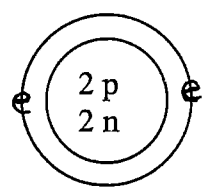

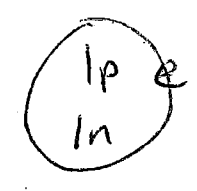



1. Complete the following table.

Symbol	Atomic Number	Atomic Mass	Number of Protons	Number of Neutrons	Number of Electrons
$^{12}_6\text{C}$	6	12	6	6	6
$^{40}_{18}\text{Ar}$	18	40	18	22	18
$^{127}_{53}\text{I}^-$	53	127	53	74	54
$^{40}_{20}\text{Ca}^{+2}$	20	40	20	20	18

2. Atoms are made up of subatomic particles, such as protons, neutrons, and electrons. The nucleus of atoms that make up isotopes of an element differ. There are three known isotopes of the element hydrogen. Make a drawing representing each of these three isotopes. A drawing of a helium isotope is shown as an example. A drawing of a helium isotope is shown as an example.

Helium, ^4_2He	Protium, ^1_1H	Deuterium, ^2_1H	Tritium, ^3_1H
			

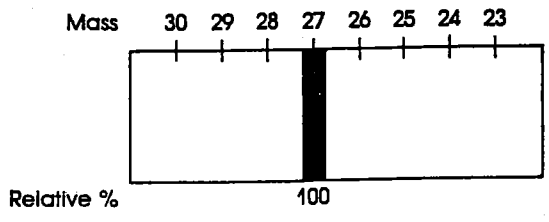
Why is the mass for hydrogen 1.0079 and not a whole number?

it is the average mass of all the isotopes

- Do the numbers of electrons for neutral isotopes of the same element differ? Yes or No
- Do the numbers of protons for neutral isotopes of the same element differ? Yes or No
- Do the numbers of neutrons for neutral isotopes of the same element differ? Yes or No
- Do the atomic numbers for neutral isotopes of the same element differ? Yes or No
- Do the mass numbers for neutral isotopes of the same element differ? Yes or No

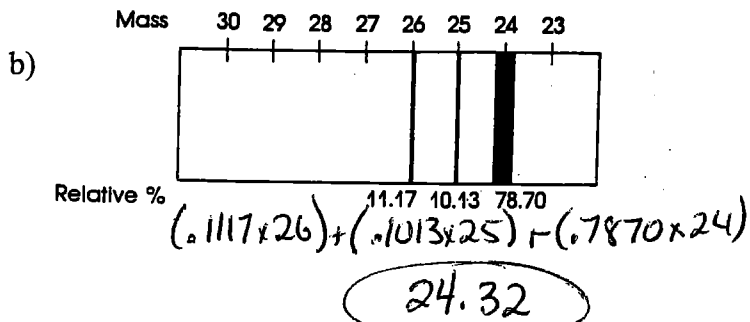
3. A mass spectrograph is an instrument used to separate an element's isotopes and to measure their relative abundances.

a)



What is the atomic mass of the isotope of the element? 27

What is this element's name? Aluminium



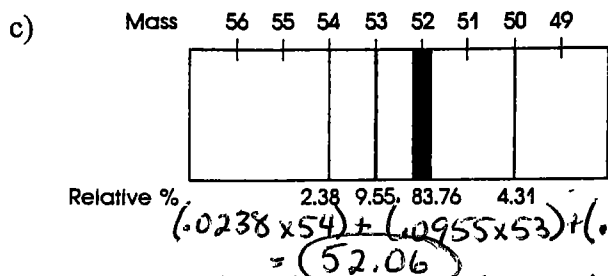
What are the atomic masses of the isotopes of the element? 24, 25, 26

Based on the experimentally obtained values of atomic mass and percent, calculate the average atomic mass of this element. Show your work below the spectrograph.

What is this element's name? Magnesium

What are the atomic masses of the isotopes of the element? 50, 52, 53, 54

Calculate the average atomic mass of this element, showing your work under the spectrograph.



What is this element's name? Chromium

- 4.
- By what other name are elements in Group 1 known? alkali metals
 - By what other name are elements in Group 2 known? alkaline earth metals
 - By what other name are the elements in Group 3-12 known? transition metals
 - By what other name are the elements in Group 17 known? halogens
 - By what other name are the elements in Group 18 known? noble gases

5. What is true of elements within any group?

similar chemical + physical properties

6. The electron configuration of an atom reveals the placement of electrons within the orbitals of the atom and is the key to chemical behavior.

Write the electron configurations for atoms that have the following atomic numbers

3: Li $1s^2 2s^1$ or $[He] 2s^1$

11: Na $1s^2 2s^2 2p^6 3s^1$ or $[Ne] 3s^1$

19: K $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ or $[Ar] 4s^1$

What if anything do these electron configurations have in common? all end with s^1

What would you expect about the relative properties of these elements? similar

Where are these atoms located on the periodic table? group 1 alkali metals

7. Write the electron configurations for the atoms that have the following atomic numbers.

9: F $1s^2 2s^2 2p^5$ or $[He] 2s^2 2p^5$

17: Cl $1s^2 2s^2 2p^6 3s^2 3p^5$ or $[Ne] 3s^2 3p^5$

35: Br $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$ or $[Ar] 4s^2 3d^{10} 4p^5$

What if anything do these electron configurations have in common? all end with p^5

What would you expect about the relative properties of these elements? similar

Where are these atoms located on the periodic table? group 17 halogens

8. Calcium tends to form a 2+ ion. Write the electron configuration of a neutral Ca atom and the Ca²⁺ ion.

Ca: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$ or [Ar] 4s²

Ca²⁺: $1s^2 2s^2 2p^6 3s^2 3p^6$ or [Ar]

Explain why the 2+ ion is the one that tends to typically form.

Ca loses 2 electrons to have a full outer shell

What family on the periodic table does Ca belong to? alkaline earth metals

What ions would other elements in that family form? Why?

+2 all end in s² so all will lose 2 electrons to have a full outer shell

9. Sulfur tends to form a 2- ion. Write the electron configuration of a neutral S atom and the S²⁻ ion.

S: $1s^2 2s^2 2p^6 3s^2 3p^4$ or [Ne] 3s² 3p⁴

S²⁻: $1s^2 2s^2 2p^6 3s^2 3p^6$ or [Ne] 3s² 3p⁶

Explain why the 2- ion is the one that tends to typically form.

S gains 2 electrons to have a full outer shell

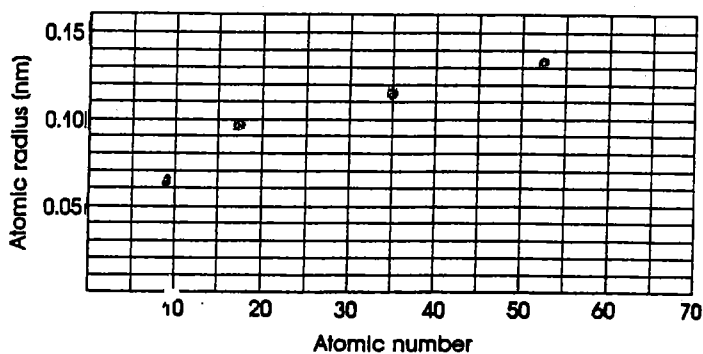
What family on the periodic table does S belong to? group 16 chalcogens

What ions would other elements in that family form? Why?

-2 all gain 2 electrons to have a full outer shell

10. The atomic radius of the first few atoms in Group 17 have been estimated to have the following values:

F	0.064 nm
Cl	0.099 nm
Br	0.114 nm
I	0.133 nm



Graph these values versus atomic number on the grid.

What do you notice about the relationship? radius increases down a family

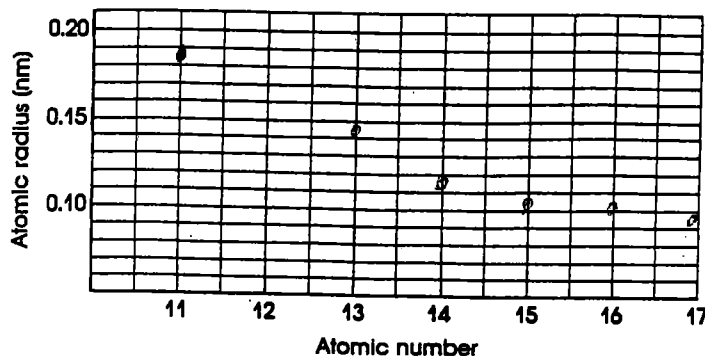
Account for this relationship in terms of atomic forces and structure.

- more shells = larger size
- electrons further from the nucleus so less electrostatic attraction

11. The radii of the first seven elements in period 3 have been estimated to have the following values:

Na	0.186 nm
Al	0.143 nm
Si	0.117 nm
P	0.110 nm
S	0.104 nm
Cl	0.099 nm

Graph these values versus atomic number on the grid.



What do you notice about the relationship? *radius decreases across a period (left to right)*

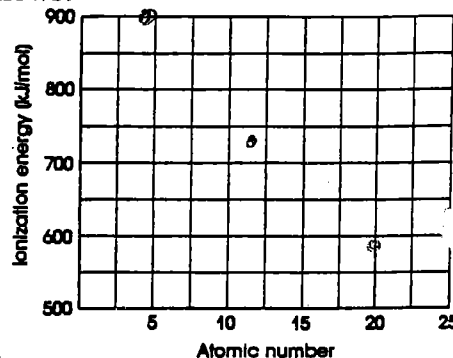
Account for this relationship in terms of atomic forces and structure.

larger positive charge on nucleus attracts outer electrons in more

12. The ionization energies of the first three atoms in group 2 are as follows:

Be	900 kJ
Mg	736 kJ
Ca	590 kJ

Graph these values versus atomic number on the grid.



What do you notice about the relationship? *IE decreases down a family*

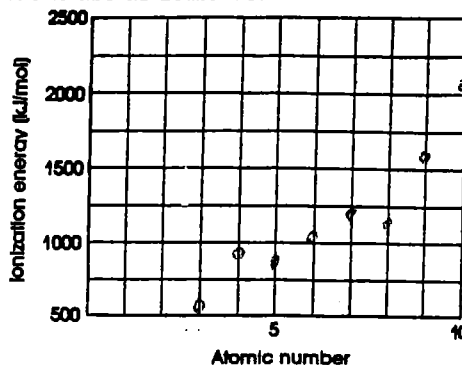
Account for this relationship in terms of atomic forces, structure, and radius.

electrons are farther from the nucleus, so held less strongly and are easier to remove

13. The ionization energies of the elements in period 2 are as follows:

Li	519 kJ
Be	900 kJ
B	799 kJ
C	1088 kJ
N	1406 kJ
O	1314 kJ
F	1682 kJ
Ne	2080 kJ

Graph these values versus atomic number on the grid.



What general trend do you notice? *IE increases across a period, left to right*

Account for this general trend in terms of atomic forces, structure, and radius.

electrons are "pulled in" by larger positive charge on nucleus so electrons are harder to remove