October 18, 2001 Chemistry 117 Exam 1

Print your name. _____ NAID number _____

Important Instructions:

This exam consists of multiple parts. For the multiple choice component follow the instructions below.

1) Use a soft (#2) graphite pencil only in filling out the answer sheet. ***Make dark marks*** in the correct circles on your answer sheet.

2) Print your name in the boxes on the upper left of Side 1 and blacken the respective circle under each letter of your name**. Fill in your *last name first*.**

3) Enter the first letter of the test color in the last box of the name grid and blacken the corresponding circle under the letter. *This is a **White** exam*.

4) You must enter a 10-digit identification code on your answer sheet as follows. The **left most digits will be 117**, followed by the 7-digits of your NAID number (the numbers before the dash). Next, blacken the respective circle under each digit of this identification code.

5) ***Sign your name*** *(do not print)* in the upper left hand corner of the answer sheet.

6) Answer each question by blackening the circle of the letter corresponding to the best or most correct answer to that question. *There is only **one correct answer to each question***. If you blacken more than one circle for a question it will be scored as incorrect.

7) There should be **25 answers filled in** on the opscan when you are finished.

8) Be prepared to **show a NDSU I.D.** when turning in your exam and opscan sheet.

<u>Part I: Multiple Choice</u> Each problem is worth 3 points.

1. All of the following are subatomic particles except

(a) an electron (b) a proton (c) a neutron (d) a H^+ ion **(e)** no exceptions

2. The chemical symbols of the elements given below are all correct except:

(a) Fe (b) Ca (c) Po **(d)** A (e) C

3. How many micrometers are there in 3.672 km? (1000 m = 1 km; 0.000001 m = 1 μm)

(a) 3.672×10^{9} (b) 2.723×10^{-7} (c) 2.723×10^{-4} (d) 3.672×10^{6} (e) 3672

4. How many atoms are in one formula unit of $(NH_4)_4Fe(CN)_6$?

(a) 15 (b) 25 (c) 28 **(d)** 33 (e) 35

5. Which description below fits the $^{112}Cd^{2+}$ ion?

(a) 48 protons, 64 neutrons, 48 electrons
(b) 48 protons, 62 neutrons, 48 electrons
(c) 48 protons, 64 neutrons, 46 electrons
(d) 48 protons, 62 neutrons, 46 electrons
(e) 50 protons, 64 neutrons, 48 electrons

6. How do the Fe^{2+} ion and the Fe^{3+} ion differ?.

(a) by number of neutrons
(b) they are isotopes
(c) by atomic number number Z
(d) by number of electrons

7. The present form of the periodic table evolved from the pioneering work of:

(a) Einstein **(b)** Mendelev (c) M. Curie (d) Becquerel (e) Rutherford

8. Elements in columns of the periodic table have similar chemical properties because of:

(a) same number of protons
(b) same number of outer shell electrons
(c) same number of inner shell electrons
(d) same number of neutrons
(e) they are isotopes

9. The melting point of antimony was listed in one handbook as 1167.3 °F or 630.7 °C. Expressed on the Kelvin scale of temperature this would be:

(a) 357.6 K (b) 496.8 K (c) 583.7 K (d) 894.2 K **(e)** 903.9 K

10. Which set of elements below includes only elements which are metals?

(a) lead (Pb), bismuth (Bi), bromine (Br), magnesium (Mg)
(b) nitrogen (N), silicon (Si), sulfur (S), arsenic (As)
(c) uranium (U), americium (Am), praseodymium (Pr), zinc (Zn)
(d) zinc (Zn), radon (Rn), barium (Ba), tin (Sn)

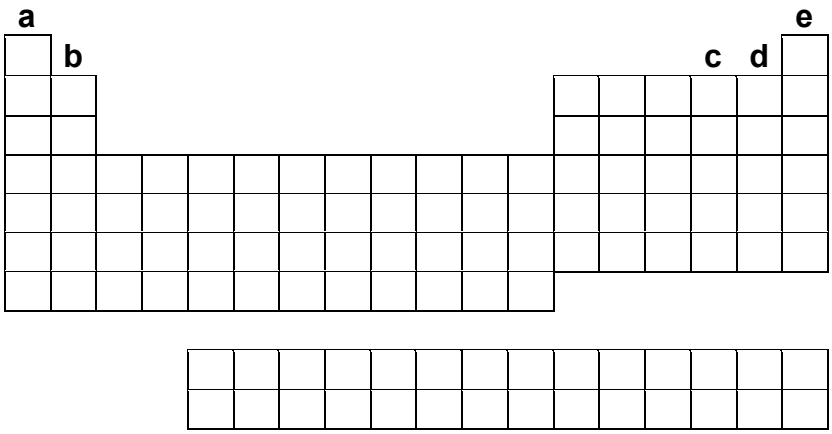
11. What is the correct name for the ionic compound, $CuBr_2$?

(a) copper(I) bromide(II)
(b) copper(II) bromide
(c) copper(II) bromite
(d) copper dibromide
(e) cuprous bromide

12. An anion is defined as

(a) a charged atom or group of atoms with a net negative charge.
(b) a stable atom.
(c) a group of stable atoms.
(d) an atom or group of atoms with a net positive charge.

Use the periodic table below to answer questions 13-16.



13. Using the periodic table shown above in what column are the noble gases located? a, b, c, d, or **e**

14. Using the periodic table shown above in what column are the alkali metals located? **a**, b, c, d, or e

15. Using the periodic table shown above in what column are the alkaline earth metals located? a, **b**, c, d, or e

16. Using the periodic table shown above in what column are the halogen elements located? a, b, c, **d**, or e

17. Which of the following elements is most likely to be a good conductor of electricity?

(a) N (b) S (c) He (d) Cl **(e)** Fe

18. What is the formula for the binary ionic compound formed by potassium and nitrogen?

(a) KN (b) K_2N (c) NK_2 **(d)** K_3N (e) NK_3

19. The correct name for $KHCO_3$ is

(a) calcium bicarbonate.
(b) calcium carbonate.
(c) potassium carbonate.
(d) calcium hydrogen carbon trioxide.
(e) potassium bicarbonate.

20. Co–60 is a beta emitter with a half-life of 5.3 years. Approximately what fraction of the Co–60 atoms in a particular sample will remain after 32 years?

(a) 1/6 (b) 1/8 (c 1/16 (d) 1/32 **(e)** 1/64

21. A radioisotope decays to give an alpha particle and Pb-208. What was the original element?

(a) Se (b) Bi **(c)** Po (d) Hg (e) Rn

22. The energy released by the sun is the result of

(a) natural radioactivity.
(b) nuclear fusion.
(c) combustion of hydrogen.
(d) photosynthesis.
(e) nuclear fission.

23. Which element forms stable +2 cations?

(a) Kr (b) I (c) Se (d) Al **(e)** Ba

24. How many valence electrons does a chlorine (Cl) atom have?

(a) 1 (b) 2 (c) 5 **(d)** 7 (e) 10

25. Which one of the following elements is a transition element?

(a) Sr (b) Pb (c) As **(d)** Fe (e) H

Part II: Calculations (5 points each) You must show all steps in a legible fashion to receive full credit.

26. A sample of ozone, O_3, contains 3.011 x 10^{12} atoms (10^{12} represents a trillion). How many moles of ozone does this sample represent? (Relative atomic weight of O is 15.999 a.m.u.)

27. Balance the chemical equation for the combustion of the welding gas, the hydrocarbon acetylene (C_2H_2), with oxygen (O_2). Show a balanced equation with coefficients and label the reactants and products.

28. Aspartame® is an artificial sweetener marketed as Nutrasweet®. The chemical formula is $C_{14}H_{18}N_2O_5$. What is the mass in grams of one mole of this substance?

29. How many moles are present in 2.13 grams of this sweetener?

30. How many H atoms are in the 2.13 grams of this sweetener?