

Using the previous graph find the initial velocity of the object graphed.

2.5 m/s

How far away is the object from its starting point after 8.0 sec?

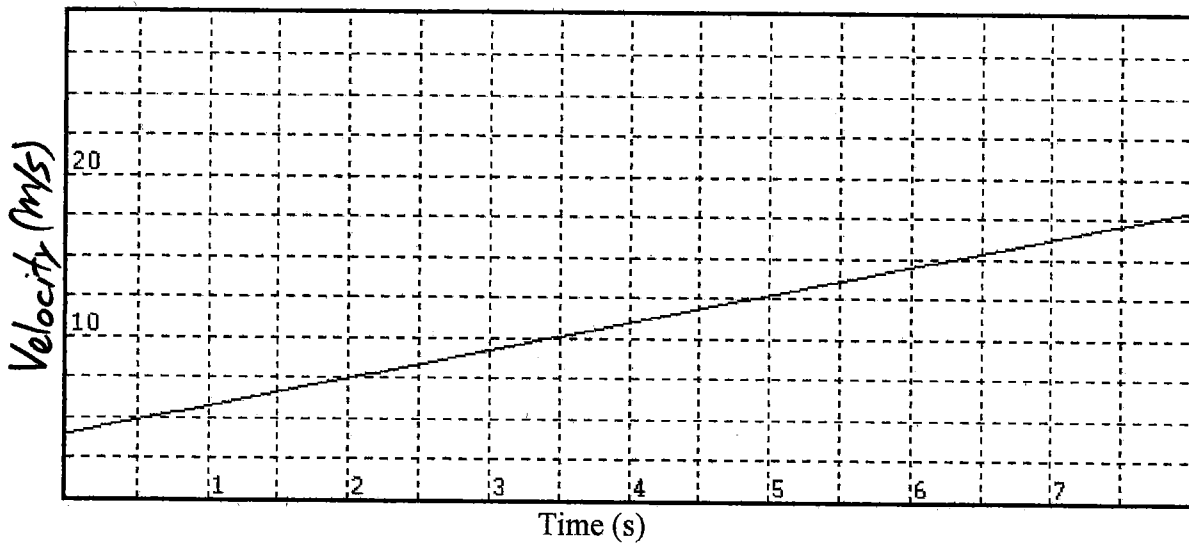
20.0 m

If the observer watched the object for 10.0 seconds what would be the final velocity?

2.5 m/s

Calculate the velocity of a car which begins 25 meters away from you and ends 100.0 meters away when driving for 4.0 seconds

19 m/s



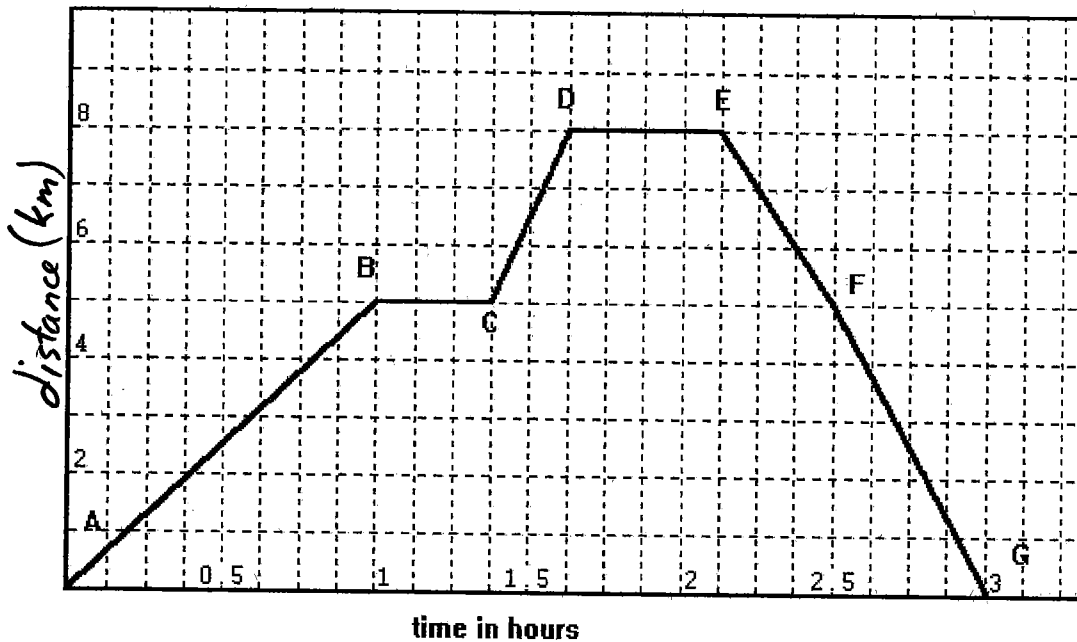
On the graph above what is the vehicle's initial velocity?

4.0 m/s

What is the acceleration of the vehicle?

1.7 m/s<sup>2</sup>

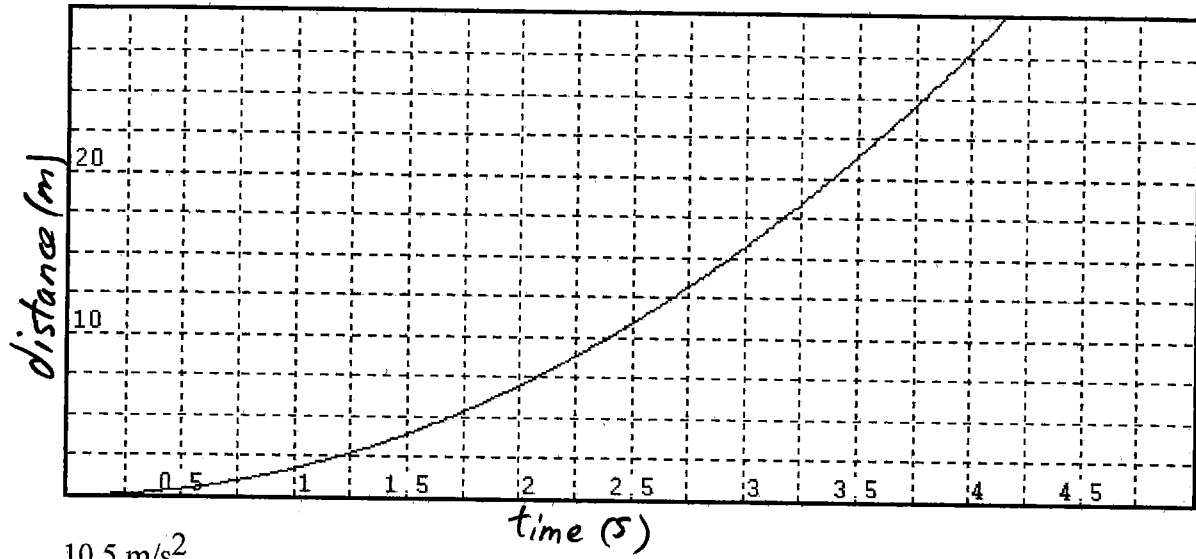
On the graph below state what the vehicle is doing between each point, and whether or not the vehicle is at constant velocity.



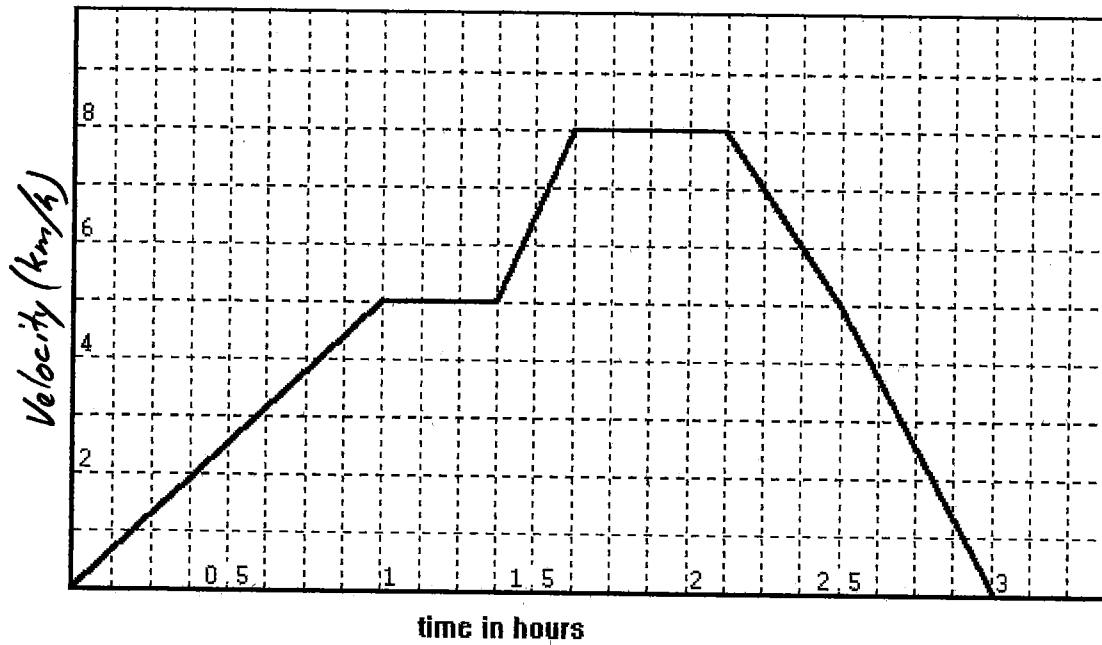
What is the total displacement of the car?

0.0 m

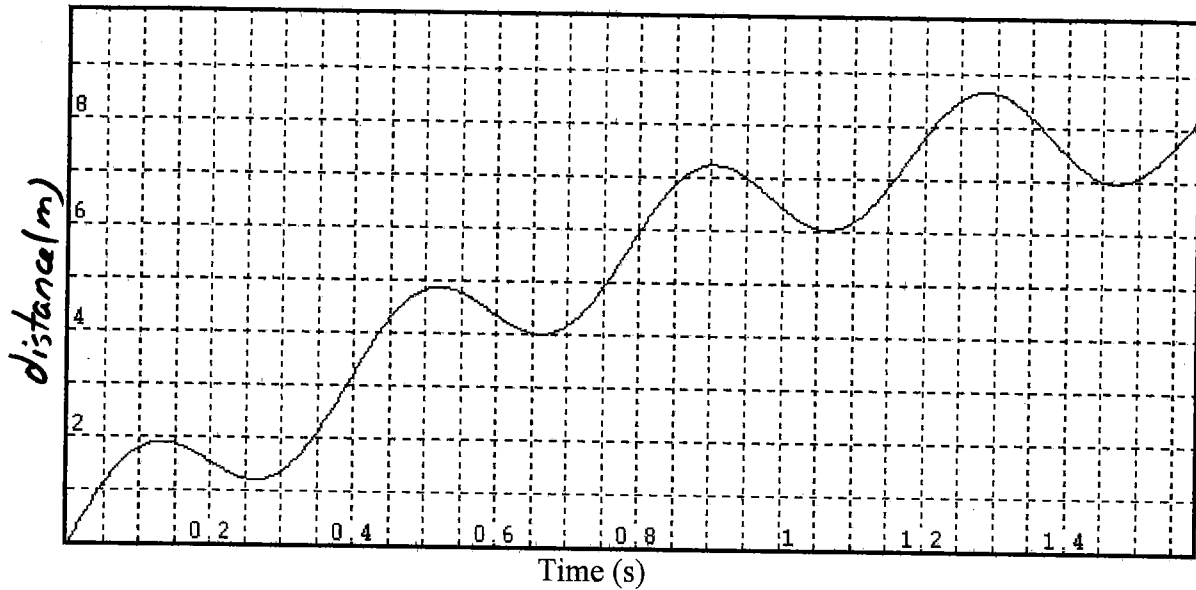
Use the graph below to find the velocity of the car at exactly 3.0 s.



Calculate the distance traveled by the vehicle in the graph below.



Calculate the average velocity of the vehicle between 0.5 s and 1.5 s on the graph below.



2.3 m/s

KINEMATICS:

Calculate the time required for an aardvark to achieve a speed of 10.0 m/s starting from rest if it can accelerate at a rate of  $1.2 \text{ m/s}^2$ .

8.3 s

What distance can be covered by an airplane with velocity 42 m/s if it accelerates at  $2.0 \text{ m/s}^2$  for 9.00 s?

459m

What is the average velocity of a bullet train which starts at rest and has a velocity of 83.3 m/s after a time of 1.00 min?

41.7 m/s

What is the acceleration of that train?

$1.39 \text{ m/s}^2$

Calculate the distance traveled by a falling rock if it struck the ground with velocity 49.0 m/s.

122 m

How long was the rock falling in the previous question?

5.00 s

VECTOR PROBLEMS:

A motor boat drives down-stream at 20.0 m/s, and the river it is in has velocity 4.0 m/s. What is the velocity of the boat as viewed from shore, and from the river?

Shore = 24.0 m/s, River = 20.0 m/s

A swimmer travels straight across a river (due north) at velocity 1.2 m/s, the current flows at 0.5 m/s [E], what is the resultant velocity of the swimmer?

1.3 m/s, 23°E of N

A bird flies at 14 m/s due east and encounters a wind blowing due south at 6.0 m/s. Find the resultant.

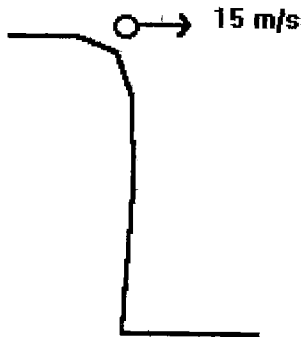
15 m/s, 23°S of E

A boater wants to travel due west across a river with velocity 4.0 m/s [S]. If the boat is capable of 9.0 m/s what angle must the boat take and what is its velocity?

8.1 m/s 26° N of W

How many parts are in every projectile problem?

A ball is thrown with velocity 15.0 m/s off a 25 m high cliff as shown below. Answer the questions below the picture.



How far from the base of the cliff will the ball land?

34 m

What will be the ball's final horizontal velocity?

15 m/s

What will be the ball's final vertical velocity?

22 m/s

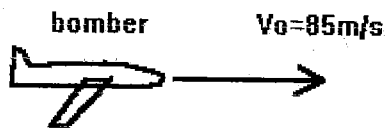
How far from the top of the cliff will the ball land?

42 m

What will be the speed of the ball?

27 m/s

Use the diagram below to answer the following questions:



City



If the bomber is at altitude 5.00 km, how far from the city should a bomb be released in order to land on the target?

$2.71 \times 10^3$  m

PENDULUMS:

How long should a pendulum be in order to have a period of 1.50 sec?

0.56 m

On Venus where the acceleration due to gravity is  $9/10$  of earth what would be the frequency of a pendulum of length 75 cm?

0.55 Hz

The acceleration of a ramp is known to be  $a = g(h/d)$  where  $h$  is the ramp's height, and  $d$  is its length along the ramp. Calculate the acceleration due to gravity on the planet Ytivarig if a ball rolls down a 5.0m ramp with acceleration  $6.2 \text{ m/s}^2$  when the ramp is raised to a height of 1.78 m.

$17 \text{ m/s}^2$

A ramp on an angle of  $25^\circ$  has what acceleration?

$4.1 \text{ m/s}^2$

What angle must a ramp be set at to produce an acceleration of  $8.0 \text{ m/s}^2$  ?

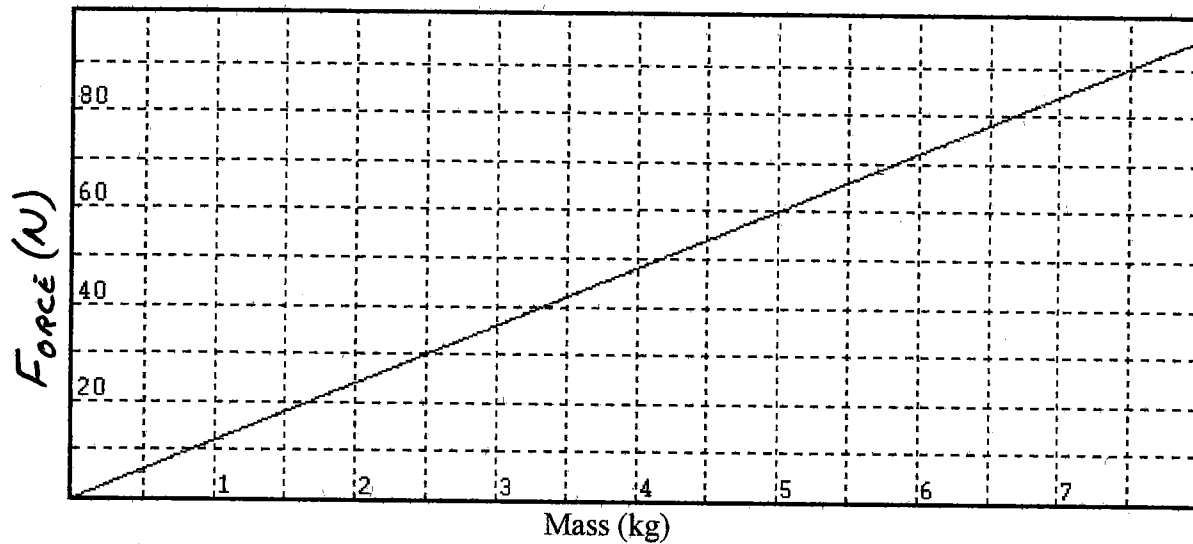
### FORCES:

Calculate the force of gravity on a 12 gram toy.

0.12 N

The following graph is a plot of force in Newtons vs. mass in kg for a planet called Tenalp. Calculate the acceleration due to gravity using the graph.





$g = 12.5 \text{ m/s}^2$

If the radius of planet Tenalp is  $7.00 \times 10^6 \text{ m}$  use a 2.0 kg mass and the graph to find the mass of the planet.

$8.8 \times 10^{24} \text{ kg}$

Using the table of  $\mu$  values from page 85 of your text solve the following problems.

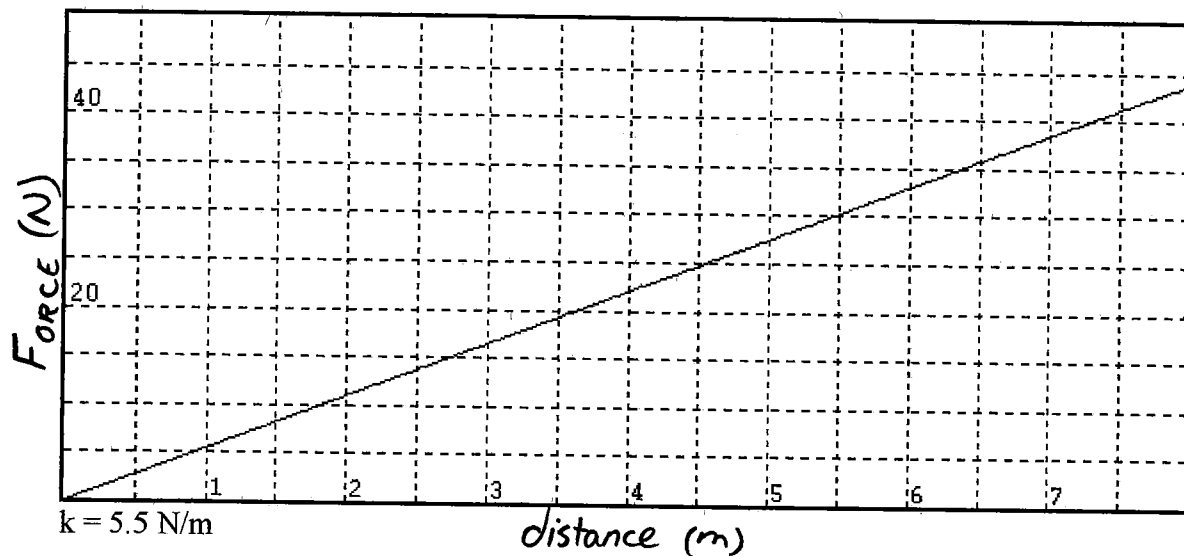
Calculate the force of friction between a 12 kg mass of steel on a steel table.

48 N

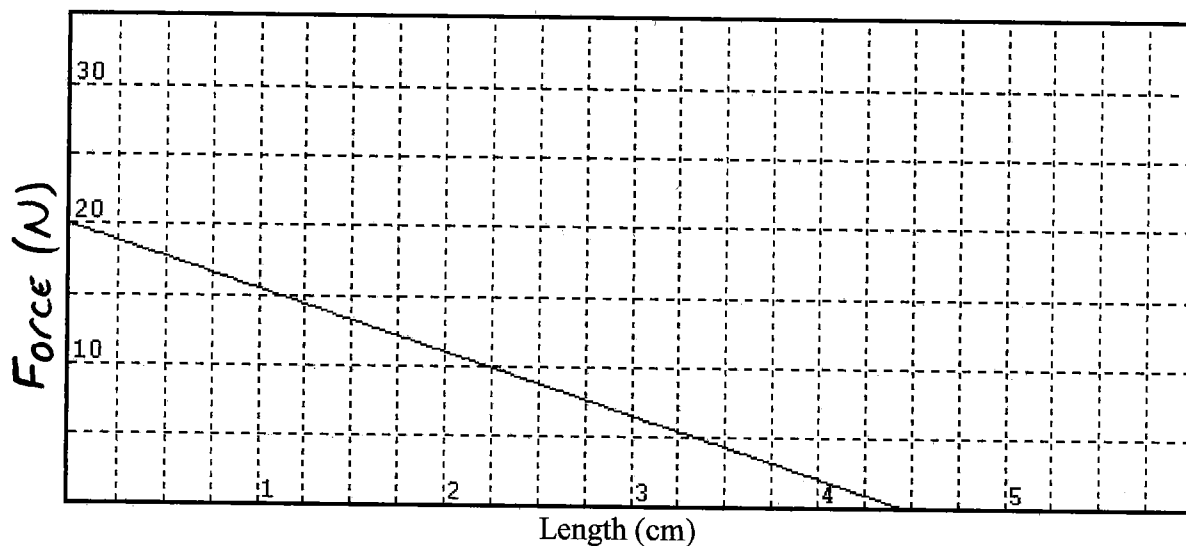
Calculate the coefficient of friction for a 750 kg boulder which requires 3000 N to drag along the ground.

$\mu = 0.41$

Use the graph below to find the spring constant of a bungee cord.



A spring is compressed according to the graph below of the force required vs. the true length of the spring. Find the spring's constant and the uncompressed length of the spring.



length = 4.44 cm  
 $k = 450 \text{ N/m}$

How far will a 17 kg mass extend a spring with spring constant 480 N/m?

$x = 0.34 \text{ m}$

What is the force of friction between a 95 kg rubber block on a piece of asphalt at a distance of  $3.60 \times 10^8 \text{ m}$  from earth's centre. Assume the block is anchored in space and has no mass.

$$3.4 \times 10^{-2} \text{ N}$$

NEWTON'S LAWS:

State Newton's First Law:

State Newton's Second Law:

A mule pulls a cart with a force of 700 N [E]. The cart has mass 45 kg and coeff. of friction = 1.4. What is the resultant net force and acceleration (ignore the mass of the mule)?

$$F_{\text{net}} = 82 \text{ N [E]}, a = 1.8 \text{ m/s}^2$$

A cart is accelerated from rest to 3.00 m/s in 2.0 s. If the cart has mass 0.50 kg what is the net force acting on the cart?

$$0.75 \text{ kg}$$

A car is pushed by 3 grade 11 students at constant velocity. If each student exerts 400N of force find the  $F_{\text{net}}$ ,  $F_f$ , and mass of the car using p.85

$$F_{\text{net}} = 0\text{N}, F_f = 1200 \text{ N}, m = 3000 \text{ kg}$$

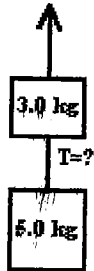
If an object has a negative acceleration this indicates the object is \_\_\_\_\_.

A spring with constant  $k = 400 \text{ N/m}$  starts compressed 0.50 m by a 75 kg mass. The spring causes the object to move as it returns to its original length. If the object has an acceleration of  $1.0 \text{ m/s}^2$ , find the coefficient of friction.

$$\mu = 0.17$$

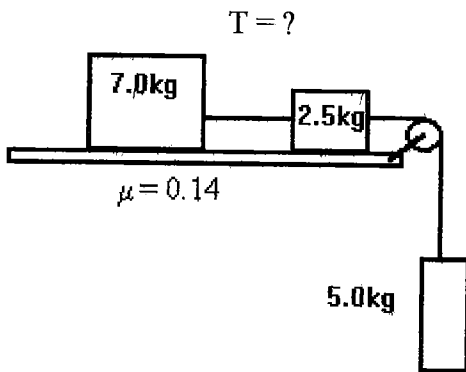
State Newton's Third Law

Two masses are accelerated upward by a rope at  $1.5 \text{ m/s}^2$  see below:  
 find a) the total force need to lift them  
 b) the tension between the masses



$F \text{ to lift} = 90 \text{ N}$   
 $T = 56.5 \text{ N}$

Find the tension in the location shown.



$T = 27.3 \text{ N}$

MOMENTUM AND IMPULSE:

Calculate the momentum of a 98.0 gram baseball thrown at 60.0 km/hr.

$p = 1.63 \text{ kg}\cdot\text{m/s}$

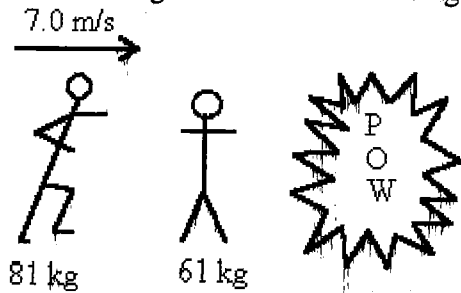
What force from the brakes is required to change a car's momentum from 90 km/hr to 60 km/hr in 5.0 seconds when the driver has seen a radar trap if the car's mass is 1250 kg?

$F = -3130 \text{ N}$

A force of 75 N is applied to a 15 kg object traveling at 9.0 m/s. If the force is applied for 2.0 s what is the object's final velocity?

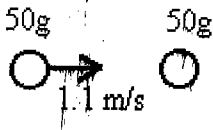
19m/s

Use the diagram to find the missing final velocity if the collision is completely inelastic:



$V_f = 4.0 \text{ m/s}$

Find the final velocity in the following diagram if the collision is completely elastic



$V_f = 1.1 \text{ m/s}$

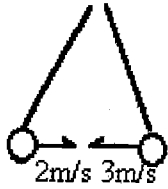
A 70 kg person moving at 5.0 m/s collides with a 40 kg person at rest. After the impact the 40 kg person is moving at velocity 5.0 m/s, what is the velocity of the other person?

2.1 m/s

A 70 kg person moving at 5.0 m/s collides with a 40 kg person at rest. After the impact the 40 kg person is moving at velocity 10.0 m/s, what is the velocity of the other person?

- 0.71 m/s

Two equal masses of 15 grams approach each other as seen in the diagram below. If the collision is 100 % elastic what will their final velocities be? What will they be if the collision is 100 % inelastic?



-3 m/s and -2 m/s for elastic

-0.5 m/s and 0.5 m/s for inelastic

ENERGY:

How much energy is required to lift a 50 kg mass up to a height of 50 m?

$2.5 \times 10^4$  J

What is the kinetic energy of a 20 gram bat flying at 6.0 m/s?

0.36 J

What final temperature is recorded when  $4.0 \times 10^4$  J is used to heat 5.0 kg of copper (use the table on page 145 text) if it started at  $20.0^\circ\text{C}$ ?

$38.6^\circ\text{C}$

State the Law of Conservation of energy

A rock is dropped from a height of 7.0 m, calculate its final velocity when striking the ground.

$V_f = 12$  m/s

An arrow is fired straight up from the height of 1.5 m. It left the bow at 20.0 m/s, to what height will it climb?

$$h = 21.9\text{m}$$

A piece of lead is dropped from height 10.0 m. It is seen to bounce up to a height of 6.0 m, what is the rise in temperature of the lead if all energy remained in it?

$$\Delta T = 0.30\text{ }^{\circ}\text{C}$$

A steel ball bearing is dropped from height 20.0 m, it strikes the ground and bounces up, at height 9.0 m the bearing is traveling upward at 1.0 m/s, what energy was lost as heat if the bearing has mass 50.0 g?

$$E_h = 5.37\text{ J}$$

What is the efficiency of the collision in the previous question?

$$\text{eff} = 45\%$$

A refrigerator is listed to be 65 % efficient, how much energy is used to cool food if it consumes  $6.0 \times 10^4\text{ J}$  in one day?

$$3.9 \times 10^4\text{ J}$$

A rollercoaster has a maximum height of 50.0 m on the first hill, the cars drop 30.0 m, then rise 10.0 m to the top of the second hill. Calculate the speed of the cars at the top of the second hill assume 100% efficiency. Re-calculate the speed if the efficiency is only 30%.

$$100\% \text{ eff} = 19.8\text{ m/s}$$

$$30\% \text{ eff} = 10.8\text{ m/s}$$

POWER:

What power is required to lift a 25 kg mass two meters in 3.00s?

163 W

An aardvark burns 100 000.0 J of energy in one day. What power does this require?

1.2 W

If the aardvark sleeps for 8.00 hours what power is required?

1.7W

If the aardvark uses 4000 J of the 100 000 while sleeping what power is needed in the waking hours?

1.7W

### STATIC ELECTRICITY:

Opposite charges \_\_\_\_\_

Similar charges \_\_\_\_\_

Explain in terms of movement of charges how a neutral object is attracted to a positively charged object. (Recall that positive charges are fixed, not able to move).

What is the value of the elementary charge?

What two sub-atomic particles carry one elementary charge?

State Coulomb's Law



Calculate the charge transferred between a cloud and the earth if  $7.5 \times 10^{20}$  electrons flow in a lightning bolt.

$$Q = 1.2 \times 10^2 \text{ C}$$

What is the current flowing in the above lightning bolt if it lasts for 1.3 s?

$$I = 92 \text{ A}$$

Calculate the force between two helium nuclei which are  $1.0 \times 10^{-4}$  m apart.

$$F = 9.2 \times 10^{-20} \text{ N}$$

What is the charge on each of two balloons if there is a force of repulsion of 1.4 N between them, their centres are 0.90 m apart, and the charge is evenly distributed on each balloon?

$$q_1 = q_2 = 1.1 \times 10^{-5} \text{ C}$$

How much energy is required to send a lithium nucleus across a potential difference of 90.0 MV

$$E = 4.3 \times 10^{-11} \text{ J}$$

What is the current produced when  $7.2 \times 10^2$  J are used by a 120 V toaster operating for 30.0 s?

$$I = 0.20 \text{ A}$$

What is the rise in temperature of the toast in the above question if it has mass 25 g, specific heat =  $750 \text{ J}/(\text{kg} \cdot ^\circ\text{C})$  and the transfer of energy is 100% efficient?

$$\Delta T = 37.3 \text{ }^\circ\text{C}$$

Most toast is about 12 °C warmer after popping, what is the efficiency of the toaster above if this is the rise in temp?

$$\text{eff} = 31\%$$

How much charge is transferred in electric wires if 150 000V are generated by  $2.04 \times 10^7$  kg of water fall through a 75 m high dam which is 40 % efficient?

$$Q = 4.0 \times 10^4 \text{ C.}$$

### CURRENT ELECTRICITY:

State Ohm's Law

State Kirchoff's Current Law:

State Kirchoff's Voltage Law:

Ammeters should be connected in \_\_\_\_\_ .

Voltmeters should be connected in \_\_\_\_\_ .

What is the resistance in a kettle which draws 0.20 amps on a 120V socket?

$$R = 600 \Omega$$

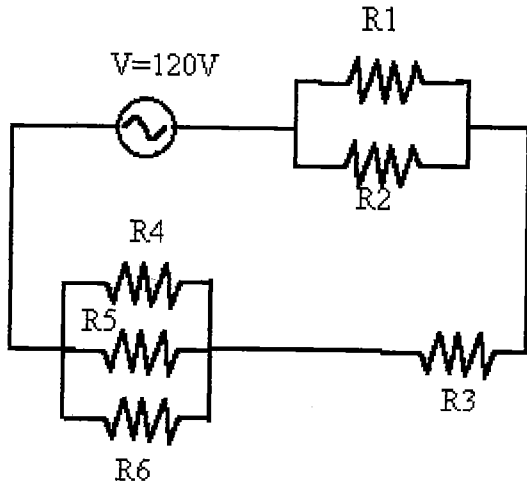
What is the total resistance of a 4700 $\Omega$ , 3200 $\Omega$ , and 1000 $\Omega$  resistors in parallel?

$$656\Omega$$

What is the current through each of the above resistors if they are operated on a 120 V socket?

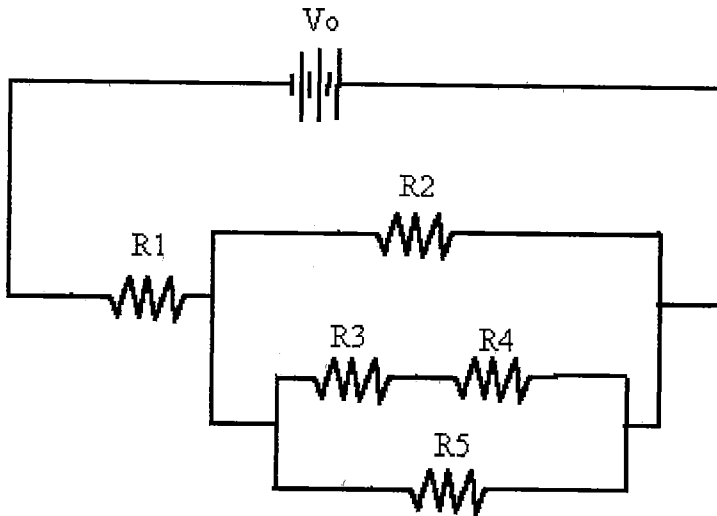
$$26 \text{ mA}, 38 \text{ mA}, 120 \text{ mA}$$

Find the missing values in the table below



$V_0 =$	$I_0 =$	$R_0 =$
$V_1 =$	$I_1 =$	$R_1 = R_2$
$V_2 = 25V$	$I_2 =$	$R_2 =$
$V_3 =$	$I_3 = 1.2 A$	$R_3 = 50 \Omega$
$V_4 =$	$I_4 = 0.72A$	$R_4 =$
$V_5 =$	$I_5 =$	$R_5 = 4R_4$
$V_6 =$	$I_6 =$	$R_6 = 117 \Omega$

For the following problem assume standard cells



$V_0 =$	$I_0 =$
$V_1 =$	$I_1 = 250 \text{ mA}$
$V_2 =$	$I_2 = 0.100 A$
$V_3 =$	$I_3 = 0.050 A$
$V_4 =$	$I_4 =$
$V_5 = 2.0 V$	$I_5 =$

Use only Kirchoff's Laws for the above question!!!

How much energy is released when 10.0 mg of mass is transformed into energy in a nuclear rxn?

$$E = 9.00 \times 10^{11} \text{ J}$$

When 1000 atoms of U-235 undergo fission,  $1.6 \times 10^{-7} \text{ J}$  are given off. What is the mass lost from each atom?

$$1.78 \times 10^{-27} \text{ kg}$$

The splitting of atoms is called \_\_\_\_\_.

The joining of nuclear material to form more massive atoms is called \_\_\_\_\_.

Describe the photoelectric effect:

Describe the Compton effect:

What was the importance of these two discoveries?

Calculate the frequency and energy of a photon with wavelength 450 nm.

$$\nu = 6.67 \times 10^{14} \text{ Hz}, E = 4.4 \times 10^{-19} \text{ J}$$

A wave experiences a change in frequency from 6.00 Hz to 6.20 Hz. What is the wavelength of the new wave, if the old wavelength was 1.20 m?

$$1.24 \text{ m}$$

What is the index of refraction of a liquid where light travels at  $2.25 \times 10^8 \text{ m/s}$ ?

$$n = 1.33$$

Use Snell's Law and the table on page 472 to find the missing angles.

Light travels from water to air. The incident angle is  $25^\circ$  from normal. Find the angle of refraction.

$$r = 32^\circ$$

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