

# Chemistry 11

## Atomic Theory Review

Name:

Date:

Block:

1. Give the atomic number and the number of protons, neutrons and electrons in the following:

<i>Ion</i>	<i>Atomic #</i>	<i>Atomic Mass</i>	<i>Protons</i>	<i>Neutrons</i>	<i>Electrons</i>
Hf <sup>3+</sup>		178			
Po <sup>2+</sup>		209			
At <sup>-</sup>		210			

2. Give the nuclear symbol of the following isotopes:

<i>Nuclear Symbol</i>	<i>Protons</i>	<i>Neutrons</i>	<i>Electrons</i>
	42	54	39
	32	42	32
	108	157	105

3. What is the average atomic mass of element X given the following proportions?  
 $^{192}\text{X} = 35.5\%$ ,  $^{194}\text{X} = 34.9\%$ ,  $^{198}\text{X} = 20.3\%$ ,  $^{209}\text{X} = 9.3\%$

4. Each single orbital can hold a maximum of \_\_\_\_\_ electrons.
5. An "s" subshell (1 orbital) can hold a maximum of \_\_\_\_\_ electrons  
A "p" subshell (3 orbitals) can hold a maximum of \_\_\_\_\_ electrons  
A "d" subshell (5 orbitals) can hold a maximum of \_\_\_\_\_ electrons  
An "f" subshell (7 orbitals) can hold a maximum of \_\_\_\_\_ electrons  
When electrons in an atom are filling energy levels, they fill the \_\_\_\_\_ possible energy levels first.

6. Give the **electron configuration** and **orbital diagram** for each of the following atoms and ions:  
(You may use core notation)

Si	Cr
Br	Ce
K	Cu
Na <sup>+</sup>	Zr <sup>4+</sup>
Mn <sup>2+</sup>	Ag <sup>+</sup>
Br <sup>-</sup>	As <sup>3-</sup>
O <sup>2-</sup>	Te <sup>2-</sup>

7. Write the configuration and then find the number of valence electrons for the following atoms:

N (configuration) \_\_\_\_\_ (# of valence e-'s) \_\_\_\_\_

Si (configuration) \_\_\_\_\_ (# of valence e-'s) \_\_\_\_\_

Ca (configuration) \_\_\_\_\_ (# of valence e-'s) \_\_\_\_\_

P (configuration) \_\_\_\_\_ (# of valence e-'s) \_\_\_\_\_

Al (configuration) \_\_\_\_\_ (# of valence e-'s) \_\_\_\_\_

8. In order to become stable,

an atom of Ca will give 2 electrons and become the ion Ca<sup>2+</sup>

an atom of Se will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

an atom of K will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

an atom of Br will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

an atom of N will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

an atom of As will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

an atom of Al will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

an atom of Te will \_\_\_\_\_ electrons and become the ion \_\_\_\_\_

9. What is the general trend in atomic radius (size of atoms) as you move from left to right across any period? (*increase/decrease*) \_\_\_\_\_

10. As you move from Li to Ne, electrons are filling (*the same/different*) \_\_\_\_\_ energy levels(s).

11. As you move across from Li to Ne, what is happening to the number of *protons* in the nucleus?  
\_\_\_\_\_. What do the protons do to the electrons? \_\_\_\_\_.

Suggest a reason why the atoms in a period actually get *smaller* as you move from left to right.

12. What is the general trend in atomic radius (size of atoms) as you move *down* a vertical column (group)? (*increase/decrease*) \_\_\_\_\_

13. Suggest a reason for this trend.

14. What is meant by **ionization energy**?
15. What is the general trend in first ionization energy as you move from left to right across any Period? (eg. from Li→Ne or from Na→Ar) (*increase/decrease*) \_\_\_\_\_
16. Keeping in mind the trend in atomic radius as you move from left to right across a period, suggest a reason for this trend in ionization energies.
17. What is the trend in ionization energy as you move down a vertical column, like from Li→Na→K or from He→Ne→Ar→Kr? (*increase/decrease*) \_\_\_\_\_
18. Suggest a reason for this trend based on atomic radius (size) and the distance and force of attraction between the nucleus and the outer electron.
19. Compare the following particles:

Sodium Ion	Oxygen Ion	Neon	Magnesium Atom	Fluorine Ion
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Arrange the particles using chemical formulas from smallest atomic radii to largest atomic radii:

20. Determine the type of bond that forms between the following atoms:
- N and O
  - Ca and P
  - K and Br
  - C and H
  - Cu and F
  - Cl and Cl

21. Fill in the table below.

<b>Compound</b>	<b>Lewis Structure</b>	<b>AXE Notation</b>	<b>Shape</b>
NO <sub>3</sub> <sup>-</sup>			Name:  Diagram:
SF <sub>4</sub>			Name:  Diagram:
PO <sub>4</sub> <sup>3-</sup>			Name:  Diagram:
BrF <sub>5</sub>			Name:  Diagram:

$\text{ClO}_2^-$			Name:  Diagram:
$\text{NCl}_3$			Name:  Diagram:
$\text{H}_2\text{O}$			Name:  Diagram:
$\text{COCl}_2$ (C is central atom)			Name:  Diagram: