

## ST January 2011 Review

1. Classify as a chemical or physical change:

a. Two powders are crushed and an enormous amount of heat and sound are released\_

Chemical because a lot of energy is released

b. A compound of  $\text{CH}_3\text{OH}$  boils until it all evaporates\_\_\_\_\_

Physical; boiling will vaporize it but it's still  $\text{CH}_3\text{OH}$

c. A nail is hammered into a wall\_\_\_\_\_

Physical; nail's composition remains the same

d. Skin forming a scab after it has been slightly cut.

Chemical; colour change signifies new compounds are being created as skin grows and repairs wound.

e. Five precious Belgian chocolates melt in your mouth\_\_\_\_\_

Melting like boiling, freezing etc is physical

f. Paint dries. Its mass *increases* as it forms a compound with oxygen.\_\_\_\_\_

New compound = chemical

g. Zinc and oxygen combine to form  $\text{ZnO}$ \_\_\_\_\_

New compound = chemical

h. Radio waves pass through your body\_\_\_\_\_

Physical= no harm from radio waves; no chemical change to DNA or anything

2. Balance the following equations:





3. You observe the reaction between CaS and 2 HCl which produces CaCl<sub>2</sub> and the poisonous H<sub>2</sub>S .

The mass before the reaction was 143 g. The products only weighed 111 grams. What happened? Was mass conserved? If so why aren't the masses equal?

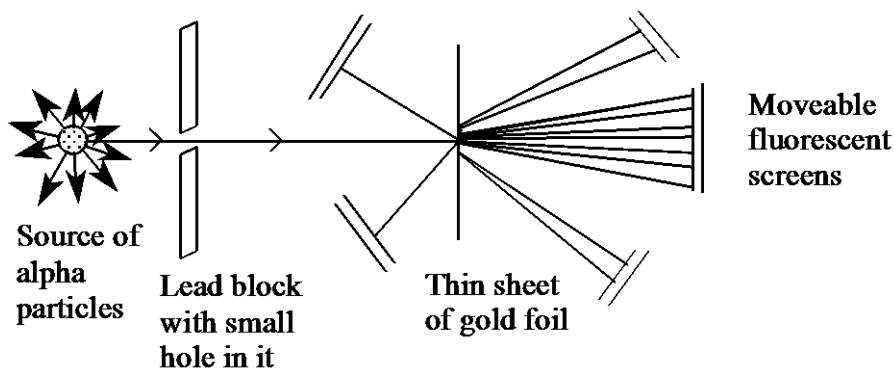
Total mass is conserved but a gas probably escaped, leading to a lower mass for the remaining solid

4. A student dissociated water using acid and electricity. If he measured approximately 27ml of hydrogen, how many ml of oxygen was probably obtained?

When 2 H<sub>2</sub>O split, you get 2 H<sub>2</sub> and only 1 O<sub>2</sub>, in other words half as much oxygen as hydrogen, so the answer = 27/2 = 13.5 ml

5. As a result of his famous experiment in which a thin sheet of gold foil was bombarded with alpha (α) particles, **Rutherford** significantly changed the atomic model proposed by Thomson.

The diagram below shows the trajectory of alpha particles passing through a thin sheet of gold foil or, in rare instances, being deflected on its surface.



Explain the results of this experiment.

A few particles bounced back from the foil because they hit the small but massive nuclei of the gold atoms. This led to the realization that an atom is mostly empty space except for that important dense positive nucleus.

6. Use your knowledge of the periodic table families to fill in the blanks

- a. The smallest alkaline earth metal is **beryllium= Be**
- b. The family that reacts with most metals is the **halogens**
- c. The least reactive family is the **noble gases**
- d. **alkali metal = Li** + Br<sub>2</sub> → 2 LiBr

7. How many electrons does a neutral atom of boron have?

**5**

8. How many protons are in a neutral atom of Ar?

**18**

9. Which, if any, of the following has more electrons? P<sup>-3</sup> or S<sup>-2</sup>  
Show work

**Electrons = protons – charge**

**P<sup>-3</sup> electrons = 15 - -3 = 18**

**S<sup>-2</sup> electrons = 16 - -2 = 18**

10. Your school's lab technicians have designed an interesting lab that uses calcium (Ca) but the school's shipment of calcium has not yet arrived. Rather than disappointing their students, the lab technicians decide not to cancel the lab and try to find a replacement for calcium.

a) Which element could replace calcium in the experiment? Explain your answer.

Mg could= same family

b) Draw a Rutherford- Bohr, a Thomson model and a Lewis diagram of calcium and the replacement element.

Rutherford-Bohr

Ca 20p 2e)8e)8e) 2e

Mg 12p 2e)8e) 2e

Thomson: draw a big circle with a mish mash of (+) or (-) for both

Lewis

Ca:

Mg:

Both have a valence of 2

11. While building a machine for the science fair, you test a number of substances to determine how well they can conduct an electrical current.

<b>Substance A</b>	A sugar cube
<b>Substance B</b>	An iron nail
<b>Substance C</b>	Sea water (NaCl)
<b>Substance D</b>	Table salt (NaCl)
<b>Substance E</b>	HCl Solution
<b>Substance F</b>	NaOH solution

There is a chemical spill that releases magnesium hydroxide ( $\text{Mg}(\text{OH})_2$ ) into the soil. Originally the pH of the soil is 7, after the spill the pH is 9. Two products: aqueous hydrogen iodide (HI) and potassium hydroxide (KOH) are available to neutralize the chemical spill.

a) Choose the product that will neutralize the spill. Justify your answer.

You need the acid HI

b) Complete and balance the chemical equation for this reaction.



12. Which of the following is the **most concentrated** solution? (2 marks)

a) 30 g of solute / 5L of solution = 6g/L most conc.

b) 5 g of solute / L of solution = 5g/L

c) 0.1 g of solute /10L =0.01 g/L

d) 3500 ppm solution= 3500 mg/L = 3.5 g/L

13. What type of energy(chemical, electrical, etc) is exemplified by each of the following:

a) The energy stored in unburned oil **chemical**

b) The energy flowing through the copper wire leading to a lamp **electrical**

c) The energy released by a radioactive nucleus **nuclear**

d) The energy of visible light **solar**

14. If an engine is 15 % efficient, how much energy does it waste if is supplied with 2000 kJ worth of gasoline? Show work.

$$x/2000 = 0.15$$

$$x = 300 \text{ kJ of useful energy}$$

$$2000 - 300 = 1700 \text{ kJ wasted}$$

Or

$$100\% - 15\% = 85\% \text{ wasted}$$

$$0.85 * 2000 \text{ kJ} = 1700 \text{ kJ wasted}$$

15. TRUE? Or FALSE? And if false, explain why.

a) Nitrogen fixing bacteria harm plants. **False. They are natural fertilizers**

b) The nitrogen in the air cannot be used directly by plants or animals.

**TRUE to make proteins, DNA they need nitrates**

c) After decomposing, urea eventually becomes nitrates.

**TRUE**

d) In the carbon cycle plants absorb carbon dioxide and use it to make sugars

**TRUE sugars are made of C, H and O. The H comes from water. The C and O come from CO<sub>2</sub>**

e) If a plant is eaten or if it decomposes, the carbon dioxide returns to the air.

**TRUE**

f) Rain can return some carbon to the land and oceans by dissolving CO<sub>2</sub>.

**TRUE CO<sub>2</sub> + H<sub>2</sub>O → H<sub>2</sub>CO<sub>3</sub>**

- g) Carbonates that are part of shells are formed from a reaction involving  $\text{H}_2\text{CO}_3$   
**TRUE**
- h) Volcanoes play no role in the carbon cycle. **FALSE. They release  $\text{CO}_2$**
- i) When the  $\text{CO}_2$  levels in the atmosphere are disturbed, it could lead either to global cooling or warming.  
**TRUE If there's too little (sometimes removed by mountain formation), the earth's avg temp decreases. The opposite occurs when we burn too many fossil fuels and forests.**
- j) Sedimentary rocks are often layer-shaped and are often found near the ocean.  
**TRUE**
- k) With pressure, metamorphic rocks become igneous rocks.  
**False . The opposite is true**  
 $\text{SiO}_2$ , found in glass, is an example of a mineral. **TRUE**
- l) A substance found to be composed of :

- [\$\text{SiO}\_2\$](#)  — 72.04%
- [\$\text{Al}\_2\text{O}\_3\$](#)  — 14.42%
- [\$\text{K}\_2\text{O}\$](#)  — 4.12%
- [\$\text{Na}\_2\text{O}\$](#)  — 3.69%
- [\$\text{CaO}\$](#)  — 1.82%
- [\$\text{FeO}\$](#)  — 1.68%
- [\$\text{Fe}\_2\text{O}\_3\$](#)  — 1.22%
- [\$\text{MgO}\$](#)  — 0.71%
- [\$\text{TiO}\_2\$](#)  — 0.30%
- [\$\text{P}\_2\text{O}\_5\$](#)  — 0.12%
- [\$\text{MnO}\$](#)  — 0.05%

is a rock. **TRUE . We have several minerals. 14% and 4% are too big to be considered impurities**





d) What Canadian province is possibly experiencing thunderstorms or a snowstorm?

Quebec



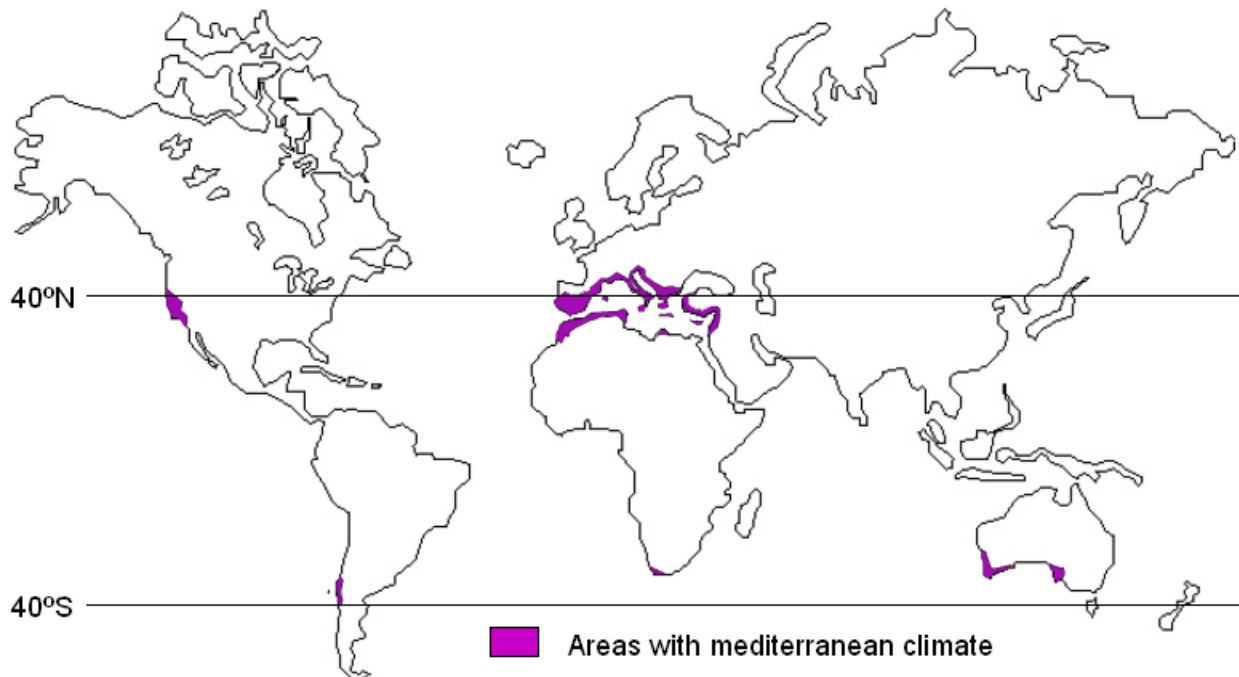
19. a) How many low tides are there in a week?

2 lows per day\* 7 days = 14 low tides

b) Aside from the moon's gravity what else is responsible for the earth's tides?

Sun's gravity, "sloshing" effect, the earth's rotation

20. What biome is found in the shaded regions?



chaparral

21. What tree-filled wetland is found in Florida's everglades?

swamp

22. a) Symbiotic(living partnership) creatures dominate which land biome?

Tundra(lichens=algae+ fungus)

b) Symbiotic(living partnership) creatures dominate which marine biome?

Coral (coral = coral+ algae)

23. What factor influences the type of biome for both terrestrial and marine biomes?

temperature

24. What profile or layer of the soil is not affected by weathering?

Bedrock(R-profile)

25. What profile or layer of the soil is home to the bacteria nodules of the nitrogen cycle?

O (organic layer)