

Name _____ Rec. TA/time _____

Show **ALL** your work or **EXPLAIN** to receive full credit.

- (4 pts) What is the correct **NET IONIC** equation from those given below to represent what happens when solutions of Na_3PO_4 and MgCl_2 are mixed.

- (2 pts) Which of the following are **strong** acids or **strong** bases? (Circle all that apply.)

HNO_3	HClO_2	HClO_4	RbOH	NH_3
HBrO_3	Ca(OH)_2	HSO_4^-	HF	$\text{CH}_3\text{CH}_2\text{OH}$

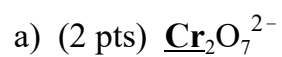
- (4 pts) **Predict the products** of the following reaction. **Complete and balance** the equation. **Indicate the physical state** of reactants and products (i.e. (s), (g), (l), (aq)). **(Show all work.)**

A solution of nitric acid, HNO_3 , is combined with a solution of Ca(OH)_2 .

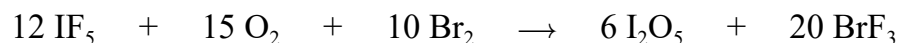
4. (3 pts) What are the expected products of the following reaction?



5. (4 pts) Determine the oxidation number of the underlined element in the following compound.
(**Must show all work.**)

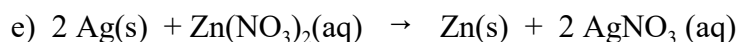
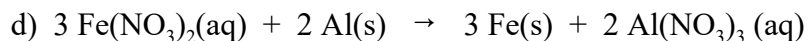
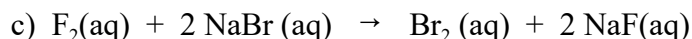
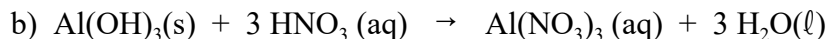
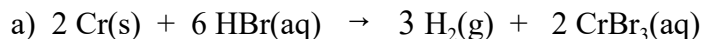


6. (5 pts) Examine the reaction below and the statements concerning the reaction. Select an answer which includes ALL of the CORRECT statements given below.



- 1) Br has been oxidized.
- 2) F is reduced.
- 3) The oxidation number of Br changed from 0 to +3.
- 4) O has been oxidized.
- 5) The oxidation number of O changed from 0 to -2.

7. (3 pts) Which of the following reactions will NOT occur as written?



8. (5 pts) Which of the following is (are) an example(s) of an **exchange** (**double-replacement** or **metathesis**) reaction (assume all reactions occur to give products and write the products)?
- 1) $\text{Pb}(\text{NO}_3)_2 (\text{aq}) + \text{NaBr} (\text{aq}) \rightarrow$
 - 2) $\text{CaSO}_4 (\text{aq}) + (\text{NH}_4)_3\text{PO}_4 (\text{aq}) \rightarrow$
 - 3) $\text{NaI} (\text{aq}) + \text{Br}_2 (\ell) \rightarrow$
 - 4) $\text{Fe} (\text{s}) + \text{HCl} (\text{aq}) \rightarrow$
 - 5) $\text{Ba} (\text{s}) + \text{O}_2 (\text{g}) \rightarrow$
9. (2 pts) Which reaction(s) in question 8 is (are) an example(s) of a **redox** reaction (assume all reactions occur to give products)?
10. (3 pts) Calculate the molarity of Na^+ when 0.832 g of Na_3PO_4 is dissolved in enough water to make 26.8 mL of solution. (Atomic weights: Na = 22.99, P = 30.97, O = 16.00)
11. (2 pts) Calculate the molarity of an H_2SO_4 solution that results when 45.0 mL of 18.0 M H_2SO_4 is diluted with 90.0 mL of H_2O assuming the volumes are additive.

USEFUL INFORMATION

1 amu = 1.66×10^{-24} g
 Avogadro's number = 6.02×10^{23} particles/mole

	IA	IIA	IIIB	IVB	VB	VIB	VII B	VIII B			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1.008 H 1																	4.003 He 2
2	6.941 Li 3	9.012 Be 4											10.811 B 5	12.011 C 6	14.007 N 7	15.999 O 8	18.998 F 9	20.179 Ne 10
3	22.990 Na 11	24.305 Mg 12											26.98 Al 13	28.09 Si 14	30.974 P 15	32.06 S 16	35.453 Cl 17	39.948 Ar 18
4	39.098 K 19	40.08 Ca 20	44.96 Sc 21	47.88 Ti 22	50.94 V 23	52.00 Cr 24	54.94 Mn 25	55.85 Fe 26	58.93 Co 27	58.69 Ni 28	63.546 Cu 29	65.38 Zn 30	69.72 Ga 31	72.59 Ge 32	74.92 As 33	78.96 Se 34	79.904 Br 35	83.80 Kr 36
5	85.47 Rb 37	87.62 Sr 38	88.91 Y 39	81.22 Zr 40	92.91 Nb 41	95.94 Mo 42	98 Tc 43	101.07 Ru 44	102.91 Rh 45	106.42 Pd 46	107.87 Ag 47	112.41 Cd 48	114.82 In 49	118.69 Sn 50	121.75 Sb 51	127.60 Te 52	126.90 I 53	131.39 Xe 54
6	132.91 Cs 55	137.33 Ba 56	138.91 La 57	178.39 Hf 72	180.95 Ta 73	183.85 W 74	186.21 Re 75	190.23 Os 76	192.22 Ir 77	195.08 Pt 78	196.97 Au 79	200.59 Hg 80	204.38 Tl 81	207.2 Pb 82	208.98 Bi 83	209 Po 84	210 At 85	222 Rn 86
7	223 Fr 87	226.03 Ra 88	227.03 Ac 89	261 Rf 104	262 Ha 105	263 Sg 106	262 Ns 107	265 Hs 108	266 Mt 109	269 110	272 111	277 112						

Lanthanide Series	140.12 Ce 58	140.91 Pr 59	144.24 Nd 60	145 Pm 61	150.36 Sm 62	151.96 Eu 63	157.25 Gd 64	158.93 Tb 65	162.50 Dy 66	164.93 Ho 67	167.26 Er 68	168.93 Tm 69	173.04 Yb 70	173.04 Lu 71
Actinide Series	232.04 Th 90	231.04 Pa 91	238.03 U 92	237.05 Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103

A PERIODIC CHART OF THE ELEMENTS
 (Based on ^{12}C)

EMPIRICAL RULES FOR THE SOLUBILITY OF IONIC SOLIDS IN H₂O

COMPOUNDS CONTAINING	SOLUBILITY	IMPORTANT EXCEPTIONS
alkali metal (grp 1A) ammonium	Soluble	None
nitrates, acetates, chlorates, perchlorates, permanganates	Soluble	None
chlorides, bromides, iodides	Soluble	Cmpds of Ag ⁺ , Hg ₂ ²⁺ , Pb ²⁺ , Hg ²⁺ iodide and Hg ²⁺ bromide
sulfates	Soluble	Cmpds of Sr ²⁺ , Ba ²⁺ , Hg ₂ ²⁺ , Pb ²⁺
hydroxides, oxides, sulfides	Insoluble	Cmpds of alkali metals (grp 1A) , ammonium, Ca ²⁺ , Sr ²⁺ , Ba ²⁺
sulfites, carbonates, phosphates, chromates	Insoluble	Cmpds of alkali metals (grp 1A) , ammonium

TABLE 4.5 • Activity Series of Metals in Aqueous Solution

Metal	Oxidation Reaction
Lithium	$\text{Li}(s) \longrightarrow \text{Li}^+(aq) + e^-$
Potassium	$\text{K}(s) \longrightarrow \text{K}^+(aq) + e^-$
Barium	$\text{Ba}(s) \longrightarrow \text{Ba}^{2+}(aq) + 2e^-$
Calcium	$\text{Ca}(s) \longrightarrow \text{Ca}^{2+}(aq) + 2e^-$
Sodium	$\text{Na}(s) \longrightarrow \text{Na}^+(aq) + e^-$
Magnesium	$\text{Mg}(s) \longrightarrow \text{Mg}^{2+}(aq) + 2e^-$
Aluminum	$\text{Al}(s) \longrightarrow \text{Al}^{3+}(aq) + 3e^-$
Manganese	$\text{Mn}(s) \longrightarrow \text{Mn}^{2+}(aq) + 2e^-$
Zinc	$\text{Zn}(s) \longrightarrow \text{Zn}^{2+}(aq) + 2e^-$
Chromium	$\text{Cr}(s) \longrightarrow \text{Cr}^{3+}(aq) + 3e^-$
Iron	$\text{Fe}(s) \longrightarrow \text{Fe}^{2+}(aq) + 2e^-$
Cobalt	$\text{Co}(s) \longrightarrow \text{Co}^{2+}(aq) + 2e^-$
Nickel	$\text{Ni}(s) \longrightarrow \text{Ni}^{2+}(aq) + 2e^-$
Tin	$\text{Sn}(s) \longrightarrow \text{Sn}^{2+}(aq) + 2e^-$
Lead	$\text{Pb}(s) \longrightarrow \text{Pb}^{2+}(aq) + 2e^-$
Hydrogen	$\text{H}_2(g) \longrightarrow 2\text{H}^+(aq) + 2e^-$
Copper	$\text{Cu}(s) \longrightarrow \text{Cu}^{2+}(aq) + 2e^-$
Silver	$\text{Ag}(s) \longrightarrow \text{Ag}^+(aq) + e^-$
Mercury	$\text{Hg}(l) \longrightarrow \text{Hg}^{2+}(aq) + 2e^-$
Platinum	$\text{Pt}(s) \longrightarrow \text{Pt}^{2+}(aq) + 2e^-$
Gold	$\text{Au}(s) \longrightarrow \text{Au}^{3+}(aq) + 3e^-$

