

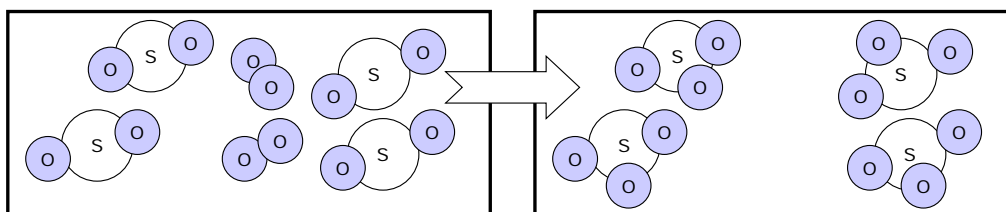
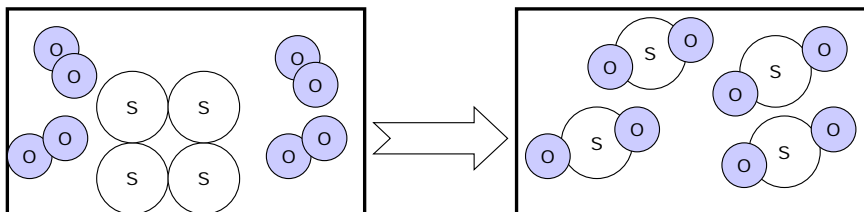
Exam: "Atomic Theory & Periodic Table" (Batxilergoa 1)

Name:

Classroom:

1. Classify the following systems (initial and final systems in each transformation) and decide if they are physical or chemical changes.

(TOTAL: 2)



①

a) Initial system: HETEROGENEOUS MIXTURE  
 $S(s) + O_2(g)$

Final system: PURE SUBSTANCE - COMPOUND  
 $SO_2(g)$

Transformation: Chemical change

b) Initial system: HOMOGENEOUS MIXTURE  
 $SO_2(g) + O_2(g)$

Final system: PURE SUBSTANCE - COMPOUND  
 $SO_3(g)$

Transformation: Chemical change

2. Given the following atom / ion, determine

- the number of protons, electrons and neutrons
- the electron configuration (box-diagram)



(TOTAL: 2)

②  ${}_{15}^{31}\text{P}$  number of particles

- number of protons → 15 protons ( $= Z$ )
- number of neutrons →  $31 - 15 = 16$  neutrons ( $A - Z$ )
- number of electrons → neutral atom  
15 electrons  
(charge = # of protons - # of electrons)

electron configuration

1s    2s    2p    3s    3p

3. Given the following periodic table (NOTE: the symbols are not real).  
(TOTAL: 2)

X	
Y	M
Z	R
Q	

T	V		D	G	
		J			L
			E		

- a) Decide which letter corresponds to this electron configuration:  $1s^2 2s^2 2p^6 3s^2$  Which group does this element belongs to?
- b) Write the real symbols for X, Z, G, V, Z and decide if they are metals or non-metals
- c) Consider the following elements: "Z", "G", "V", "M" and do the following:
  - a. arrange those elements according to their size (in increasing order)
  - b. arrange them according to their electronegativity (in increasing order)

③ a) R →  $s^2 / 2 / 2A$  / alkaline earth metals

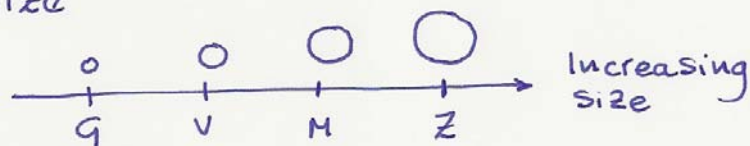
b) X → H; non-metal

Z → Na; metal

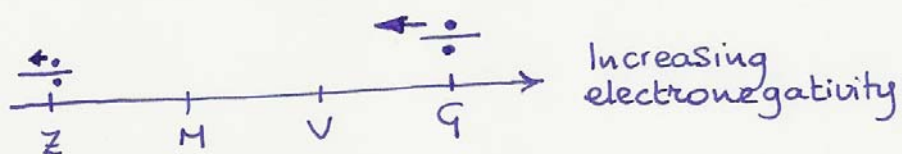
G → F; non-metal

V → C; non-metal

c) Size



Electronegativity



4. The table below gives information about some atoms / ions.

Atom/ion	# of protons	# of neutrons	# of electrons
A	8	8	10
B	12	13	10
C	15	16	15
D	5	6	5
E	15	15	15
F	16	18	16

- Which ones are cations? Which ones are anions? Write their Lewis notations
- Which ones are isotopes? Why?
- Draw a complete picture of the atom D (nucleus and orbits)
- Calculate the mass of each atom/ion (in "u" units)
- Give the ionic and covalent valences of the "F" element

(TOTAL: 2)

④

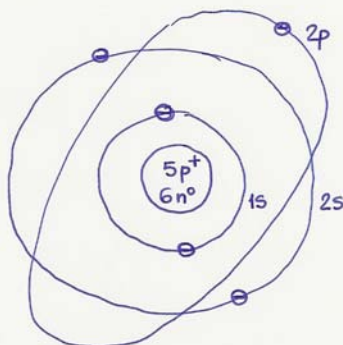
a) Cations:  $B^{2+}$

Anions:  $:A:^{2-}$

b) Isotopes → different versions of the same element

$^{31}_{15}C$  and  $^{30}_{15}E$

c)



d) Mass of each atom/ion ↔ mass number (# of protons + # of neutrons)

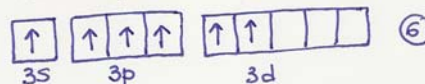
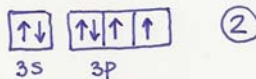
A → 16 u ; B → 25 u ; C → 31 u ;

D → 11 u ; E → 30 u ; F → 34 u

e)  $^{34}_{16}F \leftrightarrow 1s^2 2s^2 2p^6 3s^2 3p^4 \dots :F\cdot$

ionic valences →  $:F:^{2-} \rightarrow (2-)$

covalent valences



5. Let's suppose that we have a sample of hydrogen atoms and that the electrons are placed in the excited state  $n=4$ .

- draw the energy levels from  $n=1$  to  $n=4$  (considering that the origin is when the electron is out of the atom)
- draw the emission spectrum, giving
  - their placement in the IR, visible and UV regions
  - their arrangement according to their energies

(TOTAL: 2)

