

Do not open the exam until you are told to do so.

Cell phones 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.)

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 **the two answer sheets**. Make sure your name is clearly written on every page.

Time is up at 12:15!!

Potentially useful information:

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

name _____

Scored grade (instructor use only!) _____

1. Write **balanced** chemical equations, with appropriate phase labels, for the following reactions. In both cases, you may use as much scratch space as you need, but write your final answer **legibly** in the box.

a. [10 pts] The **combustion of gaseous cyclopropane, C_3H_6** .

(remember to balance rxn and include phase labels.)

**b. [10 pts]

Chlorine trifluoride gas and sodium hydroxide produce sodium chlorite, sodium fluoride and water.

(remember to balance rxn and include phase labels.)

2. (a) [3 pts] A covalent compound of H, Si and F is 41.86% Si and 56.63% F. What is the empirical formula for the compound? **Show your work below** to earn credit and write the formula in the space.

Answer: _____

(b) [2 pts] Write two other possible chemical formulas for the compound that are consistent with the empirical formula you wrote above.

(c) [3 pts] In a 50.00-g sample of the compound, **how many atoms** of fluorine are present? **Show your work below** to earn credit and write your answer, rounded appropriately, in the space.

Answer: _____

name _____

4. [2 pts] By far the two most abundant isotopes of carbon on earth are ^{12}C and ^{13}C . Based on the average atomic mass of carbon from the periodic table, which value is closest to the abundance of ^{12}C ?

1%

10%

25%

50%

75%

90%

99%

5. *(a) [2 pts] What is the molar mass of $(\text{NH}_4)_2\text{CO}_3$? **Show your work** below, and report your answer, rounded appropriately and with correct unit(s), in the space provided.

Answer: _____

(b) [2 pts] What is the systematic name for $(\text{NH}_4)_2\text{CO}_3$? _____

(c)[6 pts] In a 2.00-mol sample of $(\text{NH}_4)_2\text{CO}_3$,

How many **moles of nitrogen** are present? _____How many **grams of carbon** are present? _____How many **atoms of hydrogen** are present? _____

6. [12 pts] Fill in the blanks. (In some cases there could be more than one acceptable answer; pick **one**.)

_____ A substance that forms a network solid under normal laboratory conditions.

_____ The number of significant figures that should be reported for the molar mass of H_3AsO_4 .

_____ The product formed in the combustion of aluminum metal.

_____ A main-group metal with variable charge.

_____ An element that commonly forms both a cation and an anion.

_____ The number of neutrons in an atom of ^{37}Cl .

name _____

7. [16 pts] **Clearly** indicate whether each statement is TRUE or FALSE. If we can't tell which you mean, it's wrong.

_____ A typical atom of sulfur has 16.07 neutrons.

_____ Hydrogen is an alkali metal.

_____ Different isotopes of an element have the same number of protons.

_____ The designation "transition elements" only includes metals.

_____ O₂ is binary and diatomic.

_____ Ammonium nitrate contains both covalent and ionic bonds.

_____ The formula of a covalent network substance can be determined from the charges on its ions.

_____ Transition metals have variable charges, but main-group metals always form constant-charge cations.

8. [2 pts] Identify each of the following as an **element**, a **covalent compound** or an **ionic compound**.

IF₃ _____

F₂ _____

9. [14 pts] Give a **correct systematic name** for each of the following. Spelling counts.

_____ **Ca(HCO₃)₂

_____ **HBr

_____ **Zn(MnO₄)₂

_____ **Mn(CH₃COO)₃

_____ **SiF₄

_____ **C₄H₁₀

_____ **MgH₂

10. [16 pts] Give the correct **chemical formula for each of the following.

_____ **ammonium oxalate

_____ **sulfur trioxide

_____ **hydrogen peroxide

_____ **manganese(IV) oxide

_____ **diselenium hexasulfide

_____ elemental hydrogen

_____ **lead(II) sulfate

_____ perbromate ion

name _____

1 THE PERIODIC TABLE 18

(1A) (8A)

1	1 H 1.008	2 (2A)											13 (3A)	14 (4A)	15 (5A)	16 (6A)	17 (7A)	2 He 4.003
2	3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31	3 (3B)	4 (4B)	5 (5B)	6 (6B)	7 (7B)	8 (8B)		11 (1B)	12 (2B)	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	
4	19 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	37 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	55 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	87 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).