Dr. Zellmer | Chemistry 1210 | All Sections
Time: 7 PM Sun. | Autumn Semester 2022 | September 25, 2022
40 min | Quiz IV

Name _____ Rec. TA/time _____

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

1. (4 pts) What is the correct **NET IONIC** equtaion from those given below to represent what happens when solutions of Na_3PO_4 and $MgCl_2$ are mixed.

2. (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	CH_3CH_2OH

3. (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?

$$CaSO_3\,(s) + 2\,HNO_3\,(aq) \longrightarrow$$

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

a) (2 pts) $\underline{\mathbf{Cr}}_2O_7^{2-}$

b) (2 pts) $\underline{\mathbf{P}}_4O_6$

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.

$$12\ IF_5 + 15\ O_2 + 10\ Br_2 \longrightarrow 6\ I_2O_5 + 20\ BrF_3$$

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?

a) $2\ Cr(s) + 6\ HBr(aq) \rightarrow 3\ H_2(g) + 2\ CrBr_3(aq)$

b) $Al(OH)_3(s) + 3\ HNO_3\ (aq) \rightarrow Al(NO_3)_3\ (aq) + 3\ H_2O(\ell)$

c) $F_2(aq) + 2\ NaBr\ (aq) \rightarrow Br_2\ (aq) + 2\ NaF(aq)$

d) $3\ Fe(NO_3)_2(aq) + 2\ Al(s) \rightarrow 3\ Fe(s) + 2\ Al(NO_3)_3\ (aq)$

e) $2\ Ag(s) + Zn(NO_3)_2(aq) \rightarrow Zn(s) + 2\ AgNO_3\ (aq)$

8. (5 pts) Which of the following is (are) an example(s) of an **<u>exchange</u>** (**double-replacement** or **metathesis**) reaction (assume all reactions occur to give products and write the products)?

1) $Pb(NO_3)_2$ (aq) + NaBr (aq) →

2) $CaSO_4$ (aq) + $(NH_4)_3PO_4$ (aq) →

3) NaI (aq) + Br_2 (ℓ) →

4) Fe (s) + HCl (aq) →

5) Ba (s) + O_2 (g) →

9. (2 pts) Which reaction(s) in question 8 is (are) an example(s) of a **<u>redox</u>** 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	VIIB	VIIIB			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 H_2O

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	$Li(s) \longrightarrow Li^+(aq) + e^-$
Potassium	$K(s) \longrightarrow K^+(aq) + e^-$
Barium	$Ba(s) \longrightarrow Ba^{2+}(aq) + 2e^-$
Calcium	$Ca(s) \longrightarrow Ca^{2+}(aq) + 2e^-$
Sodium	$Na(s) \longrightarrow Na^+(aq) + e^-$
Magnesium	$Mg(s) \longrightarrow Mg^{2+}(aq) + 2e^-$
Aluminum	$Al(s) \longrightarrow Al^{3+}(aq) + 3e^-$
Manganese	$Mn(s) \longrightarrow Mn^{2+}(aq) + 2e^-$
Zinc	$Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$
Chromium	$Cr(s) \longrightarrow Cr^{3+}(aq) + 3e^-$
Iron	$Fe(s) \longrightarrow Fe^{2+}(aq) + 2e^-$
Cobalt	$Co(s) \longrightarrow Co^{2+}(aq) + 2e^-$
Nickel	$Ni(s) \longrightarrow Ni^{2+}(aq) + 2e^-$
Tin	$Sn(s) \longrightarrow Sn^{2+}(aq) + 2e^-$
Lead	$Pb(s) \longrightarrow Pb^{2+}(aq) + 2e^-$
Hydrogen	$H_2(g) \longrightarrow 2\,H^+(aq) + 2e^-$
Copper	$Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$
Silver	$Ag(s) \longrightarrow Ag^+(aq) + e^-$
Mercury	$Hg(l) \longrightarrow Hg^{2+}(aq) + 2e^-$
Platinum	$Pt(s) \longrightarrow Pt^{2+}(aq) + 2e^-$
Gold	$Au(s) \longrightarrow Au^{3+}(aq) + 3e^-$

Ease of oxidation increases