Types of Chemical Reactions

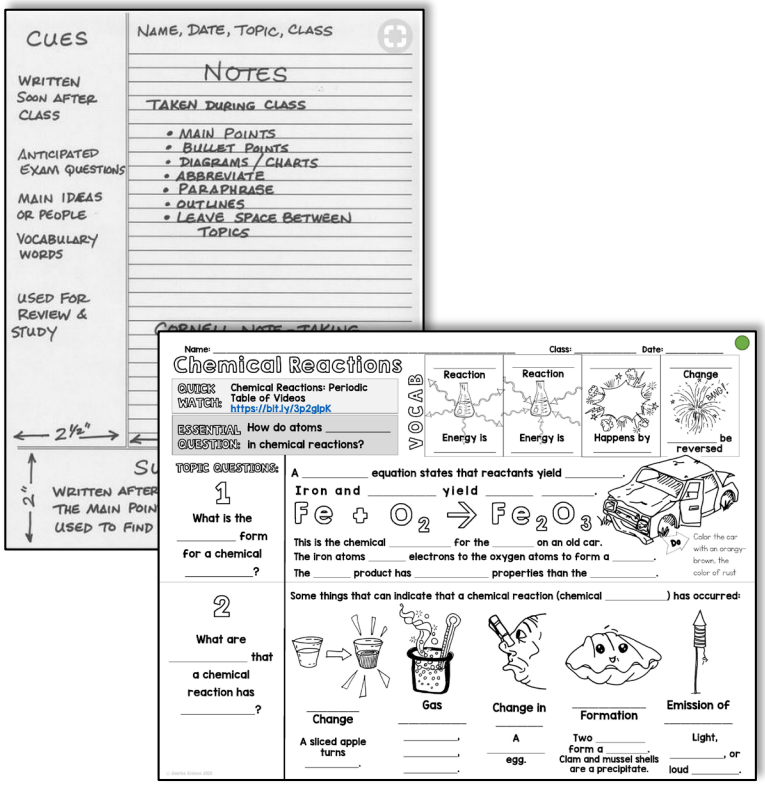
Cornell Doodle Notes TEACHER NOTES

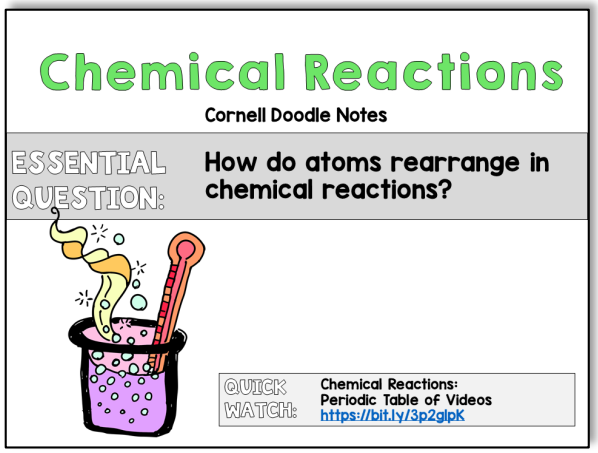
These scaffolded Cornell Doodle Notes combine two effective note-taking strategies and can be used to introduce the indications of chemical reactions (color and change, gas production, precipitate formation, and energy emission) and the 5 main types of reactions (synthesis, decomposition, single and double replacement, and combustion). NGSS MS-PS1.B (Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties form those of the reactants.) and HS-PS1.B (The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.). These notes also highlight the crosscutting concepts of patterns, and energy and matter. These notes use lots of analogies and are meant to be an introduction to identifying the types of reactions.

Cornell Notes are a note-taking strategy in which topic questions are written in a narrow left-hand column and definitions, explanations, and diagrams are filled in in the right-hand column. At the bottom of Cornell Notes, there is typically a section included for reflection on the lesson's main points. See the example to the right.

Doodle Notes are another note-taking strategy for which pictures and graphics activate the visual pathways of the brain, which helps with retention of information when compared to standard note-taking. Your visual learners will really benefit from seeing and coloring in the pictures aside the main points of the notes!

Doodle Notes is a registered trademark used with permission. See DoodleNotes.org for more details.





As a hook for the lesson, the top of the notes includes the link to a 'Quick Watch' video clip of exciting chemical reactions. I created a Powerpoint that goes with these notes. The Powerpoint walks the students through the lesson from the Essential Question and through all of the Topic Questions. There is a "Sum It Up" section at the end of the notes, for which students practice applying the concepts.

These are the included versions of these Cornell Doodle Notes:

KEY **The KEY :** All notes and "answers" are included on this version

Green Circle : Use this version for your lower-level students who need more support, take more time, or who are learning English as a second language…they will have to fill in missing words

Blue Square : Use this version for your mainstream students…they will have to write the topic questions and fill in some words throughout

On the next page are the directions for accessing the Powerpoint and Google Slides presentations for this resource.

Here are some ways that I suggest using this resource:

1) **Whole-Group lesson with scaffolding :** Decide which students should receive which level of the notes. Hand out the notes to the students. Use the Powerpoint or Google Slides as a presentation and talk aloud through the lesson while the students take notes OR If you have a document camera (an ELMO), you can fill out your own notes and the students can follow along with you as you discuss the concepts aloud! Stop throughout the lesson to have the students pair-share and discuss what they are learning. Allow them to color/doodle further during and at the end of the lesson.

2) **Scaffolded Small-Group lesson :** Separate your students into groups by learning level. Give each student group sets of the appropriate notes for their level. Make sure each group has a device to view the presentation. Post the Powerpoint or Google Slides to your Google Classroom or other online learning platform, or email the Powerpoint version to one 'student leader' in each group. The students would view the Powerpoint/Slides together on one device and fill in the notes. Encourage them to add color/further notes.

3) **Individual Note-Taking or Flipped Classroom :** Post the Powerpoint or Google Slides presentation to your Google Classroom or other online learning platform. Hand out the appropriate-level notes to each student. Students can work at their own pace to view the presentation and complete their notes. Encourage them to add color/further notes. Could also be assigned for homework or as a "half & half lab" for which one group of students is taking notes at their desks while another group is performing a lab.

4) **Distance Learning Scenario:** Create a screencast lecture using one of the presentation options, or you could record audio clips over each slide that your students will play as they view the presentation. Check out the options for student digital note-taking on the next page!

Links to Download the PPT and Google Slides Presentations

Click on this link to access the Powerpoint presentation:
https://bit.ly/3ItVXdT

Click on this link to access the Google Slides presentation:
https://bit.ly/3IDB7c4

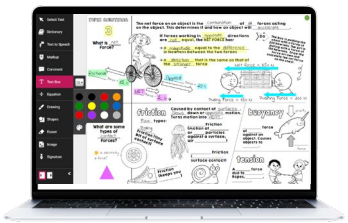
Please Note: Due to clip art licensing agreements and also to protect my work, these notes and presentations are not editable. However, you can always add additional text boxes, as well as insert new slides with images/text/video clips, etc. to customize the lesson for you and your students!

Digital Notetaking Options

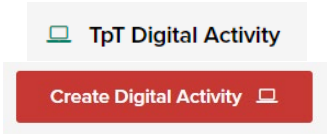
❶ ASSIGN THE GOOGLE SLIDES VERSION TO YOUR STUDENTS

Click on this link to access the Google Slides Notes Version:
https://bit.ly/3IAMNw3

❷ ASSIGN ANY SCAFFOLDED VERSION TO YOUR STUDENTS USING THE KAMI APP (see this FREE resource in my store to learn how)

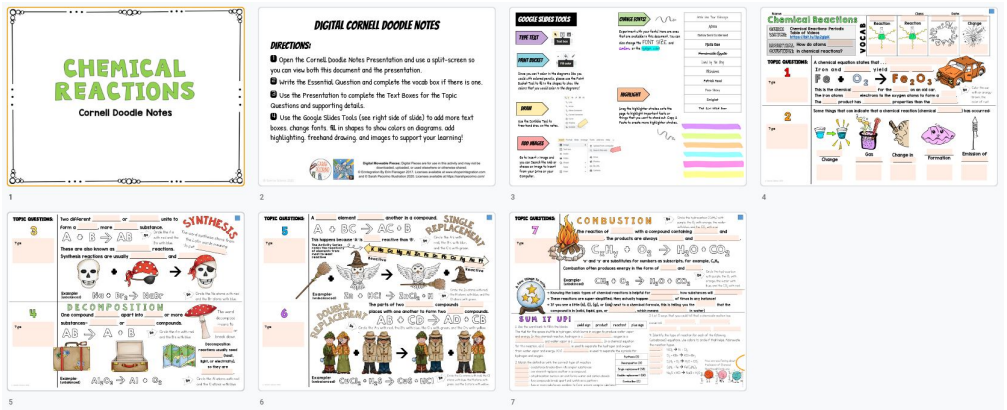


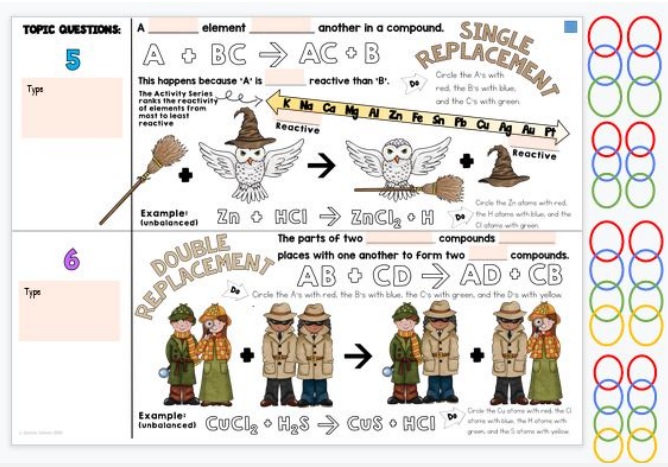
❸ ASSIGN TO YOUR STUDENTS USING TPT's DIGITAL PDF INTERACTIVE LAYER TOOL (click the digital activity button from the resource page on TPT; this version may be more limiting due to available tools in the interface)



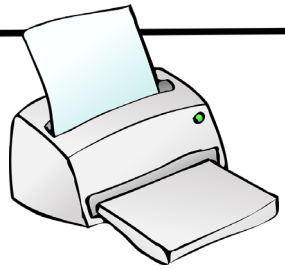
Google Slides Note-taking Option

Click on the link on the previous page to access the Google Slides Version of the Student Notes





1. Share the Google Slides version of the notes with your students via your Google Classroom (select Make a Copy for Each Student while you're creating the Assignment).
2. Also share the Google Slides presentation with them (this will be View Only for them).
3. OTHER IDEAS :
    1. Students can design a relevant digital cover for the notes.
    2. Students can add additional slides to the notes to display relevant diagrams and pictures that they find online. This task will help them to solidify their understanding of the concepts.
    3. Students can design a 'Summary Slide' at the end of the digital doodle notes. They could use text boxes (with fun fonts!), shapes, and images from the internet to create their Summary Slide. Take this a step further and ask them to record an audio explanation on top of their Summary Slide explaining what they chose to include and why. Compile all of the Summary Slides into one presentation to share with the class so that the students can view one another's work.
    4. Students can create an interactive doodle notes notebook for each unit. You could take all of the Google Slides versions for topics in the unit and combine them into one Google Slides document.



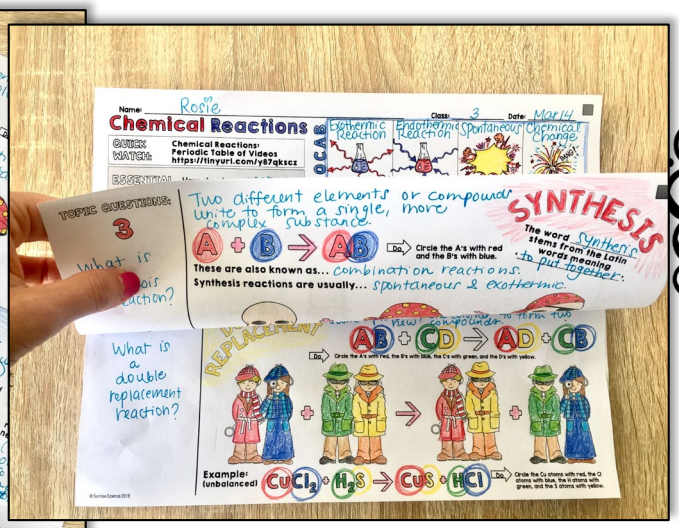
Printing Tips!

It depends how you'd like your students to use these notes. They can be printed one-sided and folded up into an interactive notebook, or you can print them double-sided and have students keep them in binders/folders.

If you print them double-sided, this is what I suggest doing:

- In the print settings on Adobe/Reader, keep the "Auto Orientation" button selected
- Click "FLIP ON LONG EDGE" and FIT to page
- Type in the page numbers that you'd like to print and the number of copies
- You can also print the pages one-sided and run them double-sided through your school's copy machine!

Printing the notes this way will avoid your students having to rotate their paper when they go to the next side. Instead, they will flip and the left and right columns will be in the same place!



Example colored notes

Thank you very much for your purchase! If this product has met your needs, please consider leaving feedback at TeachersPayTeachers.com or feel free to email me at SunriseScienceTPT@gmail.com with any questions or concerns!

You may also be interested in my other Cornell Doodle Notes products! Click on the picture to the right!

Thank you to these amazing artists!

kimberly geswein fonts

KB3 TEACH FONTS

SARAH PECORINO illustration

Digital Pieces BY ERINTEGRATION

Kate Hadfield DESIGNS

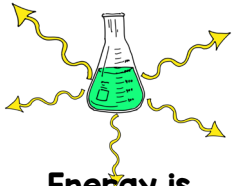
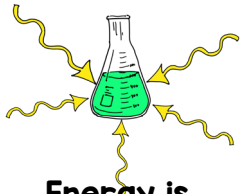
Name: _____ Class: _____ Date: _____ KEY

Chemical Reactions

QUICK WATCH: Chemical Reactions: Periodic Table of Videos https://bit.ly/3p2glpK

ESSENTIAL QUESTION: How do atoms rearrange in chemical reactions?

VOCAB

Exothermic Reaction	Endothermic Reaction	Spontaneous	Chemical Change
			
Energy is released	Energy is absorbed	Happens by itself	Cannot be reversed

TOPIC QUESTIONS:

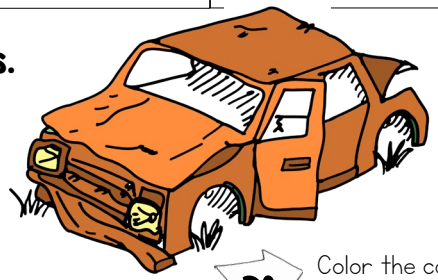
1

What is the general form for a chemical equation?

A chemical equation states that reactants yield products.

Iron and oxygen yield iron oxide.

$$Fe + O_2 \rightarrow Fe_2O_3$$



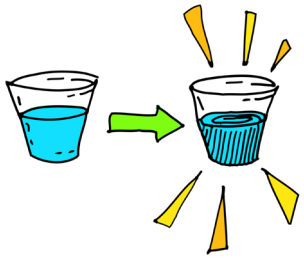
DO Color the car with an orangy-brown, the color of rust

This is the chemical reaction for the rust on an old car.
The iron atoms lose electrons to the oxygen atoms to form a bond.
The new product has different properties than the reactants.

2

What are indications that a chemical reaction has occurred?

Some things that can indicate that a chemical reaction (chemical change) has occurred:



Color Change

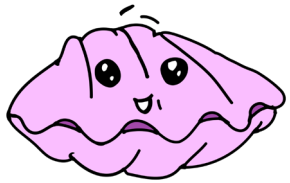
A sliced apple turns brown.

Gas Production

Bubbles, foaming, smoke.

Change in Odor

A rotting egg.



Precipitate Formation

Two liquids form a solid. Clam and mussel shells are a precipitate.

Emission of Energy

Light, heat, or loud sound.

KEY

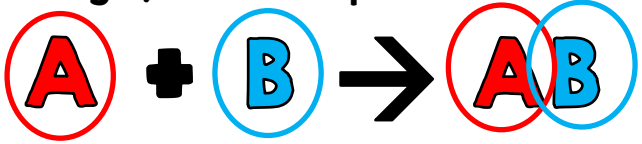
TOPIC QUESTIONS:

3

What is a synthesis reaction?

SYNTHESIS

Two different elements or compounds unite to form a single, more complex substance.



DO Circle the A's with red and the B's with blue.

The word synthesis stems from the Latin words meaning 'to put together'.

These are also known as combination reactions.
Synthesis reactions are usually spontaneous and exothermic.

Example: (unbalanced) $Na + Br_2 \rightarrow NaBr$

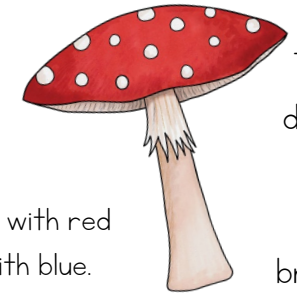
DO Circle the Na atoms with red and the Br atoms with blue.

4

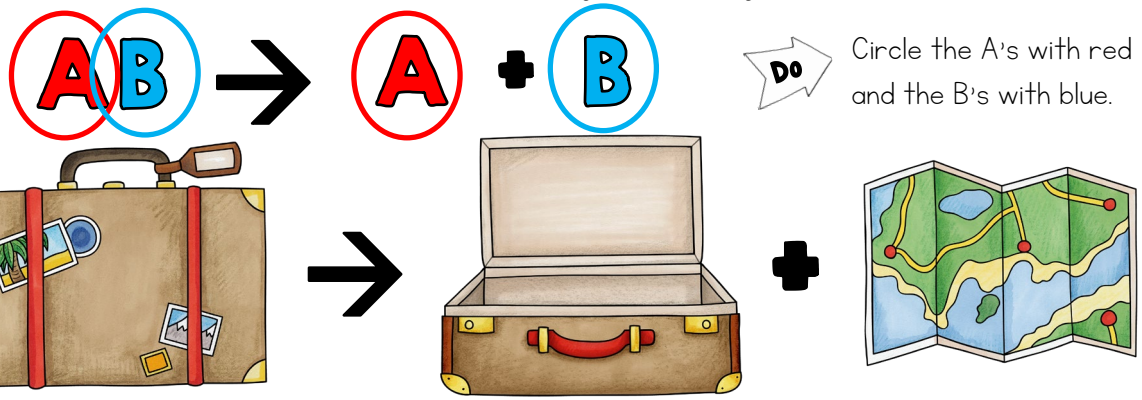
What is a decomposition reaction?

DECOMPOSITION

One compound splits apart into two or more substances–elements or simpler compounds.



The word decompose means to decay or break down.



DO Circle the A's with red and the B's with blue.

Decomposition reactions usually need energy (heat, light, or electricity), so they are endothermic.

Example: (unbalanced) $Al_2O_3 \rightarrow Al + O_2$

DO Circle the Al atoms with red and the O atoms with blue.

TOPIC QUESTIONS:

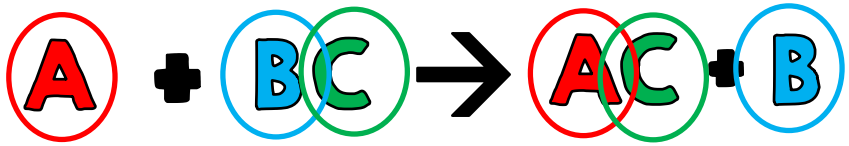
5

What is a single replacement reaction?

A free element replaces another in a compound.

KEY

SINGLE REPLACEMENT



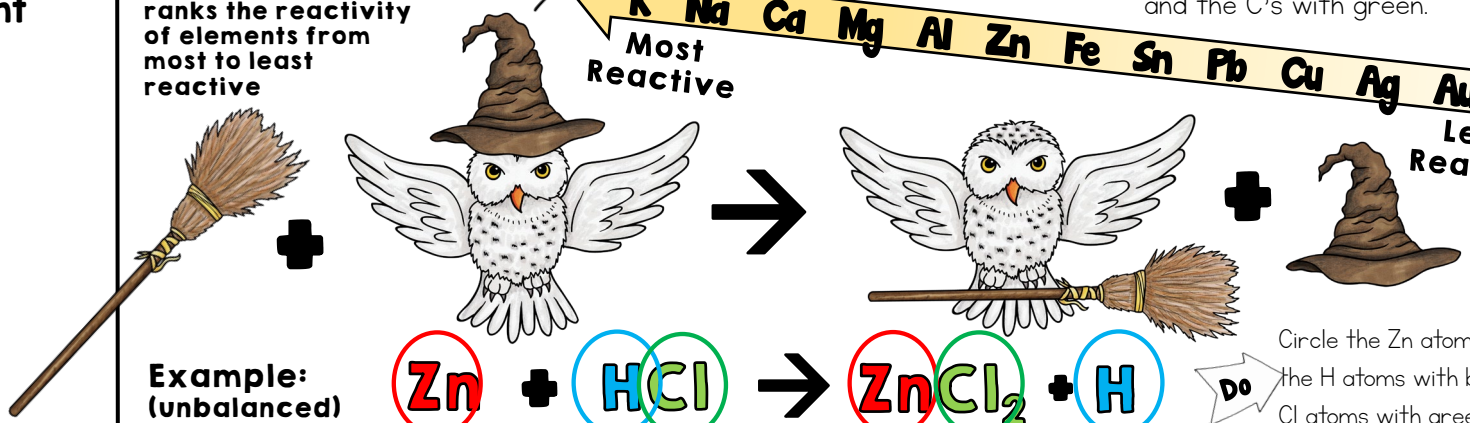
This happens because 'A' is more reactive than 'B'.

Do: Circle the A's with red, the B's with blue, and the C's with green.

The Activity Series ranks the reactivity of elements from most to least reactive

K Na Ca Mg Al Zn Fe Sn Pb Cu Ag Au Pt

Most Reactive → Least Reactive



Example: (unbalanced) $Zn + HCl \rightarrow ZnCl_2 + H$

Do: Circle the Zn atoms with red, the H atoms with blue, and the Cl atoms with green.

6

What is a double replacement reaction?

DOUBLE REPLACEMENT

The parts of two different compounds switch places with one another to form two new compounds.

Do: Circle the A's with red, the B's with blue, the C's with green, and the D's with yellow.

Example: (unbalanced) $CuCl_2 + H_2S \rightarrow CuS + HCl$

Do: Circle the Cu atoms with red, the Cl atoms with blue, the H atoms with green, and the S atoms with yellow.

TOPIC QUESTIONS:

7

What is a combustion reaction?

COMBUSTION

Do Circle the hydrocarbon (C_xH_y) with purple, the O_2 with orange, the water with blue, and the CO_2 with red.

KEY

The reaction of oxygen with a compound containing carbon and hydrogen. The products are always water and carbon dioxide.

$$C_xH_y + O_2 \rightarrow H_2O + CO_2$$

'x' and 'y' are substitutes for numbers as subscripts; for example, C_3H_8.

Combustion often produces energy in the form of heat and light.

Example: (unbalanced) $CH_4 + O_2 \rightarrow H_2O + CO_2$

Do Circle the hydrocarbon with purple, the O_2 with orange, the water with blue, and the CO_2 with red.

- **Knowing the basic types of chemical reactions is helpful for predicting how substances will interact**
- **These reactions are super-simplified; they actually happen billions of times in any instance!**
- **If you see a little (s), (l), (g), or (aq) next to a chemical formula, this is telling you the state that the compound is in (solid, liquid, gas, or aqueous, which means dissolved in water)**

SUM IT UP!

yield sign	product	reactant	plus sign

1. Use the word bank to fill in the blanks. The fuel for the space shuttle is hydrogen, which burns in oxygen to produce water vapor and energy. In this chemical reaction, hydrogen is a ___reactant___, oxygen is a ___reactant___, and water vapor is a ___product___. In a chemical equation for this reaction, a(n) ___yield sign___ is used to separate the hydrogen and oxygen from water vapor and energy. A(n) ___plus sign___ is used to separate the symbols for hydrogen and oxygen.

2. Match the definition with the correct type of reaction

Synthesis (S)	
Decomposition (D)	
Single replacement (SR)	
Double replacement (DR)	
Combustion (C)	

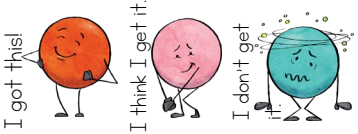
D : a substance breaks down into simpler substances
SR : one element replaces another in a compound
C : a hydrocarbon burns in air and forms water and carbon dioxide
DR : two compounds break apart and switch ionic partners
S : two or more substances combine to form a more complex substance

3. List 5 ways that you could tell that a chemical reaction has occurred: ___color change___, ___gas production___, ___change in odor___, ___precipitate formation___, ___emission of energy___

4. Identify the type of reaction for each of the following (unbalanced) equations. Use colors to circle if that helps. Abbreviate the reaction types.

D : $NiCl_2 \rightarrow Ni + Cl_2$
SR : $Cl_2 + KBr \rightarrow KCl + Br_2$
C : $C_6H_{12} + O_2 \rightarrow H_2O + CO_2$
S : $C_5H_5 + Fe \rightarrow Fe(C_5H_5)_2$
DR : $Na_2S + HCl \rightarrow NaCl + H_2S$

How are you feeling about the basics of Chemical Reactions? Circle one:



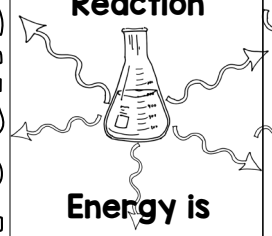
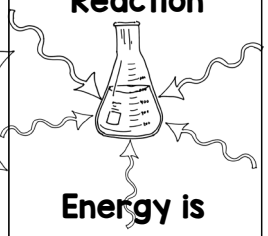
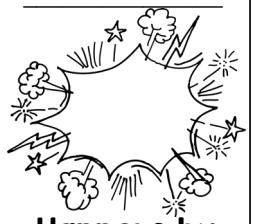
Name: _____ Class: _____ Date: _____

Chemical Reactions

QUICK WATCH: Chemical Reactions: Periodic Table of Videos https://bit.ly/3p2glpK

ESSENTIAL QUESTION: How do atoms _____ in chemical reactions?

VOCAB

_____ Reaction	_____ Reaction	_____	_____ Change
			
Energy is _____	Energy is _____	Happens by _____	_____ be reversed

TOPIC QUESTIONS:

1

What is the _____ form for a chemical _____?

A _____ equation states that reactants yield _____.

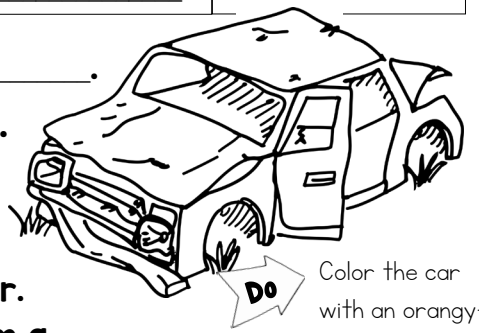
Iron and _____ yield _____ _____.

$$Fe + O_2 \rightarrow Fe_2O_3$$

This is the chemical _____ for the _____ on an old car.

The iron atoms _____ electrons to the oxygen atoms to form a _____.

The _____ product has _____ properties than the _____.

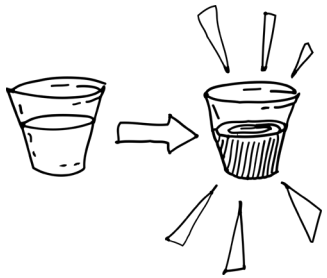


DO Color the car with an orangy-brown, the color of rust

2

What are _____ that a chemical reaction has _____?

Some things that can indicate that a chemical reaction (chemical _____) has occurred:



_____ Change

A sliced apple turns _____.

Gas _____

_____,

_____,

_____.

Change in _____

A _____ egg.

_____ Formation

Two _____ form a _____. Clam and mussel shells are a precipitate.

Emission of _____

Light, _____, or loud _____.

TOPIC QUESTIONS:

3

What is a

_____

reaction?

Two different _____ **or** _____ **unite to form a** _____**, more** _____ **substance.**

A + B → AB

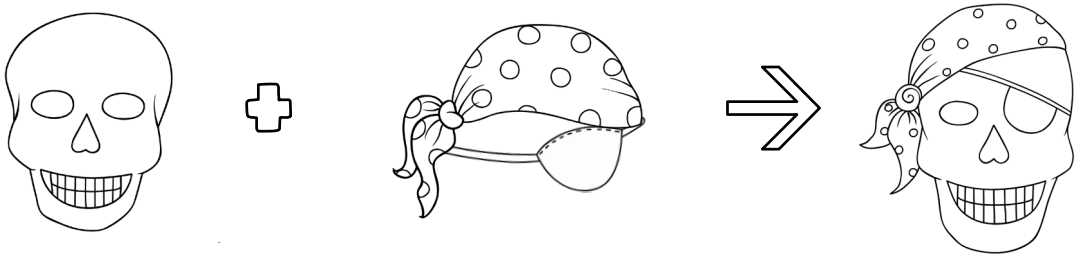
DO Circle the A's with red and the B's with blue.

These are also known as _____ **reactions.**

Synthesis reactions are usually _____ **and** _____**.**

SYNTHESIS

The word synthesis stems from the Latin words meaning 'to put _____'.



Example: (unbalanced) $Na + Br_2 \rightarrow NaBr$

DO Circle the Na atoms with red and the Br atoms with blue.

4

What is a

_____

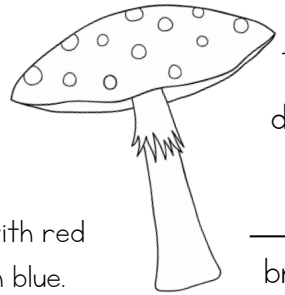
reaction?

DECOMPOSITION

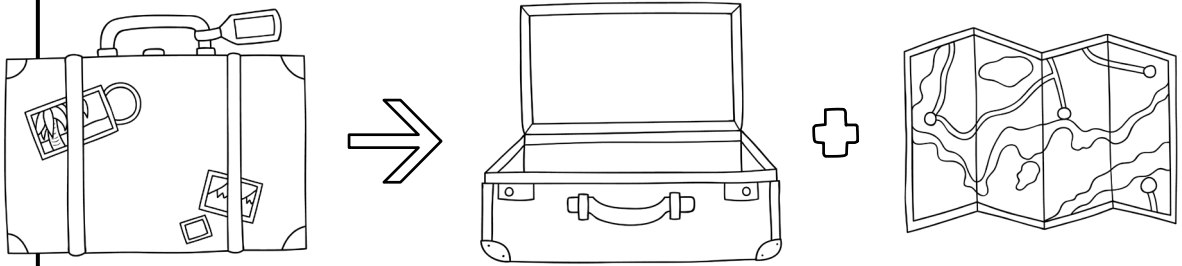
One compound _____ **apart into** _____ **or more substances–** _____ **or** _____ **compounds.**

AB → A + B

DO Circle the A's with red and the B's with blue.



The word decompose means to _____ or break down.



Decomposition reactions usually need _____ **(heat, light, or electricity), so they are** _____**.**

Example: (unbalanced) $Al_2O_3 \rightarrow Al + O_2$

DO Circle the Al atoms with red and the O atoms with blue.

TOPIC QUESTIONS:

5

What is a

_____

_____

reaction?

A _____ element _____ another in a compound.

SINGLE REPLACEMENT

$$A + BC \rightarrow AC + B$$

This happens because 'A' is _____ reactive than 'B'.

The Activity Series ranks the reactivity of elements from most to least reactive

Do Circle the A's with red, the B's with blue, and the C's with green.

K Na Ca Mg Al Zn Fe Sn Pb Cu Ag Au Pt

Reactive **Reactive**

Example: (unbalanced) $Zn + HCl \rightarrow ZnCl_2 + H$

Do Circle the Zn atoms with red, the H atoms with blue, and the Cl atoms with green.

6

What is a

_____

_____

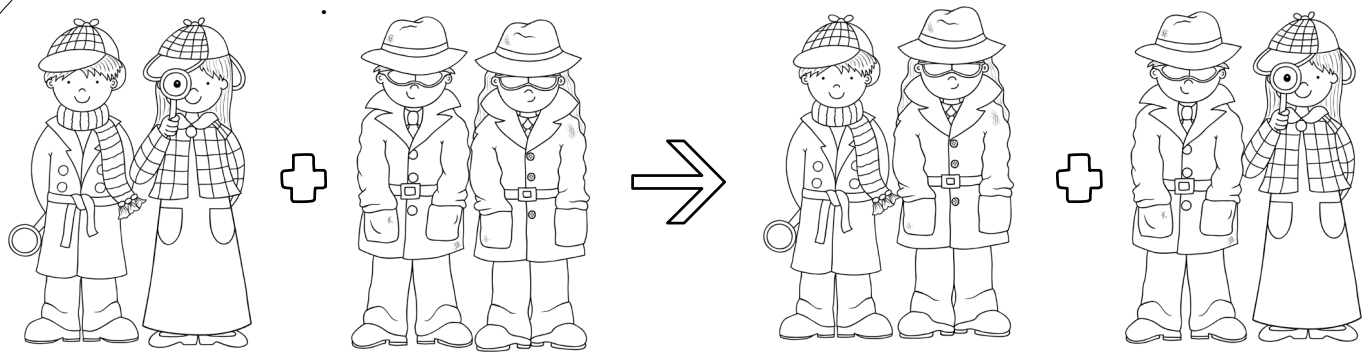
reaction?

DOUBLE REPLACEMENT

The parts of two _____ compounds _____ places with one another to form two _____ compounds.

$$AB + CD \rightarrow AD + CB$$

Do Circle the A's with red, the B's with blue, the C's with green, and the D's with yellow.



Example: (unbalanced) $CuCl_2 + H_2S \rightarrow CuS + HCl$

Do Circle the Cu atoms with red, the Cl atoms with blue, the H atoms with green, and the S atoms with yellow.

TOPIC QUESTIONS:

7

What is a _____ **reaction?**

COMBUSTION

DO Circle the hydrocarbon (C_xH_y) with purple, the O_2 with orange, the water with blue, and the CO_2 with red.

The reaction of _____ with a compound containing _____ and _____. The products are always _____ and _____ _____.

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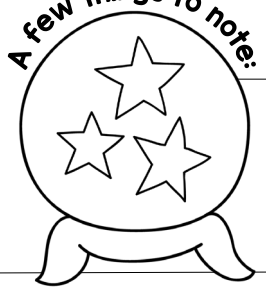

- **Knowing the basic types of chemical reactions is helpful for _____ how substances will _____**
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SUM IT UP!

yield sign	product	reactant	plus sign

1. Use the word bank to fill in the blanks.
The fuel for the space shuttle is hydrogen, which burns in oxygen to produce water vapor and energy. In this chemical reaction, hydrogen is a _____, oxygen is a _____, and water vapor is a _____. In a chemical equation for this reaction, a(n) _____ is used to separate the hydrogen and oxygen from water vapor and energy. A(n) _____ is used to separate the symbols for hydrogen and oxygen.

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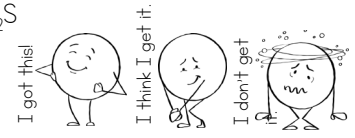
How are you feeling about the basics of Chemical Reactions? Circle one:



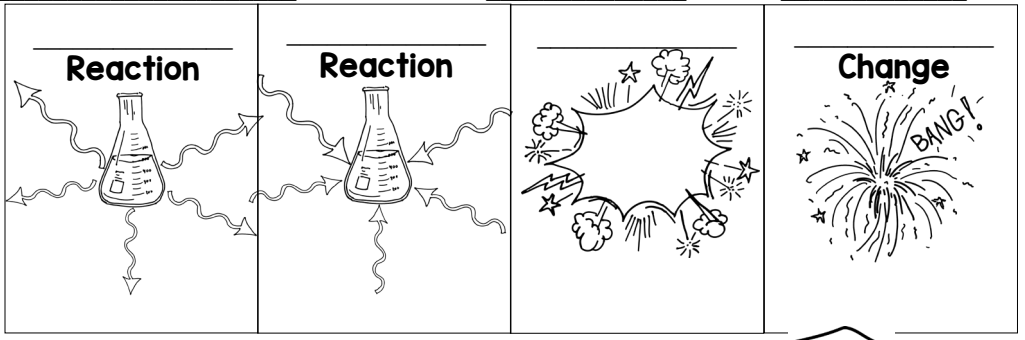
Name: _____ Class: _____ Date: _____

Chemical Reactions

QUICK WATCH: Chemical Reactions: Periodic Table of Videos https://bit.ly/3p2glpK

ESSENTIAL QUESTION: How do atoms _____ in chemical reactions?

VOCAB



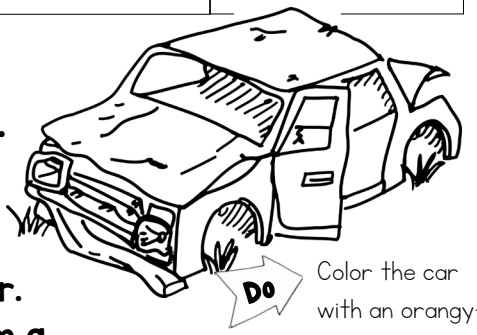
TOPIC QUESTIONS:

1

A chemical equation states that . . .

Iron and _____ yield _____ _____.

$$Fe + O_2 \rightarrow Fe_2O_3$$



This is the chemical _____ for the _____ on an old car.

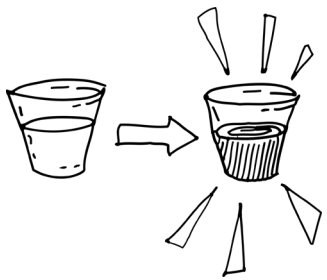
The iron atoms _____ electrons to the oxygen atoms to form a _____.

The _____ product has _____ properties than the _____.

DO Color the car with an orangy-brown, the color of rust

2

Some things that can indicate that a chemical reaction (chemical _____) has occurred:



_____
Change

Gas
_____

Change in
_____

_____
Formation

Emission of
_____

TOPIC QUESTIONS:

3

Two different _____ or _____ unite to form a _____, more _____ substance.

A + B → AB

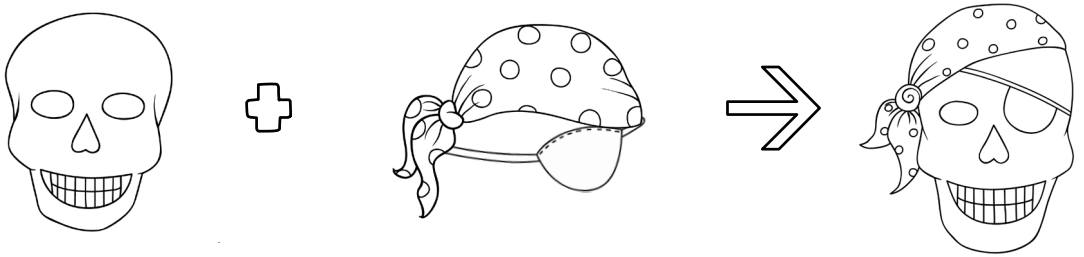
DO Circle the A's with red and the B's with blue.

These are also known as _____ reactions.

Synthesis reactions are usually _____ and _____.

SYNTHESIS

The word synthesis stems from the Latin words meaning 'to put _____'.



Example: (unbalanced) $Na + Br_2 \rightarrow NaBr$

DO Circle the Na atoms with red and the Br atoms with blue.

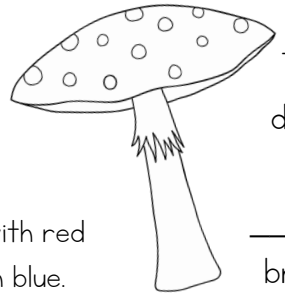
4

DECOMPOSITION

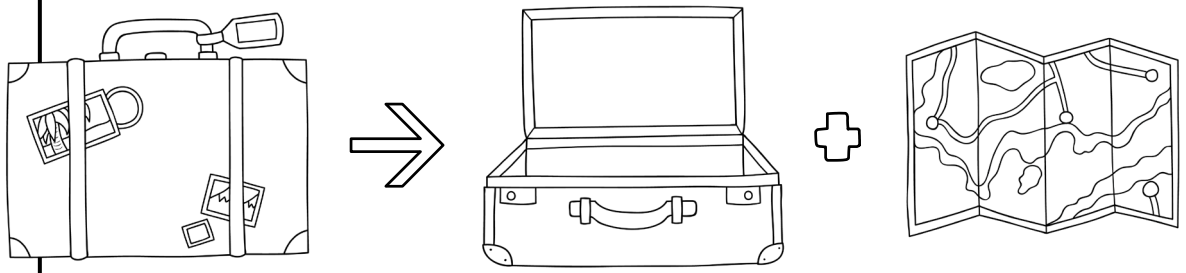
One compound _____ apart into _____ or more substances- _____ or _____ compounds.

AB → A + B

DO Circle the A's with red and the B's with blue.



The word decompose means to _____ or break down.



Decomposition reactions usually need _____ (heat, light, or electricity), so they are _____.

Example: (unbalanced) $Al_2O_3 \rightarrow Al + O_2$

DO Circle the Al atoms with red and the O atoms with blue.

TOPIC QUESTIONS:

5

A _____ element _____ another in a compound.

SINGLE REPLACEMENT

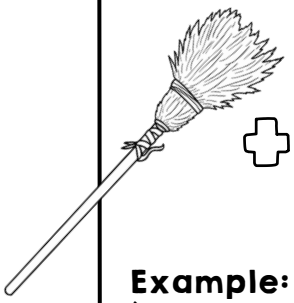
$$A + BC \rightarrow AC + B$$

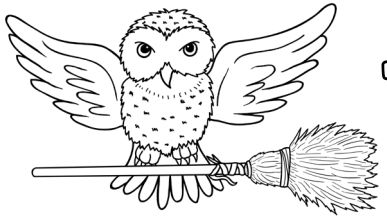
This happens because 'A' is _____ reactive than 'B'.

The Activity Series ranks the reactivity of elements from most to least reactive

K Na Ca Mg Al Zn Fe Sn Pb Cu Ag Au Pt

Reactive





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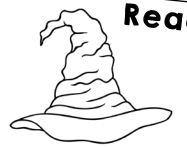


Example: (unbalanced) $Zn + HCl \rightarrow ZnCl_2 + H$

Do: Circle the Zn atoms with red, the H atoms with blue, and the Cl atoms with green.

Do: Circle the A's with red, the B's with blue, and the C's with green.

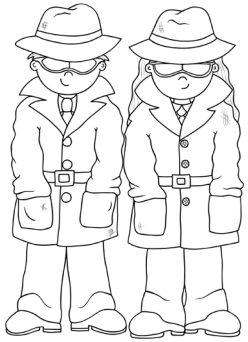
6

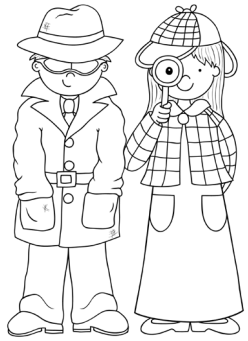
DOUBLE REPLACEMENT

The parts of two _____ compounds _____ places with one another to form two _____ compounds.

$$AB + CD \rightarrow AD + CB$$

Do: Circle the A's with red, the B's with blue, the C's with green, and the D's with yellow.





Example: (unbalanced) $CuCl_2 + H_2S \rightarrow CuS + HCl$

Do: Circle the Cu atoms with red, the Cl atoms with blue, the H atoms with green, and the S atoms with yellow.

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7

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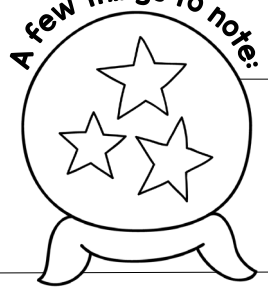

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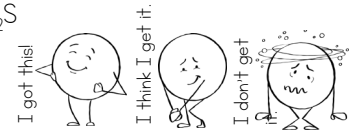

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