



Layers of the  
Atmosphere

# WEATHER UNIT

## Cycle 3 Science

Name \_\_\_\_\_

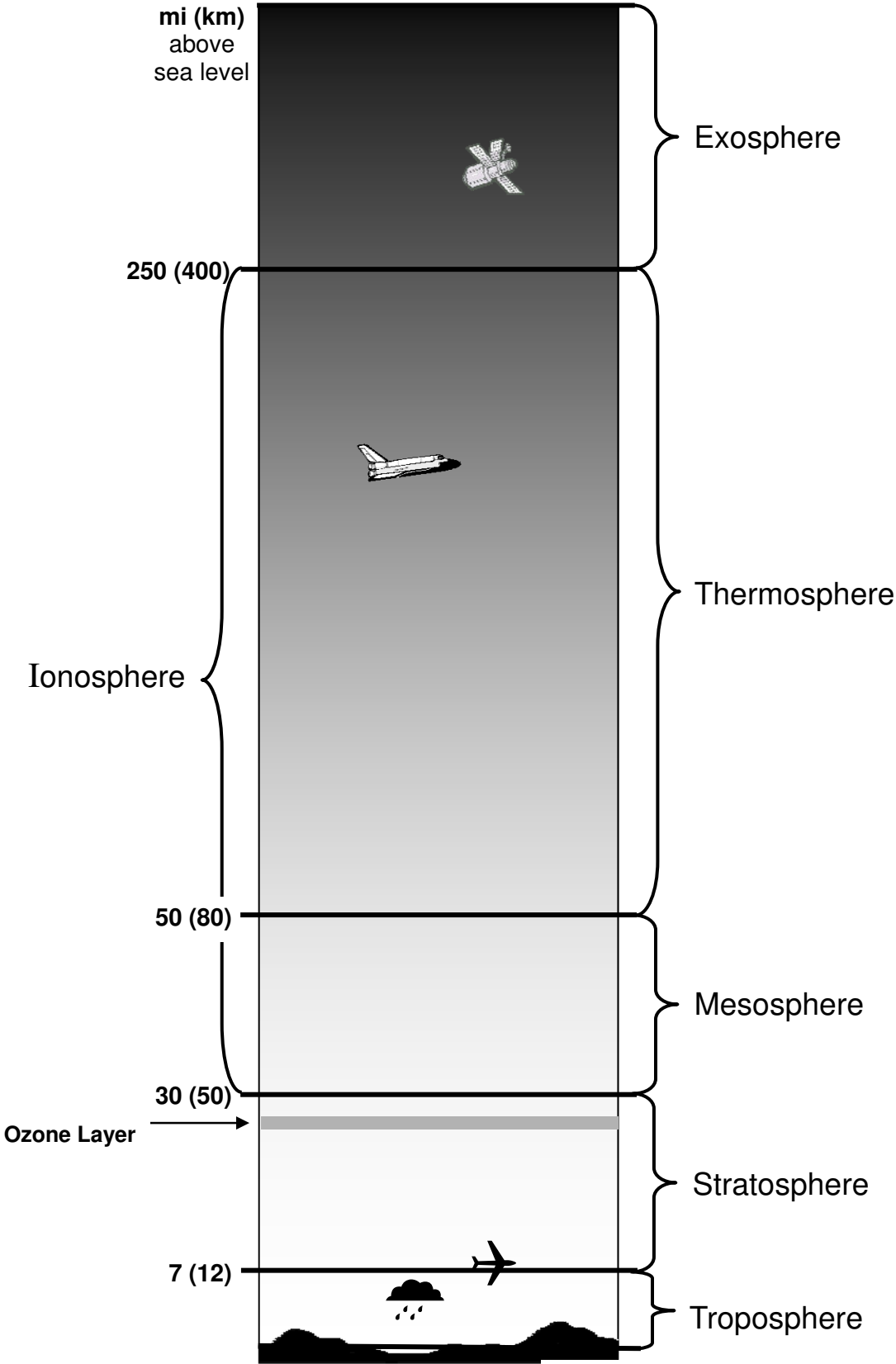
Teacher: Mr. Dan Strina

McCaig Elementary School



# NOTES---

## Atmospheric Layers



# NOTES--

## Layers of the Atmosphere

The 4 main layers of the atmosphere are classed according to changes in temperature.

- Troposphere** lowest layer of Earth's atmosphere. 9-16km above surface.  
Tropo- means "turning or changing"  
Where Earth's weather occurs  
Although shallowest layer of atmosphere, troposphere contains most of the mass of the atmosphere.  
As altitude increases, temperature decreases.  
Rain, snow storms and most clouds occur in troposphere.
- Stratosphere** from top of troposphere to 50km above Earth's surface.  
Strato means "layer or spreading out"  
Cold, -60° C  
Upper layer of stratosphere is warmer than lower layer. Contains ozone layer which absorbs heat from sun, warming the air.
- Mesosphere** Meso means "middle". Mesosphere is the middle layer of the atmosphere.  
Begins 50km above Earth's surface, ends 80km above Earth's surface.  
At top end temperature approaches -90°C.  
Most meteoroids burn up in the mesosphere, producing meteor trails.
- Thermosphere** outermost layer of the atmosphere.  
Thermo means "heat". The air is very hot there: 1800°C.  
Nitrogen & oxygen molecules convert solar energy into heat.  
Air is very thin, 0.001% as dense as the air at sea level.  
Extends from 80km above Earth's surface outward into space.  
There is no definite outer limit.
- Ionosphere** 2 layers of thermosphere are the ionosphere and the exosphere.  
From 80 – 550km above Earth's surface is ionosphere.  
It contains ions.  
Radio waves bounce off these ions in the ionosphere and bounce back to Earth's surface.  
Aurora borealis occurs in ionosphere.
- Exosphere** Exo means "outer", so exosphere is the outer layer of the thermosphere.  
It extends outward for 1000's of kilometers from 550km above Earth's surface.  
Satellites orbit in the exosphere.  
Phone calls and tv pictures reach you by communications satellites in exosphere.

# NOTES--

Weather is the condition of the air around us. Look outside. The weather may be hot or cold, wet or dry. Weather is caused by four factors. The factors are temperature, moisture, air pressure, and wind. You will learn about these factors in this unit.

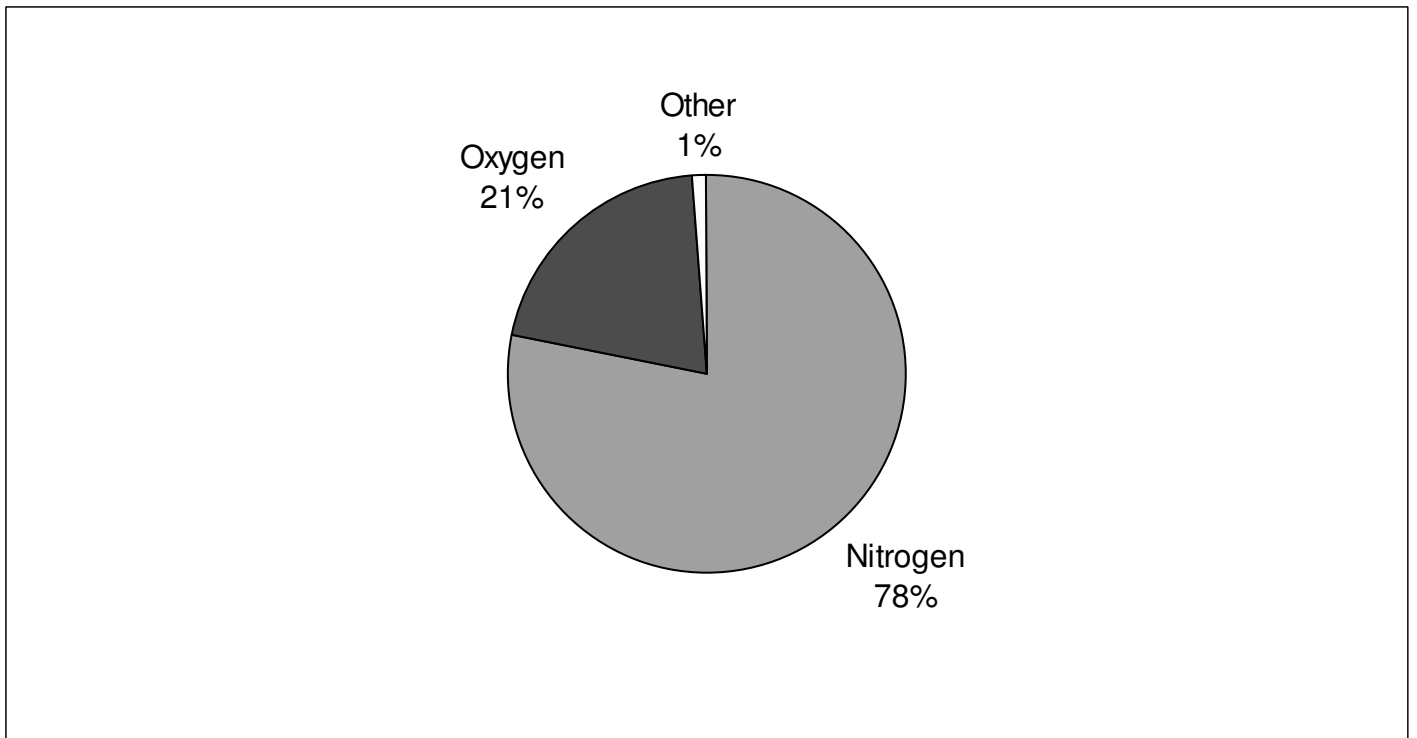
Earth is surrounded by a blanket of air called the atmosphere. All weather develops in the atmosphere. The atmosphere is a mixture of gases. About three fourths of the atmosphere is nitrogen. Almost one fourth is oxygen. The rest of the atmosphere is carbon dioxide and other gases.

Earth's **atmosphere** is held in place by gravity. The atmosphere protects life on the planet by absorbing ultraviolet radiation and by regulating temperature.

There is no exact place where Earth's atmosphere ends. Instead, it just gets gradually thinner and thinner (less dense) until it merges with outer space where it consists mostly of interplanetary gases such as hydrogen and helium.

## Air Composition

Ninety-nine percent of the air surrounding the Earth is found in the **troposphere** and the **stratosphere**. This air is made up of close to four-fifths nitrogen gas, and the rest is mostly oxygen gas. Small amounts of other gases and molecules are found in the air we breathe. Some of these are listed below.



Other major components of the air:  
(by descending percentage)

- Argon
- Carbon dioxide
- Neon
- Helium
- Methane
- Krypton
- Hydrogen
- Water vapor (variable percentage)

# NOTES--

## Composition of the Atmosphere:

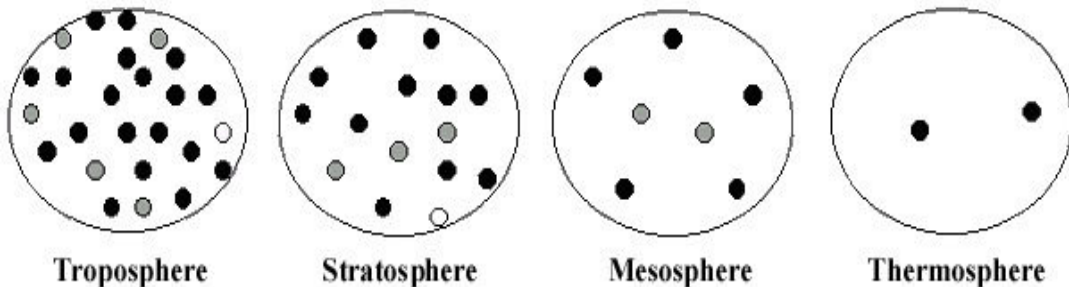
As one moves up in the atmosphere density decreases. Many experience this decrease in density as the "popping" of the ears while flying. This decrease in density is due to molecules positioning themselves farther apart.

Our atmosphere contains different types of gases; about 78% of the atmosphere is nitrogen, 21% is oxygen and 1% are various other gases. Nitrogen ( $N_2$ ) is most abundant and is essential for all living things to grow. Oxygen ( $O_2$ ) is necessary for plants and animals to use to release energy from food in a usable form.

The Ozone is made from a form of oxygen ( $O_3$ ). There are other gases in the atmosphere too! Carbon Dioxide ( $CO_2$ ), Argon (Ar), Neon (Ne), Helium (He), Methane, Krypton (Kr), Hydrogen (H).

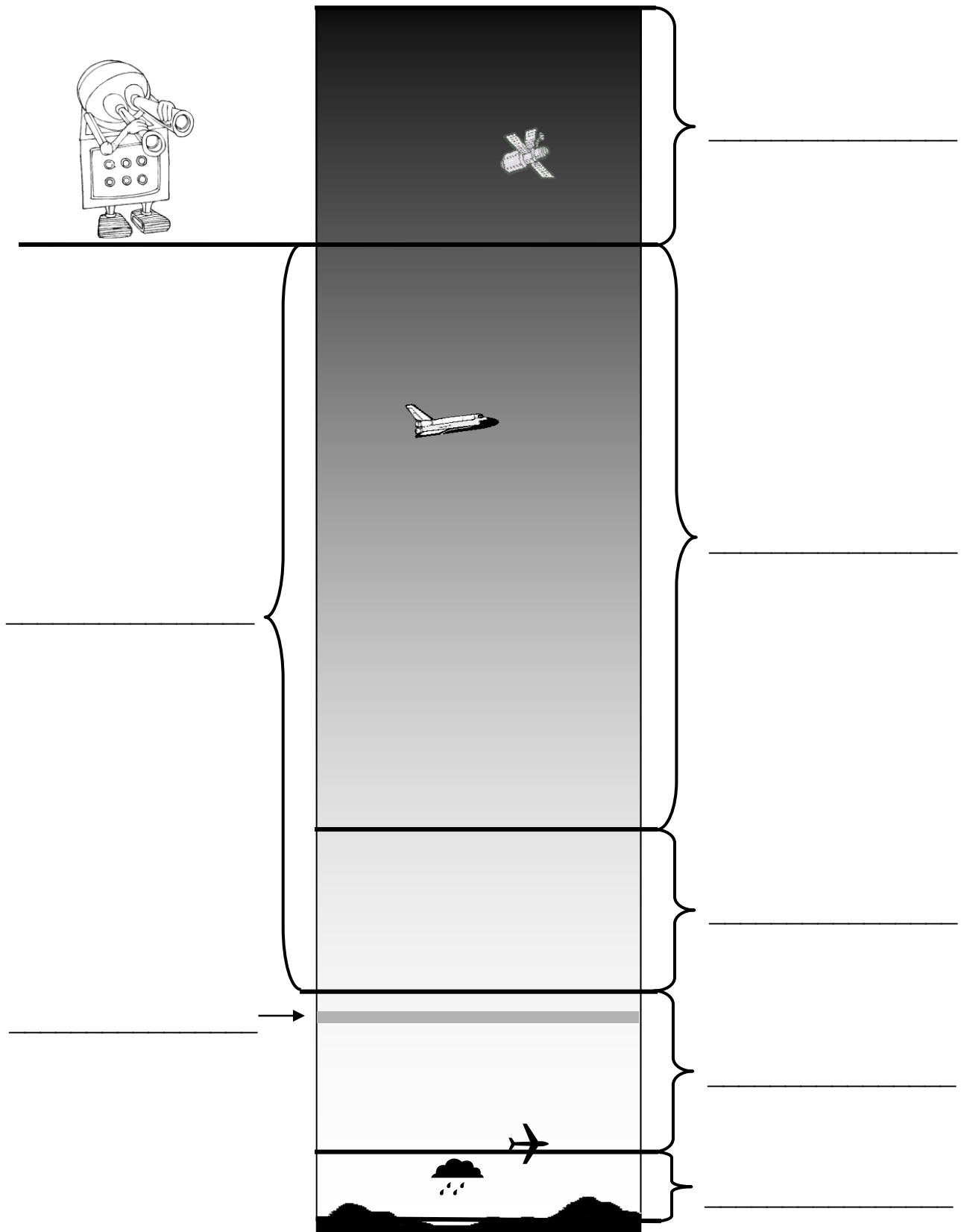
Carbon dioxide is Used by plants to produce food. Animals give off carbon dioxide as a waste product. Burning Fossil fuels release carbon dioxide into the air which causes the earth's temperature to rise.

In the troposphere, the molecules are very close together. In the other layers the number of molecules decrease and more space is between each molecule.



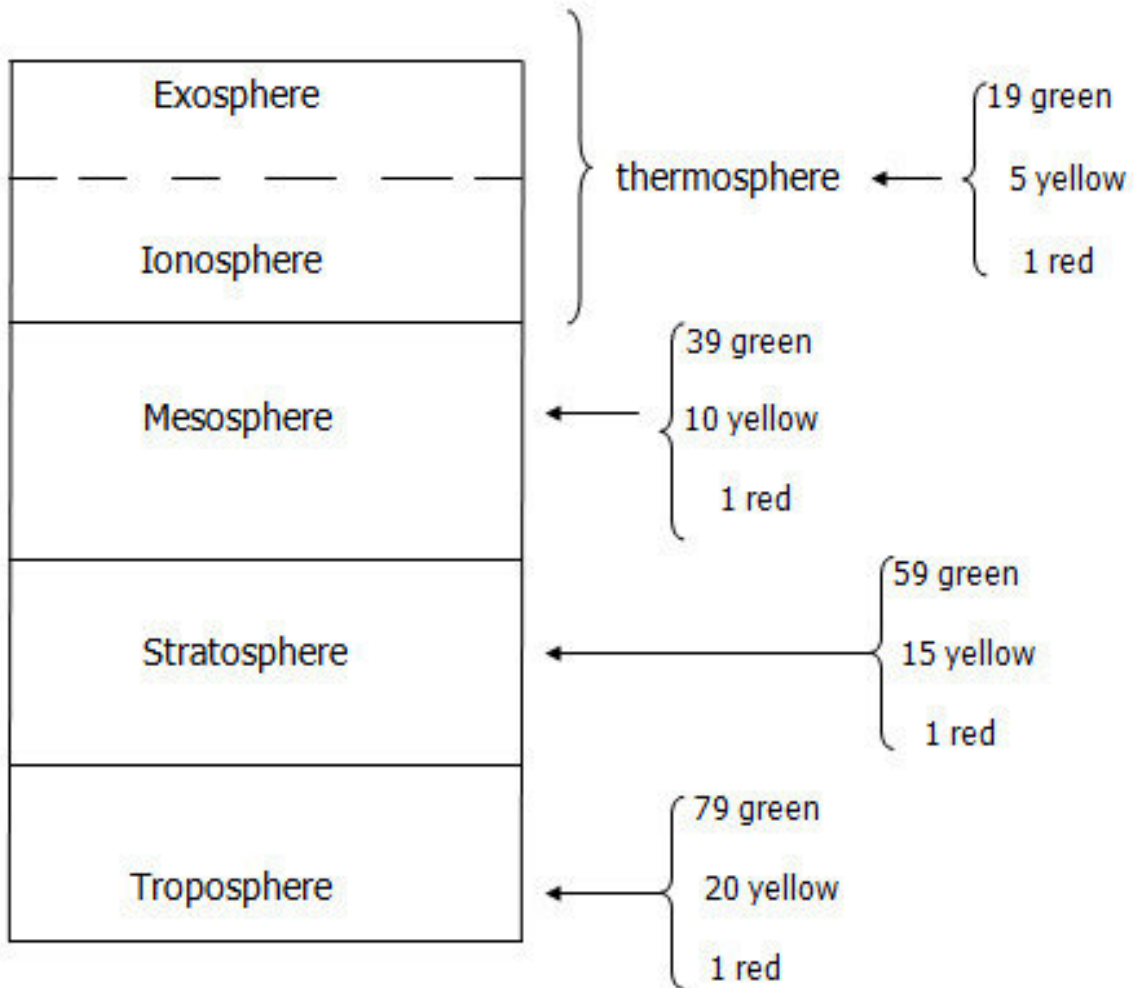
# ACTIVITIES---

Label the Atmospheric Layers



Complete the layers of the atmosphere below by drawing coloured molecules to show the composition of gases in the atmosphere by using the chart below. i.e. Yellow: O<sub>2</sub>- oxygen, Green; N<sub>2</sub>- nitrogen. Red – represent various gases.

Level	Total Number of Molecules	Nitrogen (green)	Oxygen (yellow)	Other Gases (red)
troposphere	100	79	20	1
stratosphere	75	59	15	1
mesosphere	50	39	10	1
thermosphere	25	19	5	1



You may draw clouds, meteors, satellites in the appropriate layer of the atmosphere.



**A. Fill in the missing words.**

1. Earth is surrounded by a blanket of air called \_\_\_\_\_  
(the atmosphere, oxygen)
2. The atmosphere is a mixture of \_\_\_\_\_  
(gases, rocks)
3. About three fourths of the atmosphere is \_\_\_\_\_  
(oxygen, nitrogen)
4. The layer of atmosphere closest to Earth is the \_\_\_\_\_.  
(troposphere, carbon dioxide)
5. Ozone keeps most of the sun's harmful \_\_\_\_\_ from  
reaching Earth. (radiation, sound waves)

**B. Answer True or False.**

1. Weather is the condition of the air around us.
2. Only the stratosphere contains enough air for living things to breathe.
3. All weather occurs in the mesosphere.
4. The air in the thermosphere becomes thinner and thinner until it fades into space.
5. There are several layers of the atmosphere.
6. Nitrogen keeps most of the sun's harmful radiation from reaching Earth.

**C. Answer the questions.**

1. Why are the gases of the environment important to living things?
  
  
  
  
  
  
  
  
  
  
2. What are the four factors that determine weather?

# Atmosphere Basics



Name at least 4 things our atmosphere does for us:

- 1.
- 2.
- 3.
- 4.
- 5.

What would happen if our atmosphere consisted of pure oxygen?

What is special about nitrogen, and what is its main function in the atmosphere?

Name at least 4 other gases in the atmosphere besides oxygen and nitrogen:

- 1.
- 2.
- 3.
- 4.
- 5.

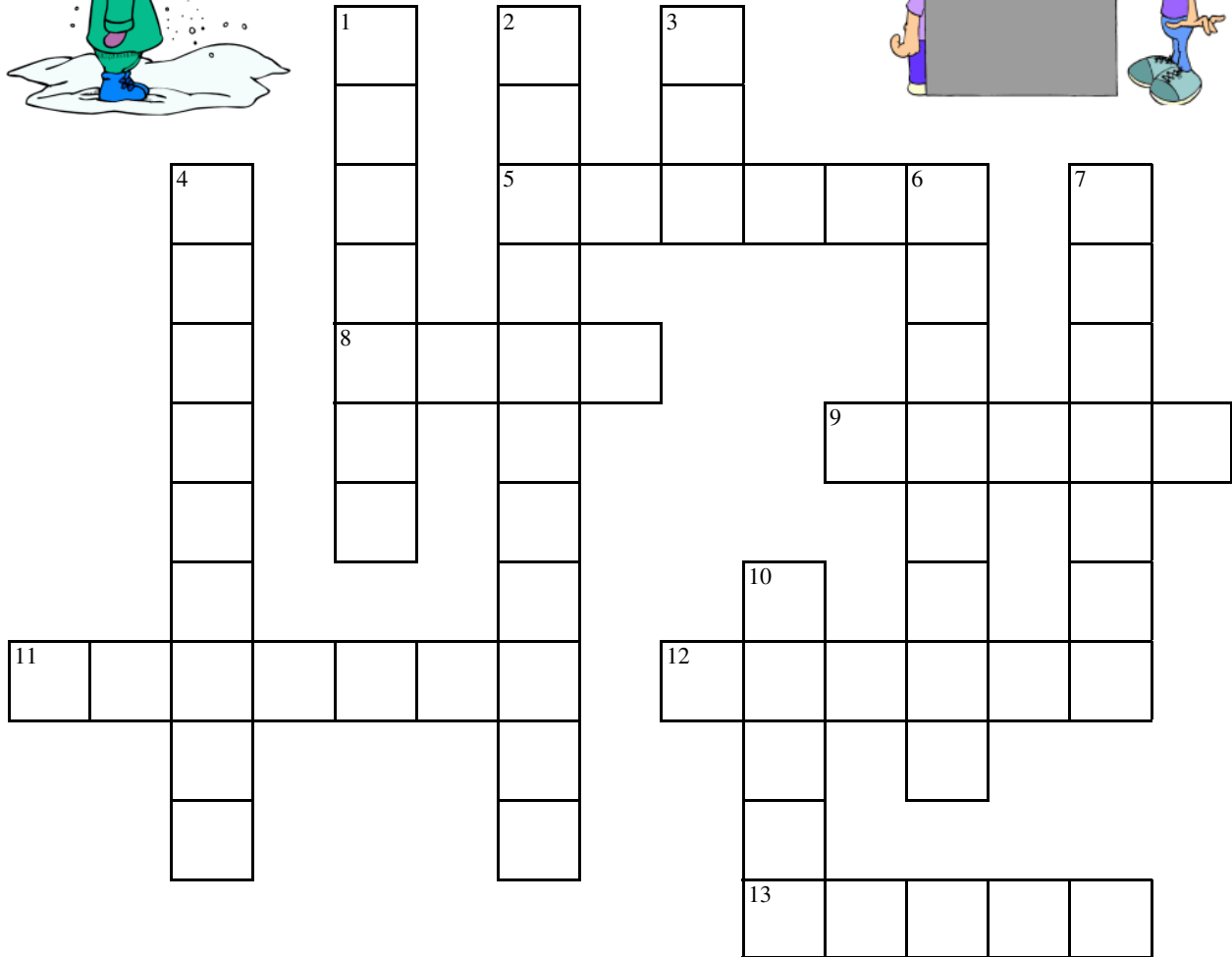
If the atmosphere is like a greenhouse, what parts of it function as the "glass"?

- 1.
- 2.



## The Puzzling Atmosphere

How well do you know your atmosphere?  
Use the clues below to help fill in the puzzle.



### ACROSS

5. This gas makes up close to one-fourth of the air surrounding Earth.
8. There is a high concentration of this and other metals in the mesosphere.
9. This is the third most abundant gas in the atmosphere.
11. The churning air in the troposphere helps determine the \_\_\_\_\_ of a place.
12. The atmosphere is composed of five \_\_\_\_\_.
13. The \_\_\_\_\_ layer is near the top of the stratosphere.



### DOWN

1. This force holds Earth's atmosphere in its place.
2. This layer holds almost all of the water vapor in the atmosphere, as well as almost 3/4 of its mass.
3. The air in the stratosphere is less dense and more \_\_\_\_\_ than in the troposphere.
4. One way in which the atmosphere helps us is by absorbing solar \_\_\_\_\_.
6. This is the most abundant gas in air.
7. These are seen in the thermosphere.
10. This type of wave is reflected by particles in the ionosphere.

## THE EARTH'S ATMOSPHERE

### 1) Complete these sentences:

- The atmosphere is a \_\_\_\_\_ of gasses that \_\_\_\_\_ The Earth.
- The main gasses in the atmosphere are \_\_\_\_\_ ( \_\_\_\_\_%), \_\_\_\_\_ ( \_\_\_\_\_%) and 1% of other gasses ( \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_).
- There are \_\_\_\_\_ layers in the atmosphere: \_\_\_\_\_, stratosphere, \_\_\_\_\_ and \_\_\_\_\_.

### 2) Match the layers of the atmosphere with its characteristics:

- It is 30 Km thick
- It contains most of the gasses of the atmosphere
- Its upper limit is called mesopause
- The meteorological phenomena occur here
- The ozone layer is here
- Is the one that surrounds the living beings
- It contains clouds of ice and dust

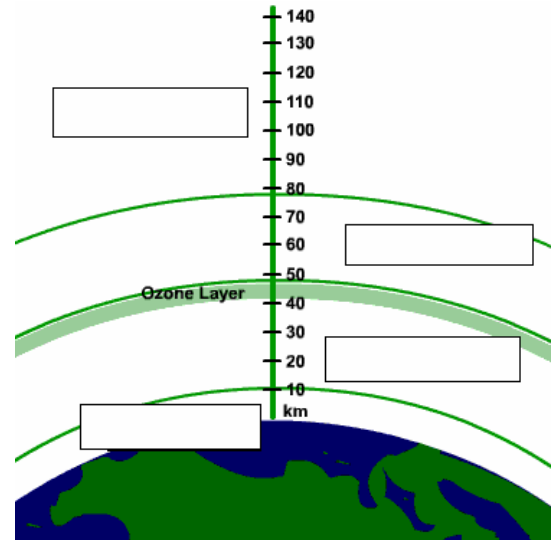
- Stratosphere
- Troposphere
- Thermosphere
- Mesosphere

### 3) In the picture on the right, write the names of the layers in the correct order:

### 4) Complete these sentences:

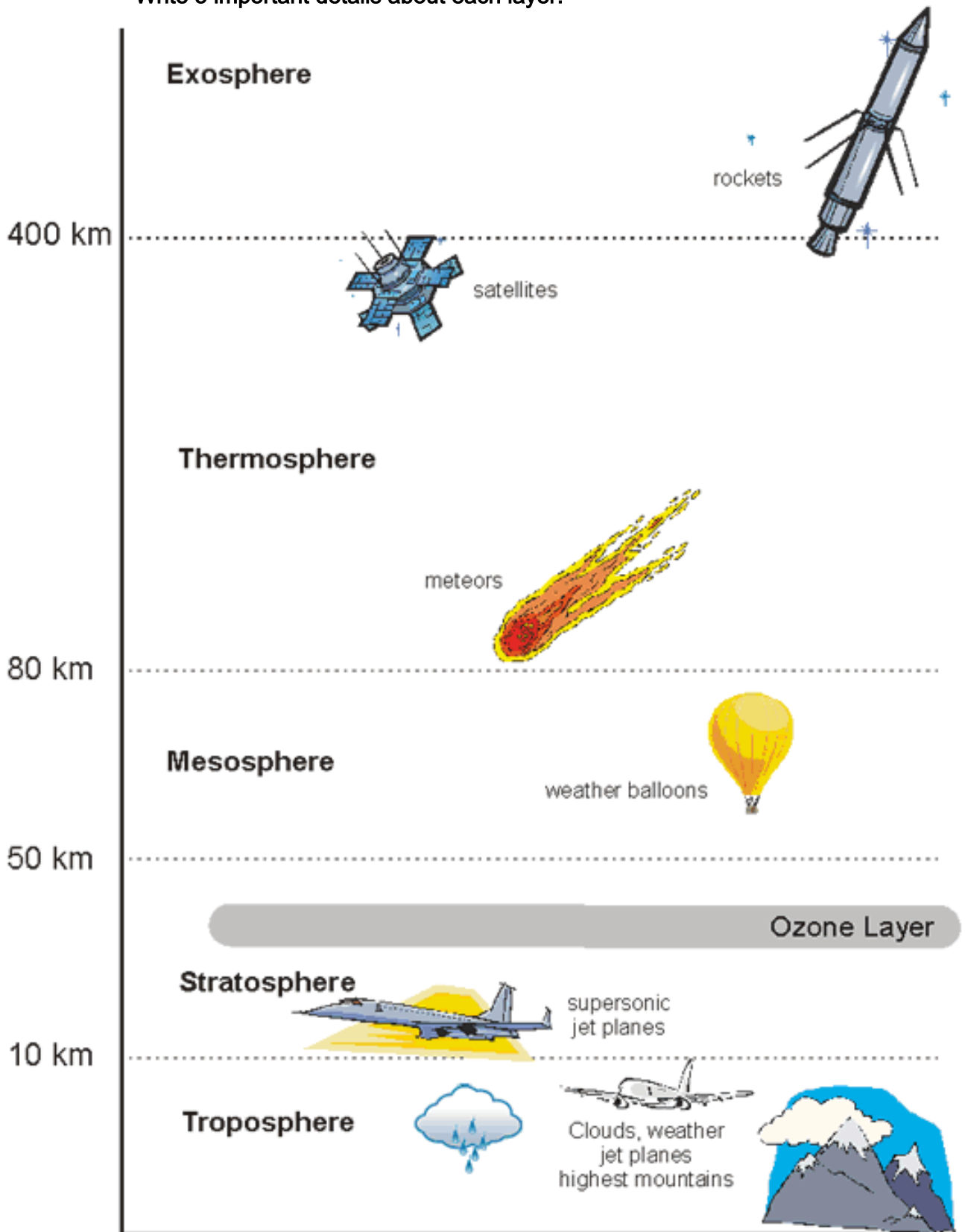
The atmosphere is necessary for us because.....:

- It \_\_\_\_\_ us from dangerous \_\_\_\_\_ from the Sun.
- It contains the \_\_\_\_\_ we breathe.
- It keeps the Earth \_\_\_\_\_.



# LAYERS OF THE ATMOSPHERE

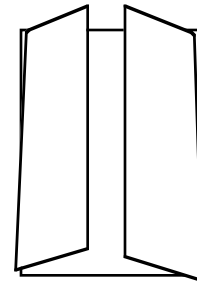
Write 5 important details about each layer.



# Layers of the Atmosphere Foldable

Name \_\_\_\_\_ Class \_\_\_\_\_

1. Fold a piece of light blue paper in half hamburger bun-style.
2. Open flat and then fold each side toward the center fold - shutter-style.



3. Color the long dark lines that represent temperatures changes: from the bottom -- blue, red, blue, red, representing decreasing, increasing, decreasing, increasing temperatures.
4. Carefully cut out the diagram of the atmosphere. Fold in half lengthwise and cut apart. Paste each half onto the front shutters of the light blue paper. Paste toward the bottom so you have room for a title at the top.
5. Cut the two parts of the title out and paste on the top of the shutters.
6. Cut out the boxes that contain the characteristics of each of the eight layers of the atmosphere. Paste inside the foldable under the correct layer. Be sure to put the main layers on the inside left and the minor layers on the inside right.
7. Cut flaps for each of the layers on the front shutters.
8. Carefully cut out the small sketches **ONE AT A TIME**. Read the words that tell you where to paste the sketch and paste to the front of the foldable on the diagram of the atmosphere. **Do NOT cut out the words that tell you where to paste each sketch!**
9. Fill in the Name Tag and paste on the back.

## **\*\* Answer these questions:**

1. List the four main layers.
2. List the four minor layers.
3. Which two minor layers of parts of a main layer?
4. Which layer is the most important to you and why?
5. What two layers protect you?
6. Which layer acts like a giant magnet? What does it attract?
7. What does the air in the troposphere do as it heats up from the sun?
8. What cloud indicates the top of the troposphere?
9. What runs along the top of the troposphere?
10. What attaches itself to this jet stream and, in a sense, tells you where the stratosphere begins?



Blackbird SR-70  
26 km



Boeing 747  
12 km



Balloon  
5-7 km



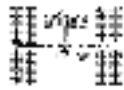
Ozone molecules  
20-30 km



Aurora Borealis  
100-250 km



Intl. Space Station  
300 km



Flock of Geese  
6-7 km



Weather  
near the surface



Cirrus Clouds  
16 km



Cumulonimbus  
up to 16 km



Radio Waves  
96-112 km



Meteors  
48-80 km



Unmanned Spacecraft  
3000 km



### TROPOSPHERE

Temperature: DECREASES, 6.5 °C per km  
Characteristics: to about -60 °C

1. Most weather occurs here where we live
2. Convection Currents

### STRATOSPHERE

Temperature: INCREASES, to about -20 °C  
Characteristics:

1. Contains most of atmosphere's ozone
2. Where jets and manned balloons have gone

### MESOSPHERE

Temperature: DECREASES, -100 °C at top  
Characteristics:

1. Protects Earth from meteors
2. Coldest region of atmosphere

### THERMOSPHERE

Temperature: INCREASES, 2,000 °C at top  
Characteristics:

1. Temps get up to 2000 °C
2. Air molecules are 1 km apart!

### OZONOSPHERE

Characteristics:

1. Ozone is made of 3 oxygen atoms
2. Protects the surface from Sun's UV rays
3. Humans are causing Ozone depletion

### IONOSPHERE

Characteristics:

1. Lower part of Thermosphere
2. Radio waves bounce back to Earth's surface

### EXOSPHERE

Characteristics:

1. Upper part of Thermosphere
2. Artificial Satellites orbit here

### MAGNETOSPHERE

Characteristics:

1. Earth's Magnetic Field
2. Causes Aurora Borealis (Northern Lights)





# Layers of the

# Atmosphere

Name \_\_\_\_\_

Class \_\_\_\_\_

Date \_\_\_\_\_

