

**Sir Wilfred Grenfell College**  
**MEMORIAL UNIVERSITY OF NEWFOUNDLAND**  
**CHEMISTRY 1810**

**Sample Final Examination**

*Time: Two and One-Half Hours*

*Name:* \_\_\_\_\_

*Student Number:* \_\_\_\_\_

*Instructor:* \_\_\_\_\_

This Examination has 9 Pages  
(not including the Periodic Table)

**Read the following carefully**

**Answer each question in the space provided. Should you need more space, use the back of the previous page. When answering problems, show all your calculations. Note: a ½ mark will be deducted for any final answer with the incorrect number of significant figures.**

**You are provided with a Periodic Table and data sheet on the last page of the examination. You may detach this sheet.**

**HAND IN THIS PAPER IN ITS ENTIRITY AT THE END OF THE EXAMINATION.**

Page	Value	Mark
2	15	
3	16	
4	14	
5	10	
6	17	
7	10	
8	8	
9	10	
<b>Total</b>	<b>100</b>	

[marks]

1. Identify each of the following terms (*spell correctly!*):

- (a) When an element exists in more than one form
- (b) The ability of carbon atoms to form chains (and hence large complex molecules)
- (c) The full name of the SI unit of mass
- (d) The name of the Group of elements that contains magnesium and calcium
- (e) The substance dissolved in a solvent
- (f) A pair of electrons in a molecule not involved in covalent bonding
- (g) Two liquids that do not mix together are said to be:
- (h) The process of separating the components of a mixture by boiling and condensing
- (i) The conical-shaped flask used in a titration
- (j) A tentative explanation of a natural phenomenon

[10]

2. Naturally-occurring copper consists of two isotopes, copper-63 and copper-65. Which is the more abundant isotope? Give your reasoning.

[2]

3. Magnesium exists in nature as a mixture of three isotopes. Their atomic masses and abundances are listed below. Calculate the average atomic mass of magnesium.

Isotope	Atomic mass (u)	Abundance (%)
Mg-24	23.94	78.60
Mg-25	24.99	10.11
Mg-26	25.98	11.29

[3]

4. Complete the following table:

[4]

Ion	# of protons	# of electrons
$S^{2-}$		
	13	10

5. A pipet is marked with the number "10." Does this mean it will deliver a volume of 10 mL or 10.00 mL?

[1]

6. A beaker contains 25.0 mL of liquid bromine (density,  $3.12 \text{ g}\cdot\text{mL}^{-1}$ ). Calculate the number of atoms of bromine that the beaker contains (show all your calculations).

[5]

7. Construct electron-dot (Lewis) diagrams for each of the following:

a) O

b)  $O^{2-}$

[4]

c) MgO

d)  $F_2O$

8. Write in the number of electrons occupying each electron energy level:

[2]

	n=1	n=2	n=3
Chlorine	_____	_____	_____

9. Identify each of the following elements by *name*:

(a) The most common element in the universe \_\_\_\_\_

(b) The most reactive halogen \_\_\_\_\_

[5]

(c) The only radioactive noble gas \_\_\_\_\_

(d) One form of this element is stored under water \_\_\_\_\_

(e) The most common gas in the atmosphere \_\_\_\_\_

[2] 10. Provide the names (correctly spelled) for each of the following compounds.

Formula	Name
$\text{Fe}_2\text{O}_3$	_____

$\text{N}_2\text{O}_3$	_____
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[2] 11. Provide the formulas for each of the following compounds.

Name	Formula
ammonium phosphate	_____

nitric acid	_____
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[2] 12. Sulfur forms two oxyanions. Write the formula of each and provide their names.

Formula	Name
_____	_____

_____	_____
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13. Identify each of the following compounds by *name*:

(a) The only basic gas \_\_\_\_\_

(b) The gas that smells like "rotten eggs" \_\_\_\_\_

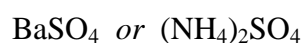
[3]

(c) The red-brown oxide of nitrogen \_\_\_\_\_

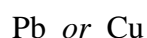
- [5] 14. A certain compound of phosphorus and oxygen contains 43.7% phosphorus.
- (a) Determine its empirical formula..
- (b) If the molar mass of the compound is  $284 \text{ g}\cdot\text{mol}^{-1}$ , calculate its molecular formula.
15. Sodium carbonate is usually found as a hydrate,  $\text{Na}_2\text{CO}_3\cdot x\text{H}_2\text{O}$ . When 9.56 g of the hydrate are heated to constant mass, there is 3.54 g of anhydrous sodium carbonate remaining. Determine the formula of the hydrate.

[5]

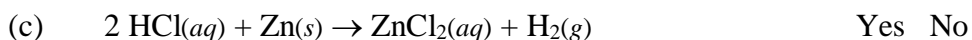
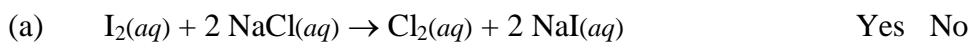
- [1] 16. In the following pair of compounds, one is water-soluble and the other is not. Circle the *soluble* compound.



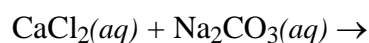
- [1] 17. In the following pair of elements, one will react with acids and the other will not. Circle the element that *will* react with acids.



- [4] 18. Which of the following reactions will occur? Circle “yes” or “no”.



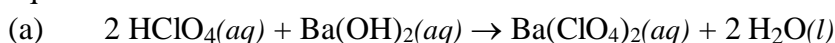
19. Complete the following equation, indicate the phase of each product, and identify the class of reaction:



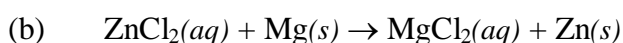
[3]

class of reaction: \_\_\_\_\_

20. Write total ionic and net ionic equations corresponding to the following molecular equations.



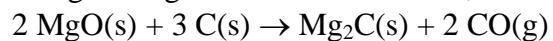
[4]



21. A sample of 4.00 g of a noble gas occupies 2.43 L at 25 °C and 102 kPa. Calculate the molar mass of the gas and hence identify it.

[4]

22. Magnesium oxide reacts with carbon to give magnesium carbide and carbon monoxide gas. If 150 g of magnesium oxide are used,

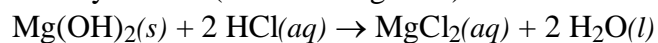


- (a) What mass of carbon will be needed for complete reaction of the magnesium oxide?

[6]

- (b) What volume of carbon monoxide gas will be produced at a temperature of 200°C and a pressure of 140 kPa?

23. Magnesium hydroxide (Milk of Magnesia) is used to neutralize excess stomach acid.



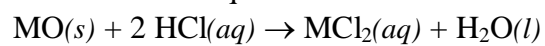
Calculate the mass of magnesium hydroxide that is needed to neutralize 0.500 L of 1.00 mol·L<sup>-1</sup> hydrochloric acid (stomach acid).

[4]

24. Calculate the concentration of 125 mL of a solution containing 4.85 g of calcium chloride.

[3]

25. To completely react with 8.14 g of a metal oxide, MO, 40.0 mL of 5.00 mol·L<sup>-1</sup> hydrochloric acid are required.



Calculate the molar mass of MO and hence deduce the identity of the metal.

Briefly explain why you think the identity of the metal is correct.

[5]



- [2]
26. (a) In what way does an aldehyde differ from a ketone?
- (b) The molecular formula of a cyclo-alkene differ from the formula of a straight-chain alkane having the same number of carbon atoms?
- [4]
26. Draw condensed formulas for each of the following:
- (a) 2-methyl-2-pentene
- (b) 3-hexanone
- (c) 2,2,3,4-tetrafluoroheptane
- (d) methyl butanoate
- [4]
27. Draw the condensed formulas for:
- (a) Toluene
- (b) The pair of alkenes which have the fewest number of carbon atoms yet are geometric isomers.
- (c) The alkane which has the fewest number of carbon atoms yet can exist as optical (chiral) isomers.
- (d) Two structural isomers of butanol.