Thurs: Seminar   12:30   Wubben 203

Fri: Test 2

     * Covers : ~~Electricity~~ ne Energy ~~and~~ electricity

        : Ch 6.3 - 6.7

           7.2 efficiency

           8.1 - 8.4

        Lectures 18 - 27

        HW 5-7

   * Bring: calculator

   * Given: Formulas on front

   * Study: 2022 test 2 all Q except 10 b

          2023 test 2 all Q

Ch 6, 7

Know : energy, energy conservation, efficiency .

Quiz 1 60% ~ 80%

1 Bullet

A 0.010 kg bullet is fired vertically. It leaves the ground with speed 100 m/s.

a) How do the bullet's kinetic and potential energies change while the bullet ascends?

b) Determine the potential energy of the bullet at its highest point. Ignore friction and air resistance.

c) Determine the maximum height that the bullet reaches above the ground.

a) KE decreases (slows down)

PE increases

b) $KE = \frac{1}{2}$ Mass × (speed)²

PE = mass × 9.8 m/s² × vertical position

At ground $KE = \frac{1}{2} × 0.010 × (100)^2$

$= 50J$

$PE = 0.010 × 9.8 × 0m$

At max $V = 0 = 0$ $KE = 0$ $= 0$ $PE = 50J$

	KE	PE	Total
launch	50J	0J	50J
max height	0J	50J	50J

c) height $= \dfrac{PE}{(mass × 9.8)} = \dfrac{50J}{0.010 × 9.8} = 510m.$

Quiz 2 95%

2 Energy produced by LEDs

Two light sources produce light with the indicate powers and for the indicated durations. Which bulb delivers the most energy for the duration that it is on? Explain your answer.

LED	Power	Duration On
Red LED	3.0 W	15 min
Green LED	10.0 W	4.0 min

$15\,min \times 60s = 900s$

$4\,min \times 60s = 240s$

Energy = power × time

RED: energy = $3.0W \times 900s = 2700J$

Green: energy = $10W \times 240s = 2400J$

=D Red more

3 Light bulb efficiency

A light bulb consumes 60 J of electrical energy each second. This is converted into light (useful energy) with efficiency 0.15. Determine the light energy produced each second.

$$\text{useful output} = \text{input} \times \text{efficiency}$$
$$= 60J \times 0.15 = 9.0J$$

Quiz3 90%

Electricity

Know * rules for forces between charges
      * electric forces and atoms
      * currents.
      * current + charge flow

Quiz4   50% - 90%

4 Sodium ions

A neutral sodium atom has 11 protons and 12 neutrons. Sodium atoms form positively charged ions by each losing one electron. A small amount of sodium chloride (salt) contains 6.0×10^{20} sodium ions. Determine the charge of all of the sodium ions in this sample.

In one ion   number of protons = 11

             "   "   electrons = 10

There is an excess of one proton per ion

$\Rightarrow$ $1.6 \times 10^{-19}\,C$ per ion

The total is $1.6 \times 10^{-19}\,C \times 6.0 \times 10^{20} = 9.6 \times 10^{1}\,C = 96\,C$

Quiz 5

5 Current and energy

A bulb is connected to a battery. The current through the bulb is 0.40 A and the voltage provided to this is 3.0 V.

a) Determine the total charge that flows in 10 minutes.

b) Determine the total energy supplied to the bulb in 10 minutes.

a) charge = current × time

10min × 60s = 600s

= 0.40A × 600s

= 240c

b) energy = total charge × voltage

= 240c × 3.0v = 720J