Chemistry 20 – Chapter 3,4 Review Worksheet

1. State the empirical definition of a gas.

2. What is the common pressure unit in use today? What is the meaning of this unit in simpler terms?

3. Convert the following pressures into the given units.
   a) 2.50 atm = _____ kPa
   b) 742 mmHg = _____ bar

   remember that you get the box

4. a) What are the conditions for SATP? Molar volume?

   b) STP? Molar volume?

   How many significant digits does **each** of these have? Why?

5. Boyle's Law gives the relationship between _____ and _____. We can say that these two quantities vary _____ as one another. Charles' Law gives the relationship between _____ and _____ in _____. We can say that these two quantities vary _____ as one another.

We can combine Boyle's and Charles' Law together to make the Combined Gas Law. It is important to understand that the Combined Gas Law only works in _____ systems; systems where _____ cannot enter or leave, but where _____ is free to enter or leave. The Combined Gas Law is very useful in situations where you have the same system under .....

6. Explain the difference between a theory and a law. Give an example of each.

7. Complete the following calculations. Remember to show your formula with the "plugged-in values" (including units), and your answer with correct units and correct number of significant digits.

   a) A gas in a sealed balloon at 100 kPa pressure, occupying a volume of 750 mL is squeezed down to 500 mL. What is the new pressure? (Assume constant temperature.)

   b) 0.300 L of a gas at SATP is placed in an STP environment. What is the new volume?

8. Use the Kinetic Molecular Theory to explain Boyle's Law, Charles' Law, Avogadro's Law, Dalton's Law of Partial Pressures..You can pick which one to answer but understand that on your test you could be asked to explain **any** one of these.

9. State Avogadro's Law. Avogadro's Law is based on what other law?

10. Do the following calculations. (Don't forget working, units, significant digits.)

    a) Calculate the number of moles of methane gas in 6.0 L at SATP.

    b) Calculate the mass of 20.0 L of nitrogen gas at STP.

11. What is an ideal gas,
    a) empirically?

    b) theoretically? (according to the Kinetic Molecular Theory)

12. Which real gas is most like an ideal gas?

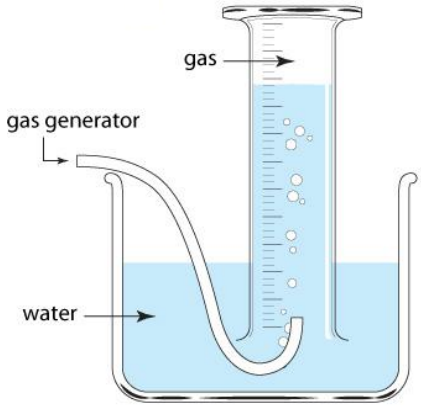
13. Under what conditions are real gases most like ideal gases?

14. What volume does 40.0 g of oxygen occupy at 120 kPa and 20.0˚C?

15. At what temperature (in ˚C) does 15.0 g of fluorine exert a pressure of 85.0 kPa in a 13.0 L container?

16. In an experiment similar to the one you did to find molar mass, *a different gas* was used in place of butane. Given the following data, what was the molar mass of the gas? (Don't forget to include the vapour pressure of water in your calculation)

air pressure .....92.7 kPa
temperature 21.5ºC
volume of gas collected ..... 428 mL
initial mass of gas cylinder .....529.725 g
final mass of gas cylinder .....529.261 g



This gas is an element on your periodic table – what is it?

17. A sample of water was decomposed to produce $H_2(g)$ and $O_2(g)$ at the same temperature and pressure. If the volume of $H_2(g)$ was 42.5 mL, what was the volume of $O_2(g)$?

18. The production of a gas to fill an airbag rapidly is accomplished by the following reaction:

$$2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$$

If 117 g of sodium azide ($NaN_3(s)$) react, how many litres of nitrogen gas will form at 20.2 ^oC and 101.2 kPa?

Answers

1. p. 99

2, p. 103-4

3. a) 253 kPa
   b) 0.989 bar

4. p. 135-6

5. p. 104-9, p. 113-8

6. notes only

7. a) 150 kPa
   b) 0.271 L or 271 mL

8. p. 100, 111, 121, 135, 143

9. p. 132-3

10. a) 0.24 mol
    b) 25.0 g

11. a) p. 147-8
    b) p. 100

14. 25.4 L

15. 63.9˚C

16. 29.5 g/mol

    to identify the gas remember that all elemental gases except the Noble Gases are diatomic

17. 21.3 mL

18. 65.1 L