

PLEASE READ THIS COVER PAGE AND FOLLOW THE INSTRUCTIONS.
DO NOT OPEN THE EXAM UNTIL YOU ARE TOLD TO DO SO.

Programmable calculators are not permitted during the exam.

On the computer graded answer sheet, enter your name and student identification number in the appropriate boxes. Enter the number of your lab section in the four columns at the upper left of the sheet. (Use a zero before the lab section number - your section number should be 0786 or 0787.) Then fill in the corresponding bubbles below your name, ID number, and lab section.

This exam has two separately stapled parts:

Part 1 consists of 3 pages with 12 multiple choice questions (5 points each, no partial credit), this cover page, and a Periodic Table with atomic numbers and masses.

Answer the 12 multiple choice questions on the computer graded answer sheets by filling in the proper bubble with a No. 2 pencil. If you change an answer, erase the undesired mark thoroughly. Mark only the best answer to each question. Use the back of the exam pages as scratch paper for these problems. You may keep the exam pages for Part 1. If you mark your answers on them, you can check them tonight on the 1111 web site.

Part 2 consists of 3 pages with 5 problems (variable credit, as indicated) covered by another periodic table. These exam pages are to be turned in with written answers. Show your work (partial credit), box your answers, and write your name on the pages to be turned in.

When you are instructed to begin the exam, please check that you have all pages.

Good luck!

Useful Information:

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32)5/9$$

$$R = 0.0821 \text{ atm L mol}^{-1} \text{ K}^{-1}$$

$$R = 8.314472 \text{ J/(mol K)}$$

$$\Delta E = q + w$$

$$-q_{\text{sys}} = q_{\text{surr}}$$

$$q = cm\Delta T$$

$$\text{specific heat capacity of water} = 4.184 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$$

$$1 \text{ J} = 1 \text{ kg m}^2 \text{ s}^{-2}$$

$$h = 6.626 \times 10^{-34} \text{ J s}$$

$$\text{speed of light } c = 3.0 \times 10^8 \text{ m s}^{-1}$$

$$\text{mass of electron} = 9 \times 10^{-31} \text{ kg}$$

$$\text{Rydberg } (hcR_{\infty}) = 2.18 \times 10^{-18} \text{ J}$$

$$r_n = a_0 n^2 / Z^2$$

$$E_n = -(hcR_{\infty})Z^2/n^2$$

Solubility Rules for Ionic Compounds in Water

Soluble Ionic Compounds

1. All common compounds of Group 1A ions (Li^+ , Na^+ , K^+ , etc.) and ammonium ion (NH_4^+) are soluble.

2. All common nitrates (NO_3^-), acetates (CH_3COO^- or $\text{C}_2\text{H}_3\text{O}_2^-$), and most perchlorates (ClO_4^-) are soluble.

3. All common chlorides (Cl^-), bromides (Br^-), and iodides (I^-) are soluble, *except* those of Ag^+ , Pb^{2+} , Cu^+ , and Hg_2^{2+} .

4. All common sulfates (SO_4^{2-}) are soluble, *except* those of Ca^{2+} , Sr^{2+} , Ba^{2+} , and Pb^{2+} .

Insoluble Ionic Compounds

1. All common metal hydroxides are insoluble, *except* Those of Group 1A and the larger members of Group 2A (beginning with Ca^{2+}).

2. All common carbonates (CO_3^{2-}) and phosphates (PO_4^{3-}) are insoluble, *except* those of Group 1A and NH_4^+ .

3. All common sulfides are insoluble, *except* those of Group 1A, Group 2A, and NH_4^+ .