

General Chemistry 101

First Semester 2011/2012

First Exam.

Date: 30/10/2011

Time: 60 min.

Student Name: ..... Reg. No.: .....

Instructor's Name: ..... Section: ..... Seat No.: .....



Answer Sheet

1- a b c d e 9- a b c d e

2- a b c d e 10- a b c d e

3- a b c d e 11- a b c d e

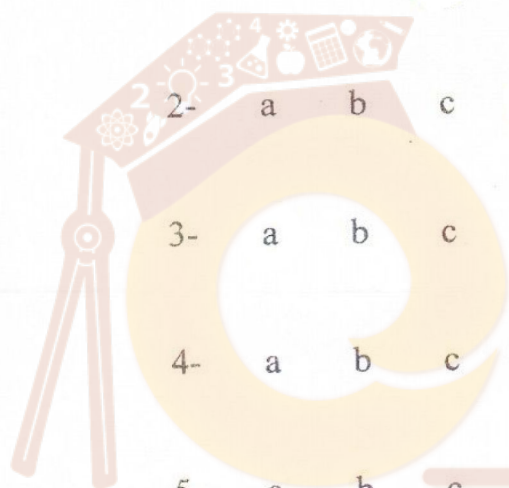
4- a b c d e 12- a b c d e

5- a b c d e 13- a b c d e

6- a b c d e 14- a b c d e

7- a b c d e 15- a b c d e

8- a b c d e 16- a b c d e



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Answer each of the following questions and put "X" on the correct choice on front page.

1- Which of the following is an intensive property?

- a) length      b) area      c) density      d) energy      e) weight

2. Carry out the following operation and report the result to the correct number of significant figures:

$$[(1.00 - 0.01) \times 2.500] \div 12.0$$

- a) 0.20625      b) 0.2063      c) 0.206      d) 0.21      e) 0.2

3. The speed of a car is 32.0 mile/hr. What is its speed in m/s?

(given: 1 mile = 1609 m)

- a) 14.3      b) 16.1      c) 18.8      d) 20.6      e) 71.6

4. The formula of iron(III) phosphate is:

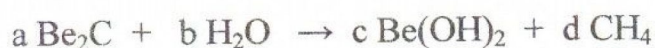
- a)  $\text{Fe}_2\text{PO}_4$       b)  $\text{FePO}_3$       c)  $\text{Fe}_2(\text{PO}_4)_3$       d)  $\text{Fe}_3(\text{PO}_4)_3$       e)  $\text{FePO}_4$

5. For the isotope  ${}_{27}^{59}\text{X}$ . The number of protons and neutrons in that isotope are:

- a) 27 and 59      b) 27 and 32      c) 32 and 27      d) 59 and 27      e) 32 and 59



10. Balance the following equation:



The ratio of coefficients  $b/d$  in the balanced equation is:

- a) 1/2      b) 2/1      c) 1/4      d) 3/1      e) 4/1

11. 13.5 g of  $\text{Li}(\text{s})$  was reacted with 14.85 g of  $\text{N}_2(\text{g})$  according to the equation:

$$\text{N}_2(\text{g}) + 6 \text{Li}(\text{s}) \rightarrow 2 \text{Li}_3\text{N}(\text{s})$$

If the actual yield is 11.6 g, what is the percent yield of this reaction ?

Atomic masses:  $\text{Li} = 6.942$  and  $\text{N} = 14.01$ .

- a) 51.4      b) 28.6      c) 66.3      d) 41.8      e) 70.2

12. Which of the following compounds is insoluble in water?

- a)  $\text{Na}_2\text{CO}_3$       b)  $\text{FeCO}_3$       c)  $(\text{NH}_4)_2\text{CO}_3$       d)  $\text{Na}_2\text{S}$       e)  $\text{AgNO}_3$

13. Which of the following reactions is an acid-base reaction?

- a)  $\text{NaCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$   
b)  $\text{Cl}_2(\text{g}) + 2\text{HI}(\text{g}) \rightarrow 2\text{HCl}(\text{g}) + \text{I}_2(\text{g})$   
c)  $\text{Ba}(\text{OH})_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaOH}(\text{aq})$   
d)  $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})$   
e)  $\text{Na}_2\text{CO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + 2\text{NaCl}(\text{aq})$

14. Balance the following redox reaction in acidic solution:



The ratio of coefficients  $d / c$  in the balanced equation is:

- a) 10 / 2      b) 7 / 3      c) 2 / 10      d) 2 / 5      e) 5 / 2

15. What is the volume of 0.910 M  $\text{Ba}(\text{OH})_2$  solution needed to titrate 25.0 mL of 1.500M  $\text{H}_3\text{PO}_4$  to produce  $\text{Ba}_3(\text{PO}_4)_2$  ?

- a) 79.2 mL      b) 92.2mL      c) 52.0mL      d) 61.8mL      e) 69.4mL

16. When excess  $\text{Na}_2\text{SO}_4$  solution was added to 20.0 mL of an unknown solution containing  $\text{Ca}^{2+}$  ion, 0.0472 g of  $\text{CaSO}_4$  precipitated. What is the molar concentration of  $\text{Ca}^{2+}$  in the unknown solution?

(Molar mass of  $\text{CaSO}_4 = 136.14 \text{ g/mol}$ )

- a)  $1.36 \times 10^{-2}$       b)  $1.73 \times 10^{-2}$       c)  $2.10 \times 10^{-2}$       d)  $2.47 \times 10^{-2}$       e)  $3.83 \times 10^{-2}$

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Section No. ....

Seat No. ....

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Use the following information: Atomic mass (amu): C = 12.0; H = 1.00; O = 16.0; S = 32.0; Al = 27.0; N = 14.0; Na = 23.0; Avogadro's no. =  $6.022 \times 10^{23}$ ;  $^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times (5/9)$ .

@@@@@@@@@@@@@@@@@@@@#####

ANSWER SHEET

1. a b **c** d e      9. **a** b c d e

2. **a** b c d e      10. a b c d e

3. **a** b c d **e**      11. a b c **d** e

4. a b c d e      12. **a** b c d e

5. a b c d e      13. a b c d e

6. a b c d e      14. a b **c** d e

7. a b **c** d e      15. **a** b c d e

8. **a** b c d e      16. a b c d e



1- Perform the following calculation and give the answer rounded to the correct number of significant figures

$$(3.28 + 2.8395) (1.00 + 4.5) / 23.95$$

- a- 1.4054      b - 2      c- 1.4      d- 1.420      e- 1.42

2- Convert  $(-10)^\circ\text{C}$  to Fahrenheit scale of temperature.

- a- 14      b- 23.3      c- 263.15      d- 42.2      e- 32.3

3- The atomic mass of  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$  are 34.968 amu and 36.956 amu, respectively. Calculate the natural abundance of  $^{35}\text{Cl}$ . Given that the average atomic mass of Cl is 35.46 amu.

- a- 24.75%      b- 98.61%      c- 1.39%      d- 51.65%      e- 75.25%

4- After balancing the following reaction,



The ratio  $(x / y)$  is equal to

- a- 3 / 2      b- 4 / 2      c- 2 / 2      d- 6 / 2      e- 2 / 6

5- The correct name for  $\text{Ni}(\text{BrO}_4)_2$  is: (Ni is a transition metal element)

- a- Nickel (II) bromate      b- Nickel (II) bromite      c- Nickel (II) perbromate  
d- Nickel (IV) perpromate      e- Nickel dibromate

6- The correct name for  $\text{SO}_3$  is

- a- Sulfur trioxide      b- Sulfur (IV) oxide      c- Sulfur monoxide  
d- Sulfur dioxide      e- Sulfur oxide

7- How many sodium ions are contained in 9.96 mg (milligram) of  $\text{Na}_2\text{SO}_3$ ? The molar mass of  $\text{Na}_2\text{SO}_3$  is 126.05 g/mol.

- a-  $1.52 \times 10^{27}$       b-  $4.76 \times 10^{20}$       c-  $9.52 \times 10^{19}$   
d-  $1.05 \times 10^{21}$       e-  $9.52 \times 10^{20}$

8- The mass percent of sulfur in  $\text{Al}_2(\text{SO}_4)_3$  is equal to

- a- 28.1%      b- 9.37%      c- 42.7%      d- 21.4%      e- 36.0%

9- The empirical formula for a compound that contains 52.14% C, 13.13% H and 34.73% O is

- a-  $\text{C}_2\text{H}_6\text{O}$       b-  $\text{CHO}$       c-  $\text{C}_4\text{H}_{13}\text{O}_2$       d-  $\text{CH}_4\text{O}_2$       e-  $\text{CH}_3\text{O}$

10- Consider the following balanced reaction. How many grams of water are required to form 56.9 g of  $\text{HNO}_3$ ? Assume that there is excess  $\text{NO}_2$  present.



- a- 38.0 g      b- 10.9 g      c- 43.4 g      d- 21.7 g      e- 8.13 g

11- Determine the limiting reactant (LR) and the mass (in g) of nitrogen that can be produced from the reaction of 50.0  $\text{N}_2\text{O}_4$  with 45.0g  $\text{N}_2\text{H}_4$  assuming 100% yield. The molar masses are as follows:  $\text{N}_2\text{O}_4 = 92.02\text{g/mol}$ ,  $\text{N}_2\text{H}_4 = 32.05\text{g/mol}$ .



- a- LR is  $\text{N}_2\text{H}_4$ , 59.0 g  $\text{N}_2$  formed      b- LR is  $\text{N}_2\text{O}_4$ , 105 g  $\text{N}_2$  formed  
c- LR is  $\text{N}_2\text{H}_4$ , 13.3 g  $\text{N}_2$  formed      d- LR is  $\text{N}_2\text{O}_4$ , 45.7 g  $\text{N}_2$  formed  
e- Both reactants are in appropriate stoichiometric ratios and 45.0 g  $\text{N}_2$  formed

12- All of the following compounds are soluble in water except

- a-  $\text{Hg}_2\text{Cl}_2$     b-  $\text{KCl}$     c-  $\text{NH}_4\text{Cl}$     d-  $\text{CuCl}_2$     e-  $\text{Ba}(\text{OH})_2$

13- Which of the following conversions involves oxidation

- a-  $\text{BF}_3 \rightarrow \text{BF}_4$                       b-  $\text{SO}_2 \rightarrow \text{CaSO}_3$   
c-  $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O}$                       d-  $\text{H}_2(\text{g}) \rightarrow \text{H}_2(\text{l})$   
e-  $\text{Ti}^{3+} \rightarrow \text{TiO}^{+2}$

14- The net ionic equation for the reaction of nitrous acid with lithium hydroxide is

- a-  $\text{HNO}_2(\text{aq}) + \text{LiOH}(\text{aq}) \rightarrow \text{LiNO}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
b-  $\text{HNO}_2(\text{aq}) + \text{LiOH}(\text{aq}) \rightarrow \text{Li}^+(\text{aq}) + \text{NO}_2^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
c-  $\text{HNO}_2(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{NO}_2^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
d-  $\text{H}^+(\text{aq}) + \text{NO}_2^-(\text{aq}) + \text{Li}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{Li}^+(\text{aq}) + \text{NO}_2^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$   
e-  $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$

15- After balancing the following chemical reaction in Basic solution, the correct ration of ( $\text{I}^- / \text{OH}^-$ ) is



a- 6/8

b- 8/10

c- 4/3

d- 4/2

e- 2/3

16- The volume in milliliters (ml) of 0.675 M NaOH required to neutralize 25.0 ml of 0.145 M  $\text{H}_3\text{PO}_4$  is equal to

a- 16.1

b- 10.7

c- 13.2

d- 5.37

e- 16.9

**General Chem. 101**  
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Name: ..... Reg. No.: .....

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$$^{\circ}\text{F} = (^{\circ}\text{C} \times \frac{9}{5}) + 32, \quad \text{K} = ^{\circ}\text{C} + 273$$



**ANSWER SHEET**

- |    |   |   |   |   |   |     |   |   |   |   |   |
|----|---|---|---|---|---|-----|---|---|---|---|---|
| 1. | a | b | c | d | e | 9.  | a | b | c | d | e |
| 2. | a | b | c | d | e | 10. | a | b | c | d | e |
| 3. | a | b | c | d | e | 11. | a | b | c | d | e |
| 4. | a | b | c | d | e | 12. | a | b | c | d | e |
| 5. | a | b | c | d | e | 13. | a | b | c | d | e |
| 6. | a | b | c | d | e | 14. | a | b | c | d | e |
| 7. | a | b | c | d | e | 15. | a | b | c | d | e |
| 8. | a | b | c | d | e | 16. | a | b | c | d | e |

1. Perform the following calculation and give the answer rounded to the correct number of significant figures

$$(15.562 - 15.512) \times 100.0$$

- a) 5      b) 5.0      c) 5.5      d)  $5 \times 10^0$       e)  $5.0 \times 10^1$

2. Convert  $3.6 \times 10^{-2}$  g/L to  $\text{mg}/\text{cm}^3$ .

- a)  $3.6 \times 10^2$       b)  $3.6 \times 10^{-1}$       c)  $3.6 \times 10^{-2}$   
d)  $3.6 \times 10^{-5}$       e)  $3.6 \times 10^{-3}$

3. The boiling point of a liquid substance is 77.0 K. What is this temperature in Fahrenheit?

- a) -321      b) -289      c) -353      d) 139      e) 171

4. Which is the correct formula for copper(II) phosphate?

- a)  $\text{Cu}_2\text{PO}_4$       b)  $\text{Cu}_3(\text{PO}_4)_2$       c)  $\text{Cu}_2\text{PO}_3$   
d)  $\text{Cu}(\text{PO}_4)_2$       e)  $\text{Cu}(\text{PO}_3)_2$

5. Which of these choices is the formula for bromous acid?

- a) KBr      b) HBr      c) HBrO      d)  $\text{HBrO}_2$       e)  $\text{HBrO}_3$

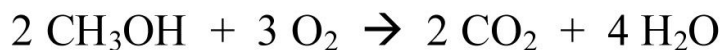
6. Calculate the number of moles of copper in 2.50 kg copper

- a) 39.5      b)  $3.93 \times 10^{-2}$       c) 3.93      d) 39.7      e) 39.3

7. A compound containing only oxygen and chlorine is 53.0 % oxygen by mass. What is the empirical formula?

- a) ClO      b) Cl<sub>2</sub>O      c) ClO<sub>2</sub>      d) Cl<sub>2</sub>O<sub>5</sub>      e) Cl<sub>2</sub>O<sub>3</sub>

8. Methanol burns up in air according to



What mass of methanol should burn to produce 165 g H<sub>2</sub>O?

- a) 147      b) 165      c) 393      d) 73.3      e) 1.4x10<sup>2</sup>

9. According to the reaction



If 0.670 g NO reacts with 0.740 g O<sub>3</sub>, how many grams of NO<sub>2</sub> will be produced?

- a) 1.41      b) 0.709      c) 1.07      d) 0.709      e) 0.740

10. Given  $6\text{Li}_{(s)} + \text{N}_{2(g)} \rightarrow 2 \text{Li}_3\text{N}_{(s)}$ . If 12.3 g of Li react with 33.6 g of N<sub>2</sub> to produce 14.0 g Li<sub>3</sub>N calculate the percent yield

- a) 16.7      b) 85.0      c) 68.0      d) 55.0      e) 54.0

11. Based on the solubility rules, which of these processes will occur if solutions of CuSO<sub>4(aq)</sub> and BaCl<sub>2(aq)</sub> are mixed?

- a) CuCl<sub>2</sub> will precipitate; Ba<sup>2+</sup> and SO<sub>4</sub><sup>2-</sup> are spectator ions.  
b) CuSO<sub>4</sub> will precipitate; Ba<sup>2+</sup> and Cl<sup>-</sup> are spectator ions.  
c) BaSO<sub>4</sub> will precipitate; Cu<sup>2+</sup> and Cl<sup>-</sup> are spectator ions.  
d) BaSO<sub>4</sub> will precipitate; Cu<sup>2+</sup> and SO<sub>4</sub><sup>2-</sup> are spectator ions.  
e) No precipitate will form.

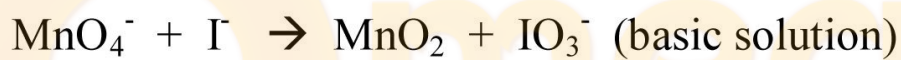
12. The oxidation number of N in  $\text{NaNO}_3$  is

- a) +6      b) +5      c) +3      d) -3      e) -5

13. Which of these equations does *not* represent an oxidation-reduction reaction?

- a)  $3 \text{Al} + 6 \text{HCl} \rightarrow 3 \text{H}_2 + \text{AlCl}_3$   
b)  $2 \text{H}_2\text{O} \rightarrow 2 \text{H}_2 + \text{O}_2$   
c)  $2 \text{NaCl} + \text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbCl}_2 + 2 \text{NaNO}_3$   
d)  $2 \text{NaI} + \text{Br}_2 \rightarrow 2 \text{NaBr} + \text{I}_2$   
e)  $\text{Cu}(\text{NO}_3)_2 + \text{Zn} \rightarrow \text{Zn}(\text{NO}_3)_2 + \text{Cu}$

14. Complete and balance the following redox equation in a basic medium. What is the coefficient of  $\text{OH}^-$  when the equation is balanced using the set of smallest whole-number coefficients?



- a) 1      b) 2      c) 4      d) 10      e) none of these

15. Calculate the mass of  $\text{MgCl}_2$  in grams required to prepare  $5.00 \times 10^2$  mL of a 2.80 M  $\text{MgCl}_2$  solution.  
(Molar mass of  $\text{MgCl}_2 = 95.2$  g/mol)

- a) 133      b) 160      c) 106      d) 66.5      e) 84.8

16. How many milliliters (mL) of a 0.276 M  $\text{HNO}_3$  are needed to neutralize completely 125 mL of 0.0120 M  $\text{Ba}(\text{OH})_2$  solution?

- a) 35.5      b) 15.0      c) 1.15      d) 5.43      e) 10.9