manometers and barometers

East.H.S. ©λ€M|5+ry

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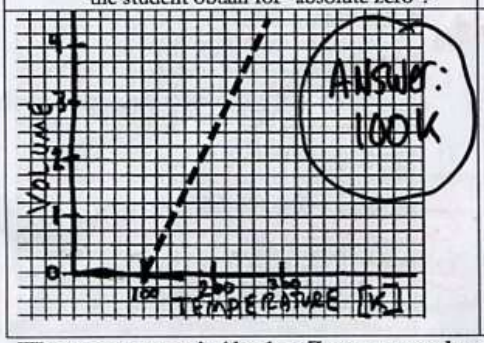
Name ANS

Date WERS

Come for assistance and cheerful encouragement after school Tues, Thurs, every day at lunch

1. For the following graph, what value did the student obtain for "absolute zero"?



2. For the following graph, what value did the student obtain for "absolute zero"?

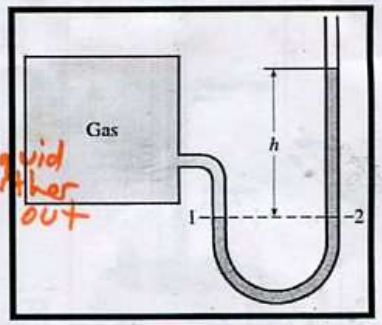
3. **What temperature is Absolute Zero supposed to always be?** 0 kelvins or -273 °C
4. **What special thing happens to matter at Absolute Zero?** it stops vibrating
5. Which of the following is **not** standard pressure?

a. 1 atm **b.** 740 mm Hg **c.** 101.3 kPa **d.** 101300 Pa **e.** none

6. The temperature at which all vibration ("The Dance") stops is (circle one *or more* choices)

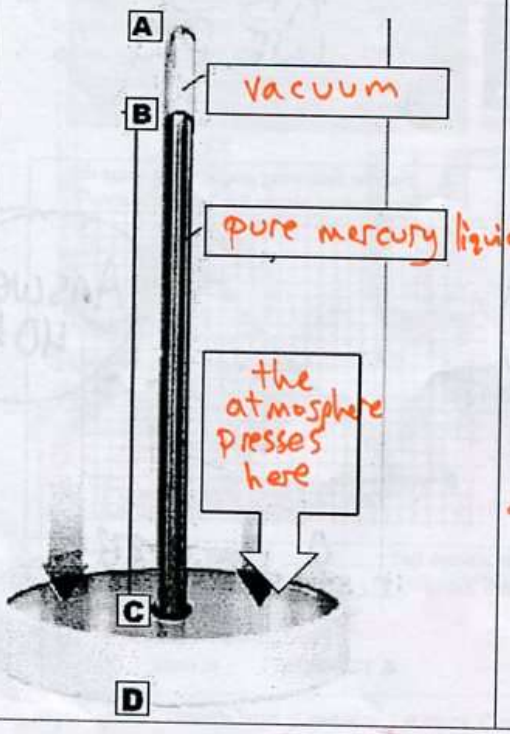
a. 0 °C **b.** -273 K **c.** 0 K **d.** 273 °C **e.** -273°C

7. If this manometer and box contained $2x10^{22}$ atoms of helium and then you added another $2x10^{22}$ atoms of helium, the height of liquid shown by "h" would
   a. decrease
   b. stay the same
   c. increase — because more gas in the box so more pressure, pushes liquid farther out

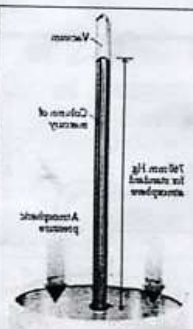


8. If the picture of this manometer and box was taken in a room in Madison (elevation 800 feet) but the box was later moved to Boulder, Colorado (useful elevation data is at the top of this page…) the height of liquid shown by "h" would
   a. decrease
   b. stay the same
   c. increase

elevation is mountainous (5,000 feet above sea level, higher than Madison so lower pressure ambient)



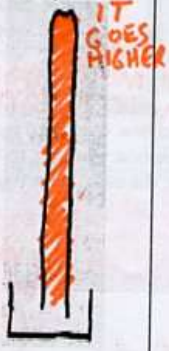
9. Write these labels into the appropriate boxes of the diagram to the left:
   - the atmosphere presses here
   - pure mercury liquid
   - vacuum
10. The distance from A to B is
    a. meaningless and useless
    b. always 760 millimeters long at sea level on an average day
11. The distance from B to C is
    a. meaningless and useless
    b. always 760 millimeters long at sea level on an average day
12. The distance from C to D is
    a. meaningless and useless
    b. always 760 millimeters long at sea level on an average day



13. Redraw how **the liquid height** would look different if …

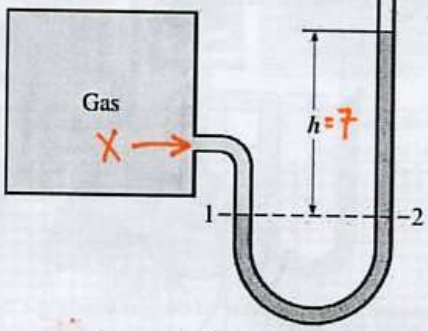
a) …if the weather caused a low pressure system in the area

b) …if a liquid of less density were substituted for the mercury



c) …if instead of a vacuum there was a small amount of air int he top of the tube

d) …if the tube were open at the top instead of closed



$X = 7 + 760$

$x = 767$

14. If this manometer is in a room that is at standard pressure, and "h" is 7.0 millimeters of mercury the pressure of the gas inside the square box is 767 mmHg

15. If gas in this box is at a pressure of 751 torr and the height of the mercury shown byt h is 13 mm , the ambient pressure in the room must be 738 mmHg $751 = 13 + X$

If this manometer and box are in a room in Madison (elevation 800 feet) and they are moved to Poughkeepsie, New York (elevation 60 feet) the height of liquid shown by "h" would

a. decrease
b. stay the same
c. increase because ambient pressure is now less

15. If this manometer and box are in our chemistry room and are moved out to the student parking lot the height of liquid shown by "h" would

a. decrease
b. stay the same inside and outside the school are same ambient pressure
c. increase

16. If this manometer and box contained 30 mL of gas at standard temperature and then the temperature of the gas were changed to 250 kelvins, the height of liquid shown by "h" would

a. decrease
b. stay the same
c. increase

① Standard temperature is 273K
② The change was 273K → 250K. Colder.

17. If this manometer and box contained 5×10^{22} atoms of helium and then you added another 2×10^{22} atoms of helium, the height of liquid shown by "h" would

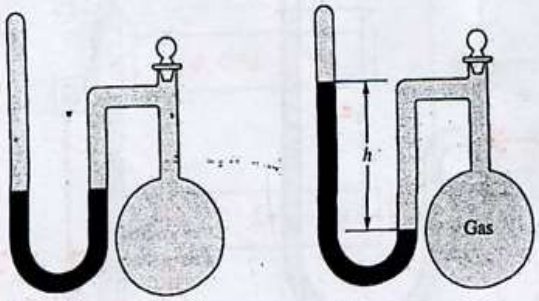
a. decrease
b. stay the same
c. increase

18. Convert 652.5 mmHg (lowest pressure ever recorded at sea level—inside Typhoon Tip) to

a. torr 652.5 torr
b. atm $652.5 \text{ mmHg} \times \left(\frac{1.00 \text{ atm}}{760. \text{ mmHg}}\right) = 0.859 \text{ atm}$
c. kPa

$652.5 \text{ mmHg} \times \left(\frac{101.3 \text{ kPa}}{760 \text{ mmHg}}\right) = 87.0 \text{ kPa}$

16. A sealed-tube manometer as shown below, left, has a complete vacuum. The liquid mercury levels in both arms of the U-tube are equal. If a gas sample is introduced into the round flask, the mercury levels are different, as shown on the right.



The difference h is the measure of the pressure of the gas inside the flask. If h is equal to 6.5 cm, calculate the pressure in the flask in the following units: 65 cm = 65 mm ← PUT IT IN millimeters

a. mmHg

$0 + 65 = X$

$65\text{ mm} = X$

b. torr

65 torr

c. pascals

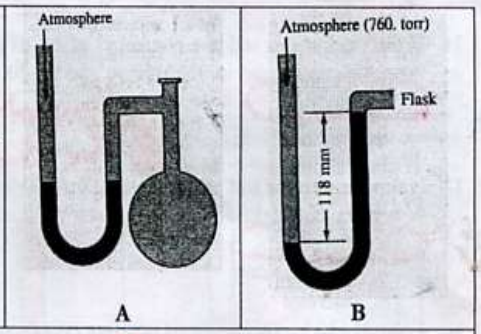
$65\text{ torr} \times \left(\frac{101300\text{ Pa}}{760\text{ torr}}\right) = 8700\text{ Pa}$ two sig figs

d. atmospheres

$65\text{ torr} \times \left(\frac{1.00\text{ atm}}{760\text{ torr}}\right) = 0.086\text{ atm}$

#20

A diagram for an open tube manometer is shown in Figure A; the flask is open to the atmosphere, the mercury levels are equal. In Figure B, a gas is now contained in the flask. Calculate the pressure in the flask in the four units given below.



a. mmHg

$760 = 118 + X$

$X = 642\text{ mmHg}$

b. torr

642 torr

c. pascals

$642\text{ torr} \times \left(\frac{101300\text{ Pa}}{760\text{ torr}}\right) = 85600\text{ Pascals}$

d. atmospheres

$642\text{ torr} \times \left(\frac{1.00\text{ atm}}{760.\text{ torr}}\right) = 0.845\text{ atm}$

October 30, 2014

QUIZ TOMORROW

PURPOSE: SOLVE MATH STORY PROBLEMS FOR GAS

WARMUP:

WHEN GAS	THE PRESSURE WILL
IS HEATED	− / 0 / +
IS PUT IN SMALLER VOLUME	− / 0 / +
HAS SOME ATOMS REMOVED	− / 0 / +

How To SOLVE STORY PROBLEMS FOR CHANGE OF PRESSURE

#1 If temperatures are given in °celsius you must first change temperature to kelvins. Never use celsius in a gas story problem.

#2 Find the numbers that are in a relationship. In gas problems, the numbers that are in a relationship will always have the same word unit.

Example: $\left(\frac{5 \text{ kelvins}}{12 \text{ kelvins}}\right)$ Example $\left(\frac{3.0 \text{ liters}}{4.0 \text{ liters}}\right)$

A quantity of gas exerts a pressure of 98.6 kPa at a at a temperature of 22.0 °C. If the volume remains unchanged, what pressure will it exert at -8.0°C? (295K) (265K)	pressure decreases	$98.6\text{kPa} \times \left(\frac{265\text{K}}{295\text{K}}\right) = 88.6\ \text{kPa}$
A gas with a volume of 5.0 L at a pressure of 0.85 atm is allowed to expand until the volume is 7.00 L. What is the new pressure?	pressure decreases	$0.85\text{atm} \times \left(\frac{5.0\text{ L}}{7.0\text{ L}}\right) = 0.6\ \text{atm}$
The pressure in an automobile tire is 2.0 atm and the tire contains 4.00×10^{27} molecules of air. If the tire is pumped up until it contains 4.79×10^{27} molecules of air, what will the new pressure be?	pressure increases	$2.0\text{atm}\left(\frac{4.79\times10^{27}\ \text{atoms}}{4.00\times10^{27}\ \text{atoms}}\right) =$ → 2.4

A quantity of gas exerts a pressure of 98.6 kPa at a ~~at a~~ temperature of 22.0 °C. If the volume remains unchanged, what pressure will it exert at -8.0°C? (295 K) (265 K)	Pressure will decrease	$98.6\,kPa \times \left(\frac{265\,K}{295\,K}\right) = 88.6\,kPa$

Never use °C for gas problems.

A gas with a volume of 5.0 L at a pressure of 0.85 atm is allowed to expand until the volume is 7.00 L. What is the new pressure?	Pressure will decrease	$0.85\,atm \times \left(\frac{5.0\,L}{7.0\,L}\right) = 0.61\,atm$

The pressure in an automobile tire is 2.0 atm and the tire contains 4.00×10^{27} molecules of air. If the tire is pumped up until it contains 4.79×10^{27} molecules of air, what will the new pressure be?	Pressure will increase	$2.0\,atm \times \left(\frac{4.79 \times 10^{27}\ molecule}{4.00 \times 10^{27}\ molecule}\right) =$ → 2.4 atm