STA 416 Chapter 3 Test Review Name: _____

% Energy Efficiency

1. Calculate the efficiency of a machine which takes 145 J to produce 68 J of work.

$$\%EE = \frac{\text{useful}}{\text{consumed}} \times 100$$

$$= \frac{68}{145} \times 100$$

$$= 47\%$$

2. Find the efficiency of a lightbulb which wastes 1050 J of the 1200 J that it consumes.

$$1200 - 1050 = 150\ J$$

$$\%EE = \frac{\text{useful}}{\text{consumed}} \times 100$$

$$= \frac{150}{1200} \times 100 = 12.5\%$$

3. How much energy per hour is required by a windmill which is 22% efficient if it is to produce 525,000 J of electricity per hour?

$$\frac{\%EE}{100} = \frac{\text{useful}}{\text{consumed}}$$

$$\frac{22}{100} = \frac{525000}{\text{consumed}}$$

2 386 363 J

Speed

4. Find the speed of a bicycle ***in km/hr and m/s*** which travels 7500 m in 12 min.

$$v = \frac{d}{\Delta t} = \frac{7.5\text{km}}{0.2\text{h}} = 37.5\ \text{km/h}$$

↳ 7.5 km

$$\frac{12}{60} = 0.2\text{h}$$

$$12 \times 60 = 720\text{s}$$

$$v = \frac{d}{\Delta t} = \frac{7500\text{m}}{720\text{s}} = 10.4\ \text{m/s}$$

5. An inchworm travels at a speed of 0.50 cm/s.

a) How long ***in hours*** will it take to travel 1 km?

$$t = \frac{d}{v} = \frac{100\,000\text{cm}}{0.50\ \text{cm/s}} = 200\,000\text{s}$$

$$\div 60$$

$$\div 60$$

$$= 55.5\text{h}$$

$$d = 1 \times 1000 \times 100 = 100\,000\text{cm}$$

b) How far ***in metres*** will it travel in 1 day?

$$d = v \times t = 0.5\text{cm/s} \times 86400\text{s}$$

$$= 43\,200\text{cm}$$

↳ 432m

Gravity

6. a) How much does a 15.0 kg iron bar weigh on Earth?

$$F = mg = 15.0 \times 9.8 = 147\text{N}$$

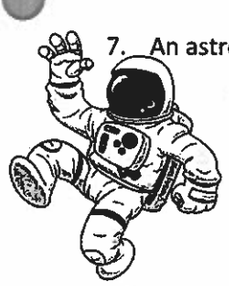
b) How much does it weigh on Mars where g = 3.72 m/s^2 ?

$$F = mg = 15.0 \times 3.72 = 55.8\text{N}$$

b) What is the gravity of an unknown planet where the bar weighs 98.7 N?

$$g = \frac{F}{m} = \frac{98.7}{15} = 6.58\ \text{N/kg}$$

7. An astronaut weighs 137.7 N on the moon where g = 1.62 m/s^2. How much does the astronaut weigh on Earth?

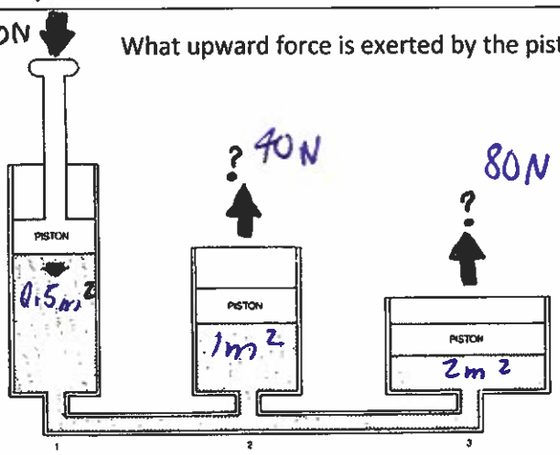


$$m = \frac{F}{g} = \frac{137.7}{1.62} = 85\text{kg}$$

$$F = mg = 85 \times 9.8 = 833\text{N}$$

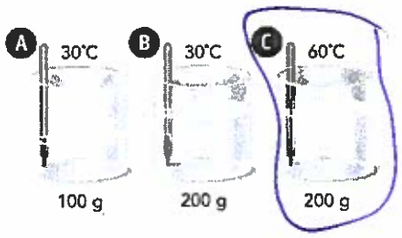
Pascal's principle

8. What upward force is exerted by the pistons if 20N are applied?



9. Which has more thermal energy? circle

a)

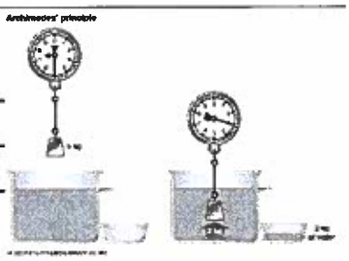


b) Which has more thermal energy, an iceberg or a cup of hot coffee?

Archimedes Principle

10. a)What does this picture tell you about Archimedes Principle?

The buoyant force is equal to the weight of water displaced.



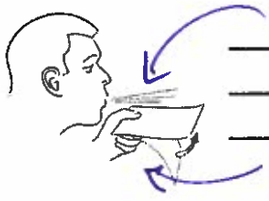
b) Explain the picture. Both items have the same mass.

The "cup" has a larger surface area and therefore displaces more water
So the "cup" has a higher buoyant force

cup $F_b > F_g$ ball $F_b < F_b$

Bernoulli's Principle

11. Use Bernoulli's principle to explain why the paper rises when you blow over it?



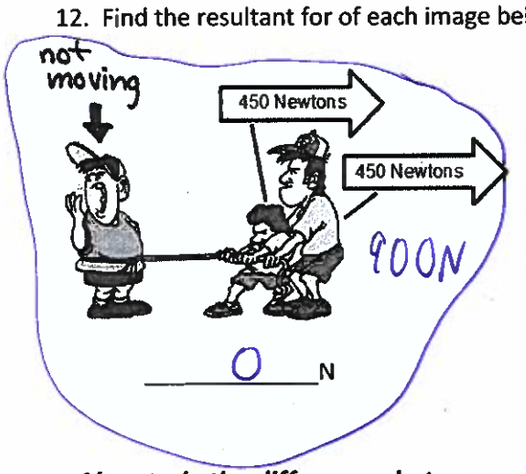
low pressure

The high pressure pushes the paper up.

High pressure

Resultant Force

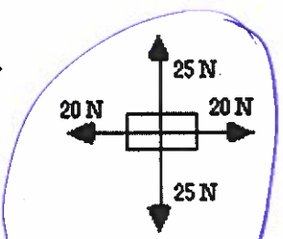
12. Find the resultant for of each image bellow. Circle the situation(s) that is/are in equilibrium.



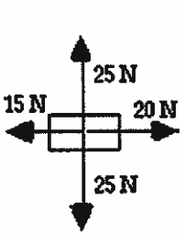
0 N

who will win?

← 50 N



0 N



5 N →

Also study the differences between: electromagnetic force, strong/weak nuclear forces & force of friction.