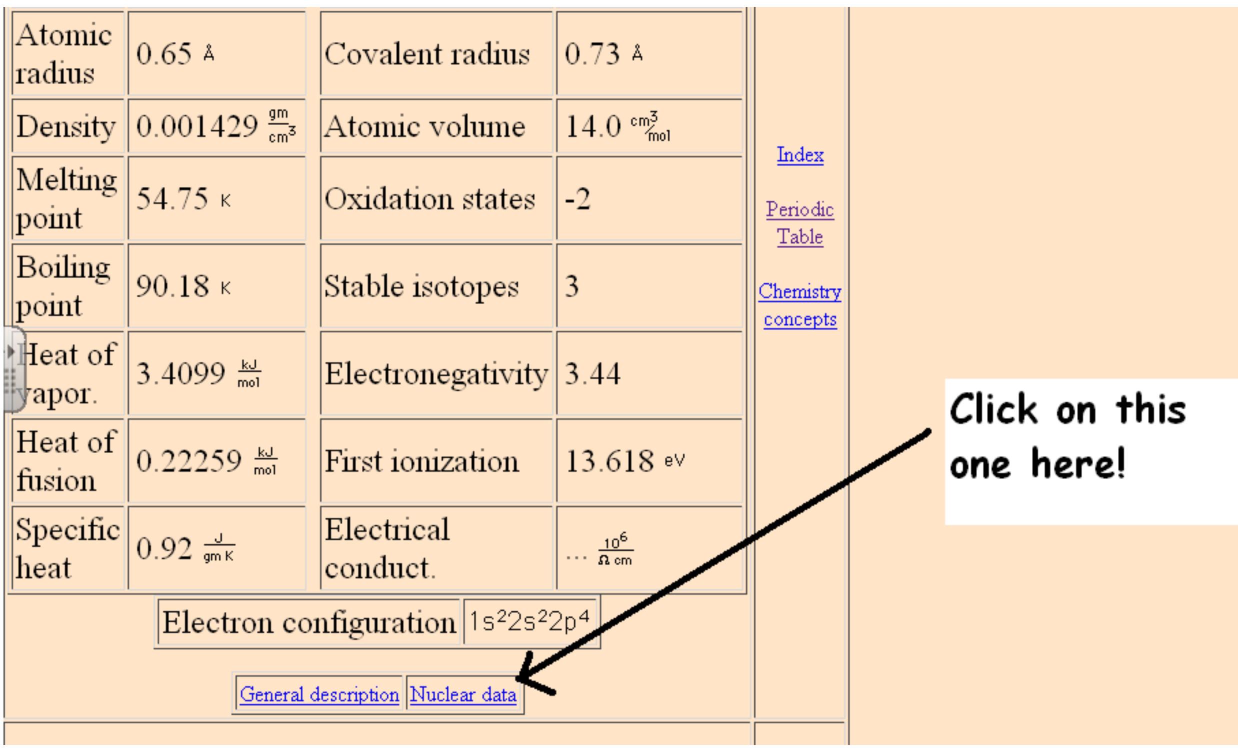
Binding Energy Lab: (Using a database!)

This lab is designed to fulfill the IB lab requirement that a database is used for at least one lab throughout the year. (The other two requirements are datalogging, and spreadsheet which we have used on so many labs...)

Aim: In this lab you will make the famous binding energy graph that is so very important in determining fission and fusion energy changes.

Rough Method:

- ➢ Use the webpage at http://hyperphysics.phy-astr.gsu.edu/hbase/pertab/pertab.html#c1
- ➢ You will then see a periodic table that acts as the portal to the database.
- ➢ Click on one of the elements (oxygen for example).
- ➢ Click on the "Nuclear data" link as shown:



➢ Now you will need to pick out your raw data from this chart:

Oxygen Nuclear Data

Z	A	Atomic Mass (u)	Nuclear Mass(GeV/c2	Binding Energy(MeV)	Spin	Natural Abund.	Half-life	Decay	Q MeV
8	13	13.02810	...	...	...	...	8.9ms	b+	17.77
8	14	14.008595	13.0449	98.74	0	...	70.6s	b+	5.14
8	15	15.003065	13.9713	111.96	1/2	...	122s	b+	2.75
8	16	15.994915	14.8952	127.62	0	0.99762	stable	...	...
8	17	16.999131	15.8306	131.77	5/2	0.00038	stable	...	...
8	18	17.999160	16.7622	139.81	0	0.002	stable	...	...

Atomic data

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Periodic Table

Chemistry concepts

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➢ Put this data into a google sheets document.

➢ **Divide** the Binding energy by the number of nucleons.

➢ REPEAT for many atoms with various nucleon numbers (Mass numbers) to get a wide range of data. (At least 40, but more is better)

➢ Graph the Binding Energy per nucleon (y-axis) against the Number of Nucleons (x-axis).

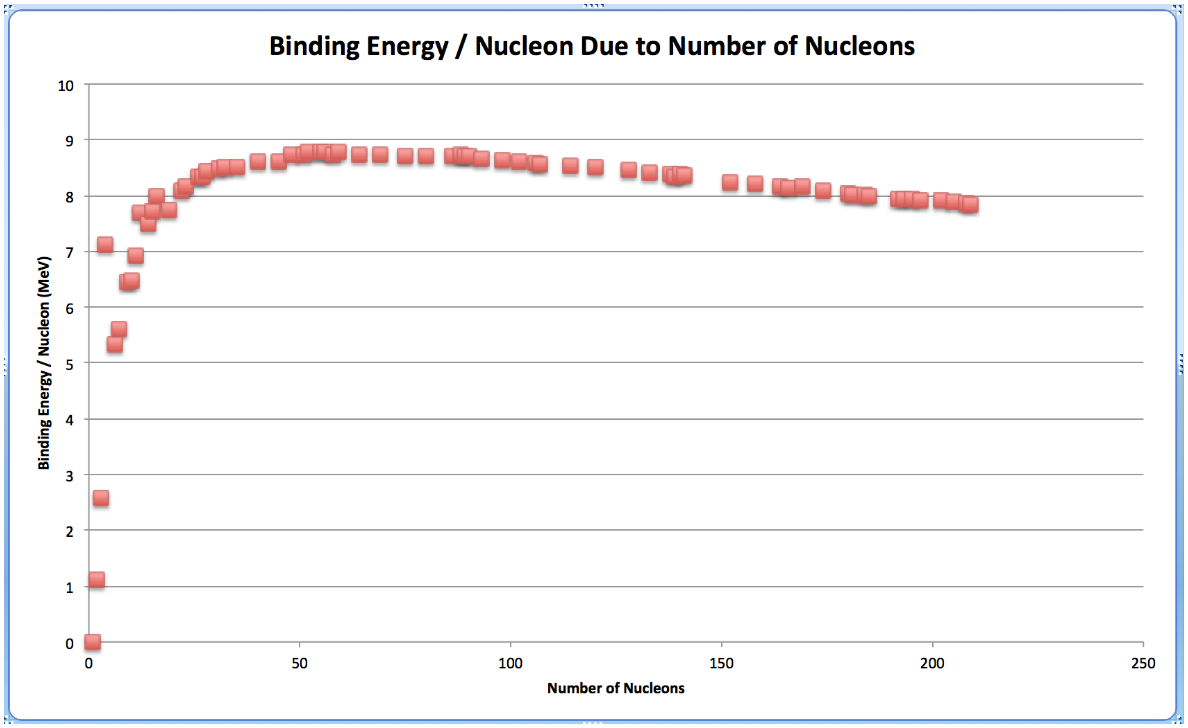
Questions

➢ Does your graph match the expected graph? Why or why not?

➢ Why do you think we graph the Binding Energy per nucleon and not just the Binding Energy?

➢ Write a **short** paragraph explaining why this graph is so darn important! (make sure to discuss fission and fusion in your graph)

Jiwook:



- Does your graph match the expected graph? Why or why not?

Yes, my graph does match the expected graph, the actual binding energy curve, precisely. First of all, most of the nucleons have the binding energy per nucleon in the range of 7 MeV to 9 MeV except for the first few nucleons. Furthermore, the graph reveals a rapid increment in the binding energy per nucleon until the number of nucleons approaches to approximately 50 - 60, which corresponds to the elements of copper or nickel; and then the binding energy per nucleon gradually but slowly diminishes.

- Why do you think we graph the Binding Energy per nucleon and not just the Binding Energy?

I think we graph the Binding Energy per nucleon instead of just “the Binding Energy” because what each reveals is dissimilar. Meanwhile the “binding energy per nucleon” indicates the general stability of the element itself depends on the number of nucleons since the “binding energy per nucleon” displays the average dispersed energy among the nucleons, the overall-combined “binding energy” of the whole element pragmatically does not define anything but the absolute energy in the atom, which can be easily and manifestly assumed.

- Write a **short** paragraph explaining why this graph is so darn important!

This graph, “Binding Energy per nucleon due to Number of Nucleons”, is significant because it illustrates the stability and practicality of each element depends on its nucleons. The stability is indicated by the “binding energy per nucleon” representing a specific amount of energy is within the cohesion of the nucleons. In addition, the practicality is shown by the mean energy itself, the “binding energy per nucleon”, since more energy per same quantity means that it is more efficient and practical.