

Name----- Last 4 ID # digits----- Section-----

I-Multiple Choice Question--3 points each. Circle the correct choice.

1. How many orbitals are there in the $n = 3$ shell?

- a) 3 b) 6 c) 9 d) 12

2. Which of the following is *not* a valid set of four quantum numbers to describe an electron in an atom?

- a) 1, 0, 0, + $\frac{1}{2}$ b) 2, 1, 1, + $\frac{1}{2}$ c) 2, 0, 0, - $\frac{1}{2}$ d) 1, 1, 0, + $\frac{1}{2}$

3. Which pair of elements would you expect to exhibit the most similar physical and chemical properties?

- a) As and Se b) Na and Cl c) As and Sb d) B and Be

4. How many electrons are there in the Lewis symbol for an iodine atom?

- a) 17 b) 8 c) 7 d) 1

5. Which of the following steps in the formation of sodium chloride is exothermic?

- a) Ionization of sodium b) Formation of gaseous chlorine atoms
c) Formation of gaseous sodium d) Addition of an electron to chlorine

6. Which of the following bonds is the *most* polar?

- a) N-O b) O-F c) B-O e) S-O

7. At what temperature (in $^{\circ}\text{C}$) will 25.0 g of carbon dioxide (at 1.00 atm) occupy 21.5 L? a) 188°C b) 461°C c) -263°C d) -270°C e) 113°C

8. How much faster would bromine vapor molecules move in a test tube than iodine vapor molecules in an identical test tube at the same temperature?

- a) 1.59 times faster b) 0.630 times as fast c) 1.26 times as fast d) 2.52 times as fast

Brooklyn College
Chemistry 1.2

Exam 1
Section _____

Name _____
last first

Directions: Write neatly. Show all calculation methods. Use proper units and proper numbers of significant digits.

6 pts.

1. Give the detailed electronic configuration for the ground state of each of the following:

(a) Cr^{2+} _____

(b) Ba^{2+} _____

(c) ${}_{60}\text{Nd}$ _____

4 pts. 2. Determine the number of unpaired electrons in the ground state of each of the following:

(a) As _____

(b) Ni^{2+} _____

3. A certain atom in an excited state may emit yellow and green photons in its visible line spectrum. Which photon has the greatest? 10pts.

a) wavelength b) frequency c) energy

Which one resulted from the largest quantum jump?..... Was the jump TO a lower

level or a higher level from where the electron started?

4. Arrange the species in each of the following sets in the order specified:

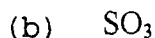
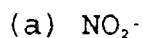
- (10pts.)
- | | | | |
|--------------------------------------|----|---------------|------------------|
| (a) increasing size (smallest first) | Ne | Na^+ | F^- |
| (b) increasing size (smallest first) | Mg | Ca | Ba |
| (c) increasing electronegativity | Na | Si | Cl |
| (d) increasing ionization energy | Na | Na^+ | Na^{2+} |
| (e) increasing ionization energy | As | Cl | He |

5. (10pts.)

What is the total pressure in a mixture of 3.00 g C_3H_8 and 1.53 g He in a 11.0 L vessel collected over water at $25^\circ C$? The vapor pressure of water at this temperature is 24 torr. (Show all formulas and the numerical setup including units.)

6. Draw electron dot (dash) diagrams for all the resonance structures of

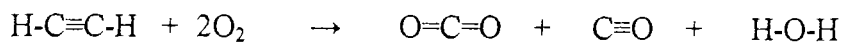
6 pts.



7. Calculate the enthalpy of the following reaction (for which a balanced equation is provided), given the bond enthalpies in the accompanying table:

10 pts.

(balanced)



C-H D (kJ/mol)
 413

C \equiv C 839

C \equiv O 1072

O₂ 495

O-H 463

8. (6 pts.)

In each of the following sets of gases, circle the one that should most closely obey the Ideal Gas Law :

a) He at STP Ne at STP Ar at STP

b) Ne at 100K & 1 Atm Ne at 200K & 1 Atm Ne at 400K & 1 Atm

c) Ne at 273K & 0.5 Atm Ne at 273K & 1 Atm Ne at 273K & 10 Atm

9. Explain Boyle's law in terms of the kinetic molecular theory.
4pts.

10. Calculate the molar mass of a gas if 4.40 g occupies 3.50 L at 560 torr and 41°C.
(10pts.)

1 H 1.0079	IIA																2 He 4.00260
3 Li 6.941	4 Be 9.01218											5 B 10.81	6 C 12.011	7 N 14.0067	8 O 16.00	9 F 18.998403	10 Ne 20.179
11 Na 22.98977	12 Mg 24.305											13 Al 26.98154	14 Si 28.0855	15 P 30.97376	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.0983	20 Ca 40.08	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.70	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9058	40 Zr 91.22	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.4	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.30
55 Cs 132.9054	56 Ba 137.33	57 La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.09	79 Au 196.9665	80 Hg 200.59	81 Tl 204.37	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0254	89 Ac 227.0278	104 Unq (261)	105 Unp (262)	106 Unh (263)												

58 Ce 140.12	59 Pr 140.9077	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.9254	66 Dy 162.50	67 Ho 164.9304	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
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90 Th 232.0381	91 Pa 231.0389	92 U 238.0289	93 Np 237.0482	94 Pu (244)	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)
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