
4. The block of ice weighs 500 newtons.

   a. Neglecting friction, how much force is needed to push it up the incline?

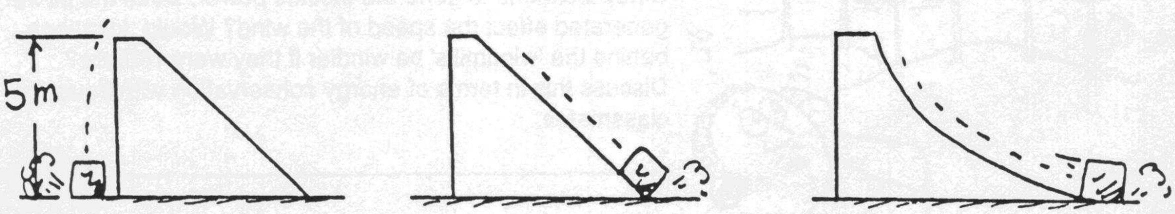
   ____

   b. How much work is required to push it up the incline compared with lifting the block vertically 3?

   ____



5. All the ramps are 5 m high. We know that the KE of the block at the bottom of the ramp will be equal to the loss of PE (conservation of energy). Find the speed of the block at ground level in each case. [Hint: Do you recall from earlier chapters how long it takes something to fall a vertical distance of 5 m from a positon of rest (assume $g = 10\ m/s^2$)? And how much speed a falling object acquires in this time? This gives you the answer to Case 1. Discuss with your classmates how energy conservation gives you the answers to Cases 2 and 3.]

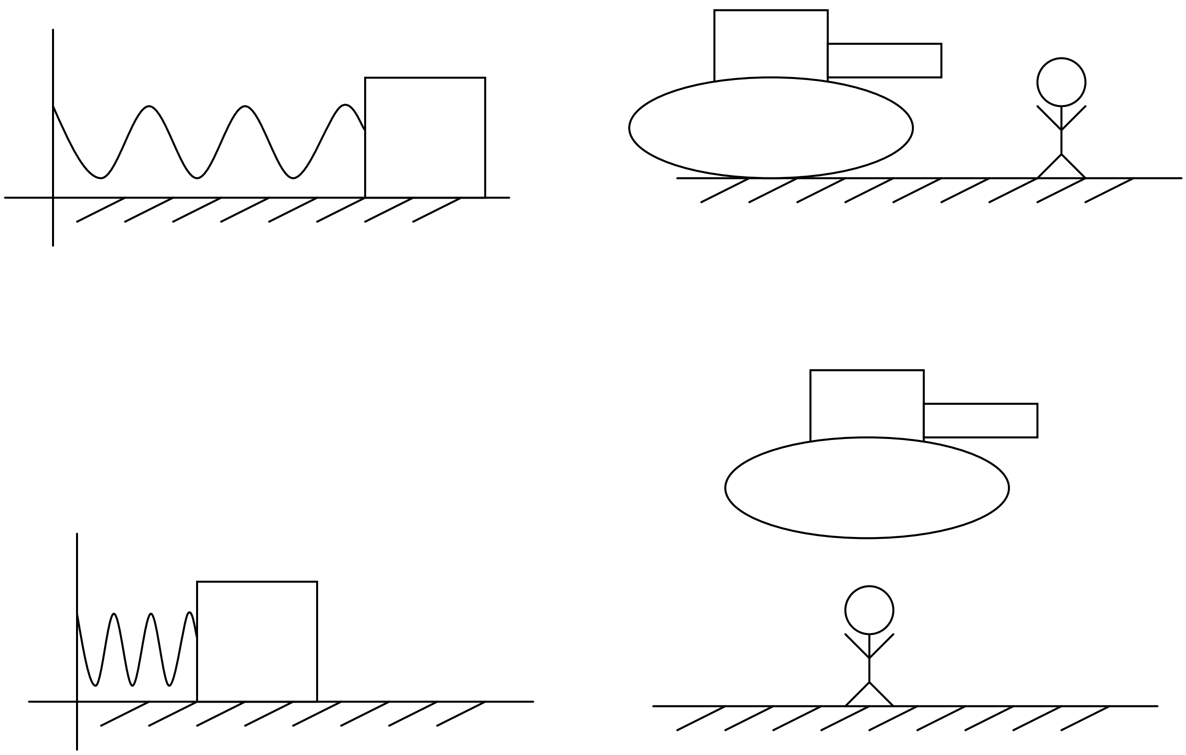


Case 1: Speed = ________ m/s   Case 2: Speed = ________ m/s   Case 3: Speed = ________ m/s.

Hewitt Drew it!

Potential Energy?

"*Energy that can be associated with the configuration (or arrangement) of a system of objects that exert forces on one another.*"



Potential Energy ⇔ Stored Conservative Force

Signs for PE can be confusing: When looking at a system (Pendulum) we have already said above that **positive** work = transfer of PE to KE = Decrease PE and increase KE = $-\Delta PE$, $+\Delta KE$

Positive work: $W = -\Delta PE = -\Delta U$

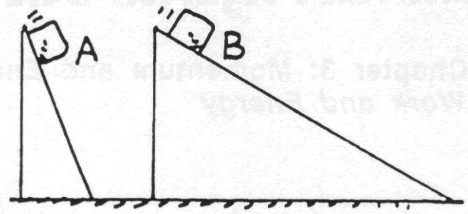
+Work done by the system(gravity) lowers the PE and raises the KE
-Work done by the system(gravity) raise the PE and lowers the KE
Work done by exterior forces is generally required to reverse this effect

6. Which block gets to the bottom of the incline first? Assume no friction. (Be carefull) Explain your answer.

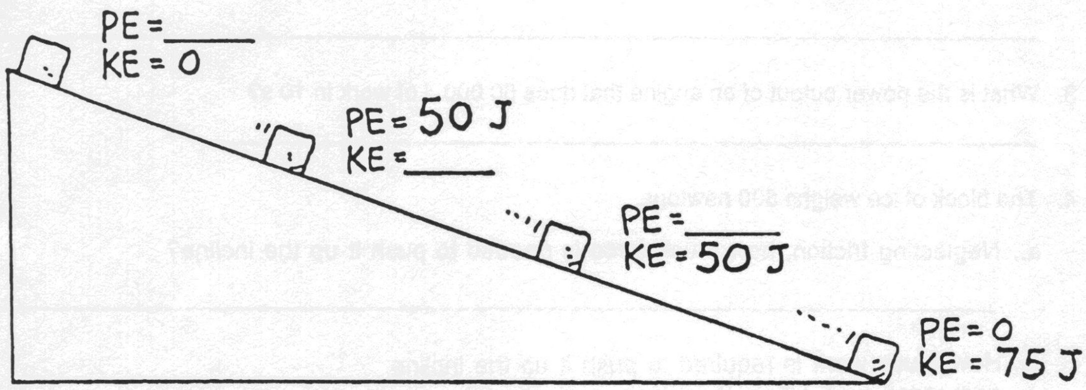
____

____

____



7. The KE and PE of a block freely sliding down a ramp are shown in only one place in the sketch. Fill in the missing values.



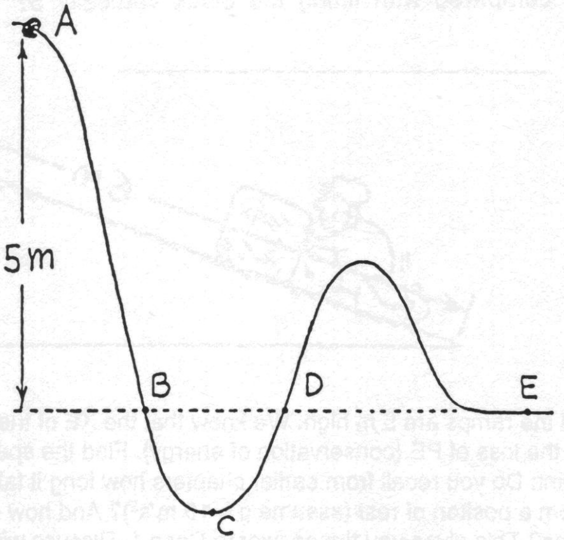
8. A big metal bead slides due to gravity along an upright friction-free wire. It starts from rest at the top of the wire as shown in the sketch. How fast is it traveling as it passes

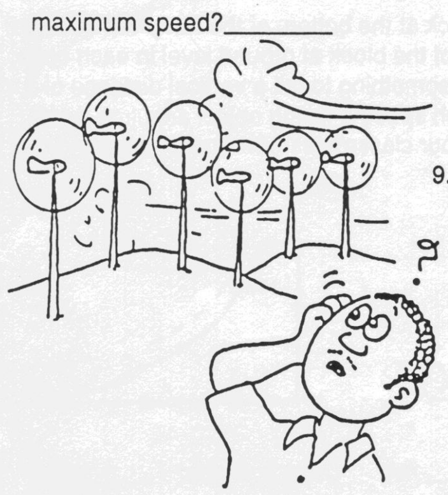
Point B?________

Point D?________

Point E?________

At what point does it have the maximum speed?________





9. Rows of wind-powered generators are used in various windy locations to generate electric power. Does the power generated affect the speed of the wind? Would locations behind the 'windmills' be windier if they weren't there? Discuss this in terms of energy conservation with your classmates.

____

____

____

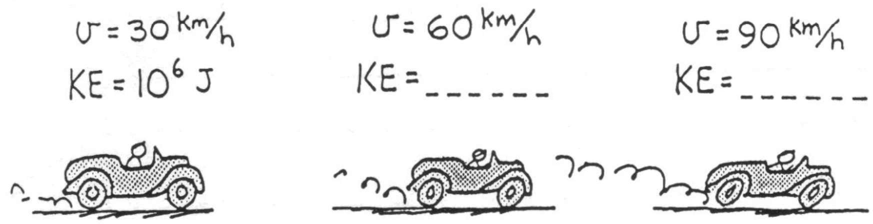
____

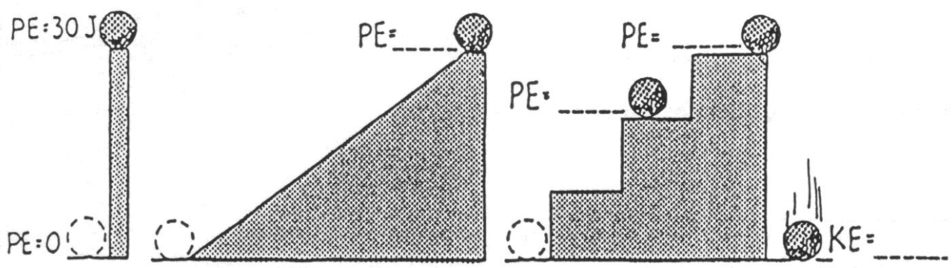
Hewitt Drew it!

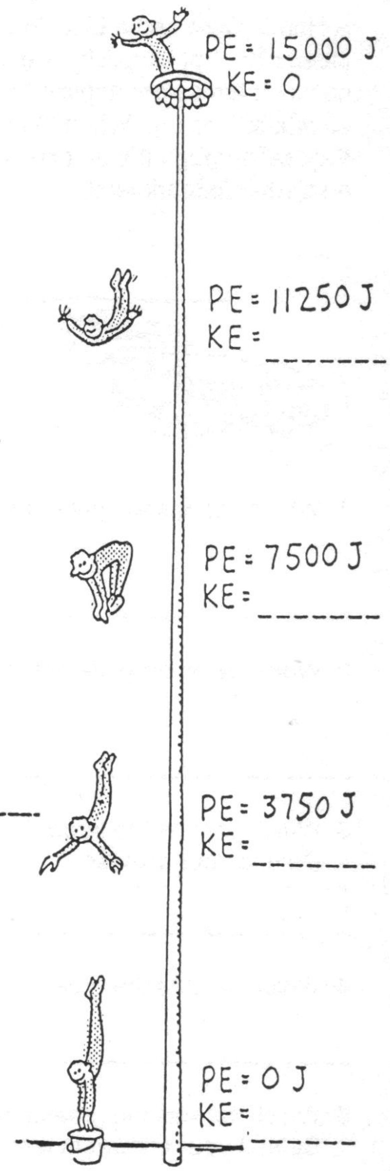
CONCEPTUAL **Physical Science** PRACTICE SHEET

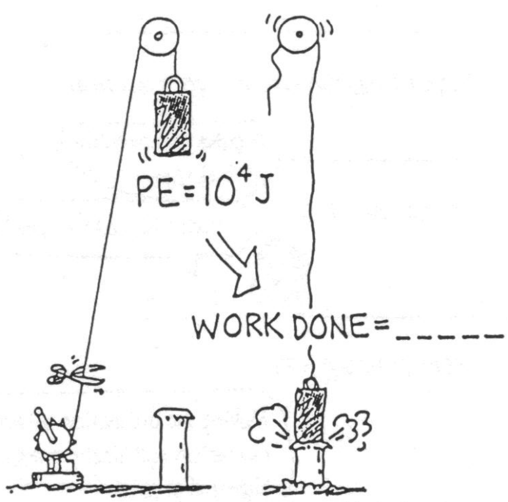
Chapter 3: Momentum and Energy
Conservation of Energy

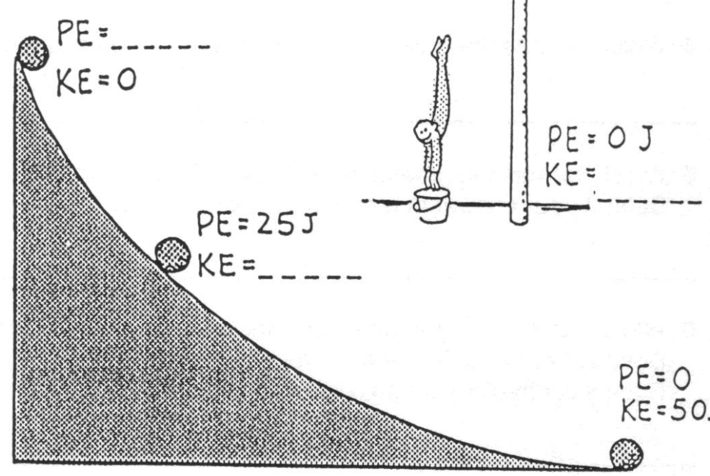
Fill in the blanks for the six systems shown.

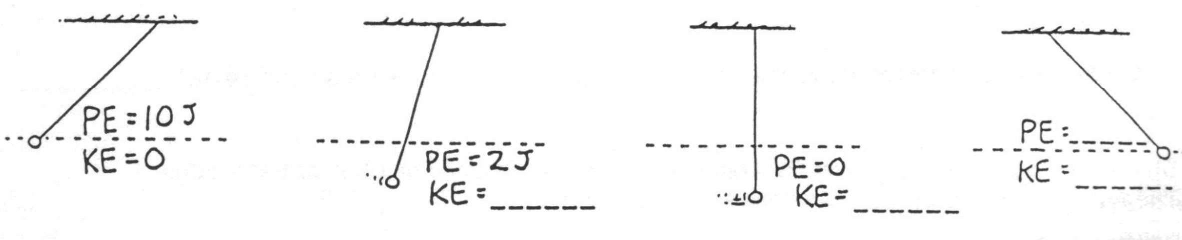












Hewitt Drew it!

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