

Cell phones, PDAs, mp3 players, and other electronic devices must be turned off and stowed out of sight (your sight and mine). Calculator policy is in effect. Infractions will cost you points!

ALL outside paper must be stowed out of sight. Unauthorized materials will result in your exam being removed and a score of 0 assigned. If you reach a point where you need more scratch paper than the space available, ask a proctor.

Please clearly and legibly write your name, in ink, at the top of both pages of your answer sheet. Your score will not be recorded and your exam will not be returned if this is not done.

All answers should be rounded to the appropriate precision (correct significant figures.)

Problems marked ** are taken directly from assigned homework problems in the text or handouts/worksheets from class.

Atomic weights are provided in the Periodic Table. These values must be used.

Be certain your answers are clear. If an answer is not clear, it will probably be considered wrong.

Use your time effectively.

When authorized to open your exam, you may carefully remove this cover sheet. When you are finished with your exam, please turn in **only the answer sheet**. Make sure your name is clearly written on both pages.

Time is up at 11:50!!

THE PERIODIC TABLE

1 (1A)	2 (2A)																	18 (8A)
1 H 1.008																		2 He 4.003
2 Li 6.941	4 Be 9.012																	
3 Na 22.99	12 Mg 24.31	3 (3B)	4 (4B)	5 (5B)	6 (6B)	7 (7B)	8 (8B)	9 (8B)	10 (8B)	11 (1B)	12 (2B)	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	
4 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
5 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.96	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3	
6 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)	
7 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (265)	105 Db (268)	106 Sg (271)	107 Bh (272)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uuh (293)	117 Uus (294)	118 Uuo (294)	

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Based on IUPAC 2007 (publ 2009).

Potentially useful information:

$$6.022 \times 10^{23}$$

Solubility trends:

- Group 1 (1A) compounds, ammonium compounds, and acids are soluble.
- All nitrates, acetates, chlorates, and perchlorates are soluble.
- Silver, lead, mercury(I) and copper(I) compounds are INSOLUBLE.
- Chlorides, bromides, and iodides are soluble.
- Sulfates are soluble except calcium sulfate and barium sulfate.
- Compounds with anions of 2- or 3- charge are INSOLUBLE.
- Hydroxides are INSOLUBLE except calcium hydroxide and barium hydroxide.

1. [3 pts] In the space provided, draw a simple sketch showing the interaction between an aqueous calcium ion and a water molecule. Represent charges accurately.

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

**S in H_2S_3 _____ C in methane _____ **Se in CaSeO_3 _____

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

**a. [10 pts] ammonia (aq) + hydrofluoric acid (aq) \rightarrow ???

reminder: net ionic?

**b. [10 pts] mercury(II) perchlorate (aq) + potassium sulfide (aq) \rightarrow ???

reminder: net ionic?

4. **(a) [5 pts] Balance the following redox reaction, occurring in aqueous solution. We'll grade the answer in the box.

(work space:) ___ HNO_2 + ___ H^+ + ___ Cl^- \rightarrow ___ N_2O + ___ H_2O + ___ HClO

(final answer:) ___ HNO_2 + ___ H^+ + ___ Cl^- \rightarrow ___ N_2O + ___ H_2O + ___ HClO

(b) [2 pts each] In the above reaction, what is:

the element oxidized? _____ the oxidizing agent? _____

5. [26 pts] **Clearly** indicate whether each statement is TRUE or FALSE.

_____ **H₂O never appears in a net ionic equation.

_____ Strong acids are molecular compounds, but they dissociate completely in aqueous solutions.

_____ All ionic compounds are strong electrolytes.

_____ **In a redox reaction, the oxidant is reduced.

_____ In a solution of Na₂SO₄, most of the Na₂SO₄ molecules remain intact; only a small fraction are dissociated.

_____ In a solution of Na₂SO₄, there are twice as many cations as anions.

_____ In a solution of HClO, most of the molecules remain intact; only a small fraction are dissociated.

_____ The name of HClO is hypochlorous acid.

_____ HClO is composed of H⁺, Cl⁻ and O²⁻ ions.

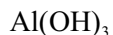
_____ **A limiting reagent is used up completely during a reaction.

_____ CO₂ is always a product in a combustion reaction.

_____ Oxidation numbers must be integers.

_____ The product that is produced in the smallest amount is the limiting reactant.

6. [6 pts] Circle the compounds below that are **soluble in water.



**7. [5 pts] $S_4N_4 + 4 AgO \rightarrow 4 AgS + 4 NO$

The equation above is balanced. The reaction is conducted beginning with 26.37 g S₄N₄ (molar mass 184.3 g) and 69.23 g AgO (molar mass 123.9 g). How many grams of NO can be made? **SHOW YOUR WORK** below and write your answer in the space provided.

answer: _____ g NO