**Pretest 1.2**
**STE Part**

1. a) Hydrogen ion and hydrogen gas do not have the same chemical properties. Is this true? Yes, hydrogen ion is not flammable, but hydrogen gas is.

   b) Is this true for all ions, that they do not have the same chemical properties as the same but neutral element? yes

   c) Give another example of the above. Calcium ion does not react with water but neutral calcium and $H_2O$ produce hydrogen gas and base.

2. Which **3** of the following elements would you place in the same family, based on their properties? Justify your choice.

| Element | Melting Point($^0$C) | Common Ion(s) | Conducts electricity? | Appearance |
|---|---|---|---|---|
| A | -101 | -1 | no | Yellow-green |
| B | 714 | 2 | yes | Shiny, silvery |
| C | 631 | 3,-3,5 | no | Dull grey |
| D | 1083 | 2,1 | yes | Shiny ,orange |
| E | 961 | 3,1 | yes | Shiny, yellow |
| F | 1063 | 1 | yes | Shiny, silvery |

D, E and F are all high-melting and shiny. They all conduct and form the +1 ion.

3. Explain why +1 is the common ion for alkali metals.

   They all have 1 loose valence electron because they have relatively too many shells for their number of protons.

4. What noble gas and what charged alkaline earth metal have the same shell diagram as $K^{+1}$?

   Ar and $Ca^{+2}$

5. Which of the following is **NOT** found in nature?

a. Ar b. Ba c. $F^{-1}$ d. $K^{+1}$

Ba. Its common form would be $Ba^{+2}$ because it an alkaline earth metal.

6. What ion formed from an element of the fourth shell ($4^{th}$ period) is found in seashells?

$Ca^{+2}$

7. How can you distinguish between lithium and iron without weighing or heating them and without reacting them with anything?

Lithium, like all alkali metals, is soft and can be cut with a knife. Iron can't.

8. List three substances that will react with halogens ?

Alkali metals, hydrogen, alkaline earth metals , water

9. Explain why fluorine forms diatomic molecules. Use dot and shell diagrams in your explanation.

Each fluorine has the nuclear strength and room to pull one electron form the other atom. As a result they end up sharing a pair of electrons, and each atom ends up with an octet.

10. I am an element that likes to form the -1 ion, and I have the smallest nucleus among the members of my family. What am I?

Fluoride

11. Which family consists of only gases (at room temperature) which do not burn?

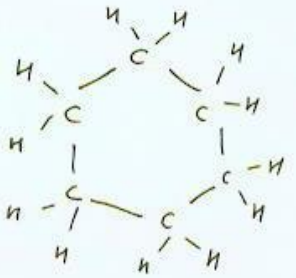
Noble gases

12. Draw appropriate dot structures for the following:

a. $C_6H_{12}$
b. $OF_2$
c. KI
d. $C_8(NO_2)_8$ This structure should be the most symmetric possible. It is the world's most powerful chemical explosive.

**Solutions appear on the next page**

a) $C_6H_{12}$



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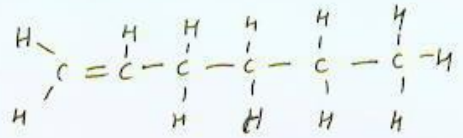
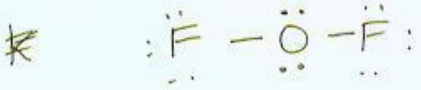
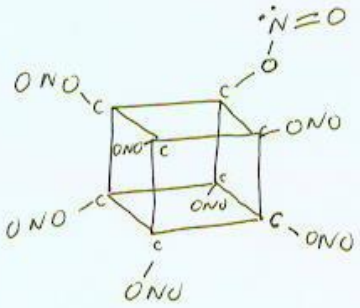


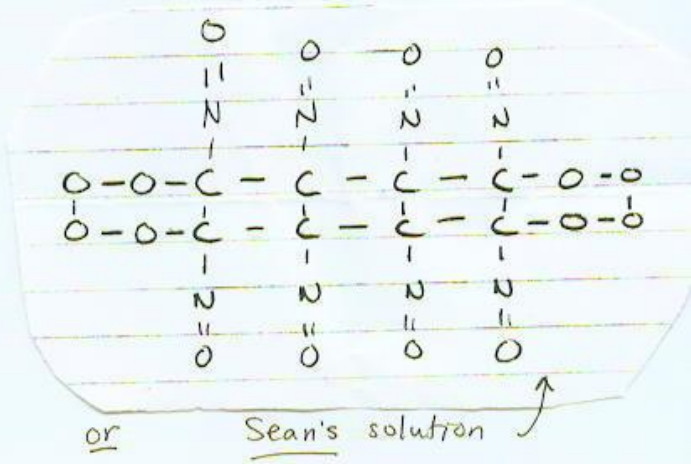
b)



c)

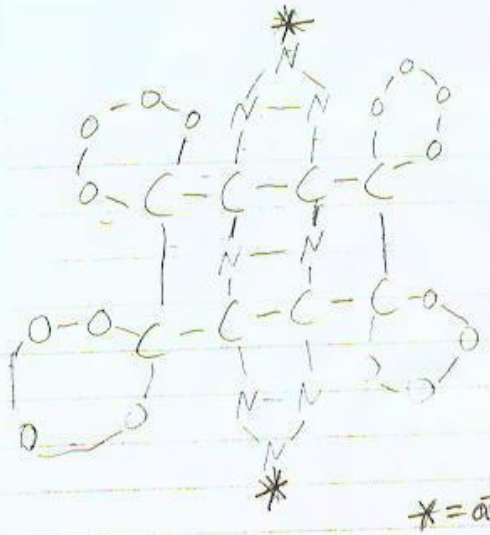
d)





or Sean's solution

or Evan's solutions:



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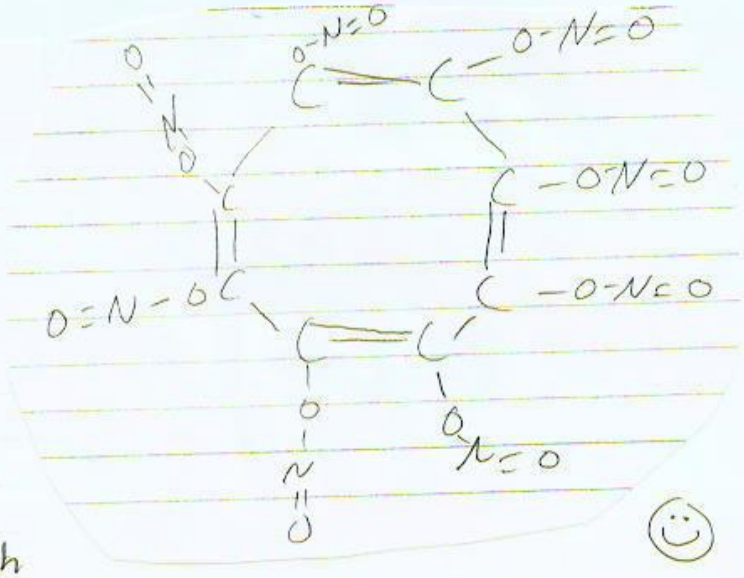
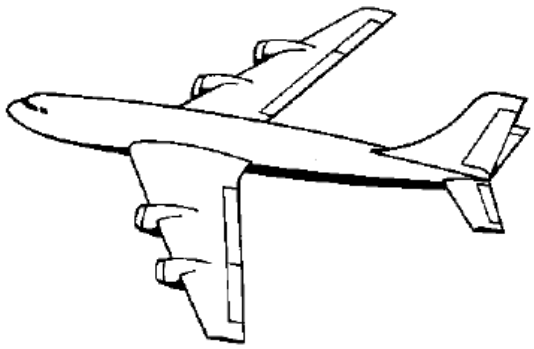
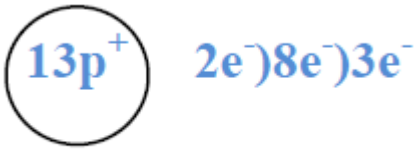


**ST PART**



13. Most airplanes are mostly made of aluminum alloys. One type of alloy, uncreatively labeled 7075, blends aluminum (Al) with a small amount of magnesium (Mg). In welding aircraft parts together they use an alloy that blends aluminum with magnesium and silicon (Si).

a) Draw a Bohr-Rutherford model of the aluminum atom.




b) Draw a Lewis structure of aluminum.


c) How many valence electrons does magnesium have? 2

d) The valence electrons of magnesium are loose. How does this affect the **physical** properties of magnesium? List two.

It makes it a good conductor of electricity and makes it lustrous.

e) Which elements are in the same period as Si, Al and Mg? Na, P ,S, Cl, Ar

f) Which elements are in the same group or family as magnesium (Mg)? Be, Ca, Sr, Ba, Ra

Use the following information for questions(g), (h) and (i)

Here is a reaction between Mg and two HCl molecules which make hydrogen gas and a compound of magnesium and chlorine.

$Mg + 2\ HCl \rightarrow H_2 + MgCl_2$

→

g) Write a balanced equation to show the reaction between Ca and HCl.

$Ca + 2\ HCl \rightarrow H_2 + CaCl_2$

h) How many electrons did each chlorine gain?

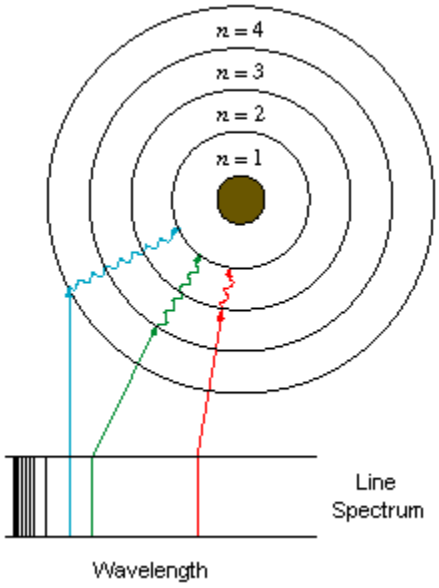
1

i) How many electrons did magnesium lose?
2

j) Draw and describe the hydrogen atom according to the way Dalton envisioned it.

k) Draw the different possibilities of an excited electron returning to the second shell of a hydrogen atom. What colors are emitted when electrons from many atoms follow such paths? Show in diagram. Who first came up with this model?

Bohr first came up with this model to explain the spectral lines of hydrogen.

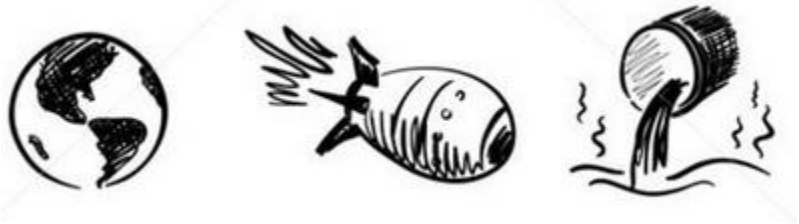



## FLASHBACK QUESTIONS

**STE**

1. Do isotopes of the same element ever have the same physical properties? Why or why not? No, they have different masses. (mass number)

2. What is the difference between a nuclear and a chemical property?



A chemical property describes its behavior towards other substances and it involves valence electrons. A nuclear property describes whether an isotope's nucleus stays the same or breaks down (radioactivity)

**ST**

1. What are 4 characteristic physical properties of water?

Density, boiling point, freezing point and specific heat

2. Use H and O to illustrate Dalton's law of multiple proportions.

$H_2O$ and $H_2O_2$ are two different compounds.

3. Balance: $2\ Na + 2\ H_2O \rightarrow H_2 + 2\ NaOH$

4. What is the difference between these symbols: ↑ and ↓ ?

The first one is for a ***gas that escapes*** from a solution; the second one is for a ***solid precipitating out*** of an aqueous solution.