

NAME:

Chemistry 514
Spring 1995
Examination 1
February 24, 1995

Problem	Points	Score
1	40	
WORK ONLY 6 OF PROBLEMS 2-8 FOR 10 POINTS EACH. CROSS OUT THE NUMBER OF THE ONE PROBLEM WHICH YOU DON'T WANT GRADED.		
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
Total	100	

Bonus (2 pts.): What element is referred to in these panels from Metal Men #2 (1963)?

1. (40 points: 3 for each choice, 2 for each reason) For each of the following groups, **circle** the item which is best described by the accompanying phrase, and briefly **explain** your reason. Sometimes the best explanation is to tell what is wrong with the other choices.

a. Two most abundant elements in our sun (circle two)

H

He

C

Fe

b. Very low water solubility

LiF

NaBr

KI

c. Exhibits a layered (2-dimensional sheet) structure in the solid state

KCl

BeCl₂

MgBr₂

CaF₂

d. Most acidic of these 3 "hydrides"

BaH₂

PdH_{0.6}

SeH₂

e. Crown ether with a preference for Li^+ ion

14-crown-4

15-crown-5

16-crown-6

f. Principal component of the earth's core

Fe/Ni

Aluminosilicate rocks

Metallic hydrogen

g. Basis of the difference between the *ortho* and *para* forms of hydrogen

nuclear spin moment

electronic state

number of neutrons

h. Used to treat symptoms of manic-depression

Li_2CO_3

CaCl_2

BeO

WORK ONLY 6 OF PROBLEMS 2–8 FOR 10 POINTS EACH. ON THE COVER SHEET, CROSS OUT THE NUMBER OF THE PROBLEM WHICH YOU DON'T WANT GRADED.

2. (10) Write out the names and symbols of the first ten elements in the periodic table (atomic numbers 1 to 10).
3. (10) (a) What is the product of reacting BeO with refluxing CH₃CO₂H? (b) Sketch its structure and point out the most important structural features (i.e., the coordination environments of the principal atoms). (c) What physical properties distinguish this compound from the product formed by reacting CaO with acetic acid?
4. (10) Why is there a profusion of elements from ⁴⁸Ti to ⁶⁴Cu, with a peak at ⁵⁶Fe, in many large stars (1.4 to 3.5 times larger than our sun)?
5. (10) Ramsay, Rayleigh and Travers discovered He, Ne, Ar, Kr and Xe in 1895-1900. What is the significance of this discovery in the development of the periodic table of the elements?
6. (10) Describe important biological roles played by any two alkaline earth elements (one biological role each).
7. (10) (a) Sketch the structure (solid and hydrocarbon solution) of LiCH₃.
(b) Qualitatively describe the intra- and inter-molecular rearrangements which LiCH₃ undergoes in hydrocarbon solution at various temperatures.
8. (10) The heavier alkaline earth elements Sr and Ba dissolve in liquid ammonia to give blue solutions. (a) What chemical species are likely to be present in the ammonia solutions of Sr and Ba? (b) Are Sr and Ba *more* or *less* likely than the alkali metals to form "alkalides", i.e., solvated metal *anions*?