

## SI Worksheet (Answers)

2/10/22

Agenda:

Kahoot on parts of periodic table

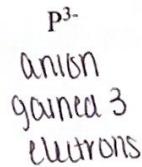
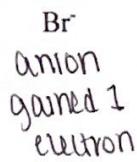
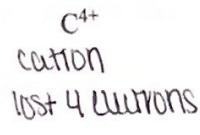
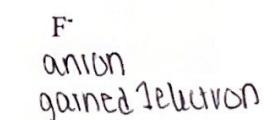
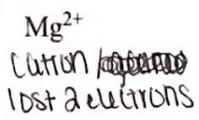
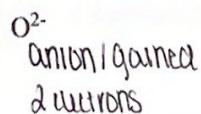
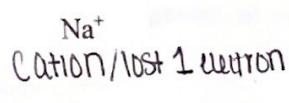
Worksheet

1. Write the corresponding name or symbol

Name	Symbol
Silicon	Si
Sulfur	S
Phosphorus	P
Sodium	Na
Magnesium	Mg
Potassium	K
Chlorine	Cl
Calcium	Ca
Argon	Ar
Aluminum	Al

Name	Symbol
Boron	B
Beryllium	Be
Carbon	C
Fluorine	F
Hydrogen	H
Helium	He
Lithium	Li
Nitrogen	N
Neon	Ne
Oxygen	O

2. Is the following elements cations or anions? Did they lose/gain electrons or protons?



\*Remember an element can NEVER lose/gain protons, only electrons!!

3. Fill in the table

Element Symbol	Shorthand Representation ${}^A_Z X$	X-A	${}^A_Z X$	Atomic Number	Mass Number	# of protons	# of neutrons	# of electrons
F	${}^{19}F$	F-19	${}_{9}^{19}F$	9	19	9	10	9
Ca	${}^{40}Ca$	Ca-40	${}_{20}^{40}Ca$	20	40	20	20	20
Si	${}^{29}Si$	Si-29	${}_{14}^{29}Si$	14	29	14	15	14
Au	${}^{197}Au$	Au-197	${}_{79}^{197}Au$	79	197	79	118	79
Mg <sup>2+</sup>	${}^{25}Mg^{2+}$	Mg <sup>2+</sup> -25	${}_{12}^{25}Mg^{2+}$	12	25	12	13	10
O <sup>-</sup>	${}^{16}O^-$	O <sup>-</sup> -16	${}_{8}^{16}O^-$	8	16	8	8	9

4. Calculating atomic weight

$$\text{atomic weight} = \left\{ \left[ \frac{\text{atomic mass of}}{\text{each isotope}} \right] \times \left[ \frac{\% \text{ abundance of}}{\text{isotope}} \right] \right\}$$

- a. Naturally occurring europium (Eu) consists of two isotopes.  ${}^{151}Eu$  (atomic mass of 150.919 amu) has an abundance of 48.03% and  ${}^{153}Eu$  (atomic mass of 152.921) has an abundance of 51.97%. What is the atomic weight of europium?

Atomic mass (amu)

${}^{151}Eu$  150.919

${}^{153}Eu$  152.921

Percent abundance

48.03%

51.97%

atomic weight = ?

$$\text{atomic weight} = \left[ (150.919) \times (48.03) \right] + \left[ (152.921) \times (51.97) \right]$$

$$= 72.49 \text{ amu} + 79.47 \text{ amu}$$

$$= 151.96 \text{ amu}$$

- b. Nitrogen is made up of two isotopes,  ${}^{14}N$  (atomic mass 14.00 amu) and  ${}^{15}N$  (atomic mass of 15.00). Given nitrogen's atomic weight of 14.007, what is the percent abundance of each isotope?

atomic mass (amu)

${}^{14}N$  14.00

${}^{15}N$  15.00

% abundance x 1-x

atomic weight 14.007

$$14.007 = (14.00x) + (15.00(1-x))$$

$$14.007 = 14.00x + 15.00 - 15.00x$$

$$14.007 = 15.00 - x$$

$$-15.00 -15.00$$

$$-0.99 = x$$

per cent abundance  
of  ${}^{14}N$  (99.1%)

Then plug into

$$1-x$$

$$1-0.99 = 0.01$$

per cent abundance  
of  ${}^{15}N$  (1%)

- c. Naturally occurring silicon consists of 3 isotopes,  $^{28}\text{Si}$ ,  $^{29}\text{Si}$  and  $^{30}\text{Si}$ , whose atomic masses are 27.9769, 28.9765 and 29.9738 amu respectively. The most abundant isotope is  $^{28}\text{Si}$  which accounts for 92.23% of naturally occurring silicon. Given that the observed atomic <sup>WEIGHT</sup> mass of silicon is 28.0855 calculate the percentages of  $^{29}\text{Si}$  and  $^{30}\text{Si}$  in nature.

	$^{28}\text{Si}$	$^{29}\text{Si}$	$^{30}\text{Si}$	
atomic mass (amu)	27.9769	28.9765	29.9738	Let $x = \text{isotopic abundance of } ^{28}\text{Si}$
percent abundance	92.23%	$x$	$y$	Let $y = \text{isotopic abundance of } ^{30}\text{Si}$

atomic weight = 28.0855

1) write your equations

$$(27.9769)(0.9223) + (28.9765)(x) + (29.9738)(y) = 28.0855$$

AND

$$0.9223 + x + y = 1.000$$

2) rearrange, so equation can be plugged in

$$\begin{aligned} 0.9223 + x + y &= 1.000 \\ -0.9223 - x &\quad -0.9223 - x \end{aligned}$$

$$y = 0.0777 - x$$

3) plug in to first equation + solve for x

$$(27.9769)(0.9223) + 28.9765x + (29.9738)(0.0777 - x) = 28.0855$$

$$25.80 + 28.9765x + 2.33 - 29.9738x = 28.0855$$

$$-0.9973x + 28.13 = 28.0855$$

$$-0.9973x = -0.041$$

$$x = 0.0401 = 4.01\% \quad (\text{w/ sig figs n4%})$$

4) plug in x, to get y

$$y = 0.0777 - 0.0401$$

$$y = 0.0376 = 3.76\%$$

Check

$$4.01 + 3.76 + 92.23 = 100 \checkmark$$

\* I may have rounded differently! If your answer is close and you set up the problem correctly, nice job!!