New West Charter High School -- Honors Chemistry -- Unit 4 -- Exam #3 -- 90 points

As usual, show all your work. And, of course, partial credit for partial achievement.

Write TRUE if the statement is true OR write the word(s) that substitute(s) for the underlined word(s) that
would make it true. Writing false only earns partial credit . Three points apiece.

_____ 1) Equal volumes of gases at the same temperature and pressure contain an equal number
of particles is one way of expressing <u>Avogadro's hypothesis</u>.

_____ 2) <u>Kilograms</u> are the SI unit for force.

_____ 3) In a mixture of gases, Dalton says that the total pressure is the <u>product</u> of the partial
pressures of the gases making up the mixture.

_____ 4) By <u>decreasing</u> the amount of gas actually present in a sample, we can better approach
ideal gas conditions.

_____ 5) If temperature and volume remain constant in the ideal gas law, the relationship between
the number of moles and the pressure would be an <u>inverse</u> relationship.

<u>Multiple Choice</u>. Write the letter that best answers each example. Three points each.

_____ 6) Which is not a feature of the kinetic model/theory of gases?

    a) The particles in a gas are considered to be small, hard spheres with insignificant volume.
    b) The motion of the particles in a gas is varied in its magnitude, constant, and random.
    c) All collisions between particles are considered to be perfectly elastic.
    d) All are features of the kinetic model/theory.

_____ 7) If we raise the temperature of a gas and increase the pressure as well, what happens to the volume?

    a) It increases.   b) It decreases.   c) One cannot tell; it depends on how much each
    increase was.   d) It does not change.   e) It depends on how many moles were present.

_____ 8) The reason why you're never supposed to hold your breath when SCUBA diving using compressed
air tanks is

    a) A full set of lungs will explode if you descend (go down) too quickly.
    b) A full set of lungs will explode if you ascend (go up) too quickly.
    c) The nitrogen will escape out of your blood causing you "the bends" if you don't exhale.
    d) The SCUBA apparatus will not function properly if you don't breathe regularly thru it.

_____ 9) Recall the aluminum can demonstration in the lab. Watching it contract in the ice bath was a clear
demonstration of

    a) Charles' Law   b) Boyle's Law   c) The Ideal Gas Law   d) The Ice Water Law

_____ 10) You often see the warning, "Do not incinerate (burn)" on aerosol cans, because they are liable to
explode if you do. This would be an example of

    a) Graham's Law   b) Boyle's Law   e) Charles' Law   d) Combined Gas Law

Calculation Section - Five points each unless specified otherwise. Show your work!

11) Calculate the ratio of the relative speeds of helium gas and sulfur hexafluoride (SF_6) gas at the same temperature.

12) As a budding chemist, maybe the crowning achievement of your semi-illustrious career was to produce the 50.0 kg of nitrous oxide, N_2O (laughing gas), needed for the governor's re-election party of 2042. Merely by thermally decomposing ammonium nitrate (NH_4NO_3), you produced it and water vapor, and gave everyone the laugh of a lifetime. You couldn't remember right now, but how many liters of water vapor was produced at 175 °C and 772 torr? (ten points)

13) On a deserted mining colony on Mars, you have been assigned...oh wait, just kidding...a cylinder of hydrogen sulfide (H_2S) gas containing 350 L is at 25 °C and 2.75 atm pressure. A plunger decreases the volume to just 120 L. You notice the new temperature is 55 °C. What will the new pressure be?

14) In a lab, you observe a 50 L cylinder of a diatomic gas to be at 4.5 atm and 315 K. How many molecules of gas are present within the cylinder?

15) As mentioned in class, the Haber process is one which produces ammonia gas, NH_3, by combining hydrogen gas with nitrogen gas. You are given 1000 L of each of the reactants at STP. How many liters of ammonia will be produced at 100 °C and 3 atmospheres pressure? Ten points on this one. (Hint: Remember limiting reagents?)

16) An elemental gas has a density of 3.741 grams per liter at STP. What gas is that? (This will make up for the harder problem on #15...but you have to show your work...no guessing!)

17) A large elastic balloon of nitrogen gas has expanded to a volume of 590 L when its temperature and pressure were raised from STP to 60 °C and 2.25 atm. What was its volume at STP?

18) You have a tank of pressurized oxygen. The gauge reads 47.2 psi. The internal thermometer reads 66 °C. If you pump 100 L of it into a sealed chamber containing 100 g butane, what theoretical volume of CO_2 can you expect to be pumped out at room temperature of 25 °C and 1.04 atm? (fifteen points on this one!)