

Name: _____

Part I. Circle your answers

- If a sample of matter is uniform throughout and *cannot* be separated into other substances by *physical means*, it is _____.
 - a compound
 - either a compound or an element
 - a homogeneous mixture
 - a heterogeneous mixture
 - an element
- What volume of 10.0 M H₂SO₄ is required to prepare 4.0 L of 0.50 M H₂SO₄?
 - 0.20 L
 - 0.40 L
 - 0.50 L
 - 1.0 L
 - 4.0 L
- A solution of silver nitrate is mixed with a solution of potassium fluoride. If a precipitate forms, the precipitate is:
 - Silver fluoride
 - Potassium nitrate
 - Potassium fluorate
 - Nitric fluoride
 - No precipitate is formed
- If 5.0 mol of both hydrochloric acid and sodium sulfide are mixed and reacted according to the equation below, how many moles of hydrogen sulfide (H₂S) are produced?
$$\text{HCl} + \text{Na}_2\text{S} \rightarrow \text{H}_2\text{S} + \text{NaCl}$$
 - 1 mol
 - 1.25 mol
 - 2.5 mol
 - 3 mol
 - 5 mol
- Which of the following is *not* a physical process?
 - distillation
 - filtration
 - chromatography
 - evaporation
 - none of the above

6. Of the choices below, which one is not an ionic compound?

- A) PCl_5
- B) MoCl_6
- C) RbCl
- D) PbCl_2
- E) NaCl

7. Boron has two naturally occurring isotopes, ^{10}B with an atomic mass of 10.0129370 amu and ^{11}B with an atomic mass of 11.0093054 amu. The atomic mass of boron is 10.81 (from the periodic table). The percent abundances of the boron isotopes are _____% ^{10}B and _____% ^{11}B .

- A) 81.0, 19.0
- B) 9.9, 90.1
- C) 49.0, 51.0
- D) 20.0, 80.0
- E) 1.0, 99.0

Part II.

8. Complete the following table (all empty cells):

NAME	FORMULA
Calcium chlorate	
	CBr_4
Ammonium phosphate	
	Fe_2O_3

9. Complete the following table (all empty cells in both rows):

Symbol	# of protons	# of neutrons	# of electrons	atomic number	mass number
$^{51}\text{V}^{+5}$					
		18	18		34

10. Selenium, an element used in the manufacture of solar energy devices, forms an oxide that contains only one atom of selenium (per formula unit) and is 37.8% oxygen by mass. What is the molecular formula of the oxide?

11. A solution with a total volume of 1000.0 mL contains 37.1 g $\text{Mg}(\text{NO}_3)_2$. If you remove 20.0 mL of this solution and then dilute this 20.0 mL sample with water until the new volume equals 500.0 mL, what is the concentration of Mg^{+2} ion in the 500.0 mL of solution? What is the concentration of nitrate ion?

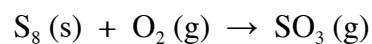
Concentration of Mg^{+2} _____ **Concentration of NO_3^-** _____

12. For each question below, equal volumes of two aqueous solutions are mixed. List the species that are present (ions, compounds, etc.) and their concentrations after mixing if they remain in solution. Include the phases for the species present. You don't need to list water.

a) Equal volumes of a 1.0 M lead (II) nitrate mixed with 1.0 M sodium chloride

b) Equal volumes of 1.0 M ammonium carbonate mixed with 1.0 M potassium perchlorate

13. Solid sulfur and oxygen gas react to produce sulfur trioxide as shown below. In a particular experiment, 5.0 g of O_2 are reacted with 6.0 g of S_8 .



a) If we assume complete consumption of the limiting reactant, what is the mass and identity of the reactant that still remains at the end of the reaction?

c) What is the % yield of SO_3 in this experiment if 7.9 g of SO_3 are isolated?

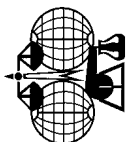
14. An iron nail is suspended on a thin wire in a sealed jar of moist air. The surface of the nail becomes red over time.

a) Describe what is happening to the mass of the nail over time.

b) List the chemical changes taking place in the jar.

IUPAC Periodic Table of the Elements

Key:		atomic number	
Symbol		name	
standard atomic weight			
1	H hydrogen 1.008	2	He helium 4.003
3	Li lithium 6.941(2)	4	Be beryllium 9.012
11	Na sodium 22.99	12	Mg magnesium 24.31
19	K potassium 39.10	20	Ca calcium 40.08
37	Rb rubidium 85.47	38	Sr strontium 87.61
55	Cs caesium 132.9	56	Ba barium 137.3
87	Fr francium	88	Ra radium
21	Sc scandium 44.96	22	Ti titanium 47.87
39	Y yttrium 88.91	40	Zr zirconium 91.22
57-71	lanthanoids	72	Hf hafnium 178.5
89-103	actinoids	104	Rf rutherfordium
23	V vanadium 50.94	24	Cr chromium 52.00
41	Nb niobium 92.91	42	Mo molybdenum 95.96(2)
73	Ta tantalum 180.9	74	W tungsten 183.8
105	Db dubnium	106	Sg seaborgium
25	Mn manganese 54.94	26	Fe iron 55.85
43	Tc technetium	44	Ru ruthenium 101.1
75	Re rhenium 186.2	76	Os osmium 190.2
107	Bh bohrium	108	Hs hassium
27	Co cobalt 58.93	28	Ni nickel 58.69
45	Rh rhodium 102.9	46	Pd palladium 106.4
77	Ir iridium 192.2	78	Pt platinum 195.1
109	Mt meitnerium	110	Ds darmstadtium
29	Cu copper 63.55	30	Zn zinc 65.38(2)
47	Ag silver 107.9	48	Cd cadmium 112.4
79	Au gold 197.0	80	Hg mercury 200.6
111	Rg roentgenium	112	Cn copernicium
5	B boron 10.81	6	C carbon 12.01
13	Al aluminium 26.98	14	Si silicon 28.09
31	Ga gallium 69.72	32	Ge germanium 72.64
49	In indium 114.8	50	Sn tin 118.7
81	Tl thallium 204.4	82	Pb lead 207.2
15	N nitrogen 14.01	16	O oxygen 16.00
33	As arsenic 74.92	34	Se selenium 78.96(3)
51	Sb antimony 121.8	52	Te tellurium 127.6
83	Bi bismuth 208.0	84	Po polonium
7	N nitrogen 14.01	8	O oxygen 16.00
15	P phosphorus 30.97	16	S sulfur 32.07
33	As arsenic 74.92	34	Se selenium 78.96(3)
51	Sb antimony 121.8	52	Te tellurium 127.6
83	Bi bismuth 208.0	84	Po polonium
17	F fluorine 19.00	18	Ar argon 39.95
35	Br bromine 79.90	36	Kr krypton 83.80
53	I iodine 126.9	54	Xe xenon 131.3
85	At astatine	86	Rn radon



57	La lanthanum 138.9	58	Ce cerium 140.1	59	Pr praseodymium 140.9	60	Nd neodymium 144.2	61	Pm promethium	62	Sm samarium 150.4	63	Eu europium 152.0	64	Gd gadolinium 157.3	65	Tb terbium 158.9	66	Dy dysprosium 162.5	67	Ho holmium 164.9	68	Er erbium 167.3	69	Tm thulium 168.9	70	Yb ytterbium 173.1	71	Lu lutetium 175.0
89	Ac actinium 227.0	90	Th thorium 232.0	91	Pa protactinium 231.0	92	U uranium 238.0	93	Np neptunium	94	Pu plutonium	95	Am americium	96	Cm curium	97	Bk berkelium	98	Cf californium	99	Es einsteinium	100	Fm fermium	101	Md mendelevium	102	No nobelium	103	Lr lawrencium

www.iupac.org/reports/periodic_table

This periodic table is dated 19 February 2010

Useful Conversion Factors and Constants

1 mol = 6.022141 × 10²³

R = 0.082058205 L-atm/mol-K

1 m = 1.0936 yd

= 8.314472 J/mol-K

4.184 kJ = 1 kcal

π = 3.1415927

1 in = 2.54 cm (exact)

c = 2.99792458 × 10⁸ m/s