

Name: KEY

CHEM 1110 Test 1A
Spring 2011, Dr. Potts

PART A: Fill-in the blank and Essay – clearly indicate your answer in the spaces provided. You may NOT use a calculator for Part A.

1. (4 pts) Indicate whether each of the following is a chemical change (C) or a physical change (P)

Change	P or C	Change	P or C
Acid rain destroying a marble statue	C	Chopping a wooden log	P
Boiling soup in a pot	P	Burning a wooden log	C

2. (9 pts) Complete the following table

Element name	Symbol	# of Protons	# of Neutrons	Mass Number
cadmium	Cd	48	72	120
zirconium	Zr	40	55	95
lead	Pb	82	128	210

3. (12 pts) Give the name and the formula of the ionic compounds formed from the following

Elements	Chemical Name	Formula
sodium and oxygen	sodium oxide	Na ₂ O
phosphorus and potassium	potassium phosphide	K ₃ P
calcium and bromine	calcium bromide	CaBr ₂

4. (12 pts) Naming and Formulas: Write the correct name/formula.

Co ₃ (PO ₄) ₂	cobalt(II) phosphate
dinitrogen pentoxide	N ₂ O ₅
ICl ₃	iodine trichloride
mercury(II) acetate trihydrate	Hg(C ₂ H ₃ O ₂) ₂ · 3H ₂ O
Cr(OH) ₃	chromium(III)
Br ₂ O ₄	dibromine tetroxide

5. (6 pts) Write the following numbers in scientific notation with the indicated number of significant figures.

Measurement	Scientific Notation
33.259 (3 SF)	3.33 × 10 ¹
0.00024569 (4 SF)	2.457 × 10 ⁻⁴
1250039 (2 SF)	1.3 × 10 ⁶

6. (7 pts) Fill in the blank with the best correct response.
- The symbol and group number of the transition element whose atoms have the fewest protons are scandium, Sc and 3B.
 - The class of elements that lies on the staircase line in the periodic table are termed metalloids.
 - The Group IA elements are termed the alkali metals and the Group IIA elements are termed the alkaline earth metals.
 - What is the chemical symbol for the element in the third period that has the same properties as oxygen? sulfur
 - What charge does phosphorus have when it is an ion? 3-

7. (10 pts) ESSAY: Answer **ONE** of the following in **4 – 6 grammatically** correct sentences
- Describe the experiment that determined the charge and mass of the electron.
 - Describe the basics of a mass spectrometer.

*see Facets of Chemistry
in Chapter 2.*

	IA																											VIII A						
1	1																	2											He					
	H																	He											4.00					
	1.008																	10.81	12.01	14.01	16.00	19.00	20.18											
2	3	4																	5	6	7	8	9	10										
	Li	Be																	B	C	N	O	F	Ne										
	6.94	9.01																	10.81	12.01	14.01	16.00	19.00	20.18										
3	11	12																	13	14	15	16	17	18										
	Na	Mg																	Al	Si	P	S	Cl	Ar										
	22.99	24.31																	26.98	28.09	30.97	32.06	35.45	39.95										
	IIA																	IIIA	IVA	VA	VIA	VIIA												
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																
	39.10	40.08	44.96	47.90	50.94	52.00	54.94	55.85	58.93	58.71	63.55	65.37	69.72	72.59	74.92	78.96	79.90	83.80																
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54																
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																
	85.47	87.62	88.91	91.22	92.91	95.94	[98]	101.1	102.9	106.4	107.9	112.40	114.8	118.7	121.8	127.60	126.90	131.30																
6	55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86																
	Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																
	132.9	137.3	175	178.5	181	183.9	186.2	190.2	192.2	195.1	197	200.59	204.4	207.2	209	[209]	[210]	[222]																
7	87	88	103	104	105	106	107	108	109	110	111	112	113	114	115	116	118	118	Uuo															
	Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	Uut	Uuq	Uup	Uuh	[223]	[226]	[294]															
	[223]	[226]	[262]	[267]	[268]	[271]	[272]	[270]	[276]	[281]	[280]	[285]	[284]	[289]	[288]	[293]																		
	IIIB	IVB	VB	VIB	VIIB	VIII B	IB	IIB																										
	57	58	59	60	61	62	63	64	65	66	67	68	69	70																				
	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb																				
	138.9	140.1	140.9	144.2	[145]	150.4	152	157.3	158.9	162.5	164.93	167.3	168.9	173																				
	89	90	91	92	93	94	95	96	97	98	99	100	101	102																				
	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No																				
	[227]	232	[231]	238	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]																				

PART B: Calculations – show all work for calculations (do nothing in your head, even moving decimal places) to receive full credit.

1. (10 pts) An unknown element has three naturally occurring isotopes. Calculate the average atomic mass and identify the element.

Isotopic Mass	Percent Abundance
38.9637 u	93.26%
39.9640 u	0.0117%
40.9618 u	6.730%

$$\begin{aligned}(38.9637\text{u})(0.9326) &= 36.34\text{u} \\ (39.9640\text{u})(0.000117) &= 0.00468\text{u} \\ (40.9618\text{u})(0.06730) &= 2.757\text{u} \\ \hline &39.10\text{u}\end{aligned}$$

Element Identity (spell, do not use symbol): potassium

2. (10 pts) Yao Ming is the tallest player in the NBA, listed at 7.50 ft tall. Unfortunately, he currently has a stress fracture and is sitting out the rest of the season. What is Mr. Ming's height in meters? (2.54 cm = 1 in)

$$7.50\text{ft} \times \frac{12\text{in}}{1\text{ft}} \times \frac{2.54\text{cm}}{1\text{in}} \times \frac{1\text{m}}{100\text{cm}} = 2.29\text{m}$$

3. (10 pts) Liquid mercury has a density of 13.534 g/mL. If a barometer (used to measure pressure) requires 0.688 gal of mercury to operate, what is the mass of mercury (in kg) that is required for the barometer to operate? (1 gal = 3.785 L)

$$0.688 \text{ gal} \times \frac{3.785 \text{ L}}{1 \text{ gal}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{13.534 \text{ g}}{1 \text{ mL}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \\ = 35.2 \text{ kg}$$

4. (10 pts) A steel ball-bearing with a diameter of 0.0100 m weighs 4.20 g. What is the density of the ball bearing in g/cm³? (Volume of a sphere = $\frac{4}{3}\pi r^3$)

$$r = \frac{d}{2} = \frac{0.0100 \text{ m}}{2} = 0.00500 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} = 0.500 \text{ cm}$$

$$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi (0.500 \text{ cm})^3 = 0.524 \text{ cm}^3$$

$$d = \frac{4.20 \text{ g}}{0.524 \text{ cm}^3} = 8.02 \text{ g/cm}^3$$