Weather Unit Review

Temperature & Pressure:

1. What is absolute zero?
2. How do you convert from Celsius to Kelvin temperature? Then solve the following temperature conversions.
    a. 25 °C = _____K
    b. 110 °C = _____K
    c. 250 K = _____° C
    d. 550 K = _____° C
3. What is pressure?

Use the following Pressure Conversions to answer the following questions:

1 atm = 101.3 kPa = 101,325 Pa = 760 mm Hg = 760 torr = 14.7 lb/in^2 (psi)

4. The air pressure for a certain tire is 103 kPa. What is this pressure in atmospheres?
5. The air pressure inside a submarine is 0.54 atm. What would be the height in millimeters of mercury (Hg) by this pressure?
6. The pressure gauge on a compressed air tank reads 43.2 lb/in^2. What is the pressure in torr?

Gas Laws:

7. What is Boyle's Law?
8. What is the Charles' Law?
9. What is Gay-Lussac's Law?
10. What is Avogadro's Gas Law?
11. What is Dalton's Gas Law of Partial Pressures?
12. What is the Combined Gas Law?
13. At constant temperature, what will happen to pressure if the volume is decreased? What gas law does this represent?
14. At constant volume, what will happen to pressure if temperature is increased? What gas law does this represent?
15. At constant pressure, what will happen to the volume of the temperature decreased? What gas law does this represent?

Use Charles', Boyle's, Gay-Lussac's, Dalton's, and Combined Gas Law to solve the following problems.

16. A balloonist puts 63,000.0 liters of air into her balloon at 32.0°C. The air in the balloon is heated to 275°C. What is the final volume of the air in the balloon?
17. At 2.0 atm of pressure, the volume of a balloon is 0.40 L. Assuming that the temperature remains constant, what will the volume of the balloon be at 1.7 atm of pressure?
18. At 300 K, the pressure inside a rigid can is 2.2 atm. If the temperature increases to 315K, what is the pressure inside the can?
19. A balloon at 1.1 atm and 37 °C floats up into the sky. What is the temperature of the balloon when the pressure is 90,000 Pa?
20. What is the final volume of a 400.0 mL gas sample that is subjected to a temperature change from 22.0 °C to 30.0 °C and a pressure change from 760.0 mm Hg to 360.0 mm Hg?
21. 2.00 liters of hydrogen is originally at 25.0 °C and 750.0 mm of Hg are heated until a volume of 4.00 liters and a pressure of 1.50 atmospheres is reached. What is the new temperature?

22. A flask contains a mixture of hydrogen and oxygen. The pressure being exerted by these gases is 785 mm Hg. If the partial pressure of the hydrogen in the mixture is 395 mm Hg, what is the partial pressure of the oxygen?

STP & Stoichiometry:

23. What is STP?
24. How many liters does 3 moles of chlorine gas occupy?
25. How many moles does 55.0 liters of hydrogen gas occupy?
26. How many atoms do 125 liters of helium gas?
27. How many liters of propane gas (C_3H_8) will undergo combustion with 50.0L of oxygen gas (O_2)?

Chemical Equilibrium:

28. What is chemical equilibrium?
29. What is Le Chatelier's principle?
30. Use Le Chatelier's principle to complete the following chart:

$$2H_2(g) + O_2(g) \leftrightarrow 2H_2O(l)$$

Stress	Equilibrium Shift	$[H_2]$	$[O_2]$	$[H_2O]$
Place in smaller container				↑
Add H_2		----	↓	
Add H_2O				----
Remove H_2		----		
Remove H_2O			↓	----

Phase Changes and Heat:

31. What are the phase changes? Which require energy? Which release energy?
32. Draw a heat curve & label the phases (s, l, and g) and where phase changes vs. warming occur.
33. What is heat? What are the 2 outcomes of heat?
34. What is temperature?
35. What is specific heat? What are the characteristics of substances that have high specific heat vs. low specific heat?
36. What is the equation for specific heat?

Use the specific heat equation to solve the following problems:

37. How much heat is released to the surroundings when 200 g of water at 96°C cools to 25°C? The specific heat of water is 4.184 J/(g°C).
38. The specific heat of ethanol is 2.44 J/(g°C). How many joules of energy are required to heat 50.0 g of ethanol from -20°C to 68°C?
39. 3.00 g of aluminum foil is placed in an oven and heated from 20°C to 662°C. If it absorbs 1728 J of heat, what is the specific heat of aluminum?