

Name _____ ID # _____

When is your CHEM 1F92 lab? Day _____

Time _____ Section (A or B) _____

Which of the following Chemistry courses have you taken before starting CHEM 1F92? (Circle any that apply.)

OAC Chemistry

Grade 12U Chemistry

Brock CHEM 1P00

Other (specify) _____

INSTRUCTIONS:

Write all answers on this examination paper.

A periodic table is provided.

Nonprogrammable calculators are allowed (no organizers!)

No other aids are allowed.

FORMULAS:

$$E = h\nu = hc/\lambda$$

$$\text{Avogadro's number} = 6.022 \times 10^{23}$$

$$\text{Planck's Constant: } h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$\text{Speed of light: } c = 2.998 \times 10^8 \text{ m/s}$$

Energy of an electron in the nth orbital of a hydrogen atom:

$$E = -R_H/n^2$$

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

SHOW ALL WORK!**SCORES**

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

21. _____

TOTAL _____

1. (5 marks) Convert 5.35 g/cm^3 to lb/ft^3 . There are 454 grams in 1 pound, 12 inches in a foot, and 2.54 centimeters in an inch.

Answer: _____

2. (4 marks) Round the following calculations to the proper number of significant figures:

(a) $0.238 \times 9726 \div 19.99 = 115.79730$ **Answer:** _____

(b) $75.1 + 445.7 + 646 = 1166.8$ **Answer:** _____

(c) (2 marks) $(988.8 - 929.93) \div 499.96 = 0.11774942$ **Answer:** _____

3. (2 marks) Calculate the value of the following expression:

$$\frac{(6.626 \times 10^{-34}) (2.998 \times 10^8)}{(453) \left(\frac{1}{10^9} \right)}$$

ANSWER: _____

4. (3 marks) Give formulas for the following compounds:

magnesium bromide _____

iron(II) phosphate _____

potassium carbonate _____

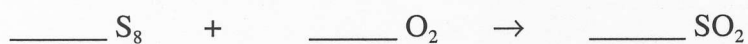
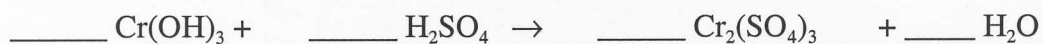
5. (3 marks) Name the following compounds:

HNO_2 _____

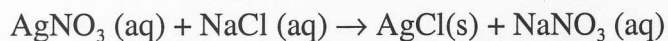
P_4S_5 _____

Cu_2SO_4 _____

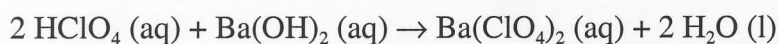
6. (6 marks) Balance the following equations with the lowest whole number coefficients:



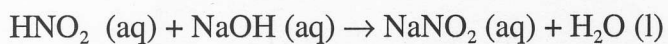
7. (3 marks) Write balanced net ionic equations for the following reactions.



Answer: _____



Answer: _____

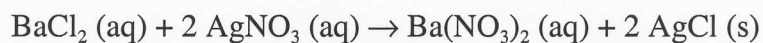


Answer: _____

8. (10 marks) An organic compound contains 26.88 % C, 2.256 % H, and 70.87 % F. What is its empirical formula?

Answer: _____

9. (10 marks) Barium chloride reacts with silver nitrate to produce a silver chloride precipitate according to the following equation:



If 38.95 mL of BaCl_2 solution produces 0.7308 g of AgCl , what is the molarity of the BaCl_2 solution?

Answer: _____

10. (2 marks) "No two electrons in an atom can have the same four quantum numbers" is a statement called

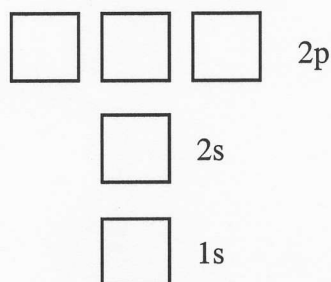
- A. The Pauli Exclusion Principle
- B. Hund's Rule
- C. The Schroedinger Equation
- D. Dalton's Atomic Theory
- E. The Heisenberg Uncertainty Principle

Answer (give letter): _____

11. (6 marks) The ion ${}_{44}^{99}\text{X}^{2+}$ contains _____ protons, _____ electrons, and _____

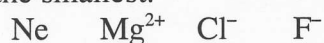
neutrons. Its mass number is _____ and its atomic number is _____. The element X is _____.

12. (3 marks) Show the ground-state electronic configuration for a carbon atom.



13. (4 marks) An atom of vanadium has _____ unpaired electrons. The V^{3+} ion has _____ unpaired electrons.

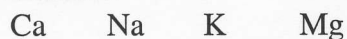
14. (4 marks) Use periodic trends and predict which of the following species has the largest radius and which the smallest.



Answers: Largest radius. _____

Smallest radius. _____

15. (4 marks) Use periodic trends and predict which of the following atoms has the largest 1st ionization energy and which the smallest.



Answers: Largest 1st I.E. _____

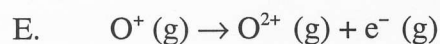
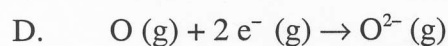
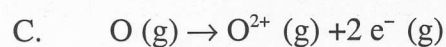
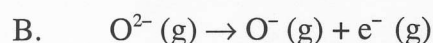
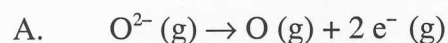
Smallest 1st I.E. _____

16. (2 marks) Which element will show an unusually large jump in ionization energy values between I_3 and I_4 , the third and fourth ionization energies?



Answer: _____

17. (2 marks) Which of the following equations represents the second ionization energy of oxygen?



Answer (give letter): _____

18. (4 marks) Determine the oxidation number of:

Br in Br_2O .

Answer: _____

N in HNO_3 .

Answer: _____

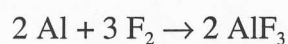
Mn in $\text{Ba}(\text{MnO}_4)_2$.

Answer: _____

Fe in Na_3FeO_4 .

Answer: _____

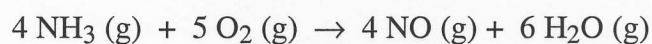
19. (2 marks) Identify the oxidizing and reducing agent in the following reaction:



Oxidizing agent _____

Reducing agent _____

20. (8 marks) Consider the reaction of ammonia with oxygen to produce nitrogen oxide and water according to the equation below. If 5 moles of NH_3 and 8 moles of O_2 are allowed to react, what is the limiting reactant? How many moles (if any) of each species are present after the reaction? Show your reasoning clearly!



Limiting reactant: _____

Moles NH_3 remaining after reaction: _____

Moles O_2 remaining after reaction: _____

Moles NO produced: _____

Moles H_2O produced: _____

21. (13 marks) Complete this paragraph with the words and phrases given in the box below:

All acids have certain properties in common. When dissolved in water they produce a _____ taste, they turn _____ from blue to red, and they react with metals such as iron to liberate _____. Water solutions of _____, on the other hand, taste _____, turn litmus from _____ to _____, and produce a _____ sensation when rubbed between the fingers.

As long as we are dealing with water solutions of these substances, we can use the _____ definition of an acid and a base, which states that an acid is any substance that releases _____, while a base is any substance that releases _____. The _____ definition eliminates the need for water in the definition by defining acid-base reactions in terms of a _____ from an acid to base, regardless of solvent.

Use these words and phrases to fill in the blanks in the paragraph above.

Arrhenius
bases
bitter
Bronsted
blue
electron pair
greater
hydrogen gas

hydrogen ions
hydronium ions
hydroxide ions
less
Lewis
litmus
proton

pH paper
proton transfer
red
slippery
smaller
sour
zinc

PERIODIC TABLE OF THE ELEMENTS

Brock University 2003

Atomic Number → 3
 Li ← Element symbol
 Atomic Weight → 6.941

1A 1
 2A 2
 3A 13
 4A 14
 5A 15
 6A 16
 7A 17
 8A 18

1 H 1.008	2 He 4.003																																
3 Li 6.941	4 Be 9.012	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18																										
11 Na 22.99	12 Mg 24.31	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95																										
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80																
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3																
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (210)	85 At (210)	86 Rn 222																
87 Fr (223)	88 Ra (226)	89 Ac** (227)	104 Rf (257)	105 Db (260)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Dl (267)	111 Nh (270)	112 Fl (279)	113 Mc (288)	114 Lv (293)	115 Ts (294)	116 Og (294)	117 Uue (295)	118 Uuq (296)																

58 Ce 140.1	59 Pr 140.9	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.25	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

*Lanthanide Series

**Actinide Series