


18.2 LAB ACTIVITIES


NAME _____

Part 1 ADIABATIC COOLING AND HEATING

https://phet.colorado.edu/sims/html/gas-properties/latest/gas-properties_all.html

Go to PHET and do a search for "gas properties." Click on the sim and launch "explore" on the

first page that comes up.  Play around with the sim for a couple of minutes, then hit the

reset button  to begin. Change the 300K thermometer to a 27 C thermometer. Pump the tire pump about 6 times to fill the chamber with air. Let the molecules distribute evenly.

1. What is the pressure? _____ What is the temperature? _____

Pull the handle on the left of the box even farther left. Pull it out as far as it can go.

2. What is the pressure? _____ What is the temperature? _____
3. What happens if air is allowed to expand?

Grab the handle on the left again and slide it to the right this time.

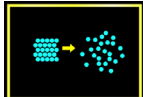
4. What is the pressure? _____ What is the temperature? _____
5. What happens if air is compressed?

6. In any of these experiments, were you adding heat or taking it away? _____ And yet, you saw increases and decreases in temperatures.
7. Define adiabatic cooling _____
8. Define adiabatic heating _____

Part 2 STATES OF MATTER

https://phet.colorado.edu/sims/html/states-of-matter/latest/states-of-matter_all.html

Go to PHET and do a search for "states of matter." Launch the sim, then click "phase changes."



Phase Changes Play around with the sim for a couple of minutes, then hit reset to begin.

Change the molecules to water. Change the temperature unit from Kelvin (K) to Celsius (C)

9. What is the current temperature? _____ What are the molecules doing?
_____ what is the current pressure? _____

Add some heat so that the temperature is just slightly above zero degrees.

10. What phase change just happened? _____
11. What is the official temperature needed for this phase change to occur?
_____ Celsius or _____ Fahrenheit
12. What is the pressure in this state? _____

Now add more heat until you get close to, but not over 100 C.

13. What are molecules starting to do? _____
14. If a molecule flies up into the air, what do we call it? _____

Add more heat until you are just over 180 C.

15. Are there any more molecules in the liquid state? _____
16. How would you describe the motion of these molecules in this new state?

17. What is the name of the phase change? _____
18. What is the new pressure? _____
19. What had to happen in order for pressure to register on the gauge?

20. Reset the sim. If a heat wave from the sun came down and hit 1 molecule of the neon solid block, energized it, then it flew up into the air (skipping melting), what would you call it? _____
21. Heat the neon until it becomes a liquid. Note the temperature. Heat it more until it becomes gas. Does it melt and evaporate at the same temperatures as water?

22. From the gas state, cool it once again into liquid. What is this phase change called?

23. How cold did it have to be to get to this state? _____
24. Where are the molecules located in this state? _____
25. Why are they not on the sides of the container? _____
26. Cool it all the way down to 272 C. What phase change did you just simulate?

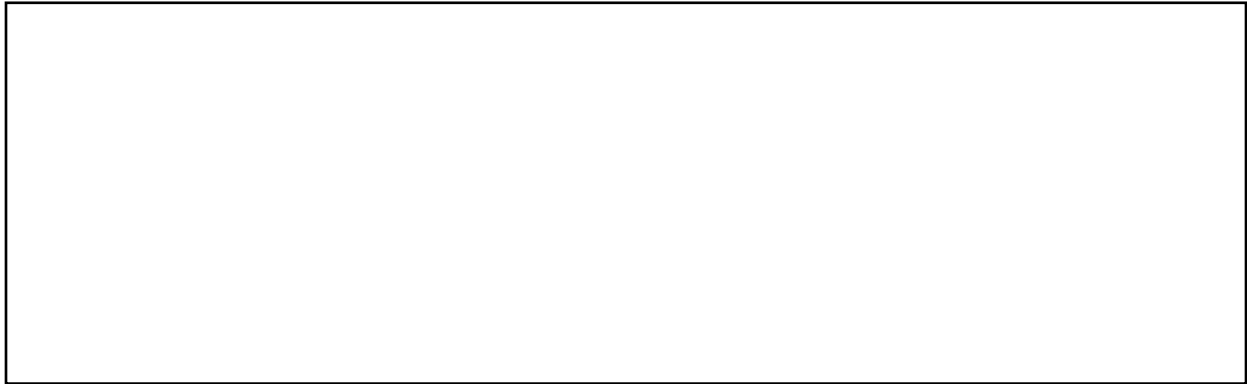
27. Does neon freeze at the same temperature as water? _____

PART 3 PROCESSES THAT LIFT AIR

Get one square of toilet paper, and separate the 2 sheets. Taking one of the sheets, cut it into 4ths. Make a loose ball from one of the tiny squares to represent the movement of air in the following activities.

A] Get a straw for all 4 members of your team. Put the "air ball" in the center of the table. Point your straws at the air ball from all 4 directions, north, south, east, and west. Blow at the air ball

with even pressure until it lifts. You may have to practice several times to get everyone to aim properly and blow with the same force. Draw a picture below of what happened. Use arrows to show the paths that air took.



28. What is it called when air from many directions meet and then rise? _____

B] Make a quick clay "mountain." Blow your "air ball" at the mountain and observe what happens. Draw a picture below of what happened. Use arrows to show the paths that air took.



29. When air rises, it cools, condenses, and then what weather phenomenon happens?

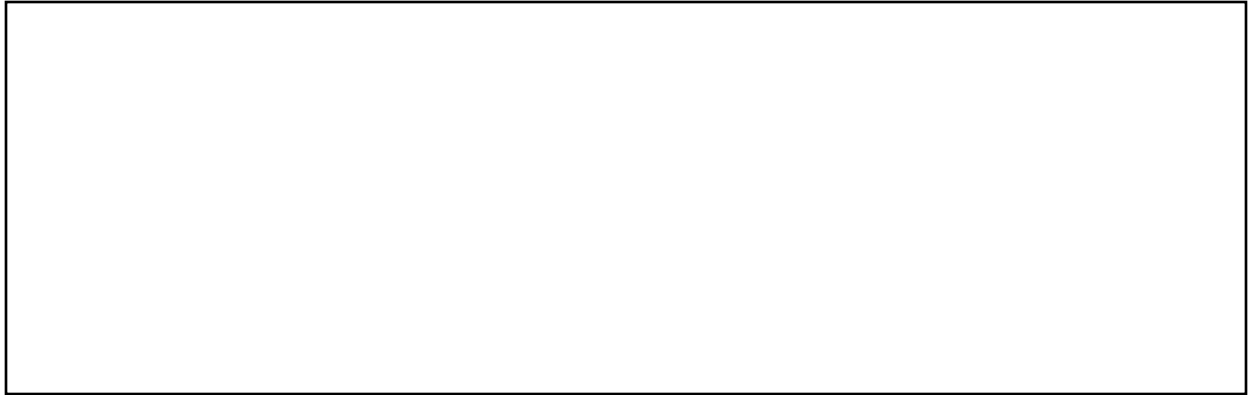
30. On your drawing, indicate which side of the mountain will get rain.

31. On your drawing, indicate which side of the mountain will be dry.

32. What is it called when the 2nd half of the mountain gets no moisture (because it all fell out on the 1st side of the mountain)? _____

33. What kind of lifting occurs due to mountains?

C] Make a ramp with your book or a simple sheet of paper. Blow on the air ball (with your breath) to make it climb your ramp. Draw a picture below of what happened. Use arrows to show the paths that air took.



34. What type of air "climbs up" another glob of air? _____

35. What type of air is below, basically acting like a ramp? _____

36. What is it called when air rises in this way? _____

D] Observe the experiment with the tea bag. NEVER light a tea bag on the table or floor without some protective metal surface underneath it. Draw a picture below showing what happened. Don't forget lines and arrows to show how the air is moving (and what type of air it is).



37. What happened to the tea bag? _____

38. Why did it do this? (What is happening at the molecular level?) _____

39. What is a rising parcel of warm air called? _____

40. What is the name of this air lifting process? _____