Endothermic and Exothermic Reactions

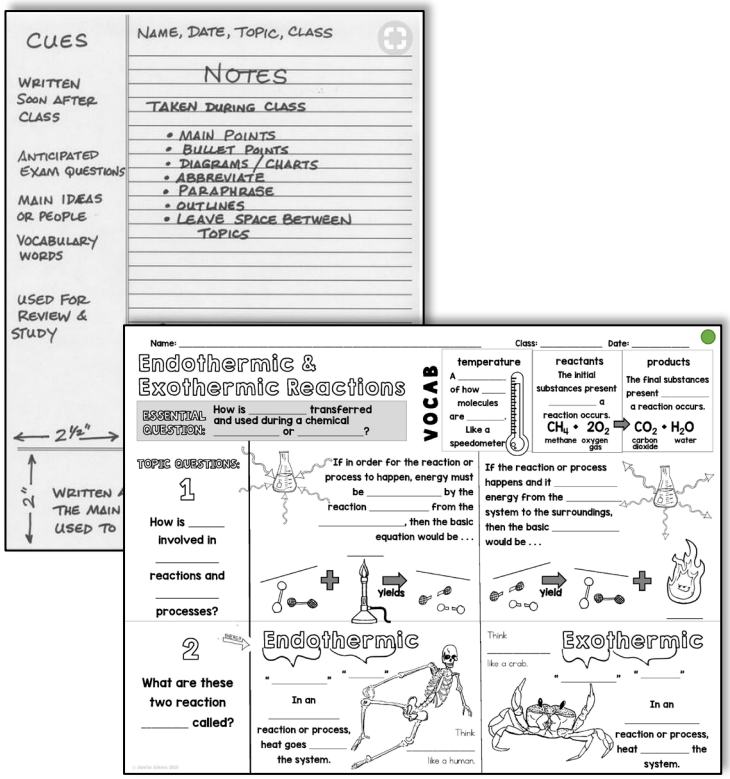
Cornell Doodle Notes TEACHER NOTES

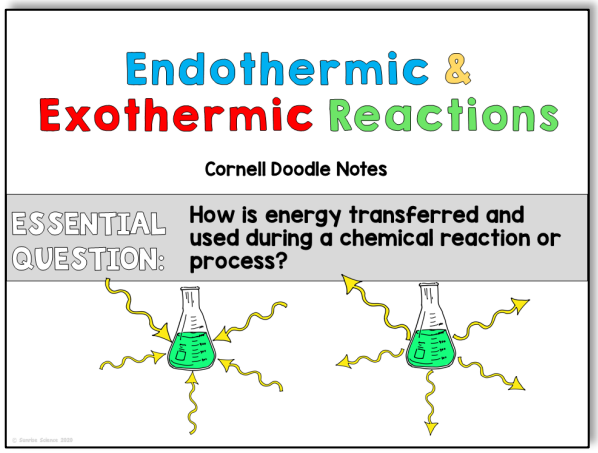
These scaffolded Cornell Doodle Notes combine two effective note-taking strategies and can be used as part of the input for NGSS Standards MS-PSI-6 (Chemical Reactions: Some chemical reactions release energy, others store energy.), HS-PSI-4-5 (Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules.) to teach about how energy flows in endothermic and exothermic chemical reactions and physical processes.

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.





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. At the end of the Powerpoint (as well as at the end of the notes themselves) there is a "Sum It Up" section in which students answer some conceptual questions, watch two follow-up video clips, and write a "$2 Summary" of the lesson's main points.

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/31LfOVg

Click on this link to access the Google Slides presentation:
https://bit.ly/37CisaN

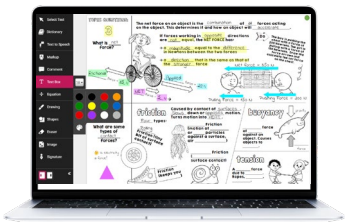
Please Note: Due to clip art licensing agreements and also to protect my work, these notes and presentations are not editable. However, you can always add additional text boxes, as well as insert new slides with images/text/video clips, etc. to customize the lesson for you and your students!

Digital Notetaking Options

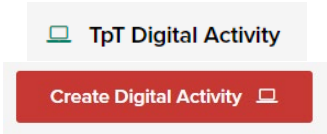
❶ ASSIGN THE GOOGLE SLIDES VERSION TO YOUR STUDENTS

Click on this link to access the Google Slides Notes Version:
https://bit.ly/3mM2D7S

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

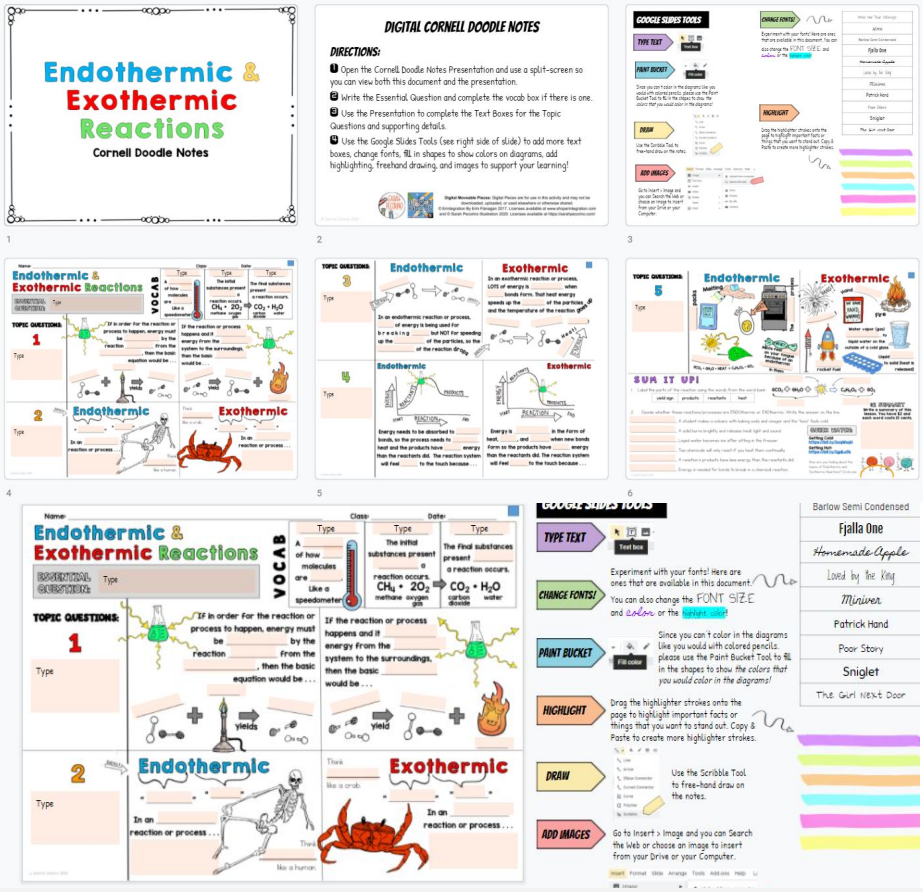


❸ ASSIGN TO YOUR STUDENTS USING TPT's DIGITAL PDF INTERACTIVE LAYER TOOL (click the digital activity button from the resource page on TPT; this version may be more limiting due to available tools in the interface)



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.

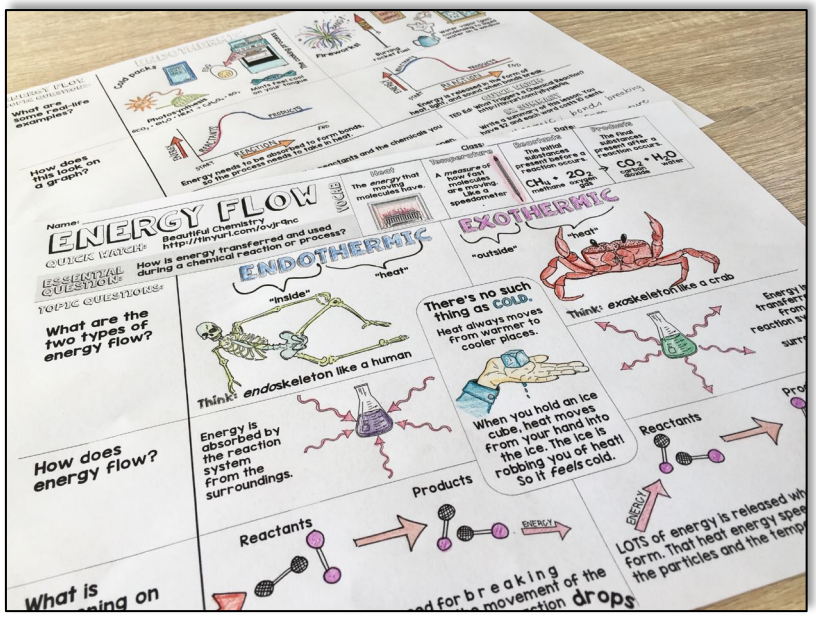
Printing Tips!

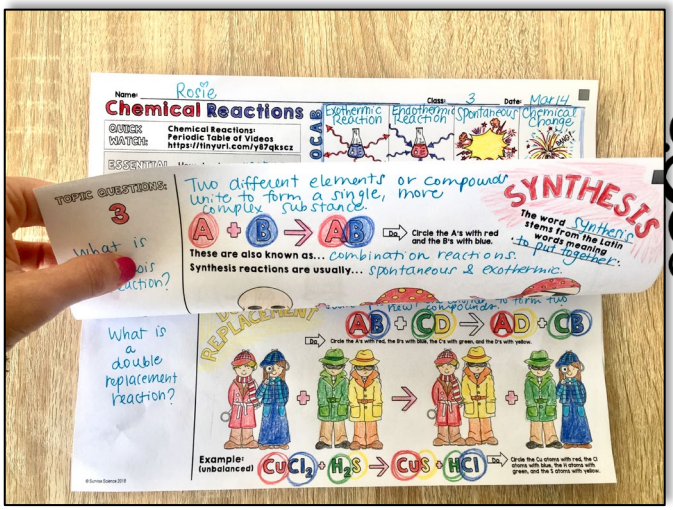
It depends how you'd like your students to use these notes. They can be printed one-sided and folded up into an interactive notebook, or you can print them double-sided and have students keep them in binders/folders.

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 kg

KB3 TEACH FONTS

SARAH PECORINO illustration

Digital Pieces BY ERI INTEGRATION

Kate Hadfield DESIGNS

CLIP ART BY PRINCE PADANIA

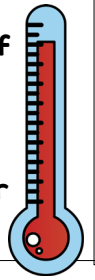
Name: _____ Class: _____ Date: _____ KEY

Endothermic & Exothermic Reactions

ESSENTIAL QUESTION: How is energy transferred and used during a chemical reaction or process?

VOCAB

temperature
A *measure* of how fast molecules are moving. Like a speedometer



reactants
The initial substances present before a reaction occurs.

CH_4 + $2O_2$
methane, oxygen gas

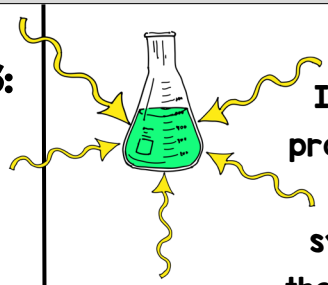
products
The final substances present after a reaction occurs.

CO_2 + H_2O
carbon dioxide, water

TOPIC QUESTIONS:

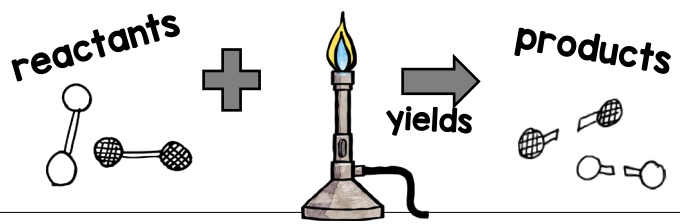
1

How is heat involved in chemical reactions and physical processes?

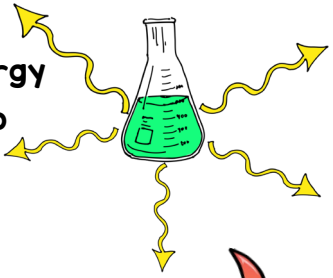


If in order for the reaction or process to happen, energy must be absorbed by the reaction system from the surroundings, then the basic equation would be

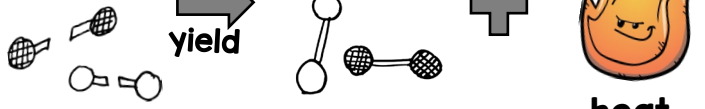
reactants + heat → yields products



If the reaction or process happens and it releases energy from the reaction system to the surroundings, then the basic equation would be



reactants → yield products + heat



2

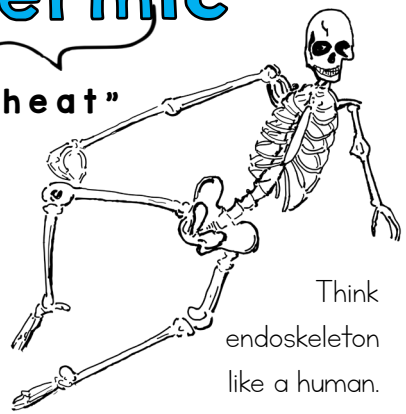
What are these two reaction types called?

ENERGY

Endothermic

"inside" "heat"

In an endothermic reaction or process, heat goes into the system.

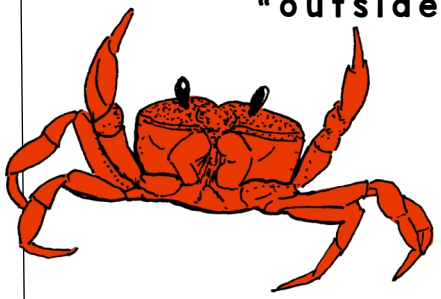


Think endoskeleton like a human.

Think exoskeleton like a crab.

Exothermic

"outside" "heat"



In an exothermic reaction or process, heat leaves the system.

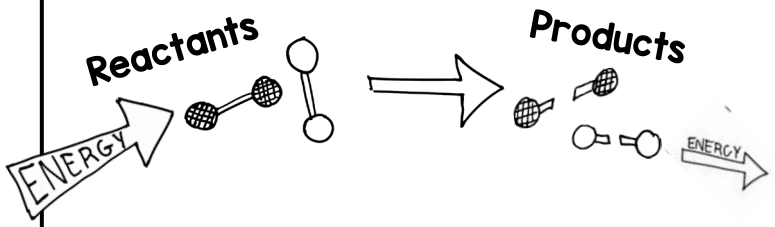
TOPIC QUESTIONS:

KEY

3

What is happening on a particle level?

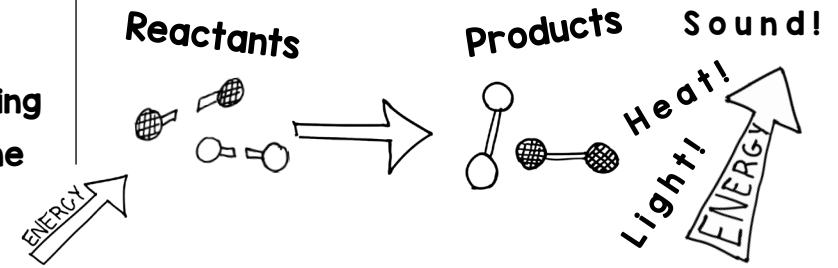
Endothermic



In an endothermic reaction or process, LOTS of energy is being used for b r e a k i n g bonds but NOT for speeding up the movement of the particles, so the temperature of the reaction **drops**

Exothermic

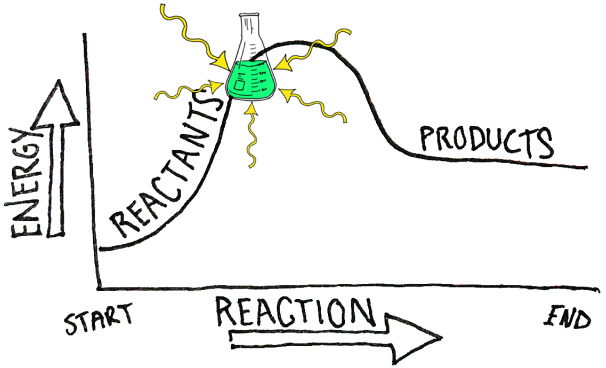
In an exothermic reaction or process, LOTS of energy is released when the new bonds form. That heat energy speeds up the motion of the particles and the temperature of the reaction **goes up**



4

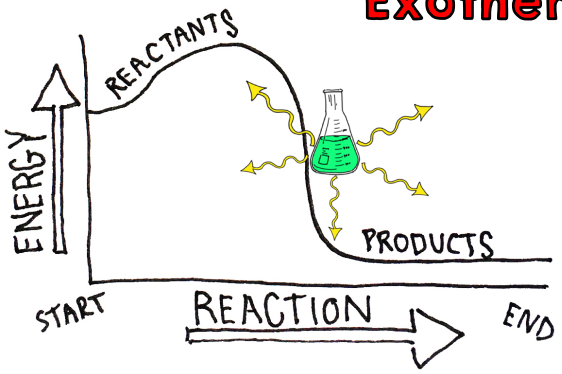
How does this look on a graph?

Endothermic



Energy needs to be absorbed to break bonds, so the process needs to take in heat and the products have more energy than the reactants did. The reaction system will feel cold to the touch because it is taking heat from your hand.

Exothermic



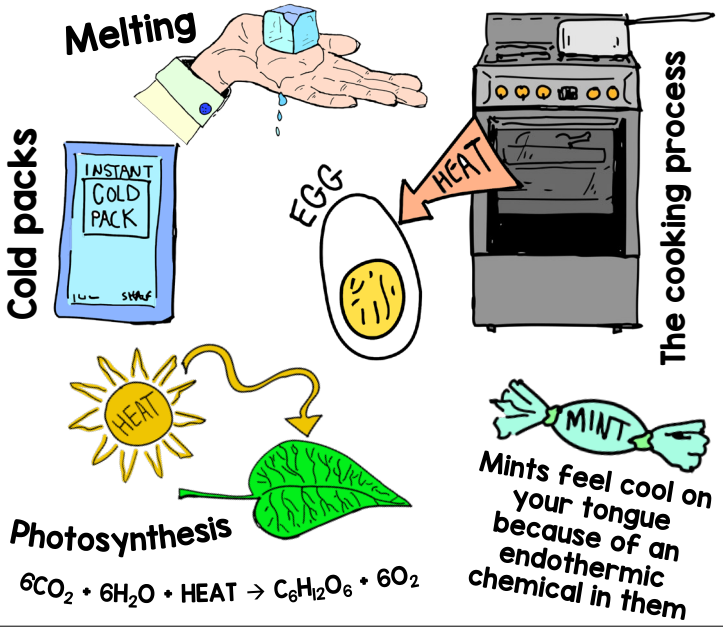
Energy is released in the form of heat, light, and sound when new bonds form so the products have less energy than the reactants did. The reaction system will feel hot to the touch because it is releasing heat to your hand.

TOPIC QUESTIONS:

5

What are some real-life examples?

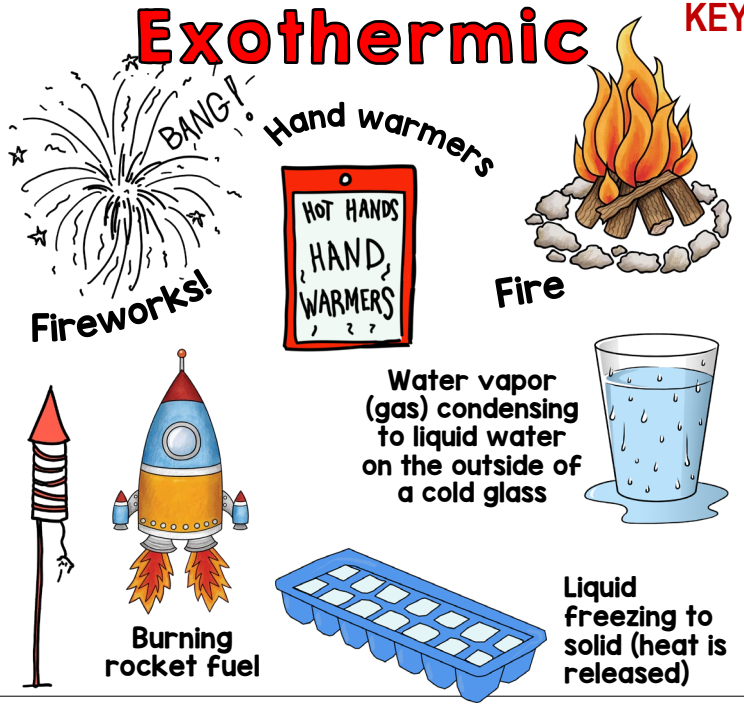
Endothermic



$6CO_2 + 6H_2O + HEAT \rightarrow C_6H_{12}O_6 + 6O_2$

Exothermic

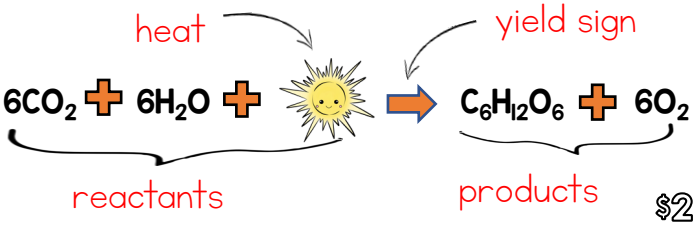
KEY



SUM IT UP!

1. Label the parts of the reaction using the words from the word bank:

yield sign	products	reactants	heat



2. Decide whether these reactions/processes are ENDOthermic or EXOthermic. Write the answer on the line.

endothermic A student makes a volcano with baking soda and vinegar and the "lava" feels cold.

exothermic A solid burns brightly and releases heat, light and sound.

exothermic Liquid water becomes ice after sitting in the freezer.

endothermic Two chemicals will only react if you heat them continually.

exothermic A reaction's products have less energy than the reactants did.

endothermic Energy is needed for bonds to break in a chemical reaction.

$2 SUMMARY

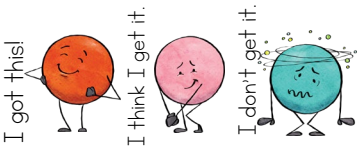
Write a summary of this lesson. You have $2 and each word costs 10 cents.

QUICK WATCH:

Getting Cold:
https://bit.ly/3oqWsq4

Getting Hot:
https://bit.ly/3gdLaTk

How are you feeling about the basics of Endothermic and Exothermic Reactions? Circle one:



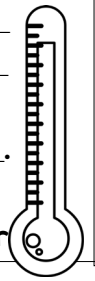
Name: _____ Class: _____ Date: _____

Endothermic & Exothermic Reactions

ESSENTIAL QUESTION: How is _____ transferred and used during a chemical _____ or _____?

VOCAB

temperature
A _____ of how _____ molecules are _____. Like a speedometer



reactants
The initial substances present _____ a reaction occurs.

$CH_4 + 2O_2$
methane, oxygen gas

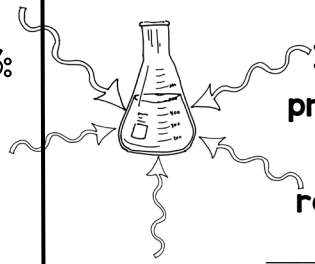
products
The final substances present _____ a reaction occurs.

$CO_2 + H_2O$
carbon dioxide, water

TOPIC QUESTIONS:

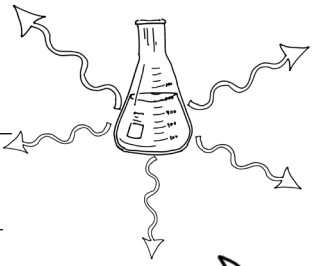
1

How is _____ involved in _____ reactions and _____ processes?



If in order for the reaction or process to happen, energy must be _____ by the reaction _____ from the _____, then the basic equation would be . . .

_____ + _____ yields _____ + _____



If the reaction or process happens and it _____ energy from the _____ system to the surroundings, then the basic _____ would be . . .

_____ yield _____ + _____

2

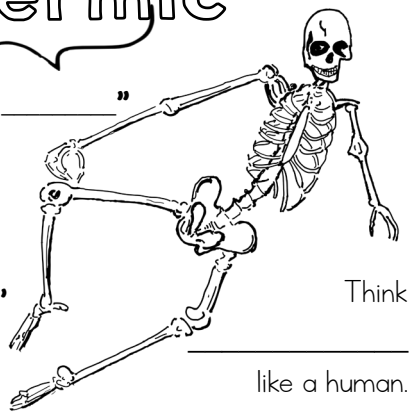
What are these two reaction _____ called?

ENERGY

Endothermic

" _____ " " _____ "

In an _____ reaction or process, heat goes _____ the system.

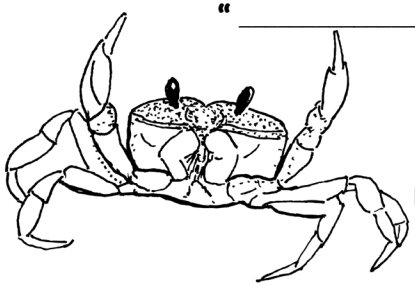


Think _____ like a human.

Exothermic

Think _____ like a crab.

" _____ " " _____ "



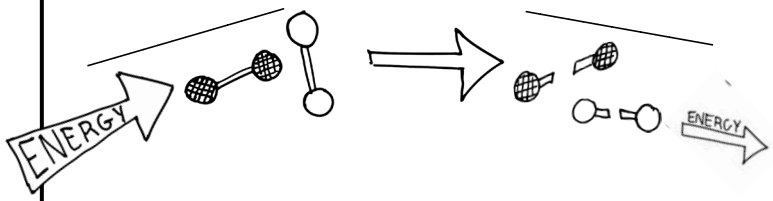
In an _____ reaction or process, heat _____ the system.

TOPIC QUESTIONS:

3

What is happening on a _____ level?

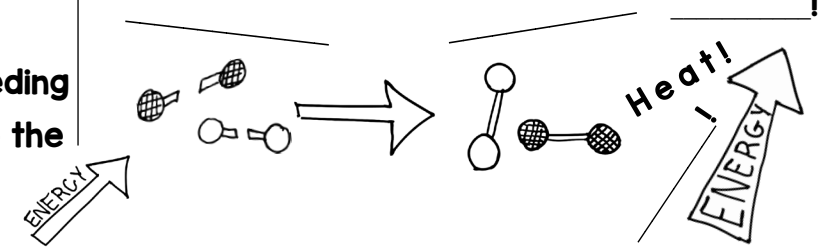
Endothermic



In an endothermic reaction or process, _____ of energy is being used for b r e a k i n g _____ but NOT for speeding up the _____ of the particles, so the _____ of the reaction drops

Exothermic

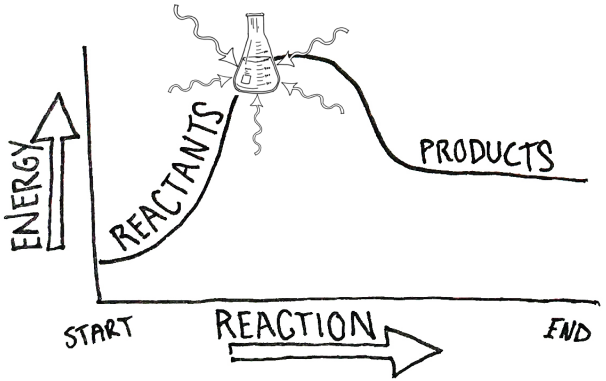
In an exothermic reaction or process, LOTS of energy is _____ when _____ bonds form. That heat energy speeds up the _____ of the particles and the temperature of the reaction goes up



4

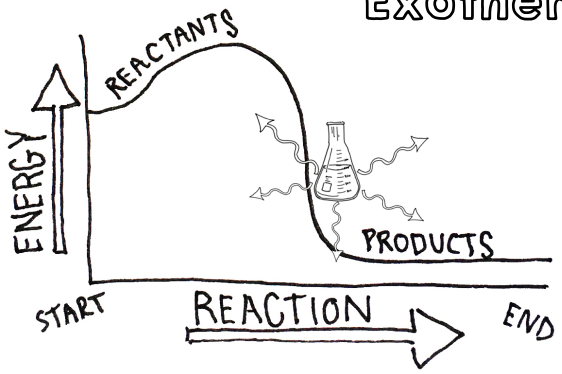
How does this look on a _____?

Endothermic



Energy needs to be absorbed to _____ bonds, so the process needs to _____ heat and the products have _____ energy than the reactants did. The reaction system will feel _____ to the touch because it is _____ heat from your hand.

Exothermic



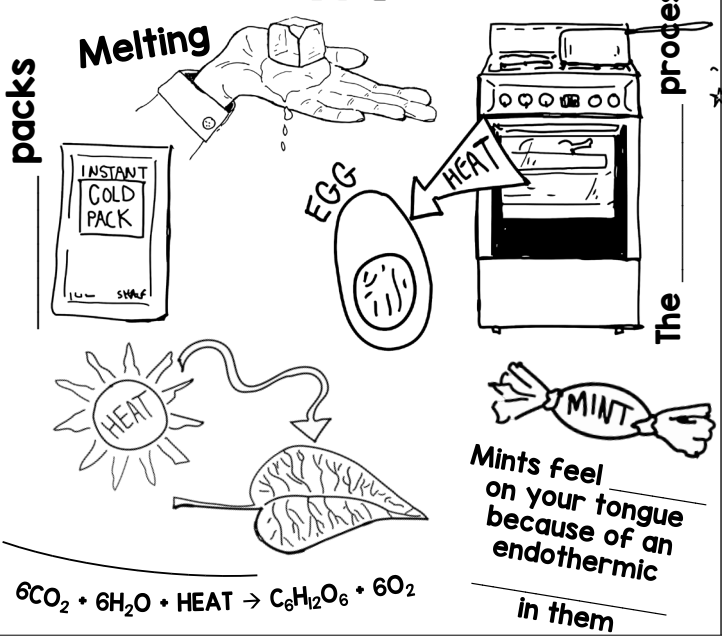
Energy is _____ in the form of heat, _____, and _____ when new bonds form so the products have _____ energy than the reactants did. The reaction system will feel _____ to the touch because it is releasing _____ to your hand.

TOPIC QUESTIONS:

5

What are some real-life examples?

Endothermic



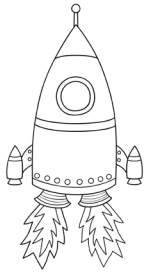
$6CO_2 + 6H_2O + HEAT \rightarrow C_6H_{12}O_6 + 6O_2$

Mints feel _____ on your tongue because of an endothermic _____ in them

Exothermic

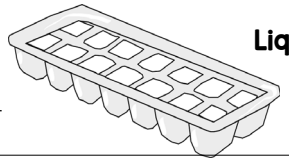
Hand

Fire



rocket fuel

Water vapor (gas) _____ to liquid water on the outside of a cold glass



Liquid _____ to solid (heat is released)

SUM IT UP!

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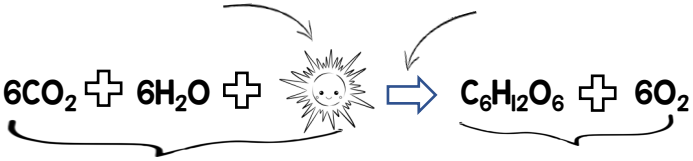
yield sign	products	reactants	heat



2. Decide whether these reactions/processes are ENDOthermic or EXOthermic. Write the answer on the line.

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_____ A solid burns brightly and releases heat, light and sound.

_____ Liquid water becomes ice after sitting in the freezer.

_____ Two chemicals will only react if you heat them continually.

_____ A reaction's products have less energy than the reactants did.

_____ Energy is needed for bonds to break in a chemical reaction.

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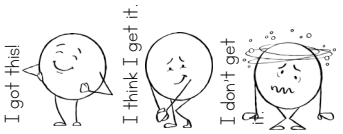
QUICK WATCH:

Getting Cold:
https://bit.ly/3oqWsq4

Getting Hot:
https://bit.ly/3gdLaTk

How are you feeling about the basics of Endothermic and Exothermic Reactions? Circle one:



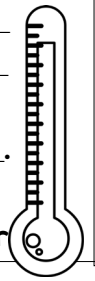
Name: _____ Class: _____ Date: _____

Endothermic & Exothermic Reactions

ESSENTIAL QUESTION:

VOCAB

_____
A _____ of how _____ molecules are _____. Like a speedometer



_____
The initial substances present _____ a reaction occurs.

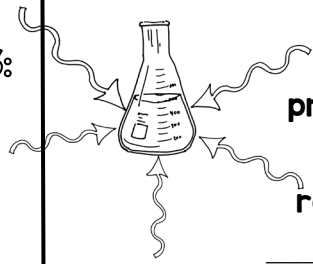
CH_4 + $2O_2$ → CO_2 + H_2O

methane | oxygen gas | carbon dioxide | water

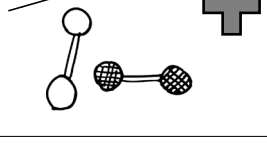
_____
The final substances present _____ a reaction occurs.

TOPIC QUESTIONS:

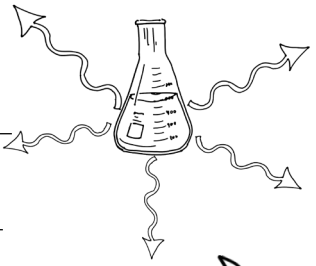
1

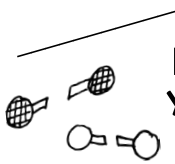
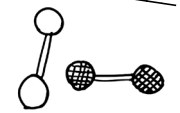


If in order for the reaction or process to happen, energy must be _____ by the reaction _____ from the _____, then the basic equation would be . . .

_____ +  yields 

If the reaction or process happens and it _____ energy from the _____ system to the surroundings, then the basic _____ would be . . .



 yield  +  _____

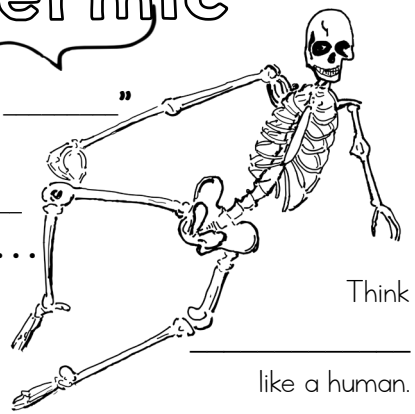
2

ENERGY

Endothermic

“ _____ ” “ _____ ”

In an _____ reaction or process . . .

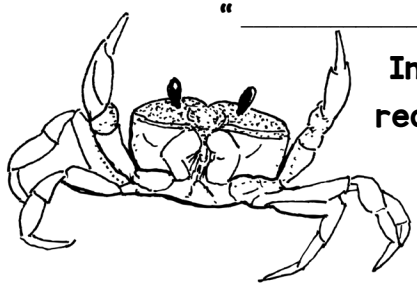


Think _____ like a human.

Exothermic

Think _____ like a crab.

“ _____ ” “ _____ ”

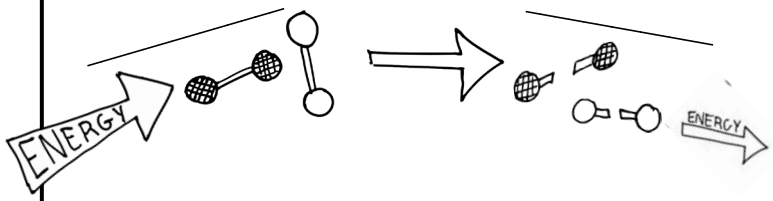


In an _____ reaction or process . . .

TOPIC QUESTIONS:

3

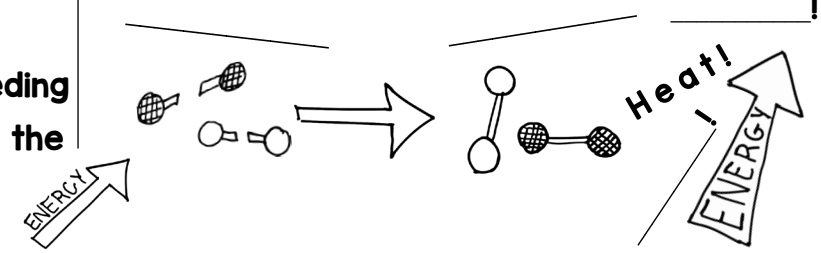
Endothermic



In an endothermic reaction or process, _____ of energy is being used for b r e a k i n g _____ but NOT for speeding up the _____ of the particles, so the _____ of the reaction drops

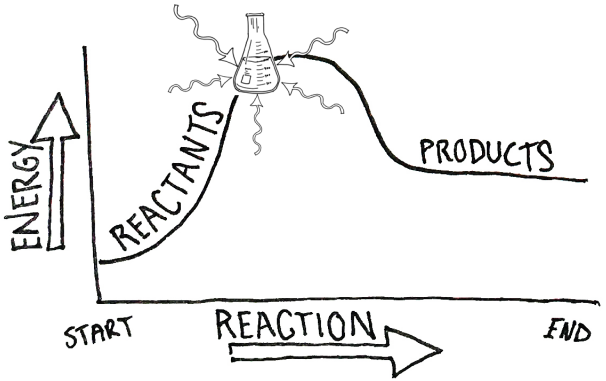
Exothermic

In an exothermic reaction or process, LOTS of energy is _____ when _____ bonds form. That heat energy speeds up the _____ of the particles and the temperature of the reaction goes up



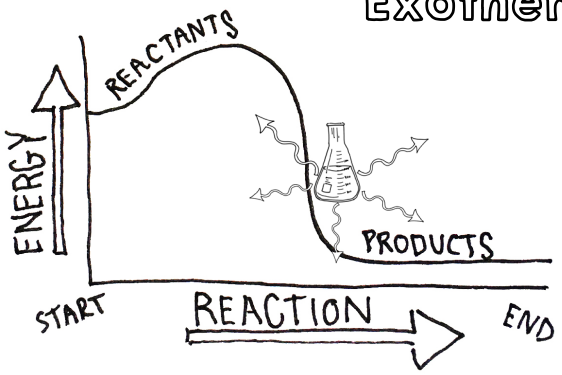
4

Endothermic



Energy needs to be absorbed to _____ bonds, so the process needs to _____ heat and the products have _____ energy than the reactants did. The reaction system will feel _____ to the touch because . . .

Exothermic

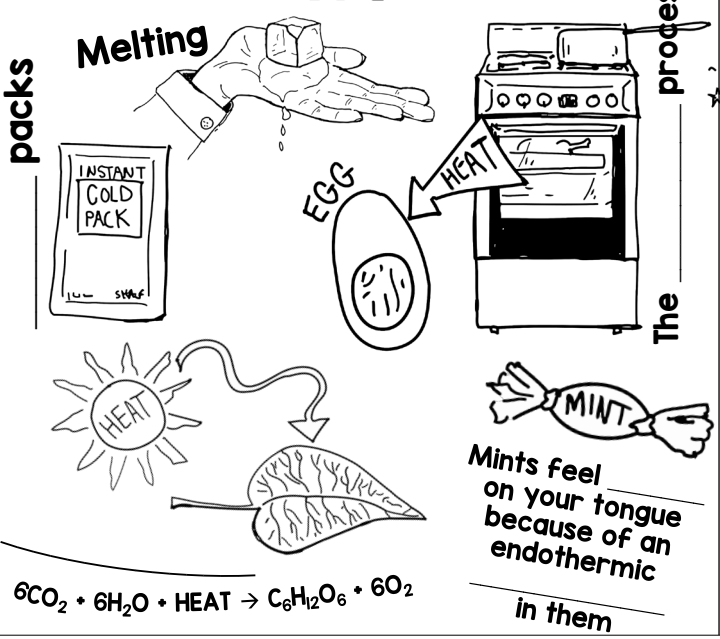


Energy is _____ in the form of heat, _____, and _____ when new bonds form so the products have _____ energy than the reactants did. The reaction system will feel _____ to the touch because . . .

TOPIC QUESTIONS:

5

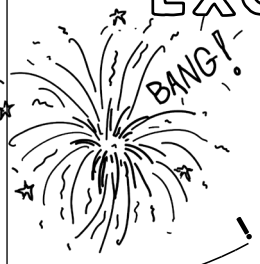
Endothermic



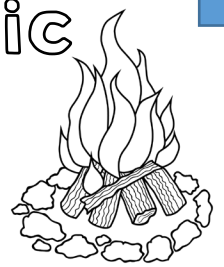
$6CO_2 + 6H_2O + HEAT \rightarrow C_6H_{12}O_6 + 6O_2$

Mints feel _____ on your tongue because of an endothermic _____ in them

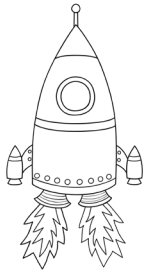
Exothermic



Hand _____ !

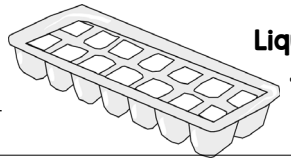


Fire



rocket fuel

Water vapor (gas) _____ to liquid water on the outside of a cold glass

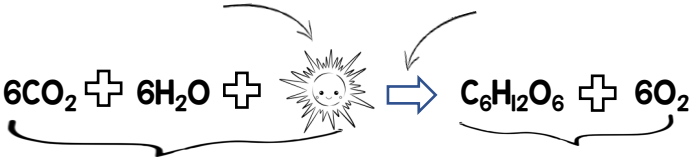


Liquid _____ to solid (heat is released)

SUM IT UP!

1. Label the parts of the reaction using the words from the word bank:

yield sign	products	reactants	heat



2. Decide whether these reactions/processes are ENDOthermic or EXOthermic. Write the answer on the line.

_____ A student makes a volcano with baking soda and vinegar and the "lava" feels cold.

_____ A solid burns brightly and releases heat, light and sound.

_____ Liquid water becomes ice after sitting in the freezer.

_____ Two chemicals will only react if you heat them continually.

_____ A reaction's products have less energy than the reactants did.

_____ Energy is needed for bonds to break in a chemical reaction.

$2 SUMMARY

Write a summary of this lesson. You have $2 and each word costs 10 cents.

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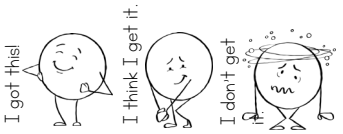

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