

	Points Earned	Points Possible
Part 1 multiple choice		30
Page 2		24
Page 3		26
Page 4		20
Total		100

All work must be shown to receive credit. Show all answers to the proper number of significant figures.

$$N_A = 6.022 \times 10^{23} / \text{mol}$$

$$K = ^\circ\text{C} + 273.16$$

$$0^\circ\text{C} = 273.16 \text{ K}$$

Grossmont College
Periodic Table

												VIIA				NOBLE GASES	
1 H 1.008	IIA											1 H 1.008	2 He 4.002				
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 23.00	12 Mg 24.30	IIIB	IVB	VB	VIB	VII B	VIII	VIII	VIII	IB	IIB	13 Al 27.00	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	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 (99)	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 (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ?? (269)								

Lanthanide series

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (147)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	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 231.0	92 U 238.0	93 Np (237)	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)

Actinide series

Part 1 – Multiple Choice (30 points)

- At which pressure would nitrogen gas be most soluble?
 - 1.0 atm
 - 1.5 atm
 - 2.0 atm
 - 2.5 atm
 - Unable to determine
- Which is the hydroxide ion?
 - H^{+1}
 - OH_2^{-1}
 - H_2OOH
 - H_3O^{+1}
 - OH^{-1}
- What is the conjugate base of HS^{-1} ?
 - H^{+1}
 - S^{-2}
 - OH^{-1}
 - HS^{+1}
 - H_2S
- All nuclides of which element must be radioactive?
 - Arsenic
 - Strontium
 - Plutonium
 - Sulfur
 - Carbon
- An alpha particle consists of
 - One proton and one neutron
 - Two protons and two neutrons
 - One proton and two neutrons
 - Two protons and one neutron
 - Two protons and four neutrons
- In which type of reaction do the nuclei of two light elements unite to form a heavier nucleus?
 - Alpha decay
 - Beta decay
 - Electron capture
 - Fusion
 - Fission
- How many neutrons are in the nucleus of cobalt-60?
 - 33
 - 29
 - 31
 - 27
 - 60
- Which hydrocarbon series contains a triple covalent bond between carbon atoms?
 - Alkynes
 - Alkanes
 - Alkenes
 - Alkatrienes
 - Alkines

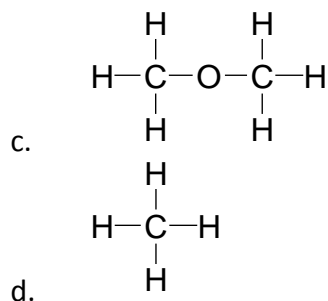
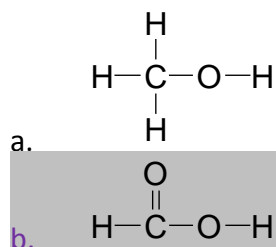
9. Two or more different compounds with the same molecular formula are

- a. Isotopes
- b. Hypermeres
- c. Hypertopes
- d. Isomers
- e. Mollimers

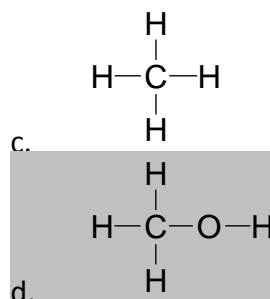
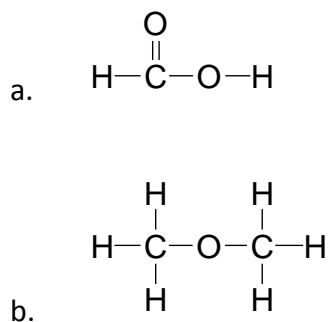
10. $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_3$ is

- a. Pentane
- b. 3-pentene
- c. Pen-2-ene
- d. Pentyne
- e. 2-pentene

11. Which is a carboxylic acid?



12. Which is an alcohol?



13. The simplest carbohydrates are

- a. Monosaccharides
- b. Peptides
- c. Dipeptides
- d. Disaccharides
- e. Potatoes

14. What are the primary constituents of proteins?

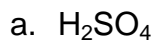
- a. Monosaccharides
- b. Amino acids
- c. Nucleic acids
- d. Proteases
- e. Rabbits

15. Fats and oils are

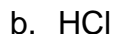
- a. Carbohydrates
- b. Nucleic acids
- c. Proteins
- d. Hydrocarbons
- e. Lipids

Part 2 – Problems and Questions (70 points)

1. (4 points) Give the proper IUPAC names for the following acids

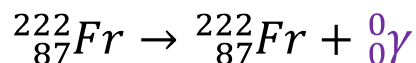
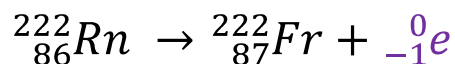


Sulfuric acid



Hydrochloric acid

2. (8 points) Determine the type of emissions (alpha, beta, or gamma) that occurred in each of the following transitions.



3. (6 points) Strontium-90 has a half-life of 28 years. If a 4.00 mg sample was stored for 140 years, what mass of Sr-90 would remain?

$$4.00\text{mg} \xrightarrow{1} 2.00\text{mg} \xrightarrow{2} 1.00\text{mg} \xrightarrow{3} 0.50\text{mg} \xrightarrow{4} 0.25\text{mg} \xrightarrow{5} 0.125\text{mg}$$

4. (6 points) A solution is prepared by dissolving 54.7 grams of KOH in 486.0 grams of water. Calculate the mass percent potassium hydroxide in a solution.

$$\begin{aligned} ?\% \text{ KOH} &= \left(\frac{\text{mass KOH}}{\text{mass solution}} \right) \times 100\% = \left(\frac{54.7 \text{ g KOH}}{(486.0 + 54.7) \text{ g soln}} \right) \times 100\% \\ &= \left(\frac{54.7 \text{ g KOH}}{540.7 \text{ g soln}} \right) \times 100\% = \boxed{10.1\% \text{ KOH}} \end{aligned}$$

5. (6 points) Calculate the number of grams of calcium chloride in 31.8 mL of a 0.4288 M solution CaCl_2 .

$$\begin{aligned} ? \text{ g CaCl}_2 &= 31.8 \text{ mL soln} \times \frac{0.4288 \text{ mol CaCl}_2}{1000 \text{ mL soln}} \times \frac{110.98 \text{ g CaCl}_2}{1 \text{ mol CaCl}_2} \\ &= \boxed{1.51 \text{ g CaCl}_2} \end{aligned}$$

6. (6 points) 46.5 ml of 0.643 M $\text{H}_2\text{C}_2\text{O}_4$ is diluted to 150.0 ml. What is the molarity of the resulting solution?

$$M_1V_1 = M_2V_2 \quad \rightarrow \quad M_2 = M_1 \left(\frac{V_1}{V_2} \right) = 0.643 \text{ M} \left(\frac{46.5 \text{ mL}}{150.0 \text{ mL}} \right) = 0.199 \text{ M H}_2\text{C}_2\text{O}_4$$

7. (8 points) A 16.7% solution of potassium phosphate (K_3PO_4) has a density of 1.53 g/mL. Calculate the molarity of the solution.

$$\begin{aligned} ? [\text{K}_3\text{PO}_4] &= \frac{\text{mol K}_3\text{PO}_4}{\text{L soln}} = \frac{1.53 \text{ g soln}}{1 \text{ mL soln}} \times \frac{16.7 \text{ g K}_3\text{PO}_4}{100 \text{ g soln}} \times \frac{1 \text{ mol K}_3\text{PO}_4}{212.3 \text{ g K}_3\text{PO}_4} \times \frac{1000 \text{ mL soln}}{1 \text{ L soln}} \\ &= \boxed{1.20 \text{ M K}_3\text{PO}_4} \end{aligned}$$

8. (6 points) A solution has an H_3O^+ concentration of 4.66×10^{-7} M.
a. Determine the pH of the solution.

$$\text{pH} = -\log[\text{H}_3\text{O}^+] = -\log(4.66 \times 10^{-7}) = \boxed{6.332}$$

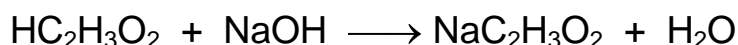
- b. Determine the pOH of the solution.

$$\text{pOH} = 14 - 6.332 = \boxed{7.68}$$

9. (3 points) A solution has a pH of 5.298. Calculate the hydronium ion concentration in the solution.

$$[H_3O^+] = 10^{-pH} = 10^{-5.298} = \boxed{5.03 \times 10^{-6} M}$$

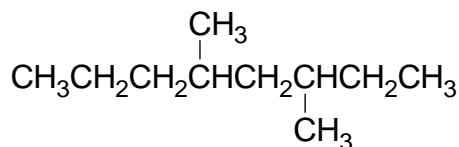
10. (8 points) A 25.00 ml sample of vinegar was titrated with 34.64 ml of 0.3155 M NaOH. Calculate the molarity of acetic acid in the vinegar sample.



$$mol NaOH = 34.64 mL \times \frac{0.3155 mol NaOH}{1000 mL} = 0.01093 mol NaOH$$

$$mol HAc = mol NaOH = 0.01093 mol HAc$$

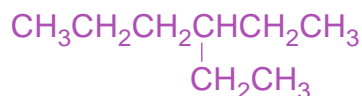
$$M HAc = \frac{mol HAc}{L soln} = \frac{0.01093 mol HAc}{0.02500 L soln} = 0.4372 M HAc$$



11. (3 points) Give the IUPAC name of

3,5-Dimethyl octane (best)

12. (3 points) Draw a condensed structural formula for 3-ethyl heptane.



13. (3 points) Explain how a saturated fat differs from an unsaturated fat in terms of its chemical structure.

A saturated fat has only single bonds and an unsaturated fat contains double bonds.