NAME: ANSWERS DATE DUE: _____

TEACHER: _____

Year 11 Term 1– Gases HOMEWORK SHEET No. 1

Success Criteria 3 – 8 (SC 1 and 2 are not assessed)

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1. List the key points of the Kinetic Molecular Theory (KMT) of gases. NOTE: Your answer should be succinct and focus on the key point, not be repeated verbatim from notes.

- gases composed of particles in constant random motion
- The volume of the particles in a gas is negligible (approaching zero), and consequently there is a large amount of space between them.
- IMFs ~~are~~ between the particles are negligible
- collisions between the particles and between the particles and surfaces are perfectly elastic - no energy is lost.
- The ~~&~~ average K.E of the particles (average speed) is dependant on temp. An inc in temp increases the speed & vice versa.

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2. Use your knowledge of the KMT to explain the following scenario.

"An inflated balloon, left in a locked car on a hot day, will expand and possibly explode."

Scaffold – firstly list the relevant key points of the KMT. Secondly use these points to explain how an increase in temp causes the volume of the balloon to increase.

Relevant Pts

- particles in constant random motion
- collisions between particles and walls of balloon create pressure and are elastic
- Average K.E (speed) of the particles depends on the temp.

Explanation

The gas particles inside the balloon move randomly and the collisions with the inside wall of the balloon cause pressure. As gas is blown into the balloon at room temp, the no. of collisions increases, so the pressure increases, so the balloon inflates.

HOWEVER this should be balanced by exactly the same effect on the outside of the balloon (hot car), but as air "leaks" out of the car, no. of moles of air in gas is reduced & pressure outside balloon does NOT ↑.

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3. Convert the following temperatures to K.

a) 104 °C 377 K

b) -31 °C 242 K

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4. The Australian National Weather Service routinely supplies atmospheric pressure data to help pilots set their altimeters. The units the ANWS uses for atmospheric pressure are mm of mercury. A barometric pressure of 775 mm of mercury corresponds to __D__ kPa.

A) 1.020 B) 77.50 C) 775 D) 103.3 E) 16.01

/1

5. Convert the following values to the units indicated in the brackets.

a) 15 345 kPa (to atmospheres) 151.5 atm

b) 77 K –boiling point of Nitrogen gas, our atmosphere is 80% N_2 (to ^0C) −196 °C

c) 1.07 atm (to kPa) 108.4 kPa

d) 231 m^3 (to L) 231,000 L

e) 923 mL (to L) 0.923 L

/3 **f)** 0.75 L (to m^3) ~~0.75 m^3~~ 0.00075 m^3 or 7.5×10^{-4} m^3

6. a) State in one sentence the relationship expressed in the Boyle's law equation.

Pressure is inversly proportional to volume

b) Boyle's law is valid only for situations in which assumptions are made about certain conditions. What are these assumptions? constant Temp & no. of moles of gas

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7. A sample of nitrogen gas 1 has a volume of 478 cm3 and a pressure of 104.1 kPa. What volume would the gas occupy at 88.2 kPa if the temperature remains constant? + n = const

$P_1 = 104.1 kPa$ $P_1V_1 = P_2V_2$

$V_1 = 478 mL$ $\frac{P_1V_1}{P_2} = V_2 = \frac{104.1 \times 478}{88.2 kPa} = 564.2 mL$

$P_2 = 88.2 kPa$

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8. Divers get "the bends" if they come up too fast because gas in their blood expands, forming bubbles in their blood. If a diver has a 0.0015 mL bubble of gas in his blood at a pressure of 35 atm (~35 m deep), but then rises instantaneously to a depth (~1 m) where he experiences a pressure of 1.1 atm, what will the volume of gas in his blood be? What is the percent increase in the size of the bubble? n = const, T = const $P_1V_1 = P_2V_2$

$P_1 = 35 atm$

$V_1 = 0.0015 mL$ $0.048 mL = \frac{35 atm \times 0.0015}{1.1 atm}$ $\frac{P_1V_1}{P_2} = V_2$

/3 $P_2 = 1.1 atm$

9. A sample of gas is transferred from a 75 mL vessel to a 500.0 mL vessel. If the initial pressure of the gas is 145 atm and if the temperature is held constant, what is the pressure of the gas sample in the 500.0 mL vessel? n; T = const $P_1V_1 = P_2V_2$

$P_1 = 145 atm$ $\frac{P_1V_1}{V_2} = P_2 = \frac{145 atm \times 75 mL}{500 mL}$

$V_1 = 75 mL$

/2 $V_2 = 500 mL$ $= 21.8 atm$

10. State the S.I. units of pressure, volume, and temperature

P in Pa V in m^3 T in K.

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11. (a) The following question should not be accurately solved using Boyle's Law. Explain why. ***"a balloon which was inflated and tied off had a volume of 2.6 L at the room pressure of 108.3 kPa. When placed in a cold refrigerator which had a pressure of only 981.2 kPa, the balloons' volume decreased to?*** n = constant, but Temp varies. Boyle's law only applies if temp is constant

(b) In question 8, the temp of the water would surely vary according to depth. Is it valid to use Boyle's law to calculate an answer to Q8? Explain.

Yes. Question is related to body temps which would not vary so Temp is constant.

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