

BROOKLYN COLLEGE  
Department of Chemistry

Chemistry 1

First Lecture Exam

October 16, 2002

Name \_\_\_\_\_

Page 1 of 5

Circle the name of your lab instructor

Kobrak, Zhou, Giroto, Hussey, Du

Before you begin the exam, write your name on this page and on the answer booklet.

Answer Questions 1-12 on the question sheet. Do questions 13-22 in the exam booklet.

For questions 13-22, show all work. Express answers with the proper units and to the correct number of significant figures. You have 90 minutes. Do not spend too much time on one question.

This exam has 5 pages. Make sure you have all of them. Calculators may be inspected.

PERIODIC CHART OF THE ELEMENTS

IA	IIA												IIIA	IVA	VA	VIA	VIIA	0
1 H 1.0079																	1 H 1.0079	2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.179	
11 Na 22.989	12 Mg 24.305											13 Al 26.981	14 Si 28.086	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948	
19 K 39.098	20 Ca 40.08	21 Sc 44.956	22 Ti 47.88	23 V 50.941	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.69	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80	
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.22	41 Nb 92.905	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29	
55 Cs 132.91	56 Ba 137.33	57 * La 138.90	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra 226.0	89 # Ac 227.03																

* Lanthanides	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
# Actinides	90 Th 232.03	91 Pa 231.03	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (254)	100 Fm (257)	101 Md (257)	102 No (255)	103 Lr (256)

Answer Questions 1–12 on these sheets.

1. (4 pts) Do these calculations:

(a)  $\frac{(6 \times 10^{-400}) \times (2 \times 10^{2000})}{3 \times 10^{-100}} =$

(b)  $(3 \times 10^{-1000}) + (4 \times 10^{-1001}) =$

2. (4 pts) Do these calculations and round off to the proper number of significant figures:

(a)  $\frac{0.000820 \text{ g}}{6.00000} =$

(b)  $165.264 \text{ g} + 1.02 \text{ g} =$

3. (3 pts) Give the number of protons, the number of neutrons, and the number of electrons in one  $^{23}\text{Na}^+$  ion.

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4. (2 pts) Classify each of the following as an element, a compound, a homogeneous mixture, or a heterogeneous mixture. (No credit for “mixture” as the answer.)

(a) Air with all dust particles removed

(b) pure water

5. (1 pt) How many atoms are there in one molecule of  $\text{H}_2\text{SO}_4$ ?

6. (2 pts) A student pours half of the water in a beaker down the sink. Which property of the water is not changed by throwing away half of the water?

(a) density    (b) mass    (c) volume    (d) All three of these properties change.

7. (2 pts) Two different isotopes of the same element have a different number of \_\_\_\_\_.  
(Fill in the blank with the name of a particle.)

8. (4 pts) Put the letter of the correct experiment in the blank space after each discovery.

Discovery of the atomic nucleus. \_\_\_\_\_

Discovery of the electron. \_\_\_\_\_

- A. Millikan's oil-drop experiment
- B. Measurement of the deflection of cathode rays in electric and magnetic fields.
- C. Darkening of photographic film by radiation emitted by uranium.
- D. Bombardment of a gold foil with alpha particles.

9. (8 pts) Give the formula of

- (a) mercury(I) bromide
- (b) silver hydroxide
- (c) perchloric acid
- (d) magnesium nitrate

10. (8 pts) Name these

- (a)  $K_2CO_3$
- (b)  $N_2O_3$
- (c)  $Cu_2SO_3$
- (d)  $Na_2O_2$

11. (2 pts) Solid NaCl is composed of

- (a) atoms
- (b) molecules
- (c) ions.

12. (1 pt) Which one of the following is a molecular compound?

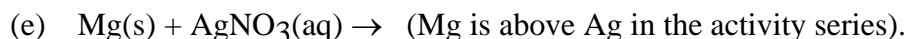
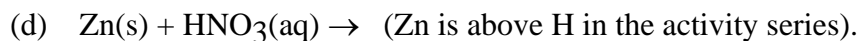
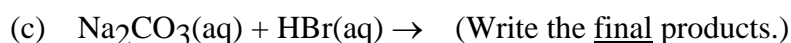
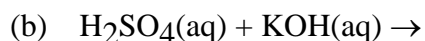
- (a)  $Na_2O$
- (b)  $N_2O$
- (c)  $Mg(NO_2)_2$
- (d)  $K_3N$ .

Answer Questions 13-22 in the answer booklet. Show all work.

13. (6 pts) Do these conversions (put work and answers in the answer booklet)
- (a) 64.5 cm to km
  - (b)  $7.72 \text{ m}^3$  to  $\text{cm}^3$
  - (c) 15.4 L to  $\text{cm}^3$
14. (4 pts) What is the volume of 643.8 g of gold, whose density is  $19.3 \text{ g/cm}^3$ ?
15. (6 pts) In a sample of 9.72 g of  $\text{CO}_2$
- (a) how many  $\text{CO}_2$  molecules are present?
  - (b) how many oxygen atoms are present?
16. (3 pts) Find the mass in grams of one molecule of  $\text{CO}_2$ .
17. (6 pts) A sample of  $\text{C}_5\text{H}_{12}$  is burned in  $\text{O}_2$  to produce 72.3 g of  $\text{H}_2\text{O}$  and carbon dioxide. Find the mass of  $\text{O}_2$  that reacted.
18. (6 pts) Find the empirical formula of a compound that has the following percentage composition by weight:
- 50.00% carbon, 5.595% hydrogen, 44.40% oxygen
19. (6 pts) A 5.209 g sample of a compound of C, H, and O when burned in oxygen produces 9.965 g of  $\text{CO}_2$  and 6.114 g of  $\text{H}_2\text{O}$ . Find the mass of carbon, the mass of hydrogen, and the mass of oxygen in the 5.209 g sample. Do NOT find the empirical formula.

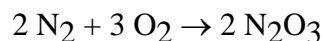
20. (10 pts) Complete and balance each of these reactions.

Answers go in the answer booklet.



21. (6 pts) For any three of the reactions in Question 20, find the net ionic reaction. Do only three reactions.

22. (6 pts) 72.0 g of  $\text{N}_2$  is mixed with 98.0 g of  $\text{O}_2$  and the reaction



occurs to the greatest extent possible. At the end of the reaction, find the mass of  $\text{N}_2$  present, the mass of  $\text{O}_2$  present, and the mass of  $\text{N}_2\text{O}_3$  present.

Extra credit – Answers go in the exam booklet

EC1 (1 pt) Give the last name (spelled correctly) of the person lecturing this course.

EC2 (1 pt) What is the meaning of the prefix iso-?

