

Name: _____

It's snowing outside – hooray!!! We have heard this sentiment many times throughout our many years at school. However, what is happening in the atmosphere that results in snow? What causes any type of precipitation for that matter? Snow is just a specific type of weather. What is the main reason we have any weather at all? How do we monitor weather variables? How do we report the weather? What on Earth can we possibly say about the weather – other than it's the thing you talk about when you have nothing else to talk about...

And that is what you will be doing – talking about the weather. **Your project will be in powerpoint format (or a comparable format that allows you to have visuals AND your voice), but it must be narrated with your voice in the powerpoint file** (your grade will be affected if you do not include your voice within the presentation). The following is a list of topics and some talking points that you must make sure to include in your project (and even some pages to reference for information). ***Be sure to include pictures to make your presentation more accessible*** and please make sure you ***do not put too much text on one slide*** (this usually makes a presentation that is overwhelming). Your narration in your powerpoint is so that you can deliver information in an easy, well organized way (I highly recommend watching the videos I have posted on the class web page to see how they are presented).

****Your project file name must include both your name and topic – for example j.rowitt – Air Pressure/Temperature*****

1. Water in the Atmosphere

- a. What is the most important substance that causes weather? (my feelings will be hurt if you get this wrong...)
 - i. Water vapor connection to air masses (how do we characterize air masses?).
 - ii. Make sure to make the connection between water vapor and its role in weather phenomena (such as hurricanes, rain storms and snow storms, etc.).
 - iii. Where is most of the water vapor in our layers of the atmosphere?
- b. ESRT pg. 12
 - i. Dew Point – what is it?
 1. How do you use the chart in the ESRT to figure it out?
 - ii. Relative Humidity – what is it?
 1. How do you use the chart in the ESRT to figure it out?
- c. Water Phase change (adding in how much energy is required would be a good idea to review past topics – ESRT pg. 1)
 - i. How does the phase change of water influence hurricane formation?
- d. For those of you who would like to advance and beautify your project – it would be a great idea to talk about the electromagnetic spectrum (ESRT pg 14.) and how the diffraction of light through water molecules in the atmosphere can result in a rainbow...

2. The layers of Earth's Atmosphere

- a. ESRT pg. 14
 - i. How do you understand this chart in your ESRT?
- b. What is the elevation that each layers starts above Earth's surface?
- c. In which layer do we find the ozone layer?
 - i. How does ozone help insulate the surface of Earth from solar radiation?
- d. In which layer does the weather happen?
- e. Describe the Temperature changes within the atmosphere.
- f. Describe the Pressure changes within the atmosphere.
 - i. How does this pressure change affect cloud formation?
- g. What heats the atmosphere? Is it heated equally all over the Earth? Why not?
- h. Explain the role our atmosphere plays in the greenhouse effect.
 - i. What is the greenhouse effect?
 1. Refer to the bottom of ESRT pg. 14 to help explain how sunlight transfers into infrared heat energy

- i. Explain (and make sure to add pictures to help visualize) why sunsets look red while the midday sun is more yellow – spoiler alert... it has something to do with our atmosphere (also as a safety note – don't look at the sun directly because you can damage your eyesight!)
 - i. To make your presentation more engaging add visuals with an explanation about the cause and location of the Aurora Borealis and Aurora Australis within our atmosphere.
3. Air Pressure and Temperature
 - a. ESRT pg. 13
 - b. What instrument do you use to measure air pressure?
 - c. What type of isolines represents values of pressure on a weather map?
 - i. How can you tell based on those lines that the winds are strong/fast?
 - d. What are the different scales to measure temperature and pressure?
 - i. How do you convert temperatures ($^{\circ}\text{C}$, $^{\circ}\text{F}$, and $^{\circ}\text{Kelvin}$) – explain how to convert using page 13 ESRT?
 - ii. How do you convert pressures (inches Hg and Millibars) – explain how to convert using page 13 ESRT?
 - e. What are the ways winds blow around a low-pressure zone? High-pressure zone?
 - f. Explain Planetary Wind Chart from ESRT page 14 on how it relates to high and low pressure systems – how can you identify the high from the low pressure systems on this chart?
 - g. How can pressure and temperatures taken from various locations in the USA help us predict the weather? What typically happens to pressure that lets us know that bad weather is coming?
 - h. What affect does temperature have on pressure?
 - i. What happens to pressure and temperature as you go up in altitude of the atmosphere?
4. Air Masses
 - a. ESRT pg. 13
 - i. Explain where you find each air mass type and what each type means.
 - b. What properties define an air mass?
 - c. What are all the names of each air mass?
 - d. Where do air masses get their names?
 - e. What are the properties of each air mass type?
 - f. What are the major air masses that affect USA? Where do these air masses come from?
 - g. How does the collision of different air masses affect the types of fronts there are?
5. Fronts
 - a. ESRT pg. 13
 - b. What are the different types of fronts?
 - i. Examples using actual weather maps may be very helpful.
 - ii. What is happening at each type of front?
 - iii. What are the temperatures at either side of each front?
 - iv. Which direction is the air mass moving?
 - v. Which type of front moves faster than the other?
 - c. How is air moving at each type of front?
 - d. What results from the different types of fronts?
 - e. How do you figure out which front you are looking at when given air pressures on a weather map?
6. Hurricanes/tornadoes
 - a. What type of pressure zone is a hurricane/tornado?
 - b. What direction do the winds of a hurricane blow?
 - c. Where does a hurricane form? Tornado form?
 - d. What path does a hurricane follow (pg. 4 of the ESRT offers a big hint to answer this question)?
 - e. What is the “present weather” symbol that represents a hurricane?
 - f. What scale measure the intensity of a hurricane? Tornado?
 - g. What is the general category that both hurricanes and tornadoes reside?

- h. How does a hurricane form (there are videos about this – can you explain it.. spoiler alert – you can if you put in effort)?
7. The Coriolis Effect
- a. What is the Coriolis Effect?
 - i. Why does it happen?
 - b. How does it affect the winds in the Northern Hemisphere? Southern Hemisphere?
 - c. **ESRT pg. 14** actually has a diagram that helps to visualize this phenomenon. Are you willing to try to explain the diagram – **spoiler alert**... I think you can and you better :-D.
 - d. Foucault Pendulum – the cause of the Coriolis Effect is supported by this device. Explain how the Foucault pendulum proves Earth’s rotation.
8. Cloud Types and Precipitation
- a. What are all the cloud types?
 - b. How do these clouds form?
 - c. Where in the atmosphere are these clouds located?
 - i. ESRT pg. 14 – you can use this chart to explain the various altitudes of cloud formation.
 - d. What is insolation?
 - e. What is albedo?
 - i. How do the various cloud types affect insolation?
 - f. What is the greenhouse effect and how does it relate to clouds?
 - i. Which clouds increase the occurrence of the greenhouse effect?
 - g. How does precipitation form within these clouds?
 - h. What are the different “present weather” symbols in your ESRT that represent the different types of precipitation?
9. Cloud Formation and air in the atmosphere
- a. ESRT pg. 14 – you can use this chart to explain how pressure changes as you increase in altitude.
 - b. What happens to air when it increases in elevation?
 - c. Explain Adiabatic cooling.
 - i. Make sure to explain it...
 - d. How does air get lifted in the first place?
 - i. Explain Orographic lifting? (very important)
 - ii. Explain Convergence? (next important)
 - e. How does density affect air masses?
 - f. Explain how is cloud formation connected to dew point and condensation...
 - g. What does a cloud need to form? What is the recipe to make a cloud?
10. Regional Winds
- a. What causes the winds?
 - b. How can you determine strong winds versus gentle winds on a weather map?
 - c. What weather instruments are used to measure wind speed and wind direction?
 - d. El Niño and La Niña... what are these phenomena? Where do they happen? How do they affect weather for USA (both east and west coasts)?
 - e. What is the ITCZ and what role does it play in El Niño?
 - f. **ESRT pg. 14** has a diagram that helps to visualize where the ITCZ is that plays a crucial role in the occurrence of this phenomenon.
 - g. How is El Niño monitored?
 - h. Satellite photos of this phenomenon would be very helpful to include with this topic.
 - i. Why are we currently getting the type of weather we are getting? (Our winter is rather warm... why is this??)