

4.1 Subatomic Particles – Answer Key

Element	Atomic #	Mass #	# Protons	# Neutrons	# Electrons in ATOM	Ion symbol and charge	# electrons in the ION
Potassium	19	39	19	20	19	K ⁺	18
Phosphorous	15	31	15	16	15	P ³⁻	18
Lithium	3	7	3	4	3	Li ⁺	2
Calcium	20	40	20	20	20	Ca ²⁺	18
Nitrogen	7	14	7	7	7	N ³⁻	10
Helium	2	5	2	3	2	N/A	N/A
Argon	18	40	18	22	18	N/A	N/A
Aluminum	13	26	13	13	13	Al ³⁺	10
Chlorine	17	37	17	20	17	Cl ⁻	18
Iodine	53	127	53	74	53	I ⁻	54

2) Noble gases – stable, full valence shell

3) a) 7 c) 50
b) 27 d) 5




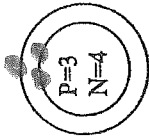




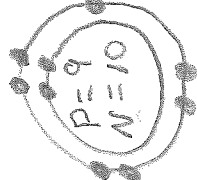
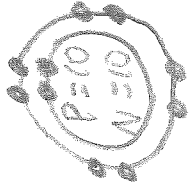
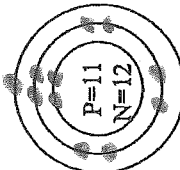

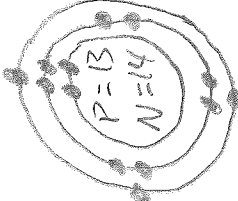
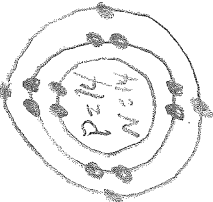
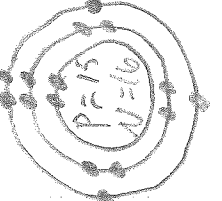
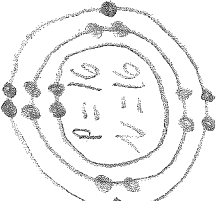
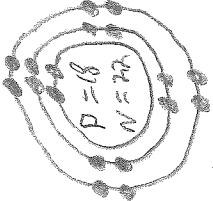
4) a) 3 c) 16
b) 14 d) 10

5) a) 2 c) 56
b) 34 d) 10

BOHR DIAGRAM WORKSHEET


NAME: _____

Draw and complete the following Bohr Diagrams for the first twenty elements. Some have been set-up for you. Label the families and number of valence electrons in each group.

 <p>P=1 H-1</p>	 <p>electron → orbital shells → Element symbol → He-4 number of protons → number of neutrons → mass number →</p>	 <p>P=2 N=2 He-4</p>				
 <p>P=3 N=4 Li-7</p>	 <p>P=5 N=6 B-11</p>	 <p>P=6 N=6 C-12</p>	 <p>P=7 N=7 N-14</p>	 <p>P=8 N=8 O-16</p>	 <p>P=9 N=10 F-19</p>	 <p>P=10 N=10 Ne-20</p>
 <p>P=11 N=12 Na-23</p>	 <p>P=12 N=12 Mg-24</p>	 <p>P=13 N=14 Al-27</p>	 <p>P=14 N=14 Si-28</p>	 <p>P=16 N=16 S-32</p>	 <p>P=17 N=18 Cl-35</p>	 <p>P=18 N=22 Ar-40</p>

1 energy level 

2 energy levels 

3 energy levels 

4 energy levels 

Goal • Demonstrate your understanding of Lewis diagrams.

What to Do

1. Complete the following table.

Name of Element	Period Number	Group Number	Number of Energy Levels	Number of Valence Electrons
helium	1	18	1	2
aluminum	3	13	3	3
oxygen	2	16	2	6
strontium	5	2	5	2
silicon	3	14	3	4
barium	6	2	6	2

2. Draw the missing Lewis diagrams in the following table. Refer to a periodic table as necessary.

H						He	
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar

Science 10

4.1 Bohr Models & Lewis Structures

1. Complete the following Bohr & Lewis diagrams.

$\frac{5}{\text{B}}$	P = <u>5</u>
Boron	N = <u>6</u>
<u>10.8</u>	E = <u>5</u>

Bohr Diagram

Lewis Structure

$\frac{3}{\text{Li}}$	P = <u>3</u>
Lithium	N = <u>4</u>
<u>6.9</u>	E = <u>3</u>

Bohr Diagram

Lewis Structure

$\frac{10}{\text{Ne}}$	P = <u>10</u>
Neon	N = <u>10</u>
<u>20.2</u>	E = <u>10</u>

Bohr Diagram

Lewis Structure

$\frac{2}{\text{He}}$	P = <u>2</u>
Helium	N = <u>2</u>
<u>4.0</u>	E = <u>2</u>

Bohr Diagram

Lewis Structure

$\frac{6}{\text{C}}$	P = <u>6</u>
Carbon	N = <u>6</u>
<u>12.0</u>	E = <u>6</u>

Bohr Diagram

Lewis Structure

$\frac{15}{\text{P}}$	P = <u>15</u>
Phosphorus	N = <u>16</u>
<u>31.0</u>	E = <u>15</u>

Bohr Diagram

Lewis Structure

$\frac{16}{\text{S}}$	P = <u>16</u>
Sulfur	N = <u>16</u>
<u>32.1</u>	E = <u>16</u>

Bohr Diagram

Lewis Structure

$\frac{12}{\text{Mg}}$	P = <u>12</u>
Magnesium	N = <u>12</u>
<u>24.3</u>	E = <u>12</u>

Bohr Diagram

Lewis Structure

$\frac{1}{\text{H}}$	P = <u>1</u>
Hydrogen	N = <u>0</u>
<u>1.0</u>	E = <u>1</u>

Bohr Diagram

Lewis Structure

2. Bohr Diagram Sequences. Draw the beginning atoms and final compound formed.

A) Ionic Bonds. (Show brackets and final ion charges).

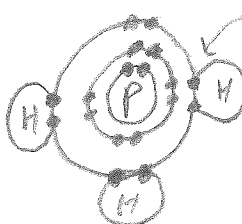
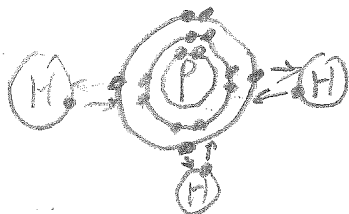
i. magnesium and chlorine
beryllium and fluorine



Ions!

B) Covalent Bonds.

i. hydrogen and phosphorous



Sharing electrons!

3. Lewis Diagram Sequences. Draw the beginning atoms and final compound formed.

A) Ionic Bonds. (Show brackets and final ion charges).

i. calcium and chlorine



Ions!

CaCl₂

ii. sodium and fluorine



iii. lithium and phosphorous

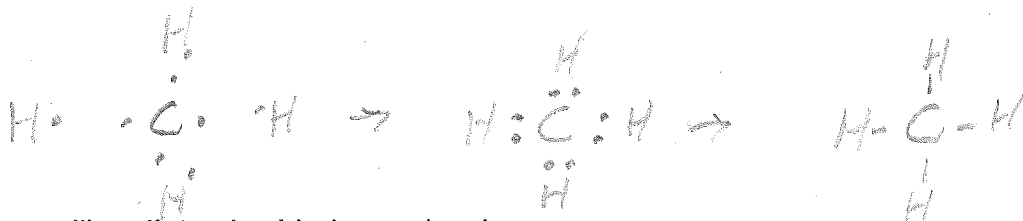


B) Covalent Bonds. (Indicate any bonding pairs with either dots or dashes.)

i. hydrogen and nitrogen



ii. hydrogen and carbon



iii. a diatomic chlorine molecule



Part C: Electron Configuration

12. How many electrons can each level hold? 1st = **2** 2nd = **8** 3rd = **18**

13. What term is used for the electrons in the outermost shell or energy level? **VALENCE**

14. Scientists use two types of diagrams to show the electron configuration for atoms. Follow your teacher's directions to complete the diagrams.

Sulfur

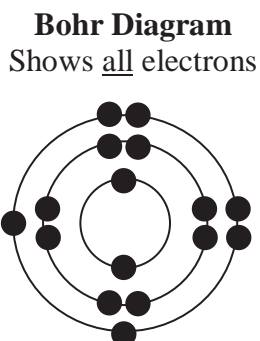
Atomic # = 16

Atomic Mass = 32

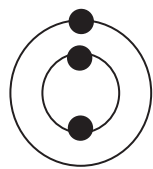
Protons = **16**

Neutrons = **16**

Electron = **16**



15. Calculate the missing information and then draw the Bohr Diagram and Lewis Structure for each element.



Li

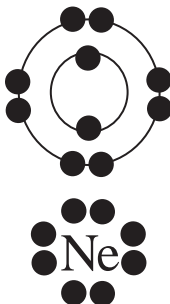
Atomic # = 3

Mass # = 7

of P = 3

of N = 4

of E = 3



Ne

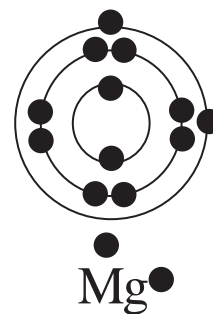
Atomic # = 10

Mass # = 20

of P = 10

of N = 10

of E = 10



Mg

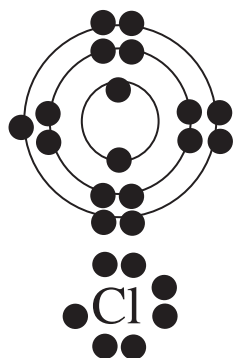
Atomic # = 12

Mass # = 24

of P = 12

of N = 12

of E = 12



Cl

Atomic # = 17

Mass # = 35

of P = 17

of N = 18

of E = 17



He

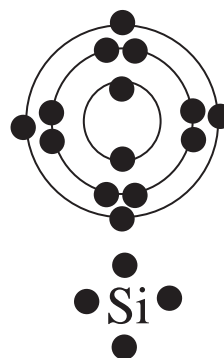
Atomic # = 2

Mass # = 4

of P = 2

of N = 2

of E = 2



Si

Atomic # = 14

Mass # = 28

of P = 14

of N = 14

of E = 14

16. Answer the questions below based on the elements in question #15.

(1) Which elements had a filled outermost shell? **He & Ne**

(2) Which element would be most likely to lose electrons in a chemical bond? **Li (Only has 1 valence electron)**

(3) Which element would be most likely to gain electrons in a chemical bond? **Cl (Only needs 1 more electron to fill its outer shell)**

(4) Which elements are not likely to bond with other elements? **He & Ne** Why? **They have full outer shells.**