

Blank Test

## Exam 1

# CHEM 111 – General Chemistry I

Fall 2019

### Instructions:

1. Read the instructions for each question carefully
2. Take 5 minutes to work each individual problem on your own, after 5 minutes we will discuss the solution as a group
3. You may use the Periodic Table below and a calculator to answer the following questions.

**Periodic Table of the Elements**

1 H Hydrogen 1.008	2 He Helium 4.003																	18 Ar Argon 39.948	19 K Potassium 39.098	20 Ca Calcium 40.078											36 Kr Krypton 83.798	37 Rb Rubidium 85.468	38 Sr Strontium 87.62											54 Xe Xenon 131.29	55 Cs Cesium 132.905	56 Ba Barium 137.327											86 Rn Radon 222	87 Fr Francium 223	88 Ra Radium 226											118 Og Oganesson 284	119 Ts Tennessine 289	120 Fl Flerovium 288											116 Lv Livermorium 293	117 Mc Moscovium 288	118 Ts Tennessine 289	119 Og Oganesson 294																								
		3 Li Lithium 6.941	4 Be Beryllium 9.012																	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948	19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.63	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798	37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.36	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.905	54 Xe Xenon 131.29	55 Cs Cesium 132.905	56 Ba Barium 137.327	57 La Lanthanum 138.905	58 Ce Cerium 140.12	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium 145	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.5	67 Ho Holmium 164.930	68 Er Erbium 167.255	69 Tm Thulium 168.930	70 Yb Ytterbium 173.054	71 Lu Lutetium 174.967	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.222	78 Pt Platinum 195.084	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.387	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium 209	85 At Astatine 210	86 Rn Radon 222	87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 251	99 Es Einsteinium 252	100 Fm Fermium 257	101 Md Mendelevium 258	102 No Nobelium 259	103 Lr Lawrencium 260
Lanthanide Series		57 La Lanthanum 138.905	58 Ce Cerium 140.12	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium 145	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.5	67 Ho Holmium 164.930	68 Er Erbium 167.255	69 Tm Thulium 168.930	70 Yb Ytterbium 173.054	71 Lu Lutetium 174.967																																																																																														
Actinide Series		89 Ac Actinium 227	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 251	99 Es Einsteinium 252	100 Fm Fermium 257	101 Md Mendelevium 258	102 No Nobelium 259	103 Lr Lawrencium 260																																																																																														

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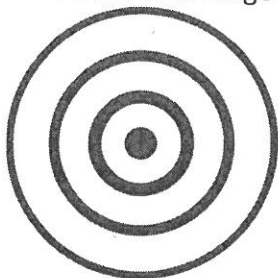
1. In your own words, describe Rutherford's famous experiment regarding atomic structure and his findings.
  
2. Convert 34.5 ft to mm.
  
3. Convert 310.0 degrees Kelvin into Fahrenheit.
  
4. Identify if the following examples are homogeneous mixtures, heterogeneous mixtures, or pure substances:
  - a. Arsenic
  - b. Lava lamp
  - c. Bowl of chili
  - d. Blood
  - e. The air we breathe
  
5. Identify each of the following as a chemical or physical property:
  - a. Ionization energy
  - b. The smell of sulfur
  - c. The ability of a metal to conduct heat
  - d. Bleaching your hair
  - e. The color of grass
  
6. Do the following calculations to the correct significant figures:
  - a.  $15.05 \times .50$
  - b.  $113.3 / 13.1$
  - c.  $650.2 - 45.2 \times 13.5$

7. How many electrons are associated with these quantum numbers?

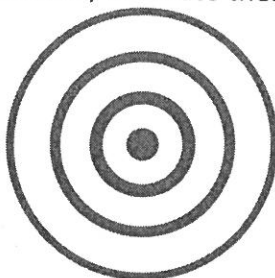
n	l	$m_l$	$m_s$	number of e <sup>-</sup>
3	2	0	+1/2	
4	1			

8. What are the electron configurations of the following elements:
- Potassium:
  - Silver:
  - Krypton:
  - Technetium:

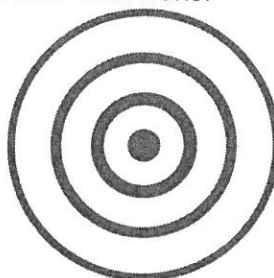
9. On the four targets below, illustrate these four situations:



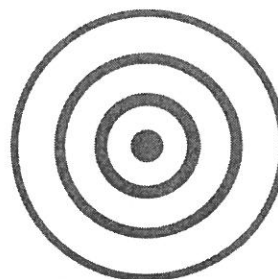
Low accuracy  
High precision



Low accuracy  
Low precision



High accuracy  
High precision



High accuracy  
Low precision

10. If I have three and a half dozen eggs, how many moles of eggs do I have?

11. You have a 4.82 gram cube of platinum in 50.0 mL of canola oil (the density of platinum is 21,447 kg/m<sup>3</sup>).

- Find the volume in cm<sup>3</sup> of the cube:
- The density of canola oil is 0.90 g/cm<sup>3</sup>- does the cube sink or float in the oil?
- How many moles of platinum are in the cube?

12. Identify the following:

- Atomic number of chromium:
- Mass number of selenium:
- Number of electrons around calcium:
- Number of neutrons in rubidium:
- Charge of a proton, neutron, and electron:

13. In your own words, describe what an isotope is:

14. Draw the shape of the following orbitals: s, p, d:

15. Using your understanding of atomic and ionic radii, explain how each radius would be different in Se and  $\text{Se}^{2-}$ . Make sure to specify which is the atomic and which is the ionic radius and how you can tell.

16. Microwave ovens emit microwave energy with a wavelength of 12.9 cm. What is the energy of exactly one photon of this microwave radiation?

17. Find the average atomic mass of magnesium given 3 isotopes, their masses, and percent abundance.

$^{24}\text{Mg}$  has a mass of 23.985 with a percent abundance of 78.70%

$^{25}\text{Mg}$  has a mass of 24.985 with a percent abundance of 10.13%

$^{26}\text{Mg}$  has a mass of 25.983 with a percent abundance of 11.17%