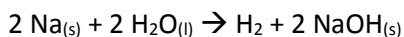


Pretest 2.1 Solutions

ST Part

1. An investigator goes into a lab after an explosion. Too large a piece of sodium had reacted with water:



- a) He sees white solid on the ceiling. What test can he carry out to reveal that the substance is a base?

He could use pH paper or litmus. The latter will turn blue. Licking the ceiling to test for bitterness is not recommended.

- b) What ion released by NaOH is responsible for its bitter taste?

Hydroxide (OH^-)

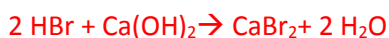
- c) What substance can eliminate NaOH's bitterness?

Acid

- d) Predict what would happen to the conductivity of aqueous sodium hydroxide if we perfectly neutralize NaOH with H_2SO_4 . Explain why the solution will /won't keep conducting electricity.

The product will still conduct electricity because salt and water will form. The ions from the salt (Na_2SO_4) in water will allow electricity to flow through the aqueous solution.

2. What two compounds will form if HBr reacts with $\text{Ca}(\text{OH})_2$? Write a balanced equation.



3. a) From the following list, find the most acidic substance?

HCl

- b) How much more acidic is it compared to the next most acidic substance?

10 times more acidic than battery acid; each pH unit is a factor of 10.

- c) Which is the most basic? NaOH

pH

- 0 - Hydrochloric Acid (HCl) of 1M
- 1.0 - Battery Acid (H_2SO_4 sulfuric acid)
- 2.0 - Lemon Juice
- 2.2 - Vinegar
- 3.0 - Apples
- 4.0 - Wine and Beer
- 4.5 - Tomatoes
- 6.6 - Milk
- 7.0 - Pure Water

- 7.2 to 7.4 - Human Blood
- 8.3 - Baking Soda (Sodium Bicarbonate)
- 10.5 - Milk of Magnesia
- 11.0 - Ammonia
- 12.4 - Lime (Calcium Hydroxide)
- 13.0 - Lye
- 14.0 - Sodium Hydroxide (NaOH)

4. a) What kind of solution, like ocean water, allows lightning's electricity to flow through it?

An electrolyte

b) What characteristic of an electrolyte allows electricity to flow through it?

It dissolves and forms ions

c) What kind of ion attracts electrons?

Positive ions

d) What do negative ions do when an electrolyte conducts electricity?

Return electrons to the circuit

5. a) What physical properties is shared by electrolytes and nonelectrolytes?

They both lower freezing point and raise boiling point of water

b) Give examples of how non electrolytes and electrolytes are used in winter.

Salt (an electrolyte) is used to melt ice. Antifreeze, a non electrolyte, is used in car radiators.

c) What chemical property is not shared by electrolytes and non-electrolytes?

Only electrolytes are corrosive; non-electrolytes are either not corrosive or less so.

6. 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.

7. 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.

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

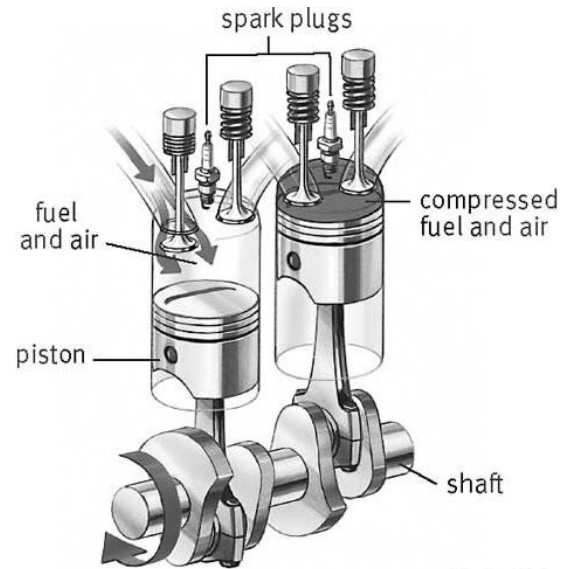
Their molecules move fast and they push and on the pistons and move them.

- 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



9. a) Is energy always conserved?

Yes

- b) Give three forms of energy that the energy of food turns into once after it's eaten, digested and further broken down by cellular respiration?

Mechanical energy (in moving muscles)

Body heat

Chemical storage (memories, fat etc)

10. a) How can tidal energy be used?

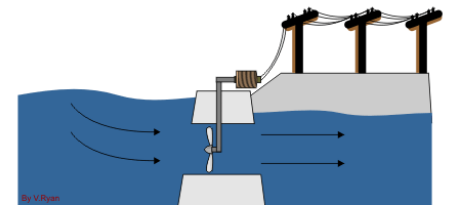
The moving water from the tide action can turn turbines.

- 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 %)

$$\text{useful/tidal} * 100\% = 4/5 * 100\% = 80\%$$

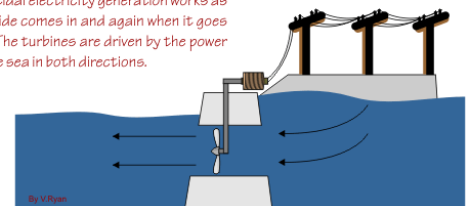
- c) What percent of the energy is wasted?

$$100\% - 80\% = 20\%$$



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

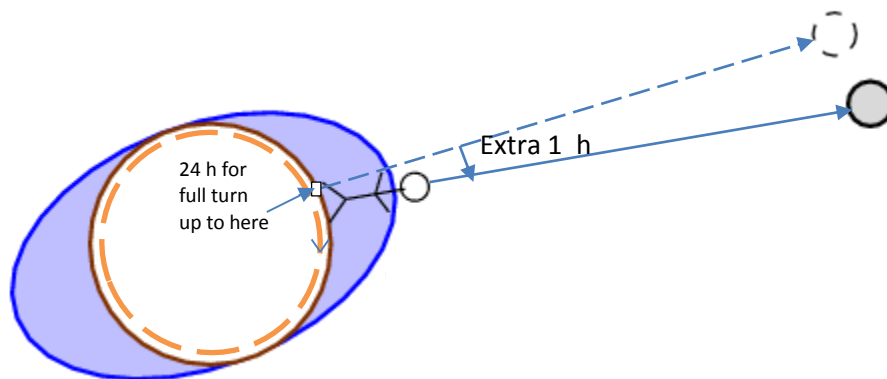
11. a) How often will the tide be coming in during the day?

Almost 2 times a day it will come in (high tide) and almost twice a day it will flow out (low tide).

b) What two things are responsible for causing tides?

Moon's gravitational force and the earth's inertia

c) Why is the tidal cycle of 2 low tides and two high tides almost 25 hours long and not 24?



The moon moves around the earth while the earth rotates on its axis. The broken line shows where high tide would be if the moon had not moved after 24 hours. So after a full day, the biggest part of the tidal bulge is further ahead in time. The solid line is where the moon actually is after 24 hours, so the earth has to rotate a little more to get to that point—about another hour.

Flashbacks from your happy past

12. Which alkali atom has less than 10 protons? **Li**

13. Convert 12 ppm to g/ml.

12 ppm means 12 mg/L

12 mg (g/1000 mg) = 0.012 g

1 L = 1000 mL

12 mg/L = 0.012g /1000ml = 0.000012 g /ml

14. How many electrons are in an ion of chloride?

Chloride ion = 17Cl^- :

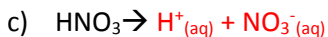
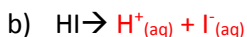
$$E = p - c = 17 - (-1) = 18$$

15. How many dots are there in the dot structure of Xe? 8

16. What is a chemical characteristic property of alcohol? It's flammable.

17. Write ionic equations for the following electrolytes:

Acids:



Bases:



Salts:

