



I love me some spaghetti  
and meatballs!

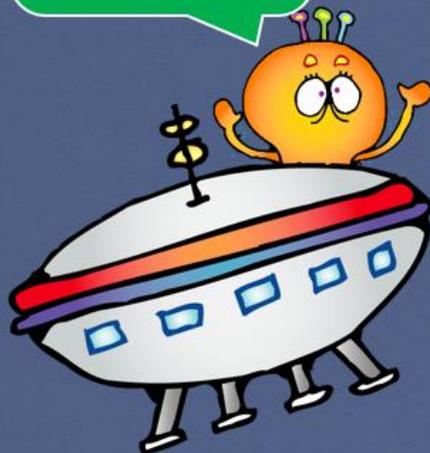
# EARTH SCIENCE

## Interactive Notebook

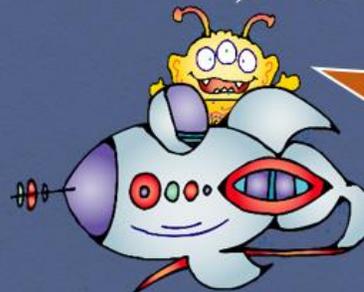
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### Earth's Atmosphere

What did you  
think of that  
new  
restaurant on  
the moon?



The food was  
okay, but  
there was just  
no  
atmosphere...



Going to give  
Earth a shot  
tonight...it has  
good reviews.



Created for you by Dr. Erica Colón

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## Introduction

If you are new to the idea of using a Science Interactive Notebook in your classroom, stop by my Nitty Gritty Science shop and download my Intro to Science Interactive Notebooks tutorial for FREE! In there you will find tips on how to begin with your students, what materials to have on hand and, most importantly, how it will enhance your students learning through reflection and creativity.

## Focused Lessons with Differentiated Instruction

The lessons shared on the following pages cover National Science Standards and meet students' needs. I have given you the notes that I would give my students (Right Side - Input Side of Notebook) so you can understand what I'm having the students focus on when working on their creative assignments (Left Side - Output Side of Notebook). Each lesson focuses on a Question of the Day (QOD) represented in red in the top margin of each "Input" page with student giving answer in red on "Output" page.

## Left Side - Output

Instructions for each Output Side are included. This includes cut-outs, foldables or master copies where applicable. You may find that students work slow at first, but once groups are organized and students know what is expected from them, not only will you see more energy focused on the final product, but also you will be shocked at the level of creativity certain students have in certain areas.

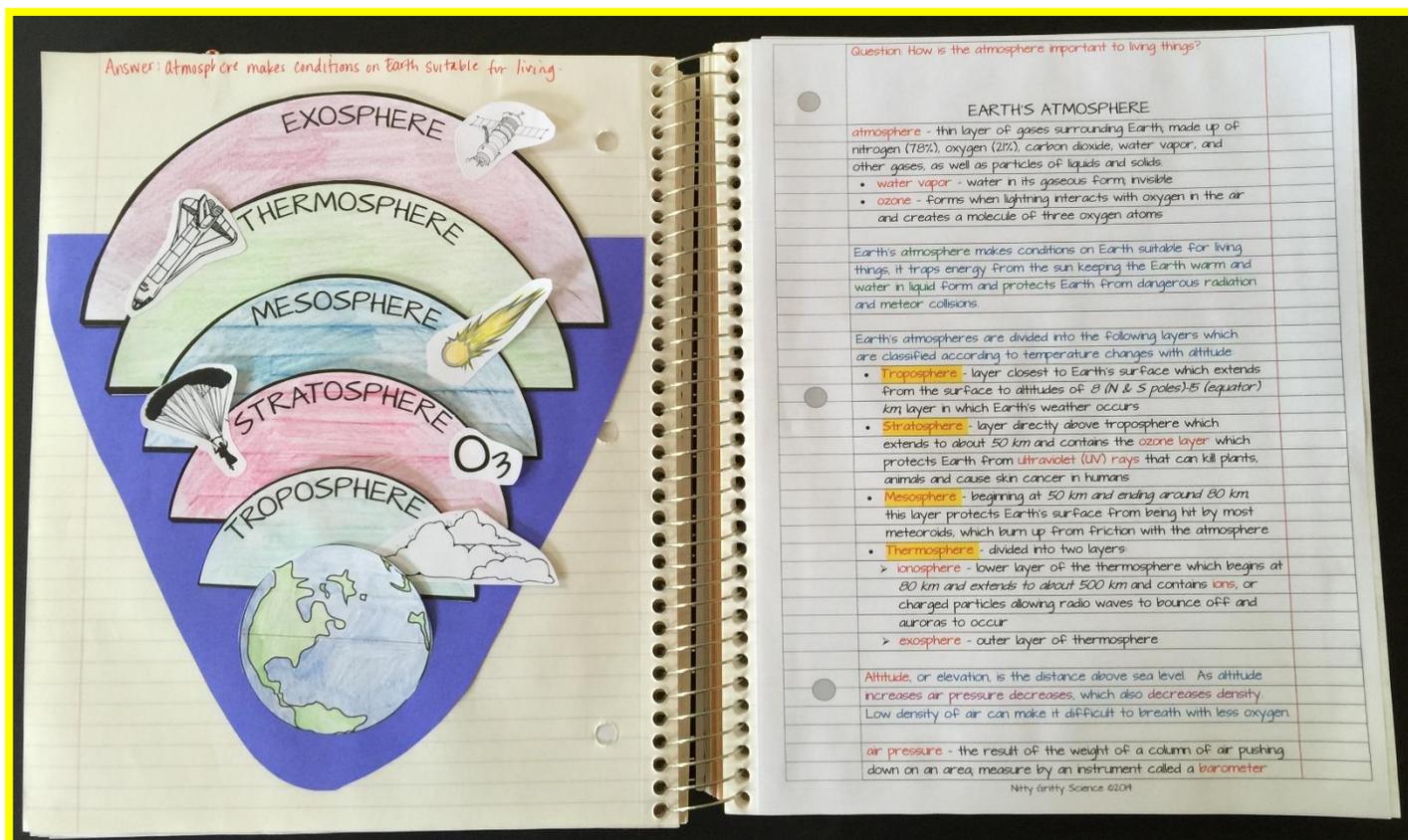
## Mini-Assessments

Mini quizzes will be given for each section so you may monitor student's level of understanding. For reproduction purposes, there are two quizzes to a page so you can cut in half and save on some paper 😊

**\*\* NEW - CHECK OUT MY STORE! \*\***

You asked, I listened...I will be offering EDITABLE NOTES with an EDITABLE CHAPTER TEST for each chapter of my Earth Science Interactive Notebooks!

## Section I: Earth's Atmosphere



### Description:

Students learn the names and order of the layers of Earth's Atmosphere with this activity. They are also asked to write a brief description as well as identify objects within each layer. I have



included two versions - one has the layers already labeled, and the other has a list of names where the students need to cut out and identify each layer.

A student printable with cut-outs are included, as well as a mini quiz.

## Layers of the Atmosphere

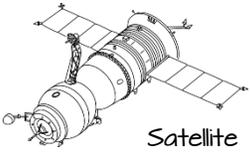
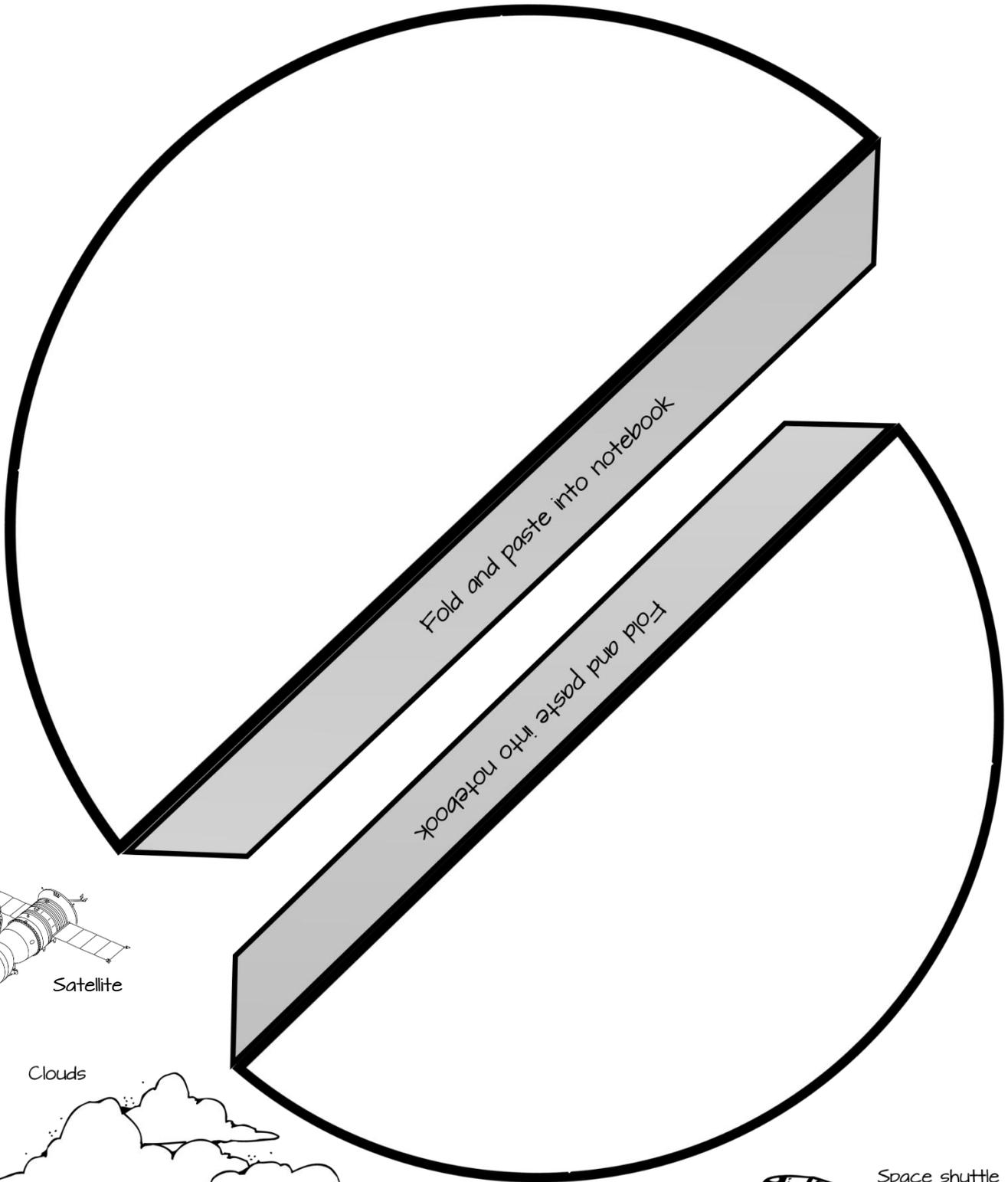
Directions:

1. Cut out the diagrams and names of the atmosphere layers on the following pages.
  2. Place the semi-circles in order from smallest to largest. The smallest semi-circle represents the layer of the atmosphere closest to Earth's surface, the largest represents the layer furthest from Earth's surface. Paste the names of the atmosphere layers on the appropriate semi-circle.
  3. Write a description of the atmosphere layers on each cut-out.
  4. Determine and paste the images (clouds, meteor, ozone layer, space shuttle, and parachute) in the atmosphere layer in which they are found.
  5. In your Science Interactive Notebook, fold and paste the atmosphere layers about 2 cm apart starting with the image of the Earth closest to you.
- 

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Satellite

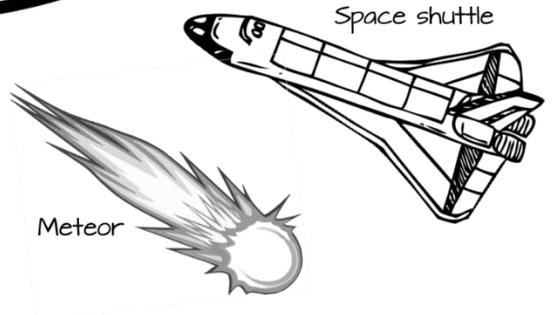
Clouds



Ozone layer

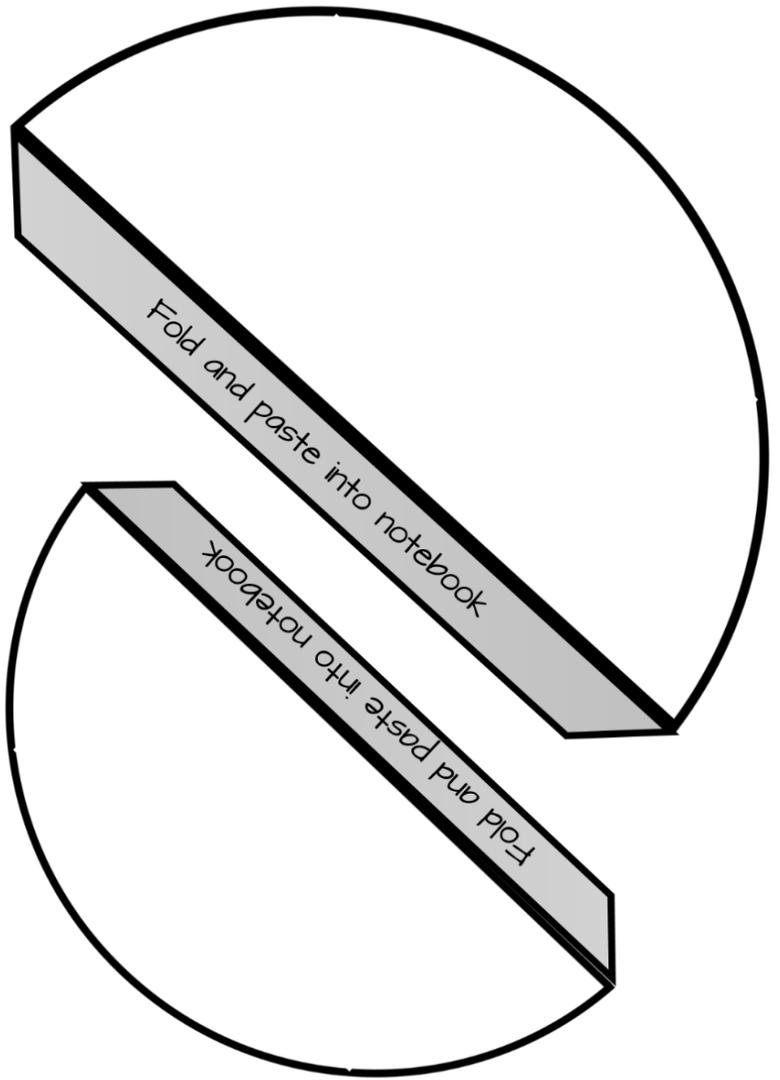
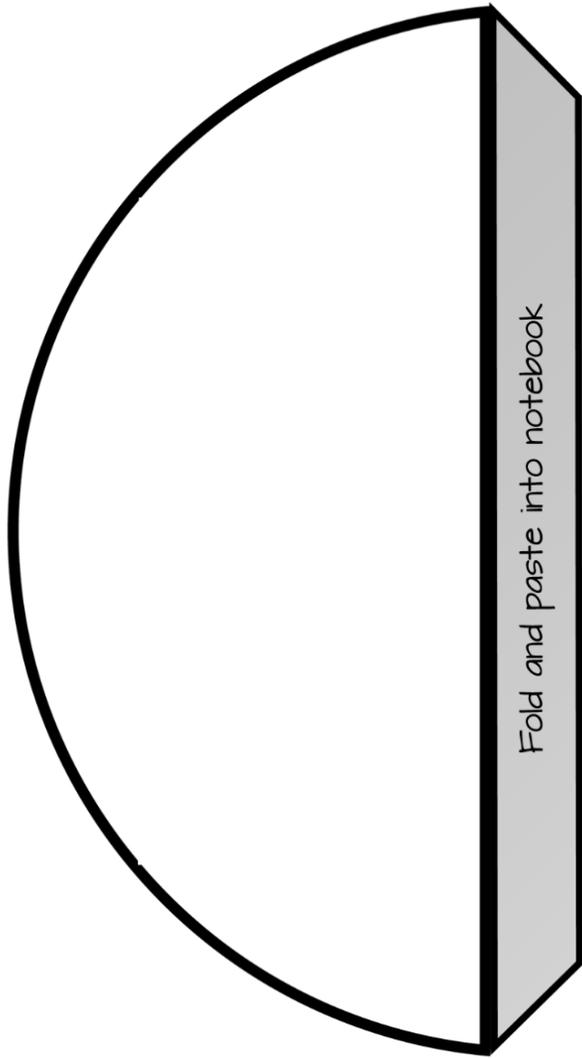


World record made in 2014 when someone parachuted from this height.



Space shuttle

Meteor



TROPOSPHERE  
THERMOSPHERE  
STRATOSPHERE  
EXOSPHERE  
MESOSPHERE



## Layers of the Atmosphere

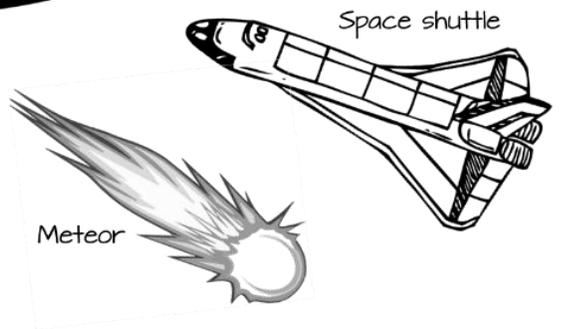
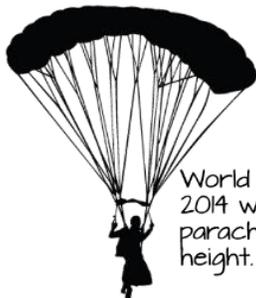
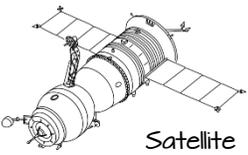
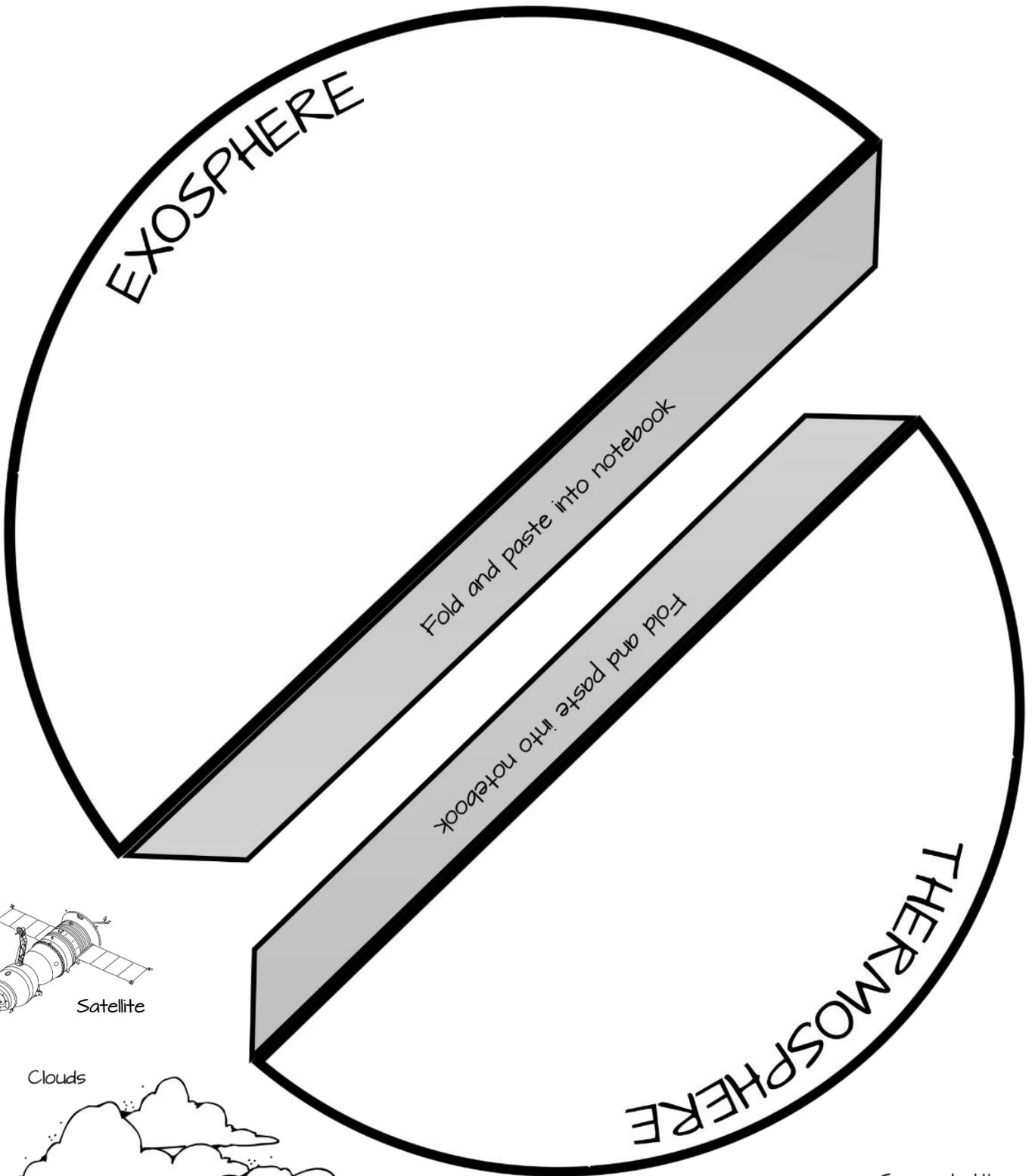
Directions:

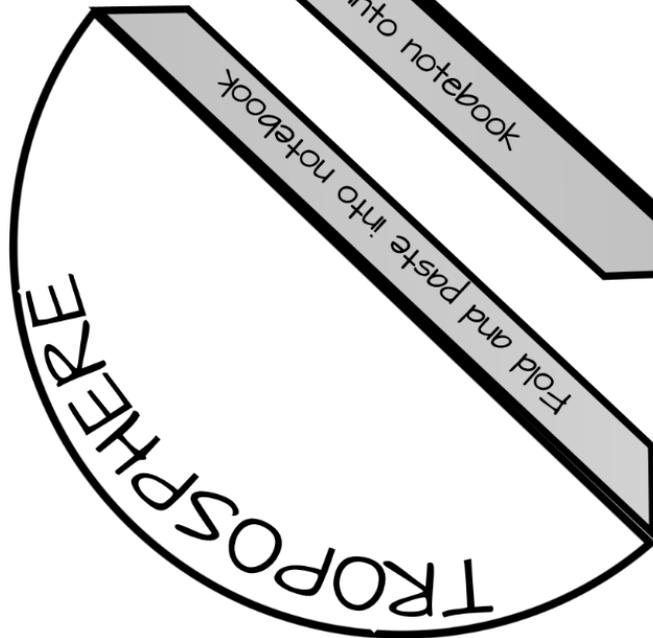
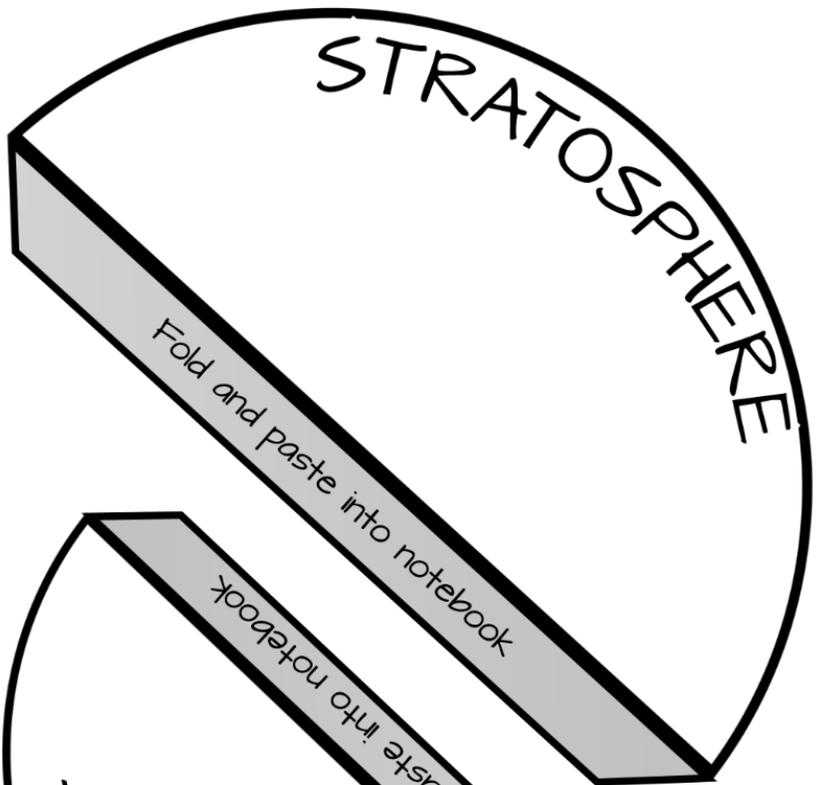
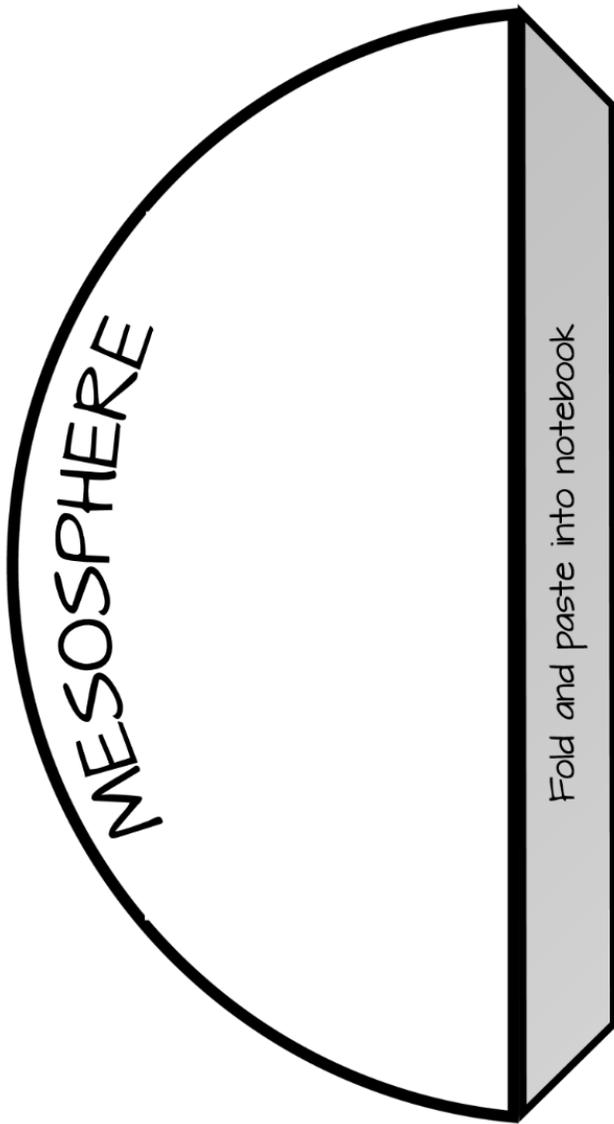
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  4. Determine and paste the images (clouds, meteor, ozone layer, space shuttle, and parachute) in the atmosphere layer in which they are found.
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Name \_\_\_\_\_ Date \_\_\_\_\_

Quiz: Earth's Atmosphere

*Circle the word that makes the statement true.*

1. (Nitrogen, Oxygen) is the most abundant gas in the atmosphere.
  2. (Water vapor, Ozone) forms when lightning interacts with oxygen in the air.
  3. The (troposphere, mesosphere) layer protect Earth from getting hit by most meteoroids.
  4. As altitude above Earth increases air pressure (decreases, increases).
  5. The main layers of the atmosphere are classified according to changes in (precipitation, temperature).
  6. Air pressure is measured by an instrument called a (barometer, altimeter).
  7. The (mesosphere, stratosphere) helps protect Earth from too much ultraviolet radiation because this layer of the atmosphere contains ozone.
- 

Name \_\_\_\_\_ Date \_\_\_\_\_

Quiz: Earth's Atmosphere

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## Section 2: Atmosphere: Energy Transfer

Answer: Radiation, conduction and convection.

Question: How is heat transferred in the troposphere?

### ATMOSPHERE: ENERGY TRANSFER

**radiation** - transfer of energy by electromagnetic waves, or energy that can travel through space

99% of radiant energy from the Sun that reaches Earth is either **visible light** - majority of sunlight in the form of a mixture of all the colors you see in a rainbow  
**infrared radiation (IR)** - form of energy with wavelengths longer than visible light and is not visible but can be felt as heat  
**ultraviolet light (UV)** - has short wavelengths and can break chemical bonds

**greenhouse effect** - as sunlight enters the atmosphere, it is converted to infrared radiation and is trapped by gases in the air, or **greenhouse gases**, a natural process to regulate temperature on Earth, which is one of the most important elements of weather

There are three types of thermal energy transfer that work together to heat the troposphere

- 1 **radiation** (see above)
- 2 **conduction** - transfer of thermal energy by contact of particles of matter, occurs where atmosphere touches Earth
- 3 **convection** - transfer of thermal energy by movement of particles within matter; heating of air currents

Convection currents are formed by less dense air, warmed by Earth's surface, being forced to rise by the downward movement of cooler, denser air.

**stability** - refers to whether circulating air motions will be strong or weak; **stable conditions** are caused by weak circulating air; **unstable conditions** are caused by strong moving air usually producing thunderstorms

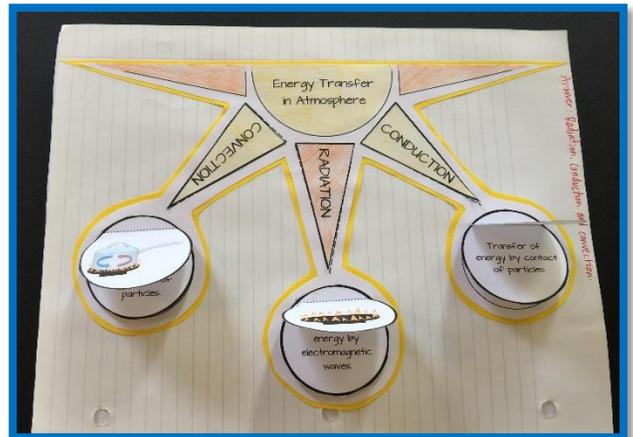
**temperature inversion** - occurs in the troposphere when temperature increases as altitude increases, trapped pollution can be a result of temperature inversion

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### Description:

Students will need to review the different forms of energy transfer and identify the definition and diagram for each, then describe or draw a real-world example of each.

Printable, cut-outs, teacher answer key and a mini-quiz are all included for this concept.



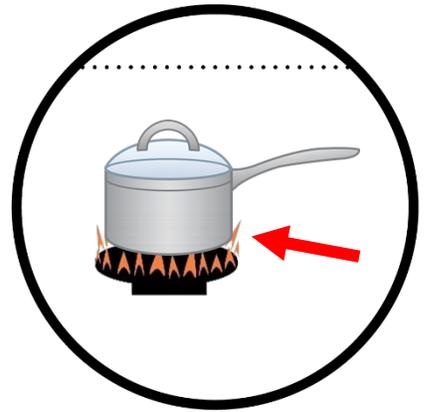
# Energy Transfer in Atmosphere

Directions:

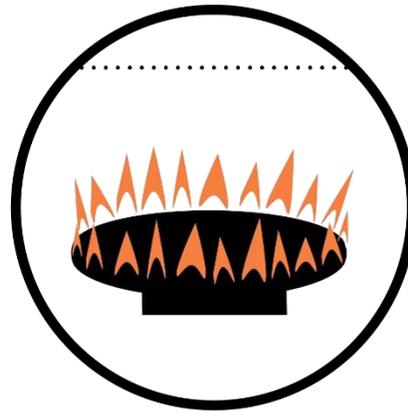
1. Cut out the following shapes below. Decide what picture and definition belongs to each type of thermal energy.
  2. Paste the vocab "rays" of the sun on the following diagram, then draw an example of how this type of thermal energy occurs on Earth.
  3. Layer the toppers on the correct circles matching the definition and diagram to each example you've drawn, Paste finished diagram into your Science Interactive Notebook.
- 



Transfer of energy by electromagnetic waves.



Transfer of energy by movement of particles.

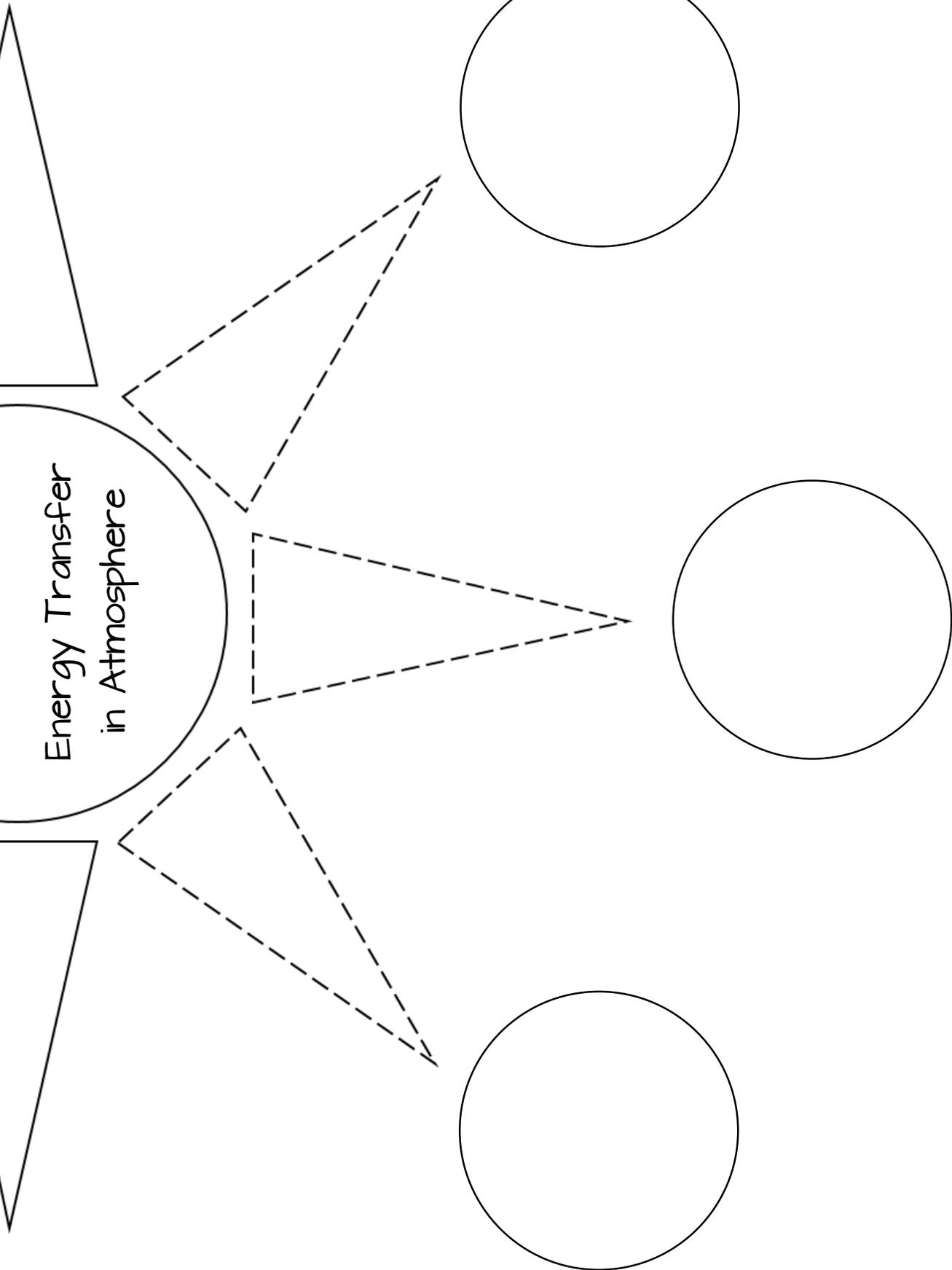


Transfer of energy by contact of particles.

RADIATION

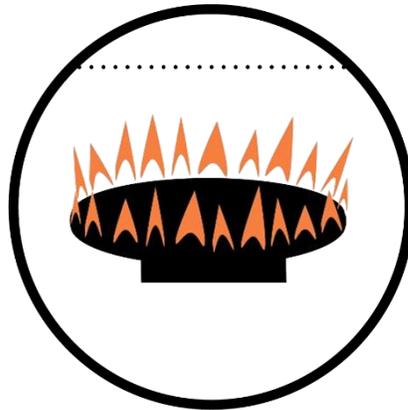
CONDUCTION

CONVECTION



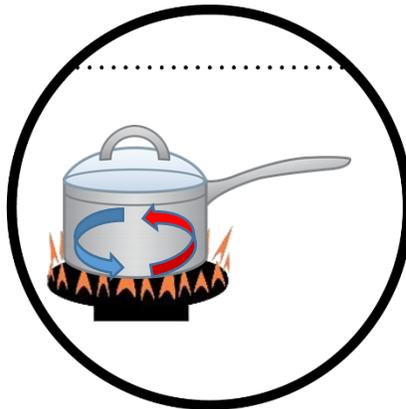
Answer Key:

RADIATION



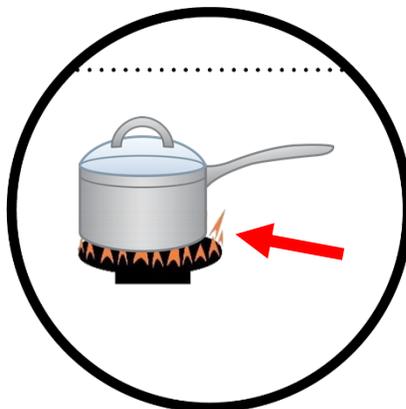
Transfer of energy by electromagnetic waves.

CONVECTION



Transfer of energy by movement of particles.

CONDUCTION



Transfer of energy by contact of particles.

Name \_\_\_\_\_ Date \_\_\_\_\_

### Quiz: Atmosphere: Energy Transfer

Match the term with the proper description.

- |                              |   |
|------------------------------|---|
| ___ 1. visible light         | a. sunlight enters the atmosphere, is converted to infrared radiation and is trapped by gasses in air |
| ___ 2. greenhouse effect     | b. temperature increases as altitude increases  |
| ___ 3. conduction            | c. transfer of energy by electromagnetic waves  |
| ___ 4. convection            | d. form of energy with wavelengths longer than visible light and can be felt as heat                  |
| ___ 5. radiation             | e. transfer of thermal energy by contact of particles of matter                                       |
| ___ 6. temperature inversion | f. majority of sunlight in form of a mixture of all the colors you see in a rainbow                   |
| ___ 7. infrared radiation    | g. has short wavelengths and can break chemical bonds   |
| ___ 8. ultraviolet light     | h. transfer of thermal energy by movement of particles within matter                                  |
- 

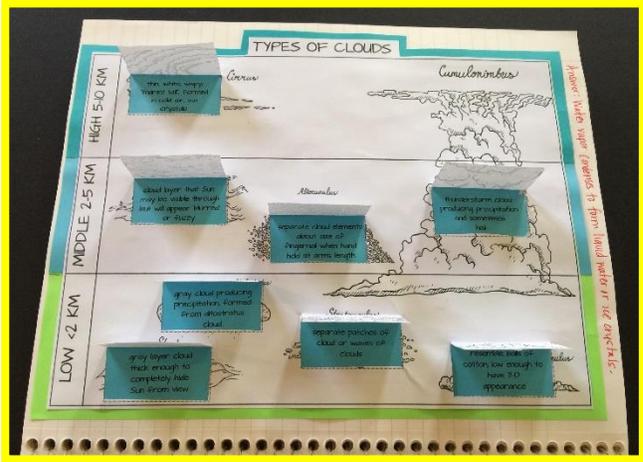
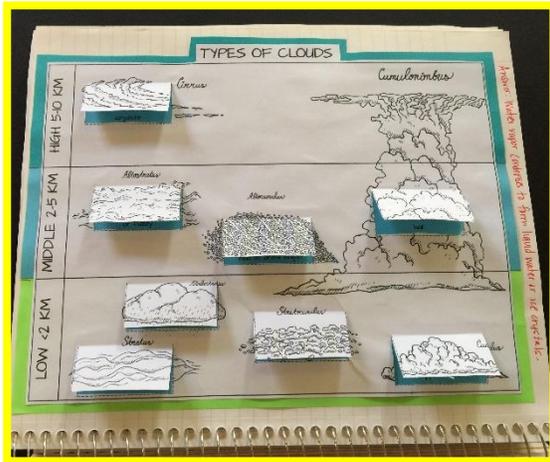
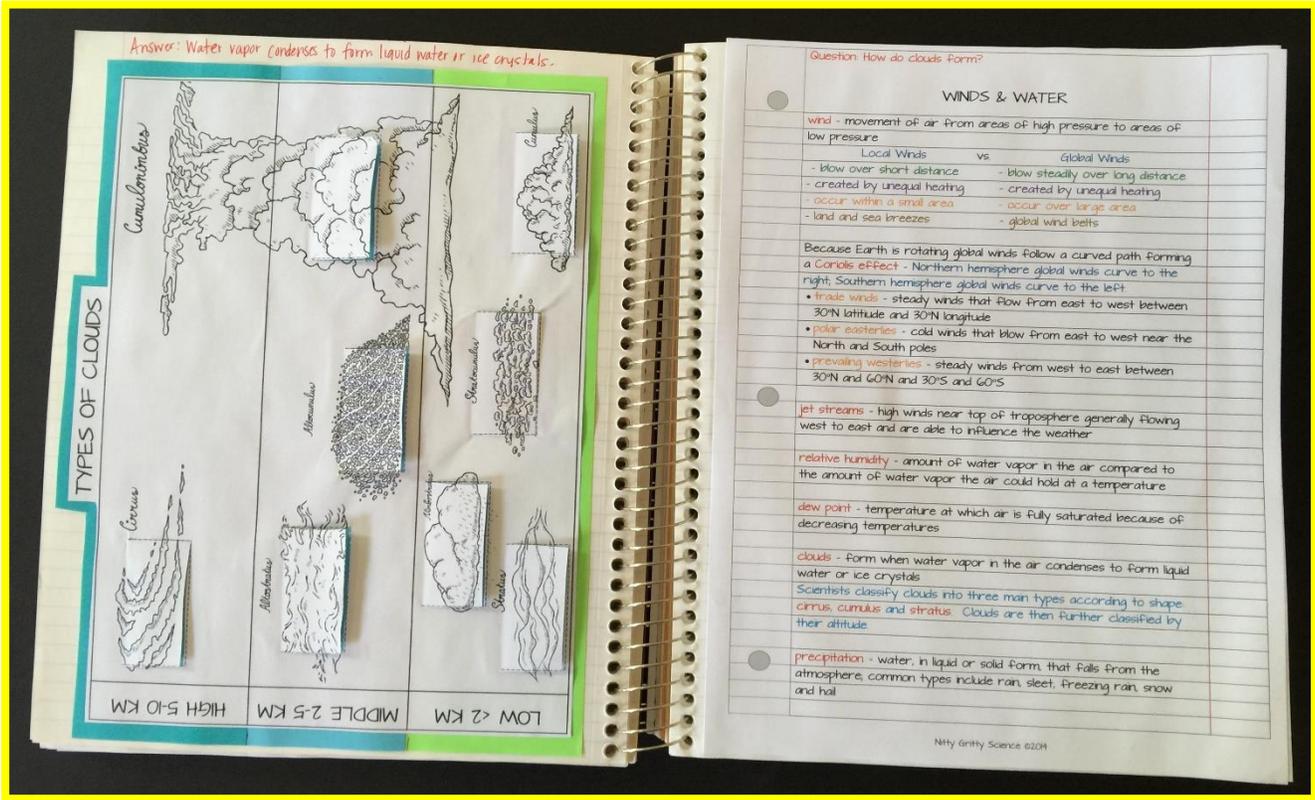
Name \_\_\_\_\_ Date \_\_\_\_\_

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| ___ 7. infrared radiation    | g. has short wavelengths and can break chemical bonds   |
| ___ 8. ultraviolet light     | h. transfer of thermal energy by movement of particles within matter                                  |

# Section 3: Winds & Water



## Description:

Students will be able to identify types of clouds based on their shape and their altitude in the troposphere. Each description will be placed behind a flap for each cloud which will help students self-quiz themselves for review. I have made a version where clouds are already labeled and another where students need to label clouds themselves.

Printables with cut-out flaps, teacher answer key and a mini-quiz are all included for this concept.

# Types of Clouds

Introduction: Meteorologists classify clouds into three main types based on their shape: cumulus, stratus and cirrus. Clouds are further classified by their altitude. Using your knowledge of clouds, complete the following activity by identifying each cloud and matching the correct description with each cloud diagram.

Directions:

1. Label each cloud by its name on the following Types of Cloud page.
2. Cut out the "flaps" using the dotted lines being careful to ONLY cut the three sides so "flap" opens.
2. Cut out the descriptions below and correctly paste behind each cloud diagram.
3. Use your knowledge of cloud types to correctly draw a CIRROCUMULUS cloud at the proper altitude.
4. Color and paste completed diagram into your Science Interactive Notebook.

cloud layer that Sun  
may be visible through  
but will appear blurred  
or fuzzy

resemble balls of  
cotton; low enough to  
have 3-D  
appearance

gray cloud producing  
precipitation; formed  
from altostratus  
cloud

thin, white, wispy;  
"mare's tail", formed  
in cold air, ice  
crystals

thunderstorm cloud  
producing precipitation  
and sometimes  
hail

separate patches of  
cloud or waves of  
clouds

gray layer cloud  
thick enough to  
completely hide  
Sun from view

separate cloud elements  
about size of  
fingernail when hand  
held at arms length



# Types of Clouds

Introduction: Meteorologists classify clouds into three main types based on their shape: cumulus, stratus and cirrus. Clouds are further classified by their altitude. Using your knowledge of clouds, complete the following activity matching the correct description with each cloud diagram.

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2. Cut out the descriptions below and correctly paste behind each cloud diagram.
3. Use your knowledge of cloud types to correctly draw a CIRROCUMULUS cloud at the proper altitude.
4. Color and paste completed diagram into your Science Interactive Notebook.

cloud layer that Sun may be visible through but will appear blurred or fuzzy

resemble balls of cotton; low enough to have 3-D appearance

gray cloud producing precipitation; formed from altostratus cloud

thin, white, wispy; "mare's tail", formed in cold air, ice crystals

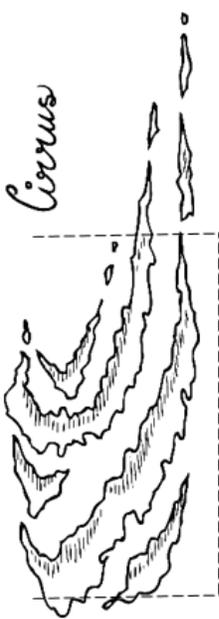
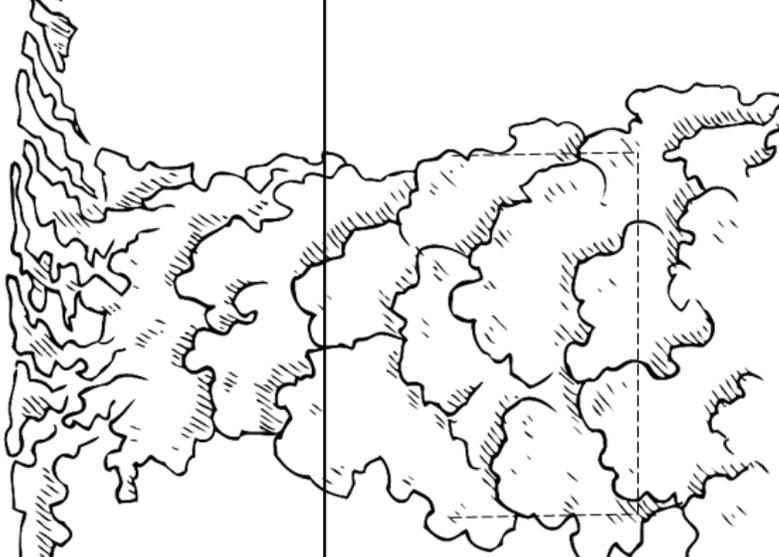
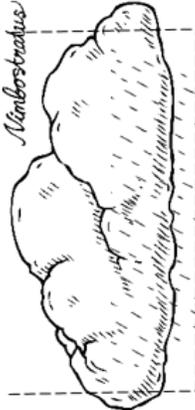
thunderstorm cloud producing precipitation and sometimes hail

separate patches of cloud or waves of clouds

gray layer cloud thick enough to completely hide Sun from view

separate cloud elements about size of fingernail when hand held at arms length

# TYPES OF CLOUDS

HIGH 5-10 KM	 <p><i>Cirrus</i></p>	MIDDLE 2-5 KM	 <p><i>Altostratus</i></p>  <p><i>Altiocumulus</i></p>  <p><i>Cumulonimbus</i></p>
LOW < 2 KM	 <p><i>Nimbostratus</i></p>  <p><i>Stratocumulus</i></p>  <p><i>Stratus</i></p>  <p><i>Cumulus</i></p>		

Answer Key:

cloud layer that Sun  
may be visible through  
but will appear blurred  
or fuzzy

**ALTOSTRATUS**

resemble balls of  
cotton; low enough to  
have 3-D  
appearance

**CUMULUS**

gray cloud producing  
precipitation; formed  
from altostratus  
cloud

**NIMBOSTRATUS**

thin, white, wispy;  
"mare's tail", formed  
in cold air, ice  
crystals

**CIRRUS**

thunderstorm cloud  
producing precipitation  
and sometimes  
hail

**CUMULONIMBUS**

separate patches of  
cloud or waves of  
clouds

**STRATOCUMULUS**

gray layer cloud  
thick enough to  
completely hide  
Sun from view

**STRATUS**

separate cloud elements  
about size of  
fingernail when hand  
held at arms length

**ALTOCUMULUS**

For the CIRROCUMULUS cloud, students should draw thin, wispy-looking cotton balls that are broken up in the high level since cirrus clouds are formed where it is very cold, and there is little water vapor making them thin and wispy.

Name \_\_\_\_\_ Date \_\_\_\_\_

**Quiz: Winds and Water**

*Compare and contrast the following:*

1. Local winds and global winds:

---

---

2. Trade winds and prevailing westerlies:

---

---

3. Cirrus clouds and cumulus clouds:

---

---

4. Sleet and snow:

---

---

-----  
Name \_\_\_\_\_ Date \_\_\_\_\_

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1. Local winds and global winds:

---

---

2. Trade winds and prevailing westerlies:

---

---

3. Cirrus clouds and cumulus clouds:

---

---

4. Sleet and snow:

---

---

# Section 4: Air Quality

AQI Category	Color	AQI Value	Health Concerns
Good	Green	0-50	Air quality is considered safe, and air pollution poses little or no risk.
Moderate	Yellow	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy for Sensitive Groups	Orange	101-150	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Unhealthy	Red	151-200	Health alert: everyone may experience more serious health effects.
Very Unhealthy	Purple	201-300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	Maroon	>300	

*Answer: Burning of fossil fuels, particulates and natural disasters.*

Which Month American city's AQI increased possibly due to Cold weather/increased CO<sub>2</sub> City B Volcano or Forest Fire City C Warm weather, ozone/CO<sub>2</sub> City A

Question: What are the major sources of air pollution?

**AIR QUALITY**

- air pollution** - the contamination of air by harmful substances including gas and smoke
- Some air pollution occurs naturally, but many pollutants are the result of human activity.
- point-source pollution** - pollution that comes from an identifiable source (ie. smokestacks, erupting volcano)
- nonpoint-source pollution** - pollution that comes from a wide-spread area and cannot be traced back to one source (ie. large city)
- Air pollution is not just harmful to human health, it can also damage plants, harm lakes and ponds and can damage man-made structures.
- The majority of air pollution comes from the burning of **Fossil Fuels**, (coal, oil, gasoline and diesel fuels) which result in pollutants that include carbon monoxide, nitrogen oxides and sulfur dioxides.
- acid precipitation** - sulfur dioxide and nitrogen oxides that combine with moisture in the atmosphere which forms precipitation with a pH lower than that of normal rainwater, includes acid rain, snow and fog.
- photochemical smog** - air pollution that forms from the interaction between chemicals in the air and sunlight.
- particulate matter** - mixture of dust, acids and other chemicals that can be hazardous to human health.
- Air Quality Index (AQI)** - an index for reporting daily air quality in order to alert people with various allergies or respiratory disorders when air quality becomes dangerous.
- The Clean Air Act (est 1970) gives the U.S. government the power to set air quality standards to protect organisms and structures from harmful effects of air pollution.

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*Answer: Burning of fossil fuels, particulates and natural disasters.*

Which Month American city's AQI increased possibly due to Cold weather/increased CO<sub>2</sub> City B Volcano or Forest Fire City C Warm weather, ozone/CO<sub>2</sub> City A

*Answer: Burning of fossil fuels, particulates and natural disasters.*

Which Month American city's AQI increased possibly due to Cold weather/increased CO<sub>2</sub> City B Volcano or Forest Fire City C Warm weather, ozone/CO<sub>2</sub> City A

## Description:

Students will learn about the Air Quality Index (AQI) that the Environmental Protection Agency (EPA) uses to report national air quality. They will need to graph the data of three cities and conclude the source of air pollution using their graph and the AQI.

Please use this source as a reference for you and your students:

[http://www.epa.gov/airnow/aqi\\_brochure\\_02\\_14.pdf](http://www.epa.gov/airnow/aqi_brochure_02_14.pdf)

Printables with two versions are included - one has AQI table completed, the other has missing information that the students need to fill in using online resources, along with a mini-quiz.

# Air Quality Index

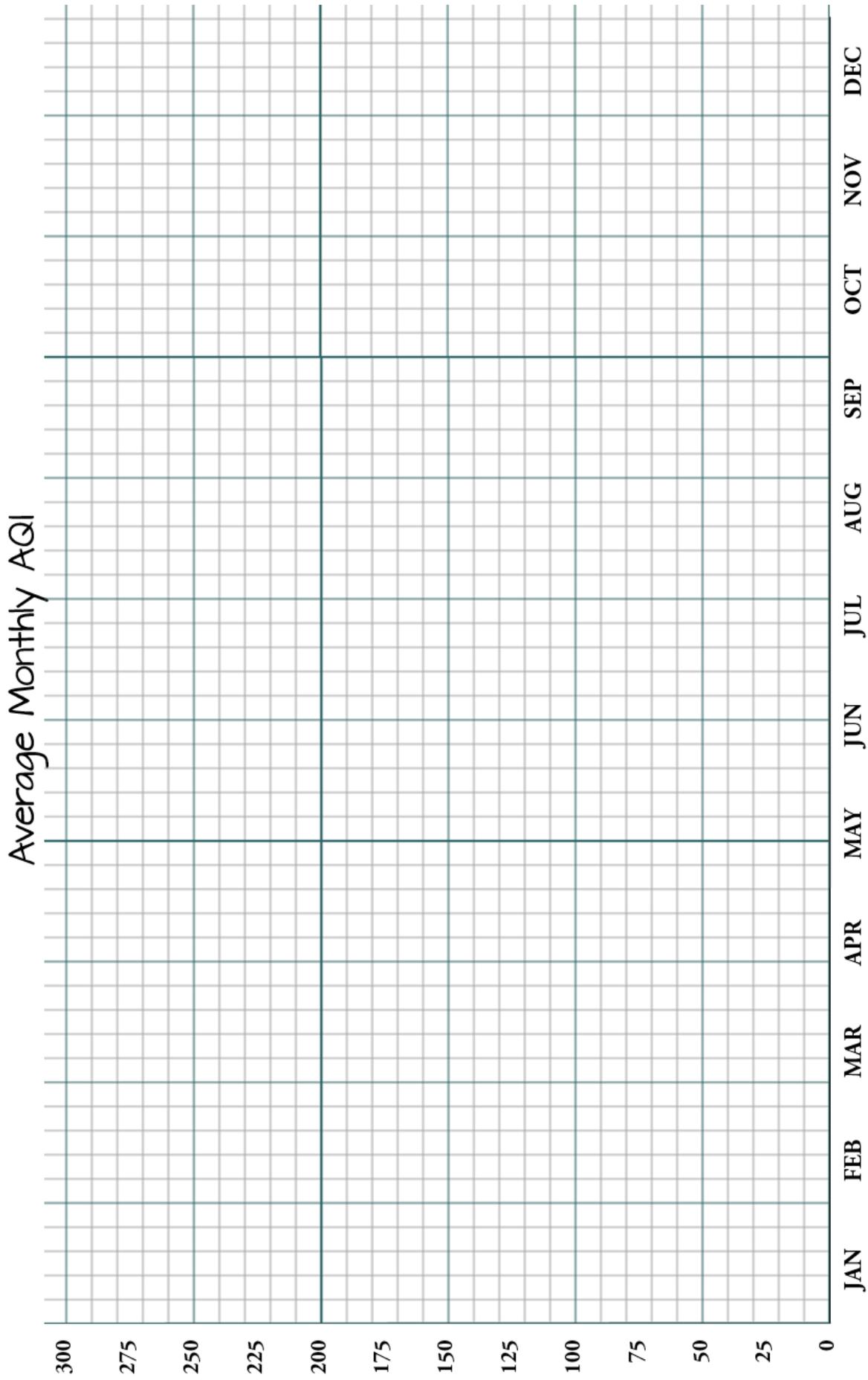
The Air Quality Index (AQI) is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health concerns you should be aware of. The AQI focuses on health effects that can happen within a few hours or days after breathing polluted air. EPA uses the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect against harmful health. (EPA-454K-03-002, August 2003, <http://www.airnow.gov/>)

**Directions:**

1. Cut out the Air Quality Index below and fill in the missing information.
2. Use the AQI and the data table to complete a bar graph comparing the air quality of three different cities. Be sure to color EACH bar (labeled A, B or C) in your graph according to the value of the AQI.
3. Use the graph to identify the cause of low air quality for each city then cut and paste the graph and questions, along with the AQI in your Science Interactive Notebook.

Data Table												
City	Average Monthly AQI											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A	50	57	48	82	115	134	161	140	120	95	65	47
B	99	97	78	52	47	40	32	40	50	55	71	85
C	10	14	20	20	15	17	28	30	27	19	276	145

AIR QUALITY INDEX (AQI)			
AQI Category	Color	# Value	Health Concerns
Good		0-50	
Moderate		51-100	
Unhealthy for Sensitive Groups		101-150	
Unhealthy		151-200	
Very Unhealthy		201-300	
Hazardous		>300	



Question: Which North American city's AQI increased possibly due to:

Cold weather/soot/increased CO \_\_\_\_\_ Volcano or Forest Fire \_\_\_\_\_

Warm weather ozone/CO \_\_\_\_\_

# Air Quality Index

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**Directions:**

1. Use the data table along with the Air Quality Index to complete a bar graph comparing the air quality of three different cities. Be sure to color EACH bar (labeled A, B or C) in your graph according to the value of the AQI.
2. Answer the questions to identify the cause of low air quality for each city.
3. Cut and paste the graph and questions, along with the AQI in your Science Interactive Notebook.

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AIR QUALITY INDEX (AQI)			
AQI Category	Color	# Value	Health Concerns
Good	Green	0-50	Air quality is considered safe and air pollution poses little or no risk.
Moderate	Yellow	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people.
Unhealthy for Sensitive Groups	Orange	101-150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	Red	151-200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	Purple	201-300	Health alert: everyone may experience more serious health effects.
Hazardous	Maroon	>300	Health warnings of emergency conditions. The entire population is more likely to be affected.

Name \_\_\_\_\_ Date \_\_\_\_\_

### Quiz: Air Quality

*Circle the word that makes the statement true.*

1. In 1970 the US government set air quality standards called the (Breath Easy Act, Clean Air Act).
  2. Particles of carbon that enter the air when wood or coal are burned are called (dust, soot).
  3. Over the past 30 years, air quality in the United States has generally (improved, declined).
  4. One cause of (acid rain, soot) is the burning of coal that contains a lot sulfur.
  5. Harmful substances in air, water, or soil are called (pollutants, particles).
  6. (Purple, Green) represents safe air quality on the Air Quality Index.
  7. Pollution that comes from a volcano is called (nonpoint-source, point-source).
  8. The majority of air pollution comes from (burning fossil fuels, particulate matter).
- 

Name \_\_\_\_\_ Date \_\_\_\_\_

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## Answer Key

### Quiz: Earth's Atmosphere

1. Nitrogen
2. Ozone
3. mesosphere
4. decreases
5. temperature
6. barometer
7. stratosphere

### Quiz: Atmosphere: Energy Transfer

1. F
2. A
3. E
4. H
5. C
6. B
7. D
8. G

### Quiz: Winds & Water

1. both movements of air created by unequal heating; local - short distance, occurs within small area; global - long distance, large area
2. both steady winds; trade - flow east to west between latitude 30°N and 30°S; prevailing westerlies - blow west to east, between lat 30-60°N and 30-60°S
3. Form when water vapor condenses; cirrus - wispy, feathery, formed at high altitude; cumulus - fluffy cotton, indicates fair weather
4. both water that fall from atmosphere; sleet - rain freezes as it falls through air; snow - water vapor in cloud converted directly to ice crystals

### Quiz: Air Quality

1. Clean Air Act
2. soot
3. improved
4. acid rain
5. pollutants
6. Green
7. point-source
8. burning fossil fuels



Thank you for your recent download of the new Earth Science Interactive Notebook series!

I know this resource will allow you and your students to have a successful year using Science Interactive Notebooks and will be a wonderful portfolio to show all they have learned throughout the school year. I can guarantee students will show pride in their work and be willing to share their notebook entries with you, their classmates and their families.

Please check out my store for the Physical and Life Science Interactive Notebook Series, as well as my Science Inquiry Units. Also, check out my new blog [www.NittyGrittyScience.blogspot.com](http://www.NittyGrittyScience.blogspot.com) to see examples and how we're getting down to the Nitty Gritty in Science Education!!

Happy Notebooking,

Dr. Erica L Colón

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Question: How is the atmosphere important to living things?

## EARTH'S ATMOSPHERE

**atmosphere** - thin layer of gases surrounding Earth; made up of nitrogen (78%), oxygen (21%), carbon dioxide, water vapor, and other gases, as well as particles of liquids and solids.

- **water vapor** - water in its gaseous form; invisible
- **ozone** - forms when lightning interacts with oxygen in the air and creates a molecule of three oxygen atoms

Earth's atmosphere makes conditions on Earth suitable for living things, it traps energy from the sun keeping the Earth warm and water in liquid form and protects Earth from dangerous radiation and meteor collisions.

Earth's atmospheres are divided into the following layers which are classified according to temperature changes with altitude:

- **Troposphere** - layer closest to Earth's surface which extends from the surface to altitudes of 8 (N & S poles)-15 (equator) km; layer in which Earth's weather occurs
- **Stratosphere** - layer directly above troposphere which extends to about 50 km and contains the **ozone layer** which protects Earth from **ultraviolet (UV) rays** that can kill plants, animals and cause skin cancer in humans
- **Mesosphere** - beginning at 50 km and ending around 80 km, this layer protects Earth's surface from being hit by most meteoroids, which burn up from friction with the atmosphere
- **Thermosphere** - divided into two layers:
  - **ionosphere** - lower layer of the thermosphere which begins at 80 km and extends to about 500 km and contains **ions**, or charged particles allowing radio waves to bounce off and auroras to occur
  - **exosphere** - outer layer of thermosphere

**Altitude**, or **elevation**, is the distance above sea level. As altitude increases **air pressure decreases**, which also **decreases density**.  
Low density of air can make it difficult to breath with less oxygen.

**air pressure** - the result of the weight of a column of air pushing down on an area; measure by an instrument called a **barometer**

Question: How is heat transferred in the troposphere?

## ATMOSPHERE: ENERGY TRANSFER

**radiation** - transfer of energy by electromagnetic waves, or energy that can travel through space

99% of radiant energy from the Sun that reaches Earth is either:

**visible light** - majority of sunlight in the form of a mixture of all the colors you see in a rainbow

**infrared radiation (IR)** - form of energy with wavelengths longer than visible light and is not visible but can be felt as heat

**ultraviolet light (UV)** - has short wavelengths and can break chemical bonds

**greenhouse effect** - as sunlight enters the atmosphere, it is converted to infrared radiation and is trapped by gases in the air, or **greenhouse gases**; a natural process to regulate **temperature** on Earth, which is one of the most important elements of weather

There are three types of thermal energy transfer that work together to heat the troposphere:

1. **radiation** (see above)

2. **conduction** - transfer of thermal energy by contact of particles of matter; occurs where atmosphere touches Earth

3. **convection** - transfer of thermal energy by movement of particles within matter; heating of air currents

**Convection currents** are formed by less dense air, warmed by Earth's surface, being forced to rise by the downward movement of cooler, denser air.

**stability** - refers to whether circulating air motions will be strong or weak; **stable conditions** are caused by weak circulating air, **unstable conditions** are caused by strong moving air usually producing **thunderstorms**

**temperature inversion** - occurs in the troposphere when temperature increases as altitude increases; trapped pollution can be a result of temperature inversion

Question: How do clouds form?

## WINDS & WATER

**wind** - movement of air from areas of high pressure to areas of low pressure

### Local Winds

vs.

### Global Winds

- blow over short distance

- blow steadily over long distance

- created by unequal heating

- created by unequal heating

- occur within a small area

- occur over large area

- land and sea breezes

- global wind belts

Because Earth is rotating global winds follow a curved path forming a **Coriolis effect** - Northern hemisphere global winds curve to the right; Southern hemisphere global winds curve to the left.

- **trade winds** - steady winds that flow from east to west between 30°N latitude and 30°S latitude

- **polar easterlies** - cold winds that blow from east to west near the North and South poles

- **prevailing westerlies** - steady winds from west to east between latitude lines 30°N and 60°N and 30°S and 60°S

**jet streams** - high winds near top of troposphere generally flowing west to east and are able to influence the weather

**relative humidity** - amount of water vapor in the air compared to the amount of water vapor the air could hold at a temperature

**dew point** - temperature at which air is fully saturated because of decreasing temperatures

**clouds** - form when water vapor in the air condenses to form liquid water or ice crystals

Scientists classify clouds into three main types according to shape: **cirrus, cumulus and stratus**. Clouds are then further classified by their altitude.

**precipitation** - water, in liquid or solid form, that falls from the atmosphere; common types include rain, sleet, freezing rain, snow and hail

Question: What are the major sources of air pollution?

## AIR QUALITY

**air pollution** - the contamination of air by harmful substances including gas and smoke

Some air pollution occurs naturally, but many pollutants are the result of human activity:

**point-source pollution** - pollution that comes from an identifiable source (i.e. smokestacks, erupting volcano)

**nonpoint-source pollution** - pollution that comes from a wide-spread area and cannot be traced back to one source (i.e. large city)

Air pollution is not just harmful to human health, it can also damage plants, harm lakes and ponds and can damage man-made structures.

The majority of air pollution comes from the burning of **fossil fuels**, (coal, oil, gasoline and diesel fuels) which result in pollutants that include carbon monoxide, nitrogen oxides and sulfur dioxides.

**acid precipitation** - sulfur dioxide and nitrogen oxides that combine with moisture in the atmosphere which forms precipitation with a pH lower than that of normal rainwater; includes acid rain, snow and fog

**photochemical smog** - air pollution that forms from the interaction between chemicals in the air and sunlight

**particulate matter** - mixture of dust, acids and other chemicals that can be hazardous to human health

**Air Quality Index (AQI)** - an index for reporting daily air quality in order to alert people with various allergies or respiratory disorders when air quality becomes dangerous

The **Clean Air Act** (est 1970) gives the U.S. government the power to set air quality standards to protect organisms and structures from harmful effects of air pollution.

Special Thanks to the following for  
specific graphics/fonts featured in this  
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DJ Inkers