Appendix B
Supplemental Worksheets

Worksheet 1: Bohr Energy Level Diagrams for Atoms   **General Science 3200**   Name: _____

Draw Bohr Energy Level Diagrams (using circles or levels) in the blocks provided for each of the following elements:

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
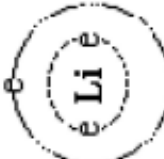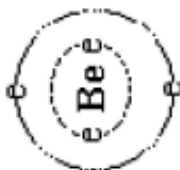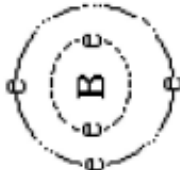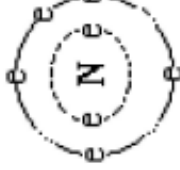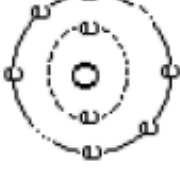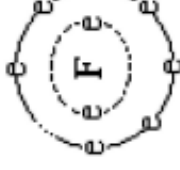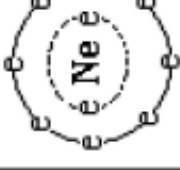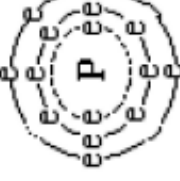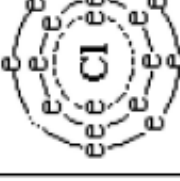
Here are the Energy Level Diagrams done without the circles:

$$\frac{1e^-}{\frac{1p^+}{H}}$$

$$\frac{8e^-}{\frac{2e^-}{\frac{10p^+}{Ne}}}$$

Worksheet 1: Bohr Energy Level Diagrams for Atoms

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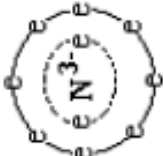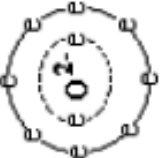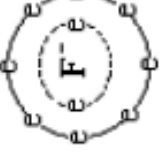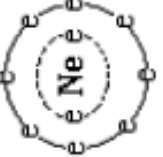
ANSWERS   (circle levels only)

H			C	N	O	F	
H			C	N	O	F	He

Worksheet 2: Bohr Energy Level Diagrams for Ions   **General Science 3200**   **Name:** _____

Draw Bohr Energy Level Diagrams for the Ions (using circles or levels) that form as a result of the loss of electrons to give filled outer energy levels. Indicate the charge of the ion as a superscript next to the symbol for the element.

H							He
Li	Be (Be^{2+} 2e)	Does Not Form an Ion B	Does Not Form an Ion C	N	O	H	Ne
Na	Mg	Does Not Form an Ion Al	Does Not Form an Ion Si	P	S	F (F$^-$)	Ar
						Cl	

Here are the Energy Level Diagrams for Ions done without circles:

$$\underline{2e^-}$$
$$\underline{4p^+}$$
$$Be^{2+}$$

$$\underline{8e^-}$$
$$\underline{2e^-}$$
$$\underline{9p^+}$$
$$F^-$$

Worksheet 2: Bohr Energy Level Diagrams for Ions　　　　**General Science 3200**

ANSWERS

H H^{1+}	H H^{1-}						He (He)
Li Li^{+}	Be Be^{2+}	B — Does Not Form an Ion	C — Does Not Form an Ion	N N^{3-}	O O^{2-}	F F^{-}	Ne (Ne)
Na Na^{+}	Mg Mg^{2+}	Al Al^{3+}	Si — Does Not Form an Ion	P P^{3-}	S S^{2-}	Cl Cl^{-}	Ar (Ar)

Note that hydrogen forms both a positive and a negative ion (very unique). Also, the noble gases were included in this chart so that the ions that have formed can be compared its nearest noble gas.

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Worksheet 3: Naming Simple Ionic Compounds   Name:_____

Formula	Name of the Ionic Compound
1) KCl	example: potassium chloride
2) $SrCl_2$	
3) CaO	
4) $AlBr_3$	
5) Ag_2S	
6) Na_3P	
7) RbF	
8) ZnI_2	
9) Li_3N	
10) Ba_3P_2	
11) Al_2S_3	
12) MgF_2	
13) $NaCl$	
14) Cs_2O	
15) $BaCl_2$	
16) KBr	
17) Ca_3N_2	
18) AgF	
19) ZnS	
20) RBr	

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Worksheet 3: Naming Simple Ionic Compounds   ANSWERS

Formula	Name of the Ionic Compound
1) KCl	**example: potassium chloride**
2) $SrCl_2$	strontium chloride
3) CaO	calcium oxide
4) $AlBr_3$	aluminum bromide
5) Ag_2S	silver sulfide
6) Na_3P	sodium phosphide
7) RbF	rubidium fluoride
8) ZnI_2	zinc iodide
9) Li_3N	lithium nitride
10) Ba_3P_2	barium phosphide
11) Al_2S_3	aluminum sulfide
12) MgF_2	magnesium fluoride
13) $NaCl$	sodium chloride
14) Cs_2O	cesium oxide
15) $BaCl_2$	barium chloride
16) KBr	potassium bromide
17) Ca_3N_2	calcium nitride
18) AgF	silver fluoride
19) ZnS	zinc sulfide
20) $RbBr$	rubidium bromide

Note that all the above questions are for naming simple ionic compounds. Complex (polyatomic) ionic compounds are to be named on Worksheet #4.

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Worksheet 4: Writing Formulas for Ionic Compounds   Name:_____

Use the periodic table to find the two ions (positive ion and negative ion) for each compound. Then write the formula.

Remember, the overall charge of the compound is neutral (zero charge). Thus, the overall positive charge must be equal to the overall negative charge.

Example: calcium chloride

Ca^{2+} Cl^- (These two charges are not the same, but 2 chloride ions will give an overall negative charge of -2. The positive ion already has a + 2 charge.)

$Ca^{2+}Cl_2^-$

Ca^{2+}	
Cl^-	Cl^-
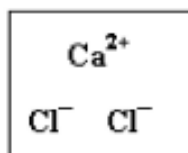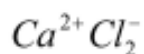
Count up the total charge.
+2, -1, -1
This adds up to zero!!

Therefore, $CaCl_2$ is the answer.

Name	Positive Ion	Negative Ion	Formula
1) sodium chloride ex.	Na^+	Cl^-	$NaCl$
2) potassium bromide			
3) calcium oxide			
4) magnesium sulfide			
5) zinc chloride			
6) sodium sulfide			
7) strontium fluoride			
8) lithium oxide			
9) potassium nitride			
10) sodium phosphide			
11) aluminum chloride			
12) calcium nitride			
13) aluminum oxide			
14) magnesium phosphide			
15) aluminum sulfide			

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Worksheet 4: Writing Formulas for Ionic Compounds   **ANSWERS**

Name	Positive Ion	Negative Ion	Formula
1) sodium chloride ex.	Na^+	Cl^-	$NaCl$
2) potassium bromide	K^+	Br^-	KBr
3) calcium oxide	Ca^{2+}	O^{2-}	CaO
4) magnesium sulfide	Mg^{2+}	S^{2-}	MgS
5) zinc chloride	Zn^{2+}	Cl^-	$ZnCl_2$
6) sodium sulfide	Na^+	S^{2-}	Na_2S
7) strontium fluoride	Sr^{2+}	F^-	SrF_2
8) lithium oxide	Li^+	O^{2-}	Li_2O
9) potassium nitride	K^+	N^{3-}	K_3N
10) sodium phosphide	Na^+	P^{3-}	Na_3P
11) aluminum chloride	Al^{3+}	Cl^-	$AlCl_3$
12) calcium nitride	Ca^{2+}	N^{3-}	Ca_3N_2
13) aluminum oxide	Al^{3+}	O^{2-}	Al_2O_3
14) magnesium phosphide	Mg^{2+}	P^{3-}	Mg_3P_2
15) aluminum sulfide	Al^{3+}	S^{2-}	Al_2S_3

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Worksheet 5: Naming Ionic Compounds with Complex Ions   Name:_____

Please use your complex ion chart, along with your periodic table, to name these compounds.

Formula	Name of the Ionic Compound
1) $NaOH$	example: sodium hydroxide
2) $Ba(NO_2)_2$	
3) $(NH_4)_2CO_3$	
4) $ZnSO_3$	
5) Ag_2CrO_4	
6) $Al(NO_3)_3$	
7) $MgSO_4$	
8) $Sr(CN)_2$	
9) $KClO_2$	
10) $Li_2S_2O_3$	
11) $(NH_4)_3P$	
12) $Ca(HCO_3)_2$	
13) $KMnO_4$	
14) $Zn(OH)_2$	
15) $Mg_3(PO_4)_2$	
16) $AgNO_3$	
17) $Al_2(SO_4)_3$	
18) $BaCO_3$	
19) $Ca(ClO_3)_2$	
20) Na_3PO_4	

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Worksheet 5: Naming Ionic Compounds with Complex Ions   ANSWERS

Formula	Name of the Ionic Compound
1) $NaOH$	**example: sodium hydroxide**
2) $Ba(NO_2)_2$	barium nitrite
3) $(NH_4)_2CO_3$	ammonium carbonate
4) $ZnSO_3$	zinc sulfite
5) Ag_2CrO_4	silver chromate
6) $Al(NO_3)_3$	aluminum nitrate
7) $MgSO_4$	magnesium sulfate
8) $Sr(CN)_2$	strontium cyanide
9) $KClO_2$	potassium chlorite
10) $Li_2S_2O_3$	lithium thiosulfate
11) $(NH_4)_3P$	ammonium phosphide
12) $Ca(HCO_3)_2$	calcium bicarbonate (or calcium hydrogen carbonate) See Chart
13) $KMnO_4$	potassium permanganate
14) $Zn(OH)_2$	zinc hydroxide
15) $Mg_3(PO_4)_2$	magnesium phosphate
16) $AgNO_3$	silver nitrate
17) $Al_2(SO_4)_3$	aluminum sulfate
18) $BaCO_3$	barium carbonate
19) $Ca(ClO_3)_2$	calcium chlorate
20) Na_3PO_4	sodium phosphate

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Name:_____

Worksheet 6: Writing Formulas for Ionic Compounds with Complex Ions

Use the periodic table and the complex ion chart to find the two ions (positive ion and negative ion) for each compound. Then write the formula.

Remember, the overall charge of the compound is neutral (zero charge). Thus, the overall positive charge must be equal to the overall negative charge.

*** If there is more than one complex ion needed, brackets must be placed around the complex ion.

Example: calcium phosphate

Ca^{2+} PO_4^{3-} (The calcium ion has a 2+ charge and the phosphate ion has a 3- charge. To have the positive and the negative be equal, 3 calcium ions are needed and 2 phosphate ions are needed. That will give 6 - 6 = 0 which is a zero charge.)

$Ca_3^{2+}(PO_4^{3-})_2$
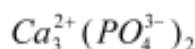
Therefore, $Ca_3(PO_4)_2$ is the answer.

Ca^{2+}	PO_4^{3-}
	PO_4^{3-}
PO_4^{3-}	Ca^{2+}
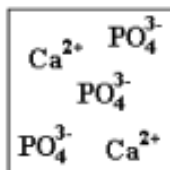
Count up the total charge.
2+, 2+, 2+, 3-, 3- = 6 - 6 = 0
This adds up to zero!!

(Note that there are brackets around the phosphate ion since there are two of them.)

Name	Positive Ion	Negative Ion	Formula
1) sodium nitrate ex.	Na^+	NO_3^-	$NaNO_3$
2) potassium hydroxide			
3) calcium carbonate			
4) magnesium sulfate			
5) zinc chlorate			
6) sodium chromate			
7) strontium nitrate			
8) lithium carbonate			
9) potassium phosphate			
10) ammonium phosphate			
11) aluminum hydroxide			
12) calcium phosphate			
13) aluminum sulfate			
14) magnesium phosphate			
15) aluminum chromate			

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Worksheet 6: Writing Formulas for Ionic Compounds with Complex Ions   ANSWERS

Name	Positive Ion	Negative Ion	Formula
1) sodium nitrate ex.	Na^+	NO_3^-	$NaNO_3$
2) potassium hydroxide	K^+	OH^-	KOH
3) calcium carbonate	Ca^{2+}	CO_3^{2-}	$CaCO_3$
4) magnesium sulfate	Mg^{2+}	SO_4^{2-}	$MgSO_4$
5) zinc chlorate	Zn^{2+}	ClO_3^-	$Zn(ClO_3)_2$
6) sodium chromate	Na^+	CrO_4^{2-}	Na_2CrO_4
7) strontium nitrate	Sr^{2+}	NO_3^-	$Sr(NO_3)_2$
8) lithium carbonate	Li^+	CO_3^{2-}	Li_2CO_3
9) potassium phosphate	K^+	PO_4^{3-}	K_3PO_4
10) ammonium phosphate	NH_4^+	PO_4^{3-}	$(NH_4)_3PO_4$
11) aluminum hydroxide	Al^{3+}	OH^-	$Al(OH)_3$
12) calcium phosphate	Ca^{2+}	PO_4^{3-}	$Ca_3(PO_4)_2$
13) aluminum sulfate	Al^{3+}	SO_4^{2-}	$Al_2(SO_4)_3$
14) magnesium phosphate	Mg^{2+}	PO_4^{3-}	$Mg_3(PO_4)_2$
15) aluminum chromate	Al^{3+}	CrO_4^{2-}	$Al_2(CrO_4)_3$

Name:_____

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Worksheet 7: Naming and Writing Formulas for Simple and Complex Ionic Compound

Fill in the chart below with the appropriate answer.

	Naming of Ionic Compound	**Formula of Ionic Compound**
1.	sodium phosphate	
2.		BeI_2
3.	gold (I) sulfate	
4.		KF
5.	magnesium sulfide	
6.		$Ca_3(PO_4)_2$
7.	lithium nitride	
8.		Rb_2CO_3
9.	iron (III) bromide	
10.		Ba_3P_2
11.	rubidium carbonate	
12.		$Sr(NO_3)_2$
13.	lead (IV) oxide	
14.		NH_4Br
15.	aluminum sulfite	
16.		$LiCl$
17.	silver chlorate	
18.		Na_2SO_4
19.	ammonium chloride	
20.		$Al(OH)_3$

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ANSWERS

Worksheet 7: Naming and Writing Formulas for Simple and Complex Ionic Compound

	Naming of Ionic Compound	**Formula of Ionic Compound**
1.	sodium phosphate	Na_3PO_4
2.	**beryllium iodide**	BeI_2
3.	gold (I) sulfate	Au_2SO_4
4.	**potassium fluoride**	KF
5.	magnesium sulfite	$MgSO_3$
6.	**calcium phosphate**	$Ca_3(PO_4)_2$
7.	lithium nitride	Li_3N
8.	**rubidium carbonate**	Rb_2CO_3
9.	iron (III) bromide	$FeBr_3$
10.	**barium phosphide**	Ba_3P_2
11.	aluminum carbonate	$Al_2(CO_3)_3$
12.	**strontium nitrate**	$Sr(NO_3)_2$
13.	lead (IV) oxide	PbO_2 (ratio in lowest terms)
14.	**ammonium bromide**	NH_4Br
15.	zinc nitrate	$Zn(NO_3)_2$
16.	**lithium chloride**	$LiCl$
17.	silver chlorate	$AgClO_3$
18.	**sodium sulfate**	Na_2SO_4
19.	ammonium chloride	NH_4Cl
20.	**aluminum hydroxide**	$Al(OH)_3$

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Worksheet 8: Name the Type of Reaction   Name:_____

For the following reactions, name each by choosing one of the five reaction types:
Synthesis, Decomposition, Single Replacement, Double Replacement, Combustion
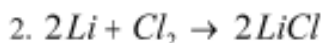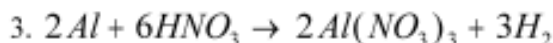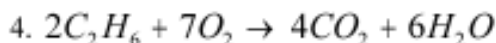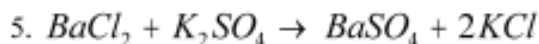
1. $2MgO \rightarrow 2Mg + O_2$

Name of Reaction: _____

2. $2Li + Cl_2 \rightarrow 2LiCl$

Name of Reaction: _____

3. $2Al + 6HNO_3 \rightarrow 2Al(NO_3)_3 + 3H_2$

Name of Reaction: _____

4. $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

Name of Reaction: _____

5. $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

Name of Reaction: _____

6. $Br_2 + 2KI \rightarrow 2KBr + I_2$

Name of Reaction: _____

7. $2Na + F_2 \rightarrow 2NaF$

Name of Reaction: _____

8. $2NH_4Cl + Ca(NO_3)_2 \rightarrow 2NH_4NO_3 + CaCl_2$

Name of Reaction: _____

9. $2K_3N \rightarrow 6K + N_2$

Name of Reaction: _____

10. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
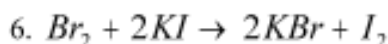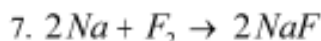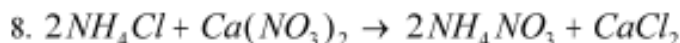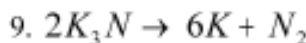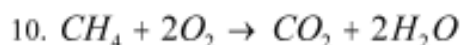
Name of Reaction: _____

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Worksheet 8: Name the Type of Reaction ANSWERS
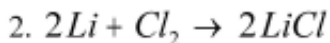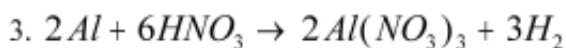
1. $2\,MgO \rightarrow 2\,Mg + O_2$

Name of Reaction: _____Decomposition_____

2. $2\,Li + Cl_2 \rightarrow 2\,LiCl$

Name of Reaction: _____Synthesis_____

3. $2\,Al + 6HNO_3 \rightarrow 2\,Al(NO_3)_3 + 3H_2$

Name of Reaction: _____Single Replacement_____

4. $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

Name of Reaction: _____Combustion_____

5. $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

Name of Reaction: _____Double Replacement_____

6. $Br_2 + 2KI \rightarrow 2KBr + I_2$

Name of Reaction: _____Single Replacement_____

7. $2\,Na + F_2 \rightarrow 2\,NaF$

Name of Reaction: _____Synthesis_____

8. $2\,NH_4Cl + Ca(NO_3)_2 \rightarrow 2\,NH_4NO_3 + CaCl_2$

Name of Reaction: _____Double Replacement_____

9. $2K_3N \rightarrow 6K + N_2$

Name of Reaction: _____Decomposition_____

10. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
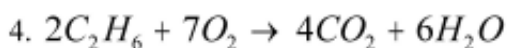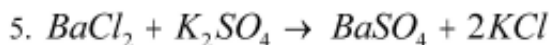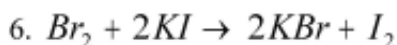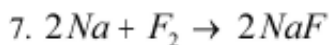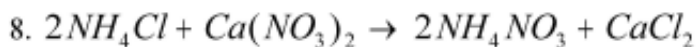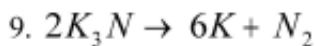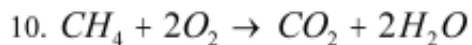
Name of Reaction: _____Combustion_____

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Worksheet 9: Predicting and the Products of a Reaction   Name:_____

Complete the following word equations and chemical equations by predicting the products using your knowledge of Synthesis, Decomposition, and Single Displacement (Single Replacement) reactions. Note: The reactions are **NOT** to be balanced here.

Part I: Word Equations

> Example: aluminum + bromine (synthesis) ➜ **aluminum bromide**

1.   beryllium + sulfur (synthesis) ➜

2.   zinc fluoride (decomposition) ➜

3.   sodium + calcium chloride (single displacement) ➜

4.   potassium oxide + chlorine (single displacement) ➜

5.   lithium + nitrogen (synthesis) ➜

Part II: Chemical Formula Equations

> Example: $NaCl$ (decomposition) ➜ $Na + Cl_2$

1. Al_2O_3 (decomposition) ➜

2. $Ag + MgBr_2$ (single displacement) ➜

3. $Rb + Cl_2$ (synthesis) ➜

4. Zn_3P_2 (decomposition) ➜

5. $Sr + N_2$ (synthesis) ➜

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Worksheet 9: Predicting and the Products of a Reaction   **ANSWERS**

Part I: Word Equations

Example: aluminum + bromine (synthesis) ➜ **aluminum bromide**

1.   beryllium + sulfur (synthesis) ➜ **beryllium sulfide**

2.   zinc fluoride (decomposition) ➜ **zinc + fluorine**

3.   sodium + calcium chloride (single displacement) ➜ **calcium + sodium chloride**

4.   potassium oxide + chlorine (single displacement) ➜ **oxygen + potassium chloride**
      (Use this question to remind students that the replacement occurs between element that have the same charge as ions.)

5.   lithium + nitrogen (synthesis) ➜ **lithium nitride**

Part II: Chemical Formula Equations

Example: $NaCl$ (decomposition) ➜ $Na + Cl_2$

1. Al_2O_3 (decomposition) ➜ $Al + O_2$

2. $Ag + MgBr_2$ (single displacement) ➜ $Mg + AgBr$

3. $Rb + Cl_2$ (synthesis) ➜ $RbCl$

4. Zn_3P_2 (decomposition) ➜ $Zn + P_4$

5. $Sr + N_2$ (synthesis) ➜ Sr_3N_2

General Science 3200

Worksheet 10: Predicting and the Products of a Reaction   Name:_____

Complete the following word equations and chemical equations by predicting the products using your knowledge of Synthesis, Decomposition, and Single Displacement (Single Replacement) reactions. Note: The reactions are **NOT** to be balanced here.

1.   calcium sulfide (decomposition) ➜

2. $K + Br_2$ (synthesis) ➜

3.   sodium + aluminum hydroxide (single displacement) ➜

4. MgS (decomposition) ➜

5. $Ca + AgNO_3$ (single displacement) ➜

6.   zinc + oxygen (synthesis) ➜

7.   lithium iodide (decomposition) ➜

8. $P_4 + Na$ (synthesis) ➜

9.   bromine + magnesium nitride (single displacement) ➜

10. ZnI_2 (decomposition) ➜

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Worksheet 10: Predicting and the Products of a Reaction   ANSWERS

1.   calcium sulfide (decomposition) ➜ **calcium + sulfur**

2. $K + Br_2$ (synthesis) ➜ KBr

3.   sodium + aluminum hydroxide (single displacement) ➜ **aluminum + sodium hydroxide**

4. MgS (decomposition) ➜ $Mg + S_8$

5. $Ca + AgNO_3$ (single displacement) ➜ $Ag + Ca(NO_3)_2$

6.   zinc + oxygen (synthesis) ➜ **zinc oxide**

7.   lithium iodide (decomposition) ➜ **lithium + iodine**

8. $P_4 + Na$ (synthesis) ➜ Na_3P

9.   bromine + magnesium nitride (single displacement) ➜ **nitrogen + magnesium bromide**

10. ZnI_2 (decomposition) ➜ $Zn + I_2$

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Worksheet 11: Counting Atoms   Name:_____

For each of the following questions, count the total number of each type of atom that is present in the formula.

1. Fe_2O_3 Example: Type of Atom / # of Atoms	2. $NaCl$ Type of Atom / # of Atoms	3. $AlCl_3$ Type of Atom / # of Atoms
Fe — 2 O — 3		
4. Li_3P Type of Atom / # of Atoms	5. Be_3N_2 Type of Atom / # of Atoms	6. KNO_3 Type of Atom / # of Atoms
7. $Ca(OH)_2$ Type of Atom / # of Atoms	8. $Ba(NO_3)_2$ Type of Atom / # of Atoms	9. Ag_2CrO_4 Type of Atom / # of Atoms
10. $Li_2S_2O_3$ Type of Atom / # of Atoms	11. $Ca_3(PO_4)_2$ Type of Atom / # of Atoms	12. $Ca(HCO_3)_2$ Type of Atom / # of Atoms
13. $(NH_4)_2CO_3$ Type of Atom / # of Atoms	14. $Al_2(SO_4)_3$ Type of Atom / # of Atoms	15. $Mg_3(PO_4)_2$ Type of Atom / # of Atoms

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Worksheet 11: Counting Atoms   **ANSWERS**

1. Fe_2O_3			2. $NaCl$			3. $AlCl_3$	
Example:			Type of Atom	# of Atoms		Type of Atom	# of Atoms
Type of Atom	# of Atoms		Na	1		Al	1
Fe	2		Cl	1		Cl	3
O	3						

4. Li_3P		5. Be_3N_2		6. KNO_3	
Type of Atom	# of Atoms	Type of Atom	# of Atoms	Type of Atom	# of Atoms
Li	3	Be	3	K	1
P	1	N	2	N	1
				O	3

7. $Ca(OH)_2$		8. $Ba(NO_3)_2$		9. Ag_2CrO_4	
Type of Atom	# of Atoms	Type of Atom	# of Atoms	Type of Atom	# of Atoms
Ca	1	Ba	1	Ag	2
O	2	N	2	Cr	1
H	2	O	6	O	4

10. $Li_2S_2O_3$		11. $Ca_3(PO_4)_2$		12. $Ca(HCO_3)_2$	
Type of Atom	# of Atoms	Type of Atom	# of Atoms	Type of Atom	# of Atoms
Li	2	Ca	3	Ca	1
S	2	P	2	H	2
O	3	O	8	C	2
				O	6

13. $(NH_4)_2CO_3$		14. $Al_2(SO_4)_3$		15. $Mg_3(PO_4)_2$	
Type of Atom	# of Atoms	Type of Atom	# of Atoms	Type of Atom	# of Atoms
N	2	Al	2	Mg	3
H	8	S	3	P	2
C	1	O	12	O	8
O	3				

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Predicting Products Note   Name: _____

Steps for Predicting Products for Synthesis, Decomposition, and Single Replacement Reactions:
1) Decide what type of reaction it would be. Write down its name.
2) Based on the reaction type, decide what the product would be.
3) Be careful to get the product formulas correct. Remember: writing formulas for ionic compounds, how to write elements (see chart given), and the charge an element will get (positive or negative).
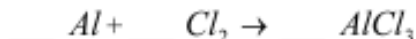4) Balance the Chemical Equation.

Predict the Product:

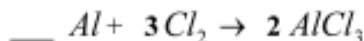**Example i)** ___ $Al +$ ___ $Cl_2 \rightarrow$
        Name of Reaction: _____
Steps:
1) Since the reactants are both elements, this must be a **synthesis** reaction.

2) When predicting products for synthesis reacts, the two elements will combine to form an ionic compound. One element will be the positive ion (Al^{3+}) and the other element will be the negative ion (Cl^-).
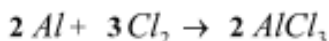
3) **Thus,** $Al^{3+}Cl^-$ **gives us** $AlCl_3$. Don't forget that the ionic compound must be neutral. Therefore we now would have:
        ___ $Al +$ ___ $Cl_2 \rightarrow$ ___ $AlCl_3$
        Name of Reaction: **Synthesis**

4) The only thing left to do is balance the chemical equation:
- aluminum is already balanced, but there are 2 chlorine atoms on the left and 3 chlorine atoms on the right. Make six on both sides as follows:
        ___ $Al +$ **3** $Cl_2 \rightarrow$ **2** $AlCl_3$
        Name of Reaction: **Synthesis**
Next, balance aluminum. There are now 2 on the right and only 1 on the left. Therefore, put a "2" in front of Al on the left.
        2 $Al +$ **3** $Cl_2 \rightarrow$ **2** $AlCl_3$
        Name of Reaction: **Synthesis**   **Correct!!!!**

Example ii) ___ $MgO \rightarrow$
        Name of Reaction: _____
Steps:
1) Since there is only ONE reactant, the type of reaction must be **Decomposition**.
2) When predicting here, the products will **always** be the **elements** that make up reactant.
3) Thus, the element for magnesium is simply Mg and the element for oxygen is O_2.

Therefore, the equation is:

$$\_\_\_ MgO \rightarrow \_\_\_ Mg + \_\_\_ O_2$$
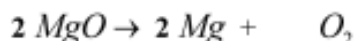
Name of Reaction: **Decomposition**

4) Balance the Chemical Equation
- the magnesium atoms are balanced (one on each side), but the oxygen atoms are not (one on the left and two on the right). To make two atoms of oxygen on both sides, place a "2" in front of MgO.

$$\mathbf{2}\, MgO \rightarrow \_\_\_ Mg + \_\_\_ O_2$$

Name of Reaction: **Decomposition**

Now the magnesium atoms no longer balanced, but the oxygen atoms are. Place a "2" in front of Mg to give two magnesium atoms on both sides of the equation.

$$\mathbf{2}\, MgO \rightarrow \mathbf{2}\, Mg + \_\_\_ O_2$$

Name of Reaction: **Decomposition**   **Correct!!!!**

Example iii) $\_\_\_ Li + \_\_\_ NaCl \rightarrow$

Name of Reaction: _____

Steps:
1) Since one reactant is an element and the other is an ionic compound. The reaction must be a **Single Replacement**.
2) In a single replacement reaction, the element on the reactants side switches with one of the elements in the ionic compound. The ones that switch (replace each other) must have the some charge as an ion (positive or negative).
3) Lithium, Li, and sodium, Na, both have a positive charge as an ion so they will switch. Chlorine (negative charged ion) will stay in the ionic compound.

$$\_\_\_ Li + \_\_\_ NaCl \rightarrow \_\_\_ Na + \_\_\_ Li^+Cl^-$$
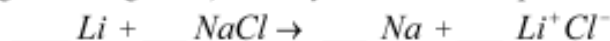
Name of Reaction: **Single Replacement**

***Don't forget to balance the charges in the ionic compound that is produced (must be neutral). Also, check to see how the element produced exists in the chart.
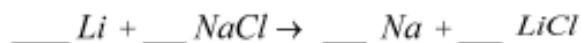
Thus,

$$\_\_\_ Li + \_\_\_ NaCl \rightarrow \_\_\_ Na + \_\_\_ LiCl$$

Name of Reaction: **Single Replacement**

4) Balance the Chemical Equation.
- One Li on both sides. One Na on both sides. One $\hookleftarrow$ on both sides. The equation is ALREADY BALANCED!!!

Therefore,

$$\_\_\_ Li + \_\_\_ NaCl \rightarrow \_\_\_ Na + \_\_\_ LiCl$$

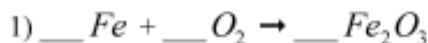Name of Reaction: **Single Replacement**   **Correct!!!**
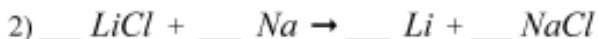
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Worksheet 12: Balancing Chemical Reactions I   **Name:**_____

Balance the following chemical reactions by placing the appropriate coefficients within the given reactions. Also, name the type of reaction: Synthesis, Decomposition, or Single Replacement.

1) ___ Fe + ___ O_2 → ___ Fe_2O_3

Name of Reaction: _____

2) ___ $LiCl$ + ___ Na → ___ Li + ___ $NaCl$

Name of Reaction: _____

3) ___ $NaBr$ → ___ Na + ___ Br_2

Name of Reaction: _____

4) ___ Al + ___ Cl_2 → ___ $AlCl_3$

Name of Reaction: _____

5) ___ MgS → ___ Mg + ___ S_8

Name of Reaction: _____

6) ___ $NaOH$ + ___ Ca → ___ Na + ___ $Ca(OH)_2$

Name of Reaction: _____

7) ___ KCl + ___ Br_2 → ___ KBr + ___ Cl_2

Name of Reaction: _____

8) ___ Be_3N_2 → ___ Be + ___ N_2

Name of Reaction: _____

9) ___ Rb + ___ I_2 → ___ RbI

Name of Reaction: _____

10) ___ Al + ___ HBr → ___ $AlBr_3$ + ___ H_2
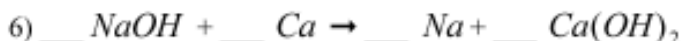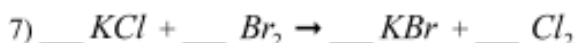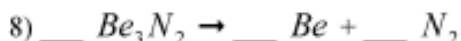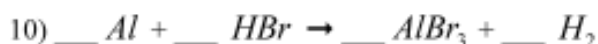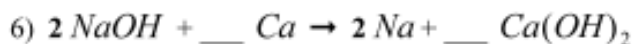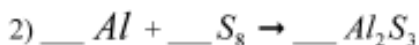
Name of Reaction: _____

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Worksheet 12: Balancing Chemical Reactions I   **ANSWERS**
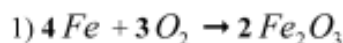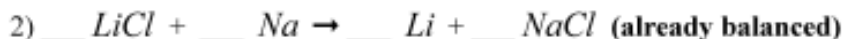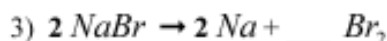
1) $4\,Fe + 3\,O_2 \rightarrow 2\,Fe_2O_3$

Name of Reaction: **Synthesis**

2) ___ $LiCl$ + ___ $Na \rightarrow$ ___ Li + ___ $NaCl$ (**already balanced**)

Name of Reaction: **Single Replacement**

3) $2\,NaBr \rightarrow 2\,Na$ + ___ Br_2

Name of Reaction: **Decomposition**

4) $2\,Al + 3\,Cl_2 \rightarrow 2\,AlCl_3$

Name of Reaction: **Synthesis**

5) $8\,MgS \rightarrow 8\,Mg$ + ___ S_8

Name of Reaction: **Decomposition**

6) $2\,NaOH$ + ___ $Ca \rightarrow 2\,Na$ + ___ $Ca(OH)_2$

Name of Reaction: **Single Replacement**

7) $2\,KCl$ + ___ $Br_2 \rightarrow 2\,KBr$ + ___ Cl_2

Name of Reaction: **Single Replacement**

8) ___ $Be_3N_2 \rightarrow 3\,Be$ + ___ N_2

Name of Reaction: **Decomposition**

9) $2\,Rb$ + ___ $I_2 \rightarrow 2\,RbI$

Name of Reaction: **Synthesis**

10) $2\,Al$ + $6\,HBr \rightarrow 2\,AlBr_3$ + $3\,H_2$
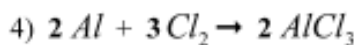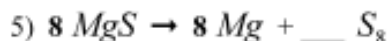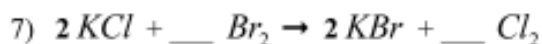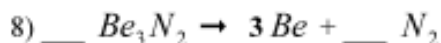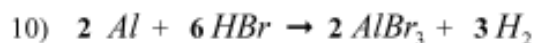
Name of Reaction: **Single Replacement**

General Science 3200

Worksheet 13: Balancing Chemical Reactions II   Name:_____

Balance the following chemical reactions by placing the appropriate coefficients within the given reactions. Also, name the type of reaction: Synthesis, Decomposition, or Single Replacement.
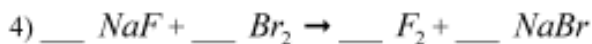
1) ___ $SrCl_2 \rightarrow$ ___ $Sr +$ ___ Cl_2
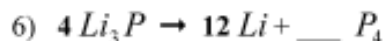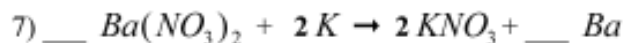
Name of Reaction: _____

2) ___ $Al +$ ___ $S_8 \rightarrow$ ___ Al_2S_3

Name of Reaction: _____

3) ___ $Ca_3(PO_4)_2 +$ ___ $Al \rightarrow$ ___ $Ca +$ ___ $AlPO_4$

Name of Reaction: _____

4) ___ $NaF +$ ___ $Br_2 \rightarrow$ ___ $F_2 +$ ___ $NaBr$

Name of Reaction: _____

5) ___ $Ca +$ ___ $O_2 \rightarrow$ ___ CaO

Name of Reaction: _____

6) ___ $Li_3P \rightarrow$ ___ $Li +$ ___ P_4

Name of Reaction: _____

7) ___ $Ba(NO_3)_2 +$ ___ $K \rightarrow$ ___ $KNO_3 +$ ___ Ba

Name of Reaction: _____

8) ___ $MgCl_2 +$ ___ $Br_2 \rightarrow$ ___ $MgBr_2 +$ ___ Cl_2

Name of Reaction: _____

9) ___ $Zn_3P_2 \rightarrow$ ___ $Zn +$ ___ P_4

Name of Reaction: _____

10) ___ $Ag +$ ___ $F_2 \rightarrow$ ___ AgF
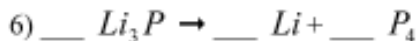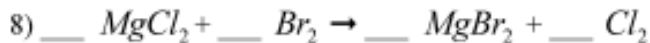
Name of Reaction: _____

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Worksheet 13: Balancing Chemical Reactions II   **ANSWERS**
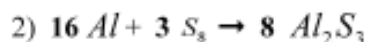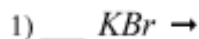
1) ___ $SrCl_2$ → ___ Sr + ___ Cl_2 **(already balanced)**

Name of Reaction: **Decomposition**

2) **16** Al + **3** S_8 → **8** Al_2S_3

Name of Reaction: **Synthesis**

3) ___ $Ca_3(PO_4)_2$ + **2** Al → **3** Ca + **2** $AlPO_4$

Name of Reaction: **Single Replacement**

4) **2** NaF + ___ Br_2 → ___ F_2 + **2** $NaBr$

Name of Reaction: **Single Replacement**

5) **2** Ca + ___ O_2 → **2** CaO

Name of Reaction: **Synthesis**

6) **4** Li_3P → **12** Li + ___ P_4

Name of Reaction: **Decomposition**

7) ___ $Ba(NO_3)_2$ + **2** K → **2** KNO_3 + ___ Ba

Name of Reaction: **Single Replacement**

8) ___ $MgCl_2$ + ___ Br_2 → ___ $MgBr_2$ + ___ Cl_2 **(already balanced)**

Name of Reaction: **Single Replacement**

9) **2** Zn_3P_2 → **6** Zn + ___ P_4

Name of Reaction: **Decomposition**

10) **2** Ag + ___ F_2 → **2** AgF
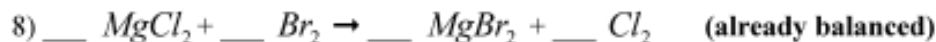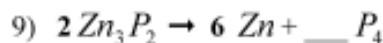
Name of Reaction: **Synthesis**

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Worksheet 14: Predicting Products and Balancing   Name:_____

Name the type of reaction: Synthesis, Decomposition, or Single Replacement. **Predict** the products of the following reactions. **Be careful** to write the formulas of the products correctly. **Balance** the chemical equation.
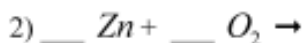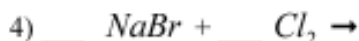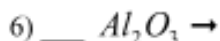
1) ___ $KBr \rightarrow$

Name of Reaction: _____

2) ___ $Zn +$ ___ $O_2 \rightarrow$

Name of Reaction: _____

3) ___ $Ca +$ ___ $AgCl \rightarrow$

Name of Reaction: _____

4) ___ $NaBr +$ ___ $Cl_2 \rightarrow$

Name of Reaction: _____

5) ___ $Li +$ ___ $P_4 \rightarrow$

Name of Reaction: _____

6) ___ $Al_2O_3 \rightarrow$

Name of Reaction: _____

7) ___ $Al +$ ___ $Ba(OH)_2 \rightarrow$

Name of Reaction: _____

8) ___ $Na_2S \rightarrow$
Name of Reaction: _____

9) ___ $MgCl_2 \rightarrow$

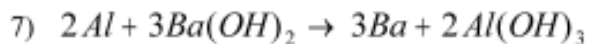Name of Reaction: _____

10) ___ $H_2 +$ ___ $I_2 \rightarrow$
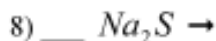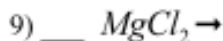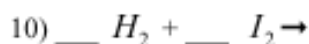
Name of Reaction: _____

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Worksheet 14: Predicting Products and Balancing   **ANSWERS**
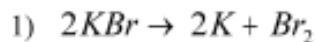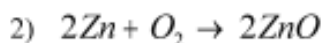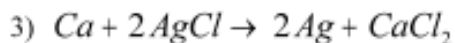
1) $2KBr \rightarrow 2K + Br_2$

Name of Reaction: **Decomposition**

2) $2Zn + O_2 \rightarrow 2ZnO$

Name of Reaction: **Synthesis**

3) $Ca + 2AgCl \rightarrow 2Ag + CaCl_2$

Name of Reaction: **Single Replacement**

4) $2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

Name of Reaction: **Single Replacement**

5) $12Li + P_4 \rightarrow 4Li_3P$

Name of Reaction: **Synthesis**

6) $2Al_2O_3 \rightarrow 4Al + 3O_2$

Name of Reaction: **Decomposition**

7) $2Al + 3Ba(OH)_2 \rightarrow 3Ba + 2Al(OH)_3$

Name of Reaction: **Single Replacement**

8) $8Na_2S \rightarrow 16Na + S_8$

Name of Reaction: **Decomposition**

9) $MgCl_2 \rightarrow Mg + Cl_2$ (already balanced)

Name of Reaction: **Decomposition**

10) $H_2 + I_2 \rightarrow 2HI$
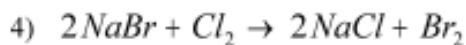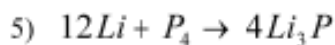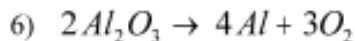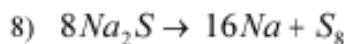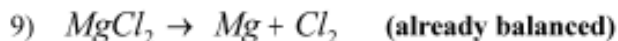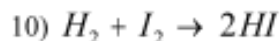
Name of Reaction: **Synthesis**

General Science 3200 Name:_____

Worksheet 15: Calculating Average Speed, Distance, and Time

Use the average speed equation to calculate the unknown variable. Ask yourself, "What is this question asking me to find?" before you begin your calculation. Remember that "v_{av}" represents speed, "Δd" represents distance, and "Δt" represents time.

$$V_{av} = \frac{\Delta d}{\Delta t}$$

$$\Delta d = V_{av} \Delta t$$

$$\Delta t = \frac{\Delta d}{V_{av}}$$

1. Calculate the average speed of a car that travels 70 km in 1.5 hours.

2. How long does it take a person running at a rate of 4 m/s to run a distance of 260 m?

3. How far would a snowmobiler travel in 0.5 hours at a rate of 25 km/h?

4. Melanie ran the 100 meter race in 12 seconds. What was her average speed?

5. If a boat sailed for 6 hours at an average speed of 55 km/h, what distance did the boat travel?

6. How much time did it take a plane flying at 575 km/h to travel a distance of 1700 km?

Worksheet 15: Calculating Average Speed, Distance, and Time

ANSWERS

$$V_{av} = \frac{\Delta d}{\Delta t}$$

$$\Delta d = V_{av} \Delta t$$

$$\Delta t = \frac{\Delta d}{V_{av}}$$

1. Calculate the average speed of a car that travels 70 km in 1.5 hours.

v_{av} = 46.7 km/h (rounded to one decimal places)

2. How long does it take a person running at a rate of 4 m/s to run a distance of 260 m?

Δt = 65 seconds

3. How far would a snowmobiler travel in 0.5 hours at a rate of 25 km/h?

Δd = 12.5 km

4. Melanie ran the 100 meter race in 12 seconds. What was her average speed?

v_{av} = 8.3 m (rounded to one decimal point)

5. If a boat sailed for 6 hours at an average speed of 55 km/h, what distance did the boat travel?

Δd = 330 km

6. How much time did it take a plane flying at 575 km/h to travel a distance of 1700 km?

Δt = 2.96 hours (rounded to two decimal places)
Δt = 3.0 hours (rounded to one decimal point)

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Worksheet 16: Analyzing Graphs   Name:_____

Describe the motion of the car for each graph.

1.

d

t
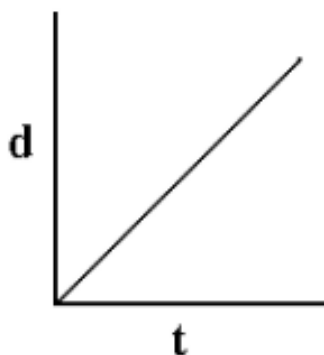
a) This graph represents _____.
b) Is the motion uniform or nonuniform?
_____
c) Explain:

2.

d

t
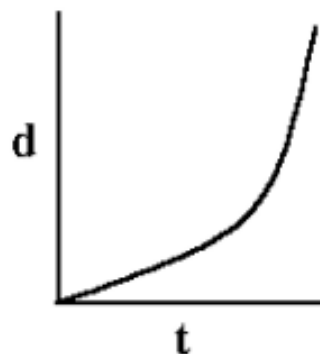
a) This graph represents _____.
b) Is the motion uniform or nonuniform?
_____
c) Explain:

3.

v

t
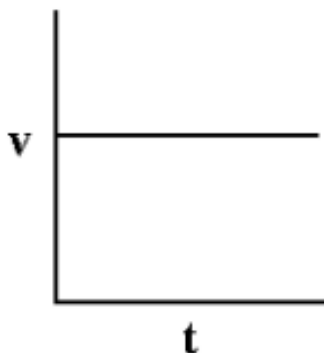
a) This graph represents _____.
b) Is the motion uniform or nonuniform?
_____
c) Explain:

4.

v

t
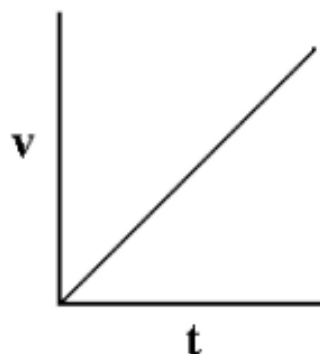
a) This graph represents _____.
b) Is the motion uniform or nonuniform?
_____
c) Explain:

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Worksheet 16: Analyzing Graphs   **ANSWERS**

1.
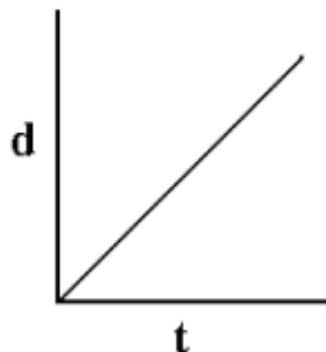
2.

a) This graph represents **speed**.
b) Is the motion uniform or nonuniform?
uniform
c) Explain: **This graph represents constant speed.**
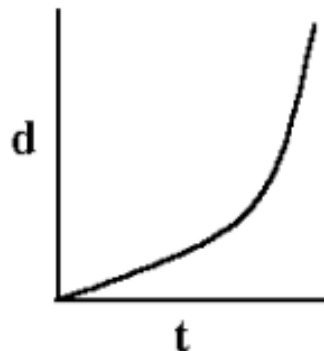
a) This graph represents **speed**.
b) Is the motion uniform or nonuniform?
nonuniform
c) Explain: **This graph represents an increase in speed. (acceleration)**

3.
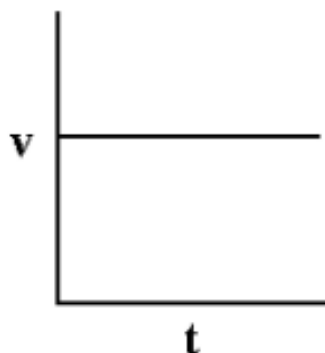
4.

a) This graph represents **acceleration**.
b) Is the motion uniform or nonuniform?
uniform
c) Explain: **This graph represents constant speed.**
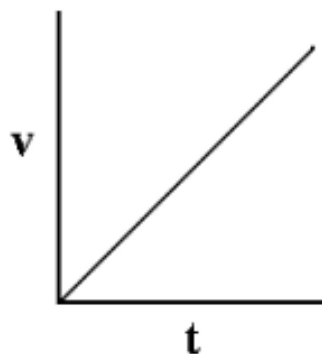
a) This graph represents **acceleration**.
b) Is the motion uniform or nonuniform?
nonuniform
c) Explain: **This graph represents an Increase in speed. (acceleration)**

NOTE:
Teachers should note that the #1 and #3 are graphs of the same motion. (#2 and #4 as well)

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Worksheet 17: Adding Vectors   **Name:**_____

Draw the **Resultant Vector** for the following questions.

1.

$\vec{v_2}$

$\vec{v_1}$

2.

$\vec{v_1}$ $\vec{v_2}$

3.

$\vec{v_1}$

$\vec{v_2}$

4.

$\vec{v_1}$

$\vec{v_2}$

5.

$\vec{v_1}$

$\vec{v_2}$

6.

$\vec{v_2}$ $\vec{v_1}$
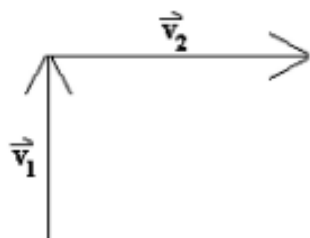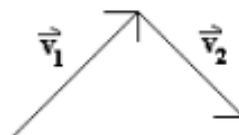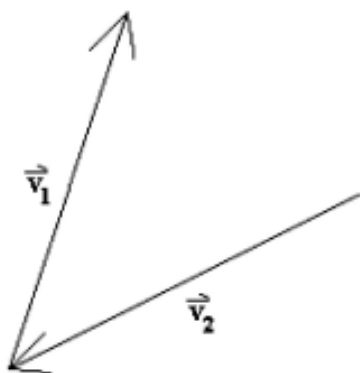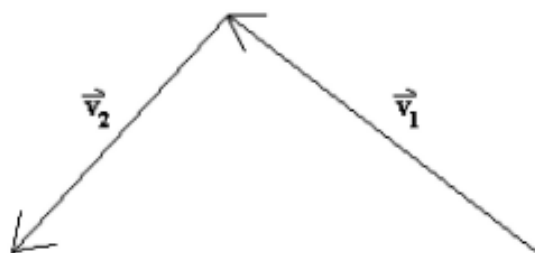
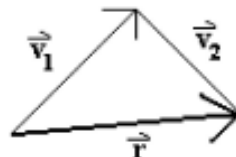**General Science 3200**

Worksheet 17: Adding Vectors   **Answers**
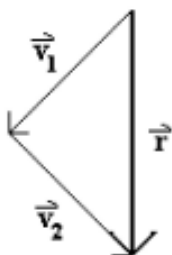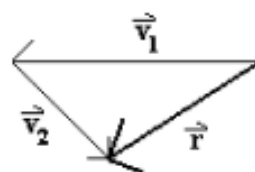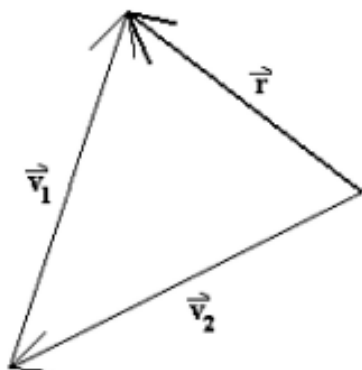
Tail of one to the head of the other.

1.

2.

3.

4.

5.

6.
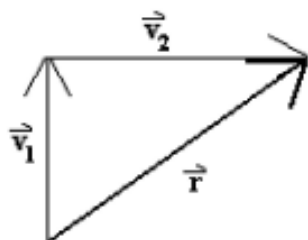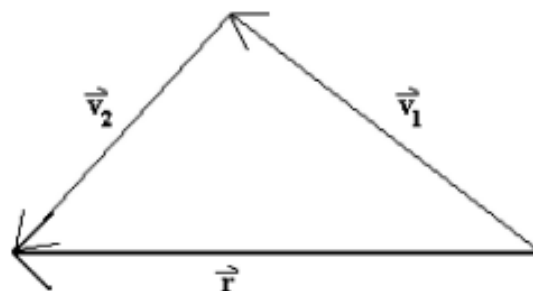
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Name:_____

Worksheet 18: Writing Vectors

Draw the **Vector** that is described in the following questions.
Use the key to the right to draw your vectors:

Draw a vector:
1. 2 km North
example:

2. 3 km South

3. 1 km West

4. 5 km NE

5. 2.5 km NW

6. 4 km SW

7. 3.5 km East

8. 3 km SE

9. 1.5 km N

10. 2 km NE

11. 5 km East

12. 2 km SE

13. 4 km South

14. 1 km SW

15. 3 km West

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ANSWERS

Worksheet 18: Writing Vectors

N

W———E

S

1 km

Draw a vector:

1. 2 km North

example:
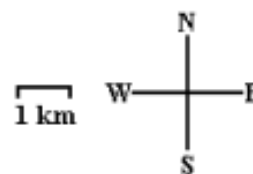
2. 3 km South

3. 1 km West

4. 5 km NE

5. 2.5 km NW

6. 4 km SW

7. 3.5 km East

8. 3 km SE

9. 1.5 km N

10. 2 km NE

11. 5 km East

12. 2 km SE

13. 4 km South

14. 1 km SW

15. 3 km West

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Name:_____

Worksheet 19: Writing Vectors

0°= 360°

270°———90°

1 km

180°

Draw the **Vector** that is described in the following questions.
Use the key to the right to draw your vectors:
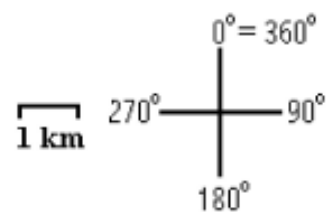
Draw a vector:

1. 2 km [22°]

2. 3 km [125°]

3. 1 km [235°]

4. 3 km [66°]

5. 2 km [150°]

6. 4 km [300°]

7. 2 km [195°]

8. 3 km [90°]

9. 1 km [240°]

10. 2 km [113°]

11. 5 km [345°]

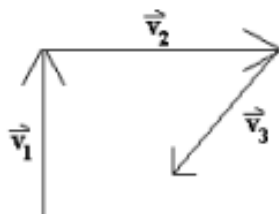12. 2 km [72°]

13. 4 km [180°]

14. 1 km [257°]

15. 3 km [305°]

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Worksheet 22: Adding Vectors   Name:_____

Draw the **Resultant Vector** for the following questions.

1.   2.
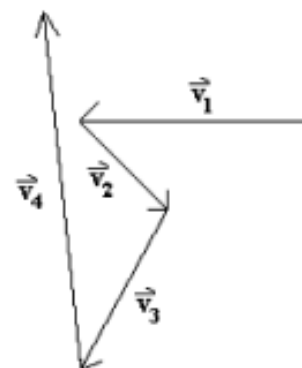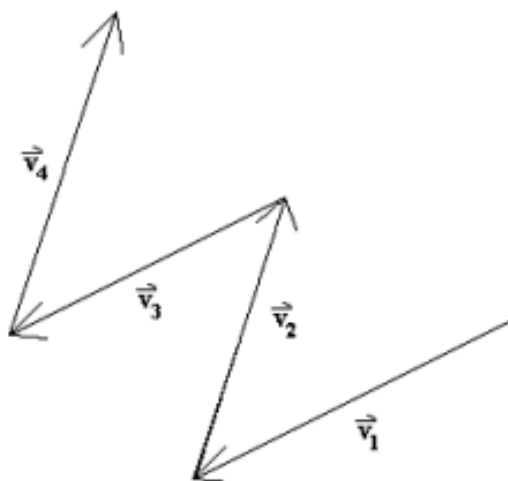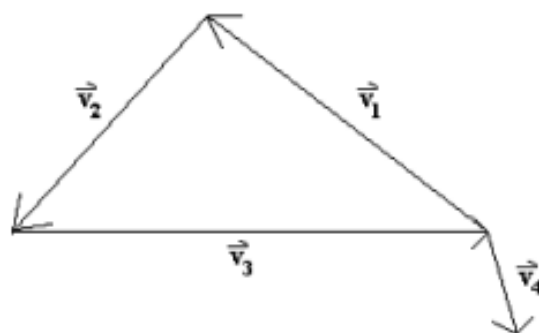

3.   4.
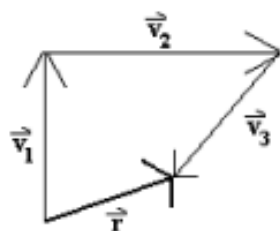

                      5.   6.
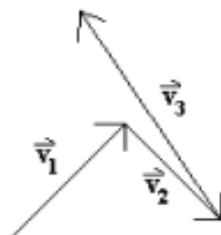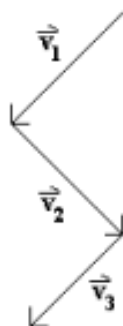
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Worksheet 22: Adding Vectors   **ANSWERS**

1.

2.

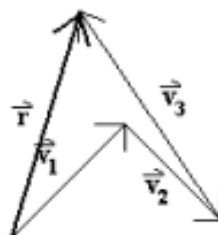
3.   4.

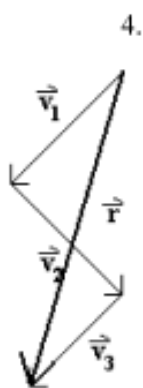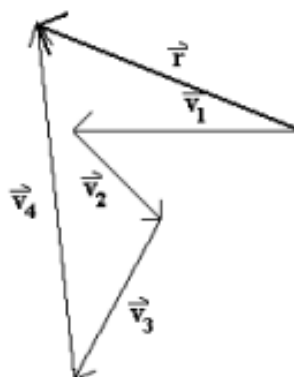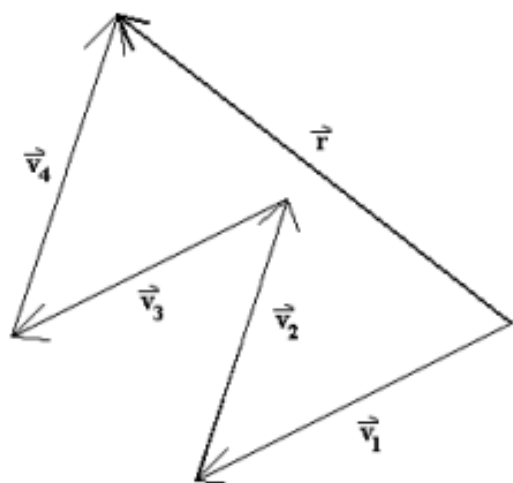5.   6.