

NAME:

Chemistry 514
Spring 1995
Examination 3
May 2, 1995

Problem	Points	Score
1	20	
WORK ONLY 3 OF PROBLEMS 2 – 6 FOR 10 POINTS EACH. CROSS OUT THE NUMBERS OF THE TWO PROBLEM WHICH YOU DON'T WANT GRADED.		
2	10	
3	10	
4	10	
5	10	
6	10	
Total	50	

BONUS (2 points): Spell the full name of the element with the symbol P.

1. (20 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.

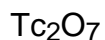
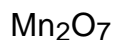
a. Compound most likely to be volatile enough to sublime or distill



b. Least stable of these compounds



c. Strongest oxidizing agent of these oxides



d. A ferromagnetic material used for recording tape



Work any three of problems 2–6 for 10 points each. Cross out the numbers of the two problems you are skipping on the cover of this exam.

2. (10) What formulas, obeying the 18-electron rule, would you expect for anionic (-1), neutral and cationic (+1) binary carbonyls of cobalt? Predict the frequencies of $\nu(\text{CO})$ infrared absorptions of each of these three complexes (range $\pm 50 \text{ cm}^{-1}$ is adequate). [Note: Although this cobalt cation is not stable at room temperature, many phosphine-substituted derivatives of it are stable.]

3. (10) Predict the principal product from treating each of these metals with elemental fluorine (F_2) at or near room temperature, 1 atm. (a) Sc; (b) W; (c) Fe; (d) Cu; (e) Zn.

4. (10) Give a specific example of any transition metal compound (solid-state or a complex) in which there is significant metal-metal bonding. Include the formula and a sketch of the structure which shows the metal-metal bond. If appropriate, give the M-M bond order.

5. (10) Describe, with chemical equations, the behavior of CrO_3 in water at high pH (above 8) and low pH (about 2 to 6). Sketch the principal chromium-containing species in these solutions.

6. (10) Write out the row of the periodic table which starts with K and ends with Kr.