name_____

Scored grade (instructor use only!)_____

1. [2 pts each] **Clearly** assign each statement as TRUE or FALSE. If we can't tell which you mean, it's wrong.

True A solution of 0.1 M magnesium chloride ($MgCl_2$) has chloride ion concentration 0.2 M. $MgCl_2 \rightarrow Mg^{2+}_{(aq)} + 2Cl^-_{(aq)}$

False In a balanced equation, the number of molecules must be the same in the reactants and products. # of atoms of each element must be conserved, but they can rearrange into different #s of molecules.

True When ionic compounds dissolve in water, they always dissociate.

False When covalent compounds dissolve in water, they never dissociate. Acids are molecular compounds that dissociate to form H^+ ions in water.

True Water molecules have an uneven distribution of charge. $\delta-$ O, $\delta+$ H, $\delta+$ H

False **Ammonia dissociates completely when dissolved in water. it's a weak base and ionizes to a small extent.

False **H_2O never appears in a net ionic equation. See #6b on this exam for example.

True **When $HClO_4$ dissolves in water, the dissociation is complete and the reverse reaction (back to neutral molecules) does not occur. $HClO_4$ is a strong acid.

True The reaction of HCl with Na_2CO_3 produces CO_2 (g). Carbonate + acid → CO_2(g)

False Oxygen always has an oxidation number of -1 in compounds. False – can be −2, −1 or even $-\frac{1}{2}$

2. [4 pts] Calculate the number of sodium ions in 2.11 mol of sodium phosphide. Write your answer (with the appropriate precision) in the space. (Na_3P)

$$2.11\ mol\ Na_3P \times \frac{3\ mol\ Na^+}{1\ mol\ Na_3P} = 6.33\ mol\ Na^+$$

answer: 6.33 mol

3. [6 pts] Calculate the volume, in liters, of 2.26 M potassium hydroxide (KOH molar mass: 39.10 + 16.00 + 1.008 = 56.108) that contains 8.42 g of solute. Circle the correct answer below.

$$8.42\ g\ KOH \times \frac{mol}{56.11\ g} \times \frac{L}{2.26\ mol} = 0.0664\ L$$

0.0510 L	**0.0664 L**	0.0730 L	0.0931 L	0.165 L
0.3729 L	2.26 L	15.1 L	51.0 L	56.1 L
73.0 L	93.1 L	156 L	373 L	15,100 L

4. [3 pts each]

Give the formula of the precipitate formed in the reaction of sodium sulfide (Na_2S) and nickel (II) sulfate ($Ni^{2+}SO_4$). $NiS_{(s)}$

Give the formula of sulfurous acid. H_2SO_3

Give the formula of ammonia. NH_3

Give the formula of one strong acid. $HCl, HBr, HI, HNO_3, H_2SO_4, HClO_4$

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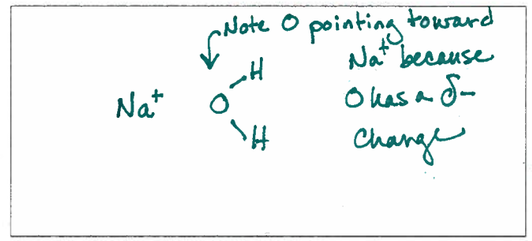
5. [3 pts] In the space provided, draw a simple sketch showing the interaction between an aqueous sodium ion and a water molecule.



6. Complete each reaction and write the **balanced net ionic equations in the boxes provided.

a. [10 pts] hydrochloric acid (aq) + lead(II) nitrate (aq) → ??? (insoluble!)

undissoc.: $2HCl_{(aq)} + Pb(NO_3)_{2(aq)} \rightarrow 2HNO_{3(aq)} + PbCl_{2(s)}$

ionic: $2H^+_{(aq)} + 2Cl^-_{(aq)} + Pb^{2+}_{(aq)} + 2NO_3^-{}_{(aq)} \rightarrow 2H^+_{(aq)} + 2NO_3^-{}_{(aq)} + PbCl_{2(s)}$

Net ionic: $Pb^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightarrow PbCl_{2(s)}$

b. [10 pts] barium hydroxide (aq) + sulfuric acid (aq) → ??? (insoluble!)

undissoc.: $Ba(OH)_{2(aq)} + H_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + 2H_2O_{(l)}$

ionic (and net ionic, since nothing cancels): $Ba^{2+}_{(aq)} + 2OH^-_{(aq)} + 2H^+_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)} + 2H_2O_{(l)}$

7. $I_2 + 3Cl_2 \rightarrow 2ICl_3$ **(unbalanced)** I · 126.9, 3Cl 106.35, 233.25

[4 pts] How many grams of final product can be prepared from the reaction of 5.0 grams of chlorine and 5.0 grams of iodine? (You must first balance the above equation.) **Show your work** and write your answer in the space. (*Include unit and round your answer appropriately. Answers that are not supported by a complete setup will not earn credit.*)

$$5.0\ g\ Cl_2 \times \frac{mol\ Cl_2}{70.90\ g\ Cl_2} \times \frac{2\ mol\ ICl_3}{3\ mol\ Cl_2} \times \frac{233.3\ g\ ICl_3}{mol\ ICl_3} = 10.97\ g\ ICl_3$$

Answer: 9.2 (2 sig figs) g ICl_3

$$5.0\ g\ I_2 \times \frac{mol\ I_2}{253.8\ g\ I_2} \times \frac{2\ mol\ ICl_3}{1\ mol\ I_2} \times \frac{233.3\ g\ ICl_3}{mol\ ICl_3} = 9.192\ g\ ICl_3$$

I_2 is limiting

8. [2 pts each] Give the correct **oxidation number** for each requested atom.

O in H_2O_2 −1 Cr in chromate ion CrO_4^{2-} +6 Fe in $FePO_4$ (Fe^{3+}, PO_4^{3-}) +3