

Units, Mixing Ratio, and Dew Point

Name: _____

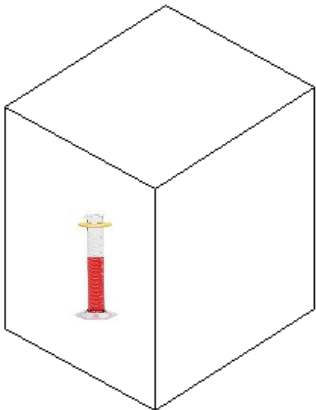


- 1. The mixing ratio today is reported to be 3.1 g/kg.
 - a. If you were to box up 1 kg of air, how much total water vapor would be contained in this box? _____
 - b. Approximately how big would this box be at our altitude? _____
 - c. If you were to box up 4 kg of air, how much total water vapor (in g) would be contained in this box? _____
 - i. How many milliliters (mL) of volume is this? _____

2. The classroom holds about 185m³ of air. A typical mixing ratio in the winter is 1.6 g/kg. How many total grams of water are dissolved in the classroom air in the winter? What would this volume of water look like? [can you compare it to something familiar to you?]

- 3. Suppose that the mixing ratio today is 13g/kg – a typical value during the summer in Albuquerque. Now also suppose that you live in a 2500 ft² house with an 8-foot ceiling – this house would hold about 557 m³ of air.
 - a. If you could manage to condense (remove) all of the water out of the air in your house, how much water (in grams) would this be?

b. What is the volume of water (in mL)? _____ How many 2-liter bottles would this fill? _____



4. You have a cubic box that measures 2 meters on each side. The air inside is completely dry. You then place 25 mL of water inside the box. After the water all evaporates, what is the mixing ratio of the air inside the box?



5. You then take an empty 12-oz coffee cup and dip it into the box of air. What is the mixing ratio of the air inside the coffee cup?

6. The temperature outside is 40°F.
 - a. What is the **maximum** amount of water that could be held in 1 kg of this air? _____
 - b. How much water is **actually** in the air when the temperature is 40F? _____
7. You have an enclosed box of air. Its temperature is 60°F. The mixing ratio of the air inside the box is 6 g/kg. Could more water vapor be added to the box without causing condensation? yes no NEI
[NEI = “Not Enough Information”]
- 8a. You have an enclosed box of air. Its temperature is 70°F. The mixing ratio of the air inside the box is 19.12 g/kg. Could more water vapor be added to the box without causing condensation? yes no NEI
- 8b. If the box from 8a is cooled down to 60°F, would any observable condensation occur inside the box?
yes no NEI
9. Is it possible to have a mixing ratio of 25g/kg when the temperature is 75°F? yes no NEI
10. The Weather Service reports that the dew point today is 60°F, and that it will remain 60°F throughout the day.
 - a. How much water (in grams) would be in one kilogram of air during the middle of the day? _____
 - b. The temperature reaches a high of 90°F at 5:00pm. What is the dew point at that time? _____
 - c. At 8PM the temperature has cooled to 75°F. What is the dew point at that time? _____
 - d. At 1am the temperature reaches 59°F. What is physically happening at that time? _____
 - e. From 1am to 6am the temperature continues to drop until it bottoms out at 43 degrees. What would you notice was happening during this time?
 - f. From 1am to 6am, what is happening to the population of water molecules in the air? (circle)
Increasing Decreasing Staying the same
 - g. From 1am to 6am, what is happening to the dew point?
Increasing Decreasing Staying the same
11. You have an enclosed box of air. The temperature of the box is 70°F. The mixing ratio of the air inside the box is 10 g/kg. **Your refrigerator is set at 40°F.** When you place the box in your refrigerator and leave it there for a few hours, will any observable moisture collect on the inside of the box after it cools? yes no NEI
12. You take a box full of outdoor air, which is at a temperature of 85°F and has a mixing ratio of 3.0 g/kg. You place this box in your refrigerator (temp is 40°F). Will there be observable moisture collecting on the inside of the box after it cools? yes no NEI
13. Tomorrow you take a box full of air, which has a dew point of 42°F. You place this box in your refrigerator (temp set at 40°F). Will there be observable moisture collecting on the inside of the box after it cools? yes no NEI
14. Approximately what is the mixing ratio of the air in question #13? _____

15. On Monday the weather service reports that the dew point is 47°F. On Tuesday the weather service reports that the dew point is 55°F. On Wednesday the dew point is 59°F

- A. On which day would there be more water molecules in the air? Mon Tues Wed NEI
- B. On which day would the mixing ratio be higher? Mon Tues Wed NEI
- C. If you took an identically-sized box of air on each day, on which day would you have the most water vapor?
Mon Tues Wed NEI

16. Think about the following events and decide how each would most likely affect the mixing ratio/dew point of the air: (circle)

Event	Air under consideration	Mixing Ratio of air <u>most likely</u>			Dew Point of air <u>most likely</u> ...		
		increases	decreases	same / NEI	increases	decreases	same / NEI
Dew forming on your lawn during the night	The outdoor air near your house.	increases	decreases	same / NEI	increases	decreases	same / NEI
Dew evaporating off of your lawn in the morning sun	The outdoor air near your house.	increases	decreases	same / NEI	increases	decreases	same / NEI
Boiling water on your stove with the lid off	The air inside your house with the windows closed	increases	decreases	same / NEI	increases	decreases	same / NEI
You increase the temperature of your house from 65°F to 70°F during the winter.	The air inside your house with the windows closed	increases	decreases	same / NEI	increases	decreases	same / NEI
Taking a hot shower.	The air in your bathroom assuming closed door, closed window, and no fan	increases	decreases	same / NEI	increases	decreases	same / NEI
A mass of very dry air moves off the coast of Canada and out over the Atlantic ocean	The moving air mass above the ocean	increases	decreases	same / NEI	increases	decreases	same / NEI
Constant rain	A raining airmass as it moves from California to Nevada to Utah	increases	decreases	same / NEI	increases	decreases	same / NEI
Unseasonably record-breaking cold air moves into Albuquerque	The outdoor air near your house.	increases	decreases	same / NEI	increases	decreases	same / NEI
Unseasonably record-breaking hot air moves into Albuquerque	The outdoor air near your house.	increases	decreases	same / NEI	increases	decreases	same / NEI
Your sprinklers go on at dusk	The outdoor air near your house.	increases	decreases	same / NEI	increases	decreases	same / NEI
You turn on the heater in your bedroom	The air in your room, windows closed.	increases	decreases	same / NEI	increases	decreases	same / NEI
You turn on your humidifier in your room.	The air in your room.	increases	decreases	same / NEI	increases	decreases	same / NEI

17. On an average day, which city would you expect has the highest dew point? (circle) The lowest? (box)
 Miami, FL Albuquerque, NM Tulsa, OK Edmonton, Canada [consult a map if you need to]