

Final Exam  
**GENERAL CHEMISTRY**  
Fall 2024

**Points of attention:**

- For each question, the maximum earned points are specified in the question.
- Write clearly! Answers that are not readable are not marked and don't earn marks!
- All answers should be written in English using **blue or black pens** only.
- Use the pencil only for diagrams and graphs.
- Show all the calculation steps in the given space.
- When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

**Exam Duration:** 2 hours  
**Instructor's Name:**  
**Exam Date:** 09/01/2014  
**Program:** PE

	<b>40</b>
	<b>10</b>

**Student Information**

Name:  ID:   
Signature:

**Invigilator**

Initials:  ☐ Student ID checked  
Time received:

**Section A:****[15 marks]**

Choose the correct options from the answers given below for each question.

1) The reaction  $\text{Zn}_{(s)} + 2\text{HCl}_{(aq)} \rightarrow \text{ZnCl}_{2(aq)} + \text{H}_{2(g)}$  is classified as:

- a. Non-oxidation-reduction reaction
- b. Single replacement reaction
- c. Combustion reaction
- d. Precipitation reaction

2) Find the volume of a 0.750 M  $\text{H}_2\text{SO}_4$  solution that contains 20.0 g of  $\text{H}_2\text{SO}_4$ .

- a. 0.180 L
- b. 1.20 L
- c. 0.260 L
- d. 0.360 L

3) Identify the statement that is false about electrolytes in chemistry.

- a. Non-electrolytes produce ions when dissolved in water.
- b. Electrolytes affect the conductivity of solutions
- c.
- d. Strong electrolytes completely ionize in water
- e. Weak electrolytes partially ionize in water

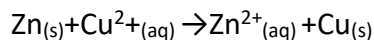
4) The purpose of a titration experiment is as follows:

- a. To determine the pH of an acidic or basic solution.
- b. To calculate the molar mass of an unknown compound.
- c. To analyze the thermal stability of a substance.
- d. To determine the concentration of an unknown solution.

5) In the reaction  $\text{NaCl}_{(\text{aq})} + \text{AgNO}_{3(\text{aq})} \rightarrow \text{AgCl}_{(\text{s})} + \text{NaNO}_{3(\text{aq})}$ , the spectator ions are:

- a.  $\text{Na}^+$  and  $\text{NO}_3^-$
- b.  $\text{Na}^+$  and  $\text{Cl}^-$
- c.  $\text{Ag}^+$  and  $\text{NO}_3^-$
- d.  $\text{Ag}^+$  and  $\text{Cl}^-$

6) The reducing agent in the following redox reaction is:



- a.  $\text{Zn}_{(\text{s})}$
- b.  $\text{Cu}_{(\text{s})}$
- c.  $\text{Zn}^{2+}_{(\text{aq})}$
- d.  $\text{Cu}^{2+}_{(\text{aq})}$

7) Identify the strong electrolyte from the following options:

- a. HF (Hydrofluoric acid)
- b.  $\text{H}_3\text{PO}_4$  (Phosphoric acid)
- c.  $\text{CH}_3\text{CO}_2\text{H}$  (Acetic acid)
- d.  $\text{HClO}_4$  (Perchloric acid)

8) Identify the compound that is insoluble in water:

- a.  $\text{BaSO}_4$
- b. KCl
- c.  $\text{NaNO}_3$
- d.  $(\text{NH}_4)_2\text{CO}_3$

9) When 2.00 L of a solution of NaCl is diluted to 3.80 L, what are the changes in the solution?

- a. Molarity and Volume
- b. Number of moles only
- c. Number of moles and Volume
- d. Molarity and Number of moles

10) Saturated hydrocarbons are also known as:

- a. Alkanes
- b. Alkenes
- c. Alkynes
- d. Alkaloids

**Section B:****[25 marks]**

Answer all questions in the answer space provided below for each question:

- 1) Bromochloropropane, a compound used as an intermediate in chemical synthesis, contains carbon, hydrogen, bromine, and chlorine. It has a molar mass of 175.0 g/mol. Analysis of a sample shows that it contains 13.7% carbon, 3.1%hydrogen, 45.6% bromine, and the remaining percentage is chlorine. Determine the molecular formula of Bromochloropropane.

- a) Determine the molecular formula of Bromochloropropane. (7)

- b) Another sample of Bromochloropropane was found to have a molar mass of 262.5g/mol. Assuming the same percentages of carbon, hydrogen, bromine, and chlorine, determine the molecular formula of this sample. (2)

2) In a laboratory experiment, a student dissolves 0.10 mol of  $\text{Pb}(\text{NO}_3)_2$  in 500 mL of water and 0.20 mol of KI in 250 mL of water. The two solutions are mixed, resulting in the formation of a bright yellow precipitate.

a. Identify the type of reaction.

(2)

b. Write the balanced chemical equation for the reaction and identify the yellow precipitate formed. (3)

c. Write the ionic equation for this reaction, showing all the ions involved. (2)

d. Identify the spectator ions in this reaction. (1)

e. Calculate the molarity of each solution  $\text{Pb}(\text{NO}_3)_2$  and  $\text{KI}$  before mixing. (2)

3) Draw all the 3 structural isomers of  $\text{C}_6\text{H}_{14}$  and provide their IUPAC names. (6)





# Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 <b>H</b> Hydrogen 1.008																	2 <b>He</b> Helium 4.003
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012																10 <b>Ne</b> Neon 20.180
11 <b>Na</b> Sodium 22.990	12 <b>Mg</b> Magnesium 24.305																18 <b>Ar</b> Argon 39.948
19 <b>K</b> Potassium 39.098	20 <b>Ca</b> Calcium 40.078	21 <b>Sc</b> Scandium 44.956	22 <b>Ti</b> Titanium 47.88	23 <b>V</b> Vanadium 50.942	24 <b>Cr</b> Chromium 51.996	25 <b>Mn</b> Manganese 54.938	26 <b>Fe</b> Iron 55.933	27 <b>Co</b> Cobalt 58.933	28 <b>Ni</b> Nickel 58.693	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.39	31 <b>Ga</b> Gallium 69.723	32 <b>Ge</b> Germanium 72.61	33 <b>As</b> Arsenic 74.922	34 <b>Se</b> Selenium 78.09	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 84.80
37 <b>Rb</b> Rubidium 84.468	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.906	40 <b>Zr</b> Zirconium 91.224	41 <b>Nb</b> Niobium 92.906	42 <b>Mo</b> Molybdenum 95.94	43 <b>Tc</b> Technetium 98.907	44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.906	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.868	48 <b>Cd</b> Cadmium 112.411	49 <b>In</b> Indium 114.818	50 <b>Sn</b> Tin 118.71	51 <b>Sb</b> Antimony 121.760	52 <b>Te</b> Tellurium 127.6	53 <b>I</b> Iodine 126.904	54 <b>Xe</b> Xenon 131.29
55 <b>Cs</b> Cesium 132.905	56 <b>Ba</b> Barium 137.327	57-71 Lanthanides	72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.948	74 <b>W</b> Tungsten 183.85	75 <b>Re</b> Rhenium 186.207	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.22	78 <b>Pt</b> Platinum 195.08	79 <b>Au</b> Gold 196.967	80 <b>Hg</b> Mercury 200.59	81 <b>Tl</b> Thallium 204.383	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.980	84 <b>Po</b> Polonium [208.982]	85 <b>At</b> Astatine 209.987	86 <b>Rn</b> Radon 222.018
87 <b>Fr</b> Francium 223.020	88 <b>Ra</b> Radium 226.025	89-103 Actinides	104 <b>Rf</b> Rutherfordium [261]	105 <b>Db</b> Dubnium [262]	106 <b>Sg</b> Seaborgium [266]	107 <b>Bh</b> Bohrium [264]	108 <b>Hs</b> Hassium [269]	109 <b>Mt</b> Meitnerium [268]	110 <b>Ds</b> Darmstadtium [269]	111 <b>Rg</b> Roentgenium [272]	112 <b>Cn</b> Copernicium [277]	113 <b>Uut</b> Ununtrium unknown	114 <b>Fl</b> Flerovium [289]	115 <b>Uup</b> Ununpentium unknown	116 <b>Lv</b> Livermorium [298]	117 <b>Uus</b> Ununseptium unknown	118 <b>Uuo</b> Ununoctium unknown

57 <b>La</b> Lanthanum 138.906	58 <b>Ce</b> Cerium 140.115	59 <b>Pr</b> Praseodymium 140.908	60 <b>Nd</b> Neodymium 144.24	61 <b>Pm</b> Promethium [144.913]	62 <b>Sm</b> Samarium 150.36	63 <b>Eu</b> Europium 151.966	64 <b>Gd</b> Gadolinium 157.25	65 <b>Tb</b> Terbium 158.925	66 <b>Dy</b> Dysprosium 162.50	67 <b>Ho</b> Holmium 164.930	68 <b>Er</b> Erbium 167.26	69 <b>Tm</b> Thulium 168.934	70 <b>Yb</b> Ytterbium 173.04	71 <b>Lu</b> Lutetium 174.967
89 <b>Ac</b> Actinium 227.028	90 <b>Th</b> Thorium 232.038	91 <b>Pa</b> Protactinium 231.036	92 <b>U</b> Uranium 238.029	93 <b>Np</b> Neptunium 237.048	94 <b>Pu</b> Plutonium 244.064	95 <b>Am</b> Americium 243.061	96 <b>Cm</b> Curium 247.070	97 <b>Bk</b> Berkelium 247.070	98 <b>Cf</b> Californium 251.080	99 <b>Es</b> Einsteinium [254]	100 <b>Fm</b> Fermium 257.095	101 <b>Md</b> Mendelevium 258.1	102 <b>No</b> Nobelium 259.101	103 <b>Lr</b> Lawrencium [262]

**Reference:**

McMurry, John E., Fay Robert C., and Robinson Jill K. (2016) "Chemistry, 7th Edition," USA, Pearson Education, Inc.

Heaton, A. (1996) (Ed.) An Introduction to Industrial Chemistry. New York: Blackie Academic and Professional.

**MLO and Bloom's Level of Complexity**

Q #	MLO Addressed	Complexity Level	Mark	Remark
1	1,2	Analyze, Apply	15	
2	2,3	Analyze, evaluate	9	
3	3	Analyze	10	
4	2	Apply	6	