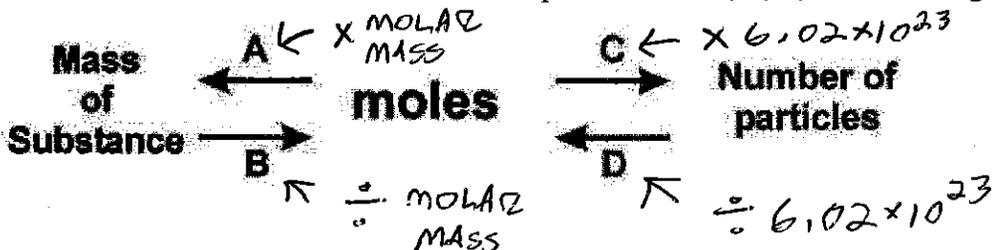


KEY - KEEP SECURE

CP Chemistry Final Exam Practice Problems

Short Answer

1. Label the conversion factors that best fit in the space labeled "A, B, C, D" in this diagram?



2. Given:

Mass of solid = 20.0 g
 Volume of water in graduated cylinder = 10.00 ml
 Volume of water + solid = 38.0 ml

VOLUME OF SOLID = $38 - 10 = 28 \text{ mL}$

What is the volume of the solid? What is the density of the object?

$$D = \frac{20.0 \text{ g}}{28 \text{ mL}}$$

3. Consider this equilibrium system at constant volume and temperature.



What factors cause equilibrium to shift left? What factors cause equilibrium to shift right?

LEFT
 $\uparrow \text{CO}_2$, $\downarrow \text{CO}$, $\uparrow \text{PRESS.}$
 $\uparrow \text{H}_2$, $\downarrow \text{H}_2\text{O}$

RIGHT
 $\downarrow \text{CO}_2$, $\uparrow \text{CO}$, $\downarrow \text{PRESS.}$
 $\downarrow \text{H}_2$, $\uparrow \text{H}_2\text{O}$

4. Describe a saturated solution. Describe an unsaturated solution. Describe a supersaturated solution.

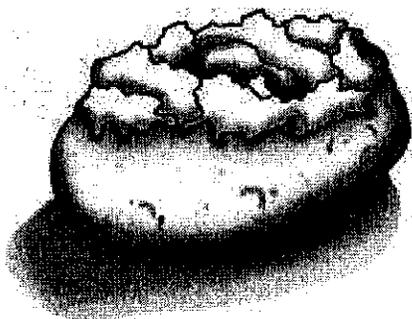
Saturated - a solution that contains the MAXIMUM AMOUNT of dissolved solute at a specific temperature.

Unsaturated - a solution that contains less than the maximum amount of dissolved solute at a specific temperature.

Supersaturated - a solution that contains more than the maximum amount of dissolved solute at a specific temperature.

5. Calculate the energy in joules.

245 Calories



1 calorie = 4.18 J

1 Calorie = 1000 cal so:

$$\left(\frac{4.18 \text{ J}}{1 \text{ cal}} \right) \left(\frac{1000 \text{ cal}}{1 \text{ Cal}} \right) \left(\frac{245 \text{ Cal}}{1} \right)$$

$1.02 \times 10^6 \text{ J}$

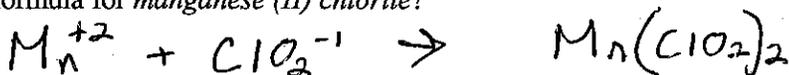
6. The oxidation number of K(s) is:

~~0~~ (ZERO)

28. Which element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6$? ARGON

29. What is the unit of energy used in the...
metric system?
SI system? JOULE

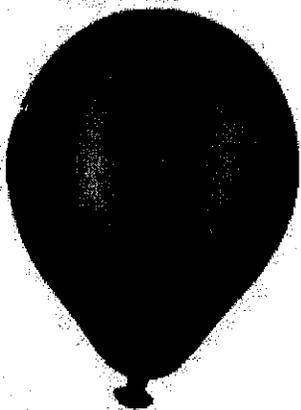
30. What is the formula for manganese (II) chlorite?



31. What is the concentration of hydroxide ions ($[OH^-]$) and hydrogen ions ($[H^+]$) of a solution with...
pH = 4? $\rightarrow 1 \times 10^{-4} M H^+$ OR $1 \times 10^{-10} M OH^-$
pOH = 4? $\rightarrow 1 \times 10^{-10} M H^+$ OR $1 \times 10^{-4} M OH^-$

32. The volume of a sample of helium is 6.8 mL at 45.0°C and 302.0 kPa. What will its volume be in the figure?

10.0 degrees C
203.0 k Pa



$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{(302)(6.8)}{45 + 273} = \frac{(203)(V)}{283 K}$$

318 K

$$V = 9.0 \text{ mL}$$

33. What is the oxidation number of bromine in KBr?

-1

34. Compare & contrast suspensions, solutions, and colloids.

SUSPENSIONS: HETEROGENEOUS MIXTURES THAT SEPERATE.

COLLOIDS: HETEROG. MIXTURES WITH TINY PARTICLES THAT FLOAT

35. A colligative property is a property that varies with...

NUMBER OF SOLUTE PARTICLES.

36. What are the common properties of acids?

SOUR TASTE

WATERY TEXTURE

REACTS W/ METALS TO FORM H_2

REACTS W/ CO_3^{2-} TO FORM CO_2

REACTS W/ BASES TO FORM H_2O

What are the common properties of bases?

BITTER TASTE

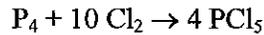
SLIPPERY TEXTURE

REACTS W/ ACIDS TO FORM H_2O

SOLUTIONS: HOMOGENEOUS MIXTURES

DO STOICH. w/ PROPORTIONS:

7. Consider the following reaction:



How many moles of P_4 reacts with...

- 2.0 mol of Cl_2 ?
- 50 grams of Cl_2 ?
- 25 liters of Cl_2 at STP?

$$\frac{1 \text{ mol } P_4}{10 \text{ mol } Cl_2} = \frac{x \text{ mol } P_4}{2 \text{ mol } Cl_2} = 0.2 \text{ mol } P_4$$

$$\frac{1 \text{ mol } P_4}{10 \text{ mol } Cl_2} = \frac{x \text{ mol } P_4}{\frac{50 \text{ g}}{70.9 \text{ g/mol}}} = 0.07 \text{ mol } P_4$$

$$\frac{1 \text{ mol } P_4}{10 \text{ mol } Cl_2} = \frac{x \text{ mol } P_4}{\frac{25 \text{ L}}{22.4 \text{ L/mol}}} = 0.11 \text{ mol } P_4$$

8. What factors will increase the rate of a chemical reaction?

TEMP, SURFACE AREA, CONCENTRATION, STABILITY OF REACTANTS, ADDITION OF A CATALYST.

9. Which family of elements contains the most reactive nonmetals? (NATURE)

~~ALKALI METALS AND GROUP 6~~ HALOGENS

10. How does molar mass affect the rate of diffusion in gases?

HEAVIER GASES DIFFUSE SLOWER

11. How does Collision Theory explain the rates of chemical reactions?

REACTANTS NEED COLLISIONS WITH ENOUGH ENERGY AND PROPER ORIENTATION

12. What is the molarity of a solution containing 68.0 grams of KBr dissolved in 80 milliliters of water?

$$M = \frac{\text{MOLES}}{L} = \frac{68 \text{ g} / 119 \text{ g/mol}}{0.08 \text{ L}} = 7.14 \text{ M}$$

13. What volume does .0594 mol of gas occupy at STP? at 423K and 3.5 atm?

$$(.0594 \text{ mol}) \left(\frac{22.4 \text{ L}}{\text{mol}} \right) = 1.33 \text{ L}$$

22.4 Moles
x 7 = 22.4
Liters

$$(3.5)(V) = (.0594)(.0821)(423) \quad V = 0.59 \text{ L}$$

14. How are acids and bases defined according to...

the Arrhenius Theory? ACID CONTRIBUTE H^+ , BASES CONTRIBUTE OH^-
 the Bronsted Lowry Theory? ACIDS DONATE H^+ , BASES ACCEPT H^+
 the Lewis theory? ACIDS ACCEPT e^- , BASES DONATE e^-

15. What is the pH of a solutions with...

- a hydrogen ion concentration is $1.0 \times 10^{-9} \text{ M}$? 9
- a hydroxide ion concentration is $1.0 \times 10^{-10} \text{ M}$? 4

16. The specific heat of water is $4.18 \text{ J/g}^\circ\text{C}$. What mass of water can be heated from 40.0°C to 75.0°C with 1550 J?

$$1550 = (\text{MASS})(4.18)(75-40) = 10.6 \text{ g}$$

17. Classify the following solutions as acid, base, or neutral..

- pH=7 - Neutral
- pH=2 - ACID

37. What effect will a catalyst have on the rate of a chemical reaction? What effect will an inhibitor have on the rate of a chemical reaction?

CATALYSTS SPEED UP RXNS BY LOWERING ACTIVATION ENERGY.
 INHIBITORS SLOW DOWN RXNS BY INCREASING ACTIVATION ENERGY.

38. What are the relationships described in the gas laws of Boyle, Charles, and Gay-Lussac?

BOYLE: $V \uparrow, P \downarrow$ GAY-LUSSAC: $P \uparrow, T \uparrow$

CHARLES: $V \uparrow, T \uparrow$

39. Which is the name of the solid substance formed in an aqueous chemical reaction?

PRECIPITATE

40. A _____ reaction is a chemical reaction that can occur in both the forward and reverse directions.

REVERSIBLE

41. Which is the correct empirical formula for this substance?

Element	Percent Composition
C	40.0%
H	6.70%
O	53.3%

42. Oxidation involves the LOSS of electrons while reduction involves the GAIN of electrons.

43. An acid that can donate one hydrogen ion is called a _____ acid while an acid that can donate more than one hydrogen is called a _____ acid.

MONOPROTIC
 POLYPROTIC

44. The combined gas law is represented by the equation: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

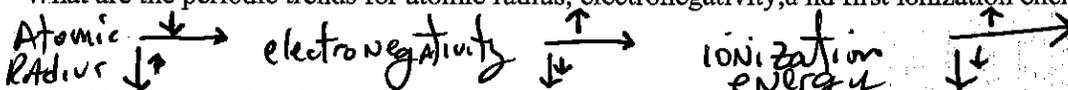
What must remain constant for this to be true?

THE AMOUNT OF GAS (moles)

45. What volume of 0.3M HCl is required to neutralize 90mL of 0.5M NaOH?

$M_A V_A = M_B V_B$ $0.3M HCl \times V_{HCl} = 0.5M NaOH \times 90ml$ 1500 ml

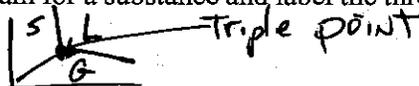
46. What are the periodic trends for atomic radius, electronegativity, and first ionization energy?



47. A solid substance that dissolves in a solvent is said to be _____ while a liquid substance that dissolves in a liquid solvent is said to be _____. A solid substance that does not dissolve in a solvent is said to be _____ while a liquid substance that does not dissolve in a liquid solvent is said to be _____.

SOLUBLE, MISCIBLE, INSOLUBLE, IMMISCIBLE

48. Draw a phase diagram for a substance and label the three phases and the triple point.



49. The erratic movement of colloid particles is called _____

ACID BASE CONJ.
 ACID CONJ. BASE

50. Identify the acid and conjugate base pair in the following equation: $\text{HCl} + \text{OH}^- \rightleftharpoons \text{H}_2\text{O} + \text{Cl}^-$

~~51. Which is the formula for a compound that contains 129.5g nitrogen and 370.5g oxygen?~~