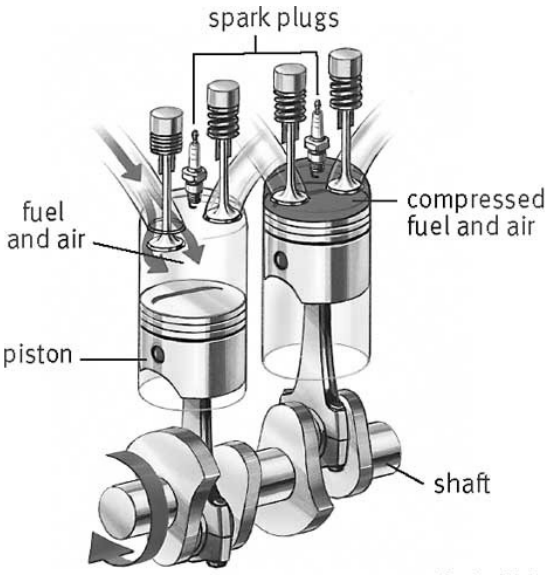
Pretest 2.1 Solutions

ST Part

Energy p50 to 54

Flashback: (Electrolytes and pH from yellow book, pages 42 to 44 and p 49)



1. Give an example of how a room cannot always be heated by an object whose temperature is very high.

   If the object's mass is too small it will not have enough heat to warm up the entire room.

2. a) How do gases within an engine do work on the pistons?

   Their molecules move fast and they push and on the pistons and move them.

   b) What form of energy is contained within gasoline?

   Chemical potential energy

c) What forms of energy are contained within the hot exhaust?

Thermal and chemical potential energy

3. a) How can tidal energy be used?

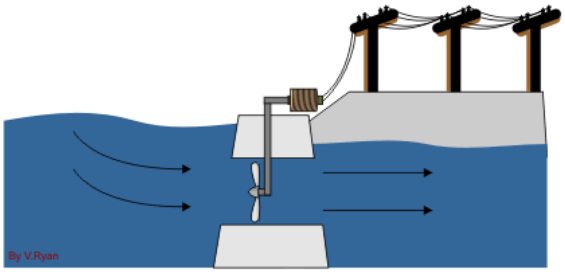
   The moving water from the tide action can turn turbines.

   b) If the movement of water represents 5 billion joules and we obtain 4 billion joules of electricity, how efficient is the tidal power plant? (Express as a %)

   useful/tidal *100%
   =4/5*100% = 80%

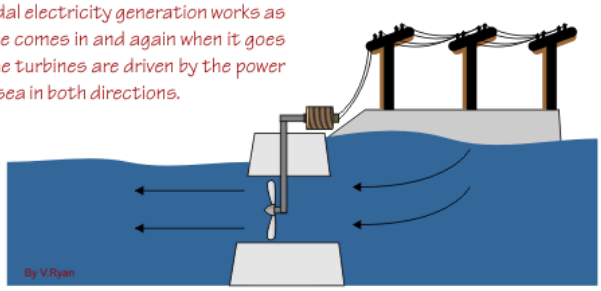
   c) What percent of the energy is wasted?

   100%– 80 % = 20%



TIDE COMING IN

This tidal electricity generation works as the tide comes in and again when it goes out. The turbines are driven by the power of the sea in both directions.



TIDE GOING OUT

4. **Flashback**

a) What 's the only electrolyte-type that can have a pH of 7?

salt

b) Why doesn't a nonelectrolyte conduct electricity?

Such a solution does not contain ions.

c) What kind of ions will raise the pH from 3.0 to 6.0?

hydroxide ions from a base

d) What does the pH become if a lake originally at pH = 6 becomes 100 times more acidic due to acid rain?

$100 = 10^2$, so we subtract the exponent of 2 from 6 to get an answer of 4.

STE PART (blue book pages 58 to 78)

Flashback: stoichiometry

1. 0.25 L of a 6 g/L solution are on the counter. How much of the solution should you dilute to 0.50 L to make a 2 g/L solution?

   $C_1V_1=C_2V_2$
   $6V_1 = 2(0.50)$
   $V_1 = 0.167$ L

2. If it took 35.25 ml of a $Ca(OH)_2$ solution to neutralize 0.98 g of H_3PO_4, what was the molarity of the alkaline solution used?

   $2\ H_3PO_{4(aq)} + 3\ Ca(OH)_{2\ (aq)} \rightarrow Ca_3(PO_4)_{2(s)} + 6\ H_2O_{(l)}$

   0.98 g of H_3PO_4(mole/98g) = 0.01 mole H_3PO_4

   0.01 mole H_3PO_4 (3 $Ca(OH)_{2\ (aq)}$/ 2 $H_3PO_{4(aq)}$) = 0.015 mole $Ca(OH)_{2\ (aq)}$

   C = n/V = 0.015 mole $Ca(OH)_{2\ (aq)}$/ 0.03525 L = 0.43 M

3. What is the molarity of a 3.0 L solution containing 3.0 grams of KCl?

3.0g KCl (mole/74.5 g) = 0.0426 mole

C = n/V = 0.0426 mole/3.0 L = 0.0142 M

4. Tomatoes have a pH of 4.5. What is the concentration of H^+ in a tomato?

$[H^+] = 10^{-pH} = 10^{-4.5} = 3.16 \times 10^{-5}$ M

5. The LD_{50} for grain alcohol is 7060 mg/kg. An 85 kg man was found dead with an empty jug of vodka next to him. If the density of grain alcohol is 0.80g/ml, and the vodka is 40% alcohol, what is the least amount of vodka that was in the jug?

7060mg/kg *85 kg = 600 100 mg = 600.1 g of alcohol
600.1 g of alcohol (ml/0.80 g) = 750.125 ml of pure alcohol'
0.40x =750.125 ml of pure alcohol
X =1.875 L of vodka

6. If the bioconcentration factor is 120, and if we find 120 ppm of methyl mercury in a fish, what is the concentration of the toxin in the water?

1 ppm

7. a) Place the following organisms in a food pyramid. The ppm are the parts per million of cadmium ion found in various organisms.

earthworm 0.30 ppm fox 2.5 ppm robin 1.0 ppm

roundworms 0.01 ppm

roundworms—earthworms—robin---fox

b) How is bioaccumulation related to how you obtained your answer in a) ?

It's the reason the concentration keeps increasing up the food chain. At each level, there's a "sponge effect", which amplifies the amount of toxin in the animal.

8. Use the following solubility rules to identify the precipitate. Also complete and balance the precipitation equation.

   $K_2CO_{3(aq)} + Fe(NO_3)_{2(aq)} \rightarrow$

   $2\ KNO_{3(aq)} + FeCO_3\downarrow$

9. Complete the following ionic equation:

   $CaCl_2 \rightarrow Ca^{+2}_{(aq)} + 2\ Cl^-_{(aq)}$

10. What accounts for the fact that some electrolytes are weak even though they are ionic?

    They do not completely break up into ions.

Solubility Rules for Ionic Compounds in Water

Anion	+	Cation	=	Solubility
Any negative ion	+	Li^+, Na^+, K^+, Rb^+, or Cs^+	=	Soluble
Any negative ion	+	Ammonium (NH_4^+)	=	Soluble
Nitrate (NO_3^-)	+	Any positive ion	=	Soluble
Acetate (CH_3COO^-)	+	Ag^+ or Hg_2^{+2}	=	Insoluble
	+	Any other positive ion	=	Soluble
Cl^-, Br^-, or I^-	+	Ag^+, Pb^{+2}, Hg_2^{+2}, or Cu^+	=	Insoluble
	+	Any other positive ion	=	Soluble
Sulfate (SO_4^{-2})	+	Ag^+, Pb^{+2}, Ca^{+2}, Sr^{+2}, Ba^{+2}, or Ra^{+2}	=	Insoluble
	+	Any other positive ion	=	Soluble
Sulfide (S^{-2})	+	Li^+, Na^+, K^+, Rb^+, Cs^+, or NH_4^+	=	Soluble
	+	Be^{+2}, Mg^{+2}, Ca^{+2}, Sr^{+2}, Ba^{+2}, or Ra^{+2}	=	Soluble
	+	Any other positive ion	=	Insoluble
Hydroxide (OH^-)	+	Li^+, Na^+, K^+, Rb^+, Cs^+, NH_4^+ or Ba^{+2}	=	Soluble
	+	Any other positive ion	=	Insoluble
PO_4^{-3}, CO_3^{-2} or SO_3^{-2}	+	Li^+, Na^+, K^+, Rb^+, Cs^+, or NH_4^+	=	Soluble
	+	Any other positive ion	=	Insoluble