

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 |

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) Fe_2PO_4 b) FePO_3 c) $\text{Fe}_2(\text{PO}_4)_3$ d) $\text{Fe}_3(\text{PO}_4)_3$ e) FePO_4

5. For the isotope ${}^{59}_{27}\text{X}$. 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

6. The correct name of the compound N_2O_3 is:
- a) Nitrogen(III) oxide.
 - b) Nitrogen trioxide.
 - c) Dinitrogen trioxide
 - d) Dinitrogen(III) trioxide.
 - e) Nitrogrm(III) trioxide.

7. What is the mass of one calcium atom ?

(Atomic mass of calcium = 40.08, Avogadro's number = 6.022×10^{23})

- a) 9.274×10^{-23} g
- b) 6.656×10^{-23} g
- c) 5.324×10^{-23} g
- d) 4.037×10^{-23} g
- e) 3.346×10^{-22} g

8. What is the mass of chlorine in 14.6 g $CaCl_2$?

(atomic masses: Cl = 35.45 and Ca = 40.08)

- a) 9.33 g
- b) 6.77g
- c) 4.24 g
- d) 8.05 g
- e) 10.6 g

9. What is the empirical formula of a compound with the following composition by mass: C: 54.5% ; H: 9.09% and O: 36.4% ?

Atomic masses : C = 12.01 ; H= 1.008 and O = 16.00.

- a) C_2H_3O
- b) C_2H_6O
- c) $C_3H_5O_2$
- d) C_2H_4O
- e) C_2H_5O

Q1: answer: c) density

$$\begin{aligned} Q_2: & (1.00 - 0.01) \times 2500 / 12.0 \\ & = 0.99 \times 2500 / 12.0 = 2.475 / 12.0 \\ & = 0.20625 \\ & = 0.21 \end{aligned}$$

$$Q_3: 32 \times \frac{1609}{3600} = 14.3 \quad \text{which is } \underline{a}$$

Q4: FePO₄

Q5: protons = 27, neutrons = 59 - 27 = 32
b) 27 and 32

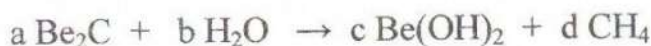
Q6: answer: c) Dinitrogen trioxide

$$Q_7: \frac{4 \times 0.08}{6.022 \times 10^{23}} = 6.656 \times 10^{-23} \quad \text{which is } \underline{b}$$

$$Q_8: \text{mass percentage Cl} = \frac{2 \times 35.45}{2 \times 35.45 + 4 \times 0.08} = 63.89\%$$

$$\text{mass Cl} = 14.6 \times 0.6389 = \underline{9.33 \text{ g}} \quad \text{which is } \underline{a}$$

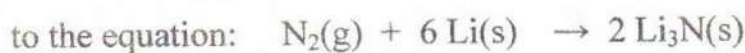
10. Balance the following equation:



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



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

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

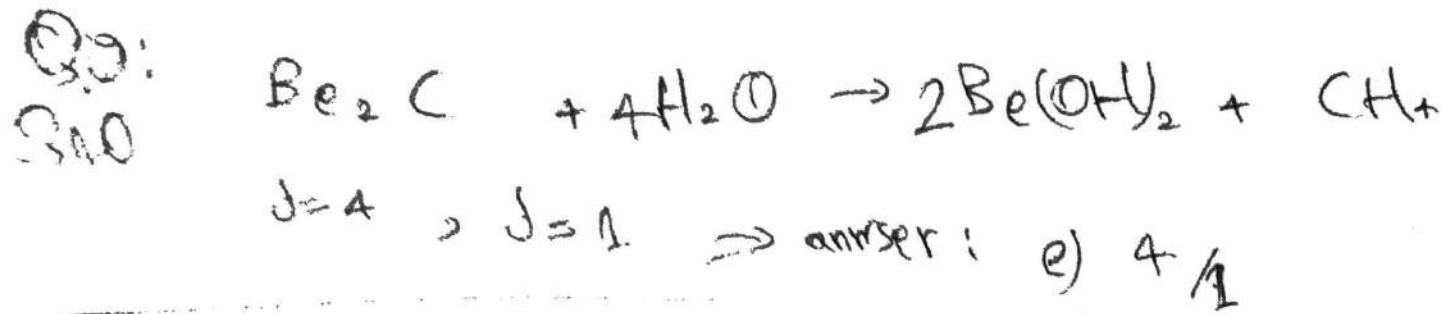
- a) 51.4 b) 28.6 c) 66.3 d) 41.8 e) 70.2

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

- a) Na_2CO_3 b) FeCO_3 c) $(\text{NH}_4)_2\text{CO}_3$ d) Na_2S e) 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) $\text{Na}_2\text{CO}_3(\text{s}) + 2 \text{HCl}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) + 2 \text{NaCl}(\text{aq})$



Q9:

	C	H	O
moles in 100g:	4.54	9.02	2.28
ratio :	1.99	3.96	1.00

 formula is d) $\text{C}_2\text{H}_4\text{O}$

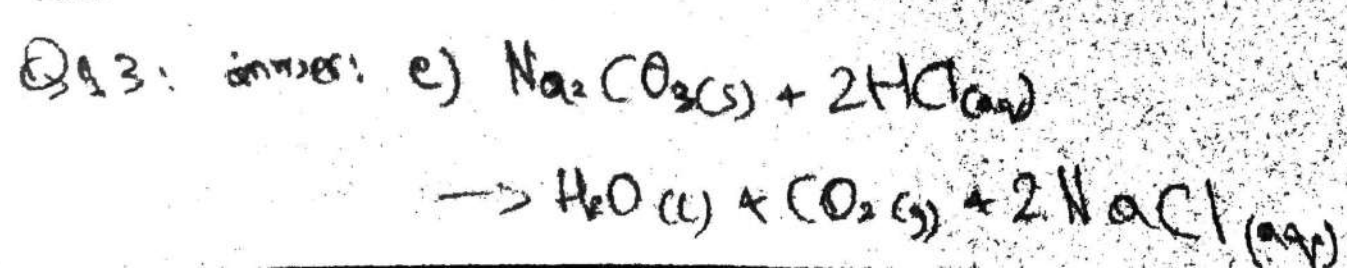
Q 11: moles Li = $\frac{13.5}{6.942} = 1.945$
 moles $\text{N}_2 = \frac{14.85}{14.01 \times 2} = 0.530$
 actual moles $\text{Li}_3\text{N} = \frac{1.06}{3 \times 6.942 + 14.01} = 0.333$

$2 \times 0.530 \text{ N}_2 \rightarrow 1.06 \text{ moles Li}_3\text{N}$
 $\frac{1}{3} \times 1.945 \text{ Li} \rightarrow 0.64822 \text{ moles Li}_3\text{N}$

Li is limiting reactant, $\text{Li}_3\text{N} = 0.64822$ moles

Percent yield = $\frac{0.333}{0.64822} \times 100\% = 51.4\%$

Q 12: answer is: b) FeCO_3



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 H_3PO_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

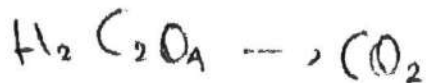
16. When excess Na_2SO_4 solution was added to 20.0 mL of an unknown solution containing Ca^{2+} ion, 0.0472 g of CaSO_4 precipitated. What is the molar concentration of Ca^{2+} in the unknown solution?

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

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

Q.14: Oxidation half: $\text{H}_2\text{C}_2\text{O}_4 \rightarrow \text{CO}_2$
 C oxidized from +3 to +4

oxidation half



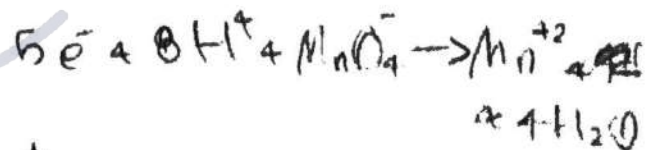
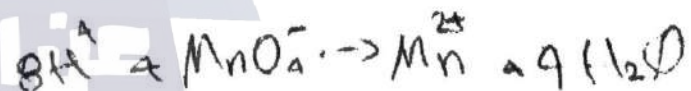
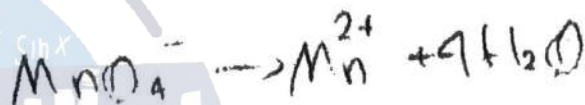
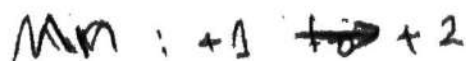
with oxygen



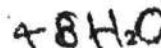
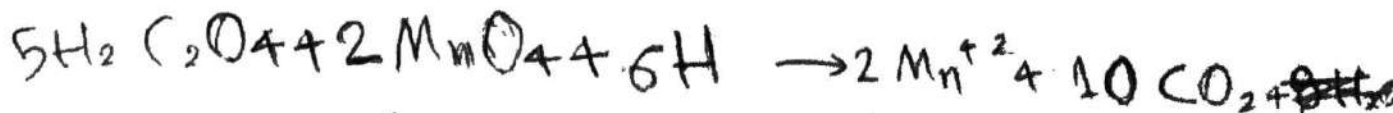
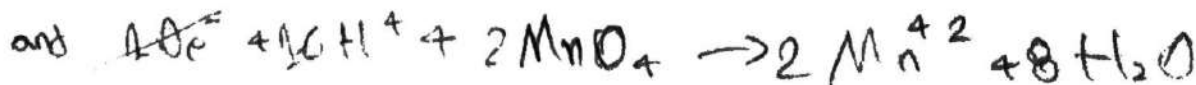
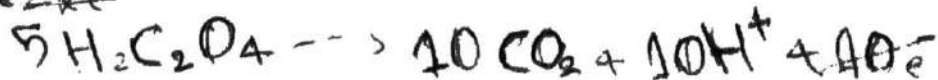
with hydrogen



reduction half



~~5x~~ ~~2x~~



General Chem. 101
First Exam

Time: 60 min.

Date: 14/11/2009

Student's Name:

Reg. No.

Section No.

Seat No.

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

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. = 6.022×10^{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}Cl and ^{37}Cl are 34.968 amu and 36.956 amu, respectively. Calculate the natural abundance of ^{35}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 SO_3 is

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

Q1: $(3.28 + 2.8395) \times (1.00 + 4.5) / 23.95$
 $= 6.1195 \times 5.5 / 23.95$
 $= 6.1195 \times 0.2296$
 $= 1.405 \rightarrow \text{c) } \underline{1.4}$

Q2: $10 \times \frac{9}{5} + 32 \rightarrow \text{a) } \underline{14}$

Q3: $34.968x + (1-x)36.956 = 35.46$
 $x = 0.7525 \mid \text{answer: e) } \underline{75.25\%}$



Q5: answer: c) Nickel(II) perbromate

Q6: answer: a) Sulfur trioxide

Q7: moles = $\frac{9.96 \times 10^3}{126.05} = 7.9 \times 10^5$ moles
 2 Na^+ for each Na_2SO_3 atom
number of ions = $2 \times 7.9 \times 10^5 \times 6.022 \times 10^{23} = \underline{9.52 \times 10^{29}}$
which is c

7- How many sodium ions are contained in 9.96 mg (milligram) of Na_2SO_3 ? The molar mass of Na_2SO_3 is 126.05 g/mol.

- a- 1.52×10^{27} b- 4.76×10^{20} c- 9.52×10^{19}
d- 1.05×10^{21} e- 9.52×10^{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- CHO c- $\text{C}_4\text{H}_{13}\text{O}_2$ d- CH_4O_2 e- CH_3O

10- Consider the following balanced reaction. How many grams of water are required to form 56.9 g of HNO_3 ? Assume that there is excess 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 N_2O_4 with 45.0g N_2H_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 N_2H_4 , 59.0 g N_2 formed b- LR is N_2O_4 , 105 g N_2 formed
c- LR is N_2H_4 , 13.3 g N_2 formed d- LR is N_2O_4 , 45.7 g N_2 formed
e- Both reactants are in appropriate stoichiometric ratios and 45.0 g N_2 formed

Q 8: mass perc = $\frac{3 \times 32.065}{(26.98 \times 2 + 32.065 \times 3 + 16 \times 4 \times 3)} \times 100\%$

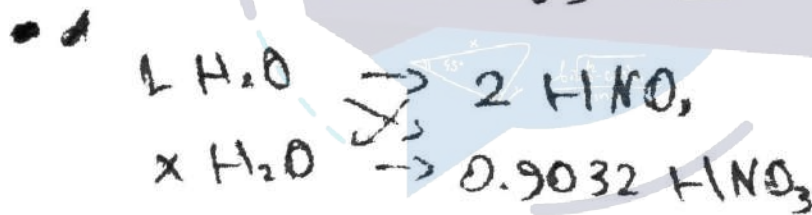
= a) 28.1%

Q 9: moles in 100 g:

	C	H	O
moles	4.34	13.03	2.12
ratio	2	6	1

formula: a) C₂H₆O

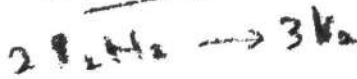
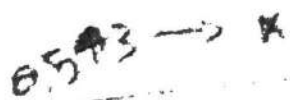
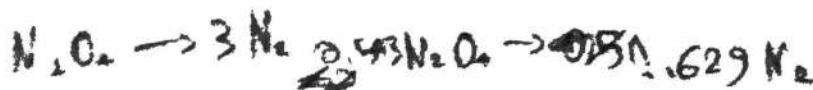
Q 10: atomic mass HNO₃ = 1 + 14 + 16 × 3 = 63
 moles HNO₃ = $\frac{56.9}{63} = 0.9032$



$x = \frac{1}{2} \times 0.9032 = 0.4516$ moles H₂O

grams H₂O = $0.4516 \times 18 = 8.13 \text{ g}$

Q 11: moles N₂O₄ = $\frac{50}{92.02} = 0.543$, moles N₂H₄ = $\frac{45}{32.05} = 1.404$



→ x = 2.106 N₂

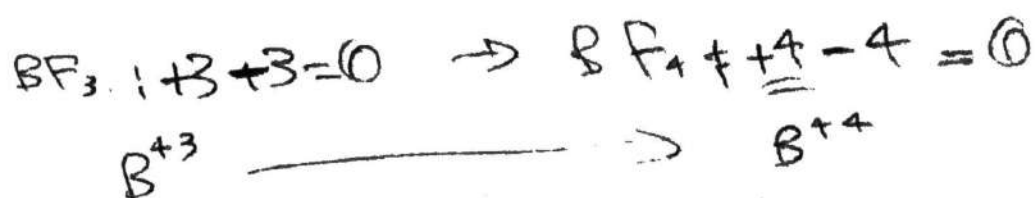
answer is

d) LR is N₂O₄,

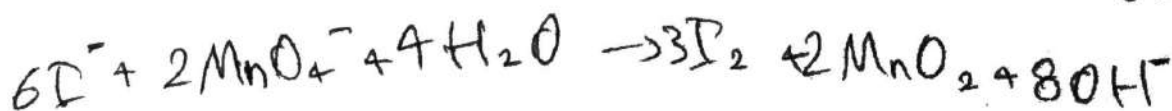
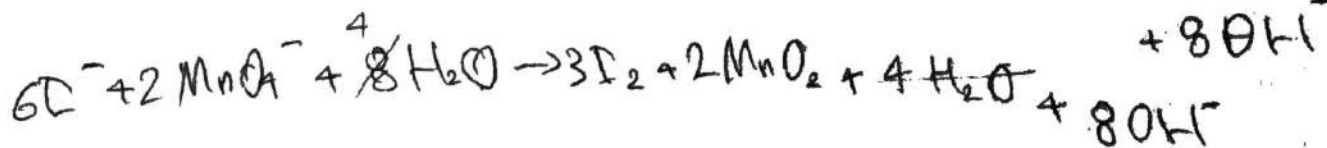
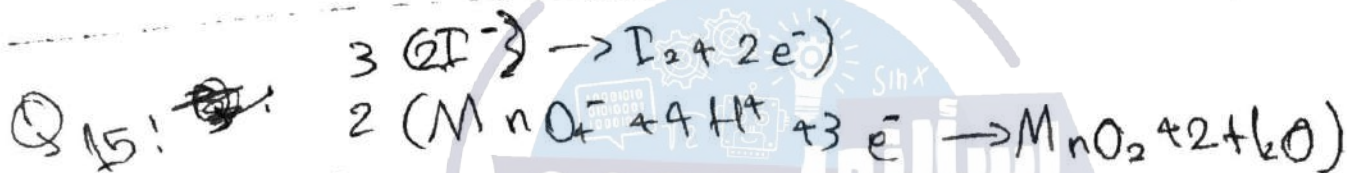
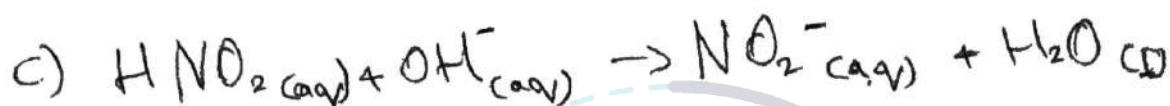
45.7 g N₂ formed

Q12: answer: a) Hg_2Cl_2

Q13: answer: a) $BF_3 \rightarrow BF_4$



Q14: answer is: ~~1/2~~



answer: a) 6/8

Q16: moles $H_3PO_4 = 0.145 \times 25 \times 10^{-3} = 3.62 \times 10^{-3}$

moles $NaOH = 3.62 \times 10^{-3} \times 3 = 1.0875 \times 10^{-2}$

volume $NaOH = \frac{1.0875 \times 10^{-2}}{0.675} = 16.1 \times 10^{-3}$ liter

General Chem. 101
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$$^{\circ}\text{F} = (^{\circ}\text{C} \times \frac{9}{5}) + 32 \quad , \quad \text{K} = ^{\circ}\text{C} + 273$$



ANSWER SHEET

- | | | | | | | | | | | | |
|----|---|---|---|---|---|-----|---|---|---|---|---|
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| 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) 5×10^0 e) 5.0×10^1

2. Convert 3.6×10^{-2} g/L to mg/cm³.

- a) 3.6×10^2 b) 3.6×10^{-1} c) 3.6×10^{-2}
d) 3.6×10^{-5} e) 3.6×10^{-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) Cu_2PO_4 b) $\text{Cu}_3(\text{PO}_4)_2$ c) Cu_2PO_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) HBrO₂ e) HBrO₃

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

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

Q1: $(15.562 - 15.512) \times 100.0 = 0.050 \times 100.0$
 $= 5.0$ which is b

Q2: $3.6 \times 10^{-2} \times \frac{1}{1} = c) \underline{\underline{3.6 \times 10^{-2}}}$

Q3: $(77 - 273) \times \frac{9}{5} + 32 = \underline{\underline{-321}} \text{ F}^\circ$ which is a

Q4: answer is ~~b~~) $\text{Cu}_3(\text{PO}_4)_2$

Q5: answer is: d) HBrO_2

Q6: $\frac{32.5 \times 10^3}{63.546} = 39.3$ which is c

Q7:	moles in 100 g	<u>c</u>	<u>d</u>
	ratio	1.49	2.94
		1	1.97

answer: c) ClO_2

Q8: moles $\text{H}_2\text{O} = \frac{165}{18} = 9.167,$

grams $\text{CH}_3\text{OH} = 4.5835 \times 32.042$
 $= \underline{\underline{147}}$

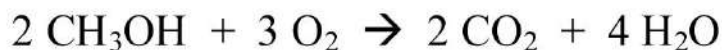
which is a

2 meth \rightarrow 4 H_2O
 $x \rightarrow 9.167$
 $x = \frac{2}{4} \times 9.167$
 $= 4.5835$
 moles CH_3OH

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

- a) ClO b) Cl₂O c) ClO₂ d) Cl₂O₅ e) Cl₂O₃

8. Methanol burns up in air according to



What mass of methanol should burn to produce 165 g H₂O?

- a) 147 b) 165 c) 393 d) 73.3 e) 1.4×10^2

9. According to the reaction



If 0.670 g NO reacts with 0.740 g O₃, how many grams of NO₂ 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 N₂ to produce 14.0 g Li₃N calculate the percent yield

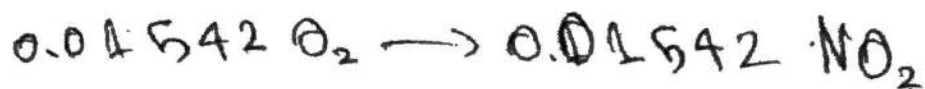
- a) 16.7 b) 85.0 c) 68.0 d) 55.0 e) 54.0

11. Based on the solubility rules, which of these processes will occur if solutions of CuSO_{4(aq)} and BaCl_{2(aq)} are mixed?

- a) CuCl₂ will precipitate; Ba²⁺ and SO₄²⁻ are spectator ions.
b) CuSO₄ will precipitate; Ba²⁺ and Cl⁻ are spectator ions.
c) BaSO₄ will precipitate; Cu²⁺ and Cl⁻ are spectator ions.
d) BaSO₄ will precipitate; Cu²⁺ and SO₄²⁻ are spectator ions.
e) No precipitate will form.

Q9: moles NO = $\frac{0.67}{14+16} = 0.0223$, moles O₂ = $\frac{0.74}{16 \times 2} = 0.01542$

O₂ is limiting reactant



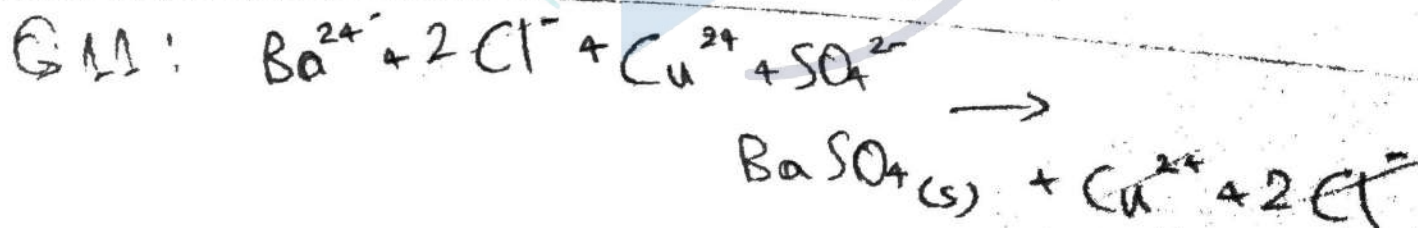
grams NO₂ = $0.01542 \times (14 + 16 \times 2) = \underline{0.709}$

Q10: moles N₂ = $\frac{33.6}{14 \times 2} = 1.2$, moles Li = $\frac{33.6 \times 2.3}{6.941} = 1.772$



theoretical mass Li₃N = $0.591 \times (3 \times 6.941 + 14) = 20.58$

yield percent = $\frac{14.0}{20.58} \times 100 = \underline{68.0}$



answer b) BaSO₄ will precipitate;

Cu²⁺ and Cl⁻ are spectator ions

Q12: $1 + x - 2 \times 3 = 0 \Rightarrow$
 $x - 5 = 0$
 $x = \underline{5}$

answer is b) 5

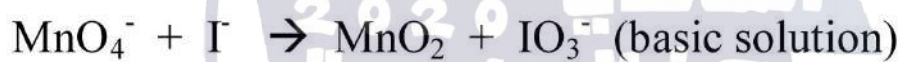
12. The oxidation number of N in NaNO_3 is

- 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 OH^- when the equation is balanced using the set of smallest whole-number coefficients?



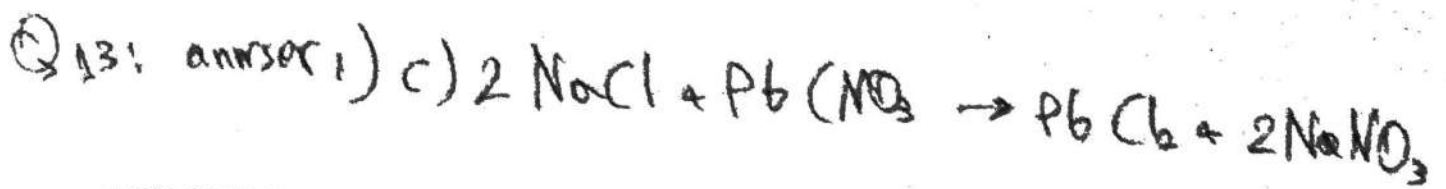
- a) 1 b) 2 c) 4 d) 10 e) none of these

15. Calculate the mass of MgCl_2 in grams required to prepare 5.00×10^2 mL of a 2.80 M MgCl_2 solution.
(Molar mass of $\text{MgCl}_2 = 95.2$ g/mol)

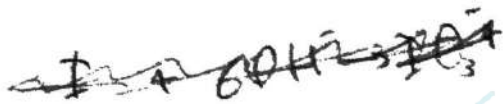
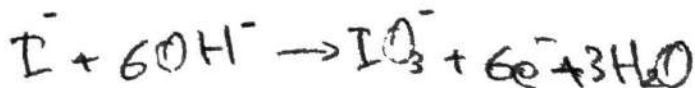
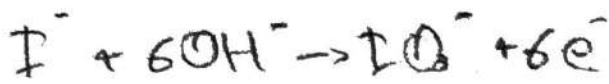
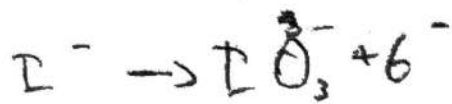
- a) 133 b) 160 c) 106 d) 66.5 e) 84.8

16. How many milliliters (mL) of a 0.276 M HNO_3 are needed to neutralize completely 125 mL of 0.0120 M $\text{Ba}(\text{OH})_2$ solution?

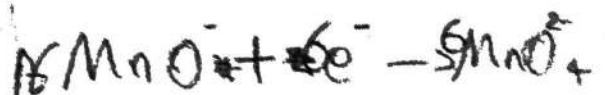
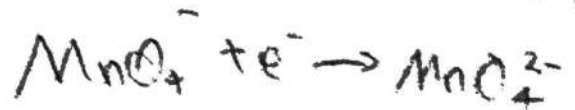
- a) 35.5 b) 15.0 c) 1.15 d) 5.43 e) 10.9



Q14: oxidation



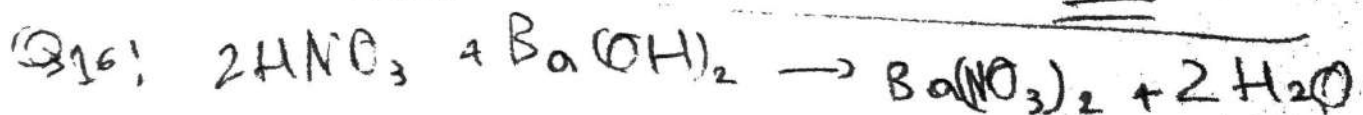
reduction



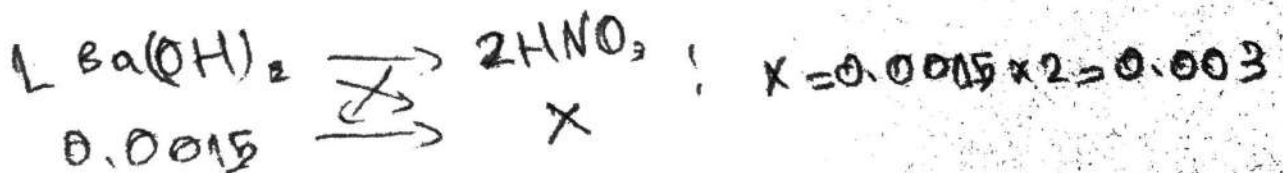
answer: e) none of these

Q15: $M = \frac{n}{L} \Rightarrow n = M \times L = 2.8 \times 0.5 = 1.4$

grams $\text{MgCl}_2 = 95.2 \times 1.4 = \underline{\underline{133}}$



moles $\text{Ba}(\text{OH})_2 = 125 \times 10^{-3} \times 0.012 = 0.0015$



liters $\text{HNO}_3 = \frac{0.003}{0.276} = \underline{\underline{10.9 \text{ mL}}}$

The University of Jordan
Department of Chemistry
General Chemistry I (0303101)
First Midterm Exam – Fall 2015/2016

Date: 7/11/2015

Time: 60 min

Name in Arabic:

Reg. No.:

Instructor Name:

Section:

Useful data: $N_A = 6.02 \times 10^{23}/\text{mol}$; $T(\text{K}) = T(^{\circ}\text{C}) + 273$.

ANSWER SHEET

1. a ~~b~~ c ~~d~~ e

2. ~~a~~ b c d ~~e~~

3. a b c ~~d~~ ~~e~~

4. a b c d ~~e~~

5. a b c ~~d~~ e

6. ~~a~~ b c d e

7. a b c ~~d~~ e

8. a b c d ~~e~~

9. a ~~b~~ c d e

10. a b ~~c~~ d e

11. a ~~b~~ c d e

12. a b ~~c~~ d e

13. a b c d ~~e~~

14. ~~a~~ b c ~~d~~ e

15. ~~a~~ ~~b~~ c d e

16. a b ~~c~~ d e

17. a ~~b~~ c d ~~e~~

18. a b ~~c~~ d e

Q1) Which of the following represents a chemical change:

- a) Melting of solid H_2O
- c) Evaporation of liquid H_2O
- e) Condensation of H_2O vapor
- b) Separation of H_2O molecule into its atoms
- ~~d) Mixing H_2O with oil~~

Q2) The result of $(3.8621 \times 1.5630) - 5.98$ is properly written as:

- a) 0.06
- b) 0.05646
- c) 0.056462
- d) 0.0565
- ~~e) 0.056~~

Q3) how many centiliters (cL) are there in 35 microliters.

- ~~a) 3.5×10^{-4} cL~~
- b) 3.5×10^5 cL
- c) 3.5 cL
- ~~d) 3.5×10^{-3} cL~~
- e) 3.5×10^4 cL

Q4) The agreement of a particular value of measurement with the true value is called

- a) significance
- b) certainty
- c) precision
- d) error
- ~~e) accuracy~~

Q5) How many protons, neutrons, and electrons, respectively, are present in an ^{27}Al isotope?

- a) 27, 14, 13
- b) 13, 13, 14
- c) 13, 27, 13
- ~~d) 13, 14, 13~~
- e) 13, 14, 10

Q6) What is the name of $MnSO_4$?

- ~~a) manganese(II) sulfate~~
- b) manganese(IV) sulfate
- c) manganese sulfate
- d) manganese(I) sulfate
- e) manganese disulfate

Q7) Which one of the following combinations of names and formulas is incorrect?

- a) $CaCO_3$ calcium carbonate
- b) $NaClO_3$ sodium chlorate
- c) Al_3PO_4 aluminum phosphate
- ~~d) KNO_2 potassium nitrate~~
- e) MgO magnesium oxide

Q8) What is the chemical formula of diiodine pentoxide?

- a) $2IO_5$
- b) I_5O_2
- c) IO_5
- d) $(IO_5)_2$
- ~~e) I_2O_5~~

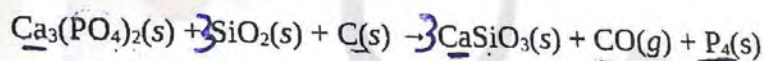
- Q9) How many grams of potassium are in 23.8 g of potassium dichromate, $K_2Cr_2O_7$?
- a) 2.02 g b) 6.33 g c) 4.04 g d) 3.32 g g e) 5.18 g

- Q10) The number of oxygen atoms in 10.0 g of $Ca_3(PO_4)_2 \cdot 3H_2O$ is (molar mass = 364.3 g/mol):
- a) 2.68×10^{23} b) 6.78×10^{23} c) 1.82×10^{23} d) 3.56×10^{23} e) 7.38×10^{23}

- Q11) A compound of bromine and fluorine contains 58.37 mass percent bromine. Determine its empirical formula.

- a) BrF_2 b) BrF_3 c) Br_2F_3 d) Br_3F e) BrF

- Q12) Balance the following equation:



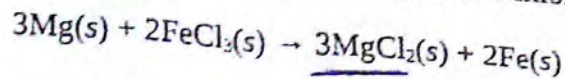
- a) $Ca_3(PO_4)_2(s) + 3SiO_2(s) + 8C(s) \rightarrow 3CaSiO_3(s) + 8CO(g) + 2P_4(s)$ ×
- b) $2Ca_3(PO_4)_2(s) + 6SiO_2(s) + 10C(s) \rightarrow 6CaSiO_3(s) + 10CO(g) + 4P_4(s)$ ×
- c) $2Ca_3(PO_4)_2(s) + 6SiO_2(s) + 10C(s) \rightarrow 6CaSiO_3(s) + 10CO(g) + P_4(s)$
- d) $Ca_3(PO_4)_2(s) + 3SiO_2(s) + 8C(s) \rightarrow 3CaSiO_3(s) + 8CO(g) + P_4(s)$
- e) $Ca_3(PO_4)_2(s) + 3SiO_2(s) + 14C(s) \rightarrow 3CaSiO_3(s) + 14CO(g) + P_4(s)$

- Q13) How many grams of sodium fluoride (NaF) are needed to form 435 g of sulfur tetrafluoride (SF_4)?



- a) 754 g b) 831 g c) 341 g d) 909 g e) 676 g

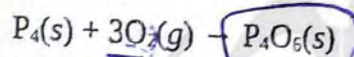
Q14) Magnesium reacts with iron(III) chloride to form magnesium chloride and iron.



A mixture of 41.0 g of magnesium (molar mass = 24.31 g/mol) and 145 g of iron(III) chloride (molar mass = 162.2 g/mol) is allowed to react. What mass of magnesium chloride, MgCl_2 , (molar mass = 95.21 g/mol) is formed

- a) 136 g b) 161 g c) 146 g d) 128 g e) 154 g

Q15) Tetraphosphorus hexaoxide, P_4O_6 , (molar mass = 219.9 g/mol) is formed by the following reaction



If a mixture of 38.7 g of oxygen (molar mass = 32 g/mol) and excess phosphorus actually produce 54.3 g of P_4O_6 , what is the percent yield for the reaction?

- a) 61.3% b) 48.8% c) 26.3% d) 77.5% e) 37.6%

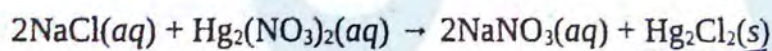
Q16) Which of the following compounds is a nonelectrolyte?

- a) KOH (aq) b) acetic acid, $\text{CH}_3\text{COOH}(aq)$ c) methanol, $\text{CH}_3\text{OH}(aq)$
d) sulfuric acid, $\text{H}_2\text{SO}_4(aq)$ e) ammonia, $\text{NH}_3(aq)$

Q17) Which of the following salts is insoluble in water?

- a) CuSO₄ b) BaCO₃ c) CaCl₂ d) Pb(NO₃)₂ e) Ba(OH)₂

Q18) Select the net ionic equation for the reaction between sodium chloride and mercury(I) nitrate.



- a) $\text{Hg}_2(\text{NO}_3)_2(aq) \rightarrow \text{Hg}_2^{2+}(aq) + 2\text{NO}_3^-(aq)$
b) $\text{Na}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{NaNO}_3(aq)$
c) $\text{Hg}_2^{2+}(aq) + 2\text{Cl}^-(aq) \rightarrow \text{Hg}_2\text{Cl}_2(s)$
d) $\text{Hg}_2^{2+}(aq) \rightarrow \text{Hg}_2(s)$
e) $\text{NaCl}(aq) \rightarrow \text{Na}^+(aq) + \text{Cl}^-(aq)$

General Chem. 0303101
First Exam

16

Date: 03/04/2014
Time: 60 min...

Name: ~~.....~~ Reg. No.: ~~.....~~
Instructor Name: ~~.....~~ Seat No.: ~~.....~~

$N_A = 6.022 \times 10^{23}$, $^{\circ}F = (^{\circ}C \times \frac{9}{5}) + 32$, $K = ^{\circ}C + 273$



ANSWER SHEET

- | | |
|--------------------------|-------------------------------------|
| 1. a a c d e | 11. a b c d e |
| 2. a b c d e | 12. a b c d e |
| 3. a b c d e | 13. a b c d e |
| 4. a b c d e | 14. a b c d e |
| 5. a b c d e | 15. a b c d e |
| 6. a b c d e | 16. a b c d e |
| 7. a b c d e | 17. a b c d e |
| 8. a b c d e | 18. a b c d e |
| 9. a b c d e | 19. a b c d e |
| 10. a b c d e | 20. a b c d e |

1. Which one of these represents a *physical* change?

- (a) apples, when exposed to air, turn brown
- (b) water, when heated, forms steam
- (c) bleach turns hair yellow
- (d) sugar, when heated, becomes brown
- (e) milk turns sour

$$0.0092$$

$$91.95 \times 10^{-4} = 92.0 \times 10^{-4}$$

2. The correct answer with the right number of significant figures for the following operation is:

$$(1.50 \times 10^{-4} \times 61.3) + 2.01 =$$

1

- (a) 2.0192 (b) 2.019 (c) 2.0 (d) 2.02 (e) 2.019195

3. The SI prefixes *kilo* and *micro* represent, respectively:

- (a) 10^6 and 10^{-6} (b) 10^{-3} and 10^6 (c) 10^3 and 10^{-6} (d) 10^{-3} and 10^{-9} (e) 10^{-6} and 10^{-3}

4. Some molecules move with speed of 6.5 miles per second. What is this speed in cm/h? (1.00 mile = 1609 m)

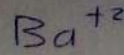
- (a) 3.8×10^9 (b) 2.6×10^9 (c) 2.0×10^9 (d) 1.1×10^6 (e) 4.1×10^9

$$\frac{6.5 \times 1609 \text{ m}}{\frac{1}{3600} \text{ h}} =$$

5. Atoms of the same element with different mass numbers are called

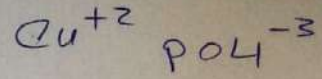
- (a) ions (b) neutrons (c) allotropes (d) chemical families (e) isotopes

6. The correct name for $\text{Ba}(\text{OH})_2$ is



- (a) barium hydrogen oxide. (b) boron hydroxide.
 (c) beryllium hydroxide. (d) barium hydroxide.
 (e) barium hydrate.

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



- (a) Cu_2PO_4 (b) $\text{Cu}_3(\text{PO}_4)_2$ (c) Cu_2PO_3 (d) $\text{Cu}(\text{PO}_4)_2$ (e) $\text{Cu}(\text{PO}_3)_2$

8. The accurate atomic masses of the two stable isotopes of indium, $^{113}_{49}\text{In}$ and $^{115}_{49}\text{In}$ are 112.904061 and 114.90388 g/mol respectively. Knowing that the average atomic mass of indium is 114.818 g/mol, calculate the percentage of $^{113}_{49}\text{In}$.

$x_2 = 1 - x_1$ (a) 93.7% (b) 57.0% (c) 1.80% (d) 10.3% (e) 4.29%

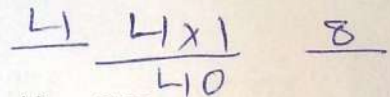
$$112.904061x_1 + 114.90388x_2 = 114.818$$

$$112.904061x_1 + 114.90388 - 114.90388x_1$$

$$-1.999819x_1 = -0.08588$$

9. A compound was discovered whose composition by mass is 90.0% C and 10.0% H. Which of these choices could be the molecular formula of this compound?

The molar masses of H and C are (H=1.000, C=12.00)



- (a) CH_4 (b) C_2H_4 (c) C_3H_4 (d) C_2H_6 (e) C_3H_8

$\frac{4 \times 1}{10}$

$\text{C} \rightarrow 12 \text{g}$
 $\text{H} \rightarrow 1 \text{g}$

$n = \frac{90}{12} = 7.5$

$n = \frac{10}{1} = 10$

$\text{C}_{7.5} \text{H}_{10} \quad 12 \text{g} \quad 10 \text{g}$

$\text{C}_{7.5} \text{H}_{10} \quad \frac{90}{12} = 7.5$

10. What is the mass, in grams, of one copper atom ($M_m = 63.55 \text{ g} \cdot \text{mol}^{-1}$)?

- (a) 1.06×10^{-22} (b) 9.3×10^{-23} (c) 7.5×10^{-23} (d) 8.04×10^{-21} (e) 1.24×10^{-22}

$\frac{1}{6.023 \times 10^{23}} = \frac{m}{63.55}$

$n = \frac{1}{6.023 \times 10^{23}}$
 10.55×10^{-23}
 0.166×10^{-23}

1x 27

X1 = نسبة المئوية 27x1

11. What is the mass percentage of aluminum in $KAl(SO_4)_2$?
The molar masses are (K=39.10, O=16.00, ~~C=12.00~~, S=32.00)

Al = $\frac{27}{240.1}$
 $\frac{27}{258.1}$
27

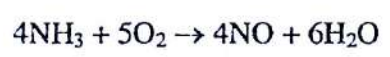
- (a) 15.38 (b) 10.43 (c) 24.73 (d) 49.46

12. A sample of Na_2CO_3 contains 3.50 moles of sodium. What is the mass of the sample (grams)? The molar masses are (O=16.00, C=12.00, Na=23.00)

- (a) 6.40 (b) 132.5 (c) 185.5 (d) 13.25 (e) 23.85

$1.75 = \frac{m}{M}$

13. Ammonia reacts with diatomic oxygen to form nitric oxide and water vapor:



When 30.0 g NH_3 and 80.0 g O_2 are allowed to react, what is the amount of NO produced (grams)? The molar masses are (O=16.00, H=1.000, N=14.00)

- (a) 52.9 (b) 26.5 (c) 11.2 (d) 29.5 (e) 37.5

$n = \frac{30}{17} = 1.76 \text{ mol} \rightarrow 0.441$
 $n = \frac{80}{32} = 2.5 \rightarrow 0.5$
 $0.441 = \frac{m}{30}$
 $0.44 = \frac{m}{30}$

14. Which of these compounds is a nonelectrolyte?

- (a) NaF (b) HNO_3 (c) CH_3COOH (d) NaOH (e) $C_6H_{12}O_6$ (glucose)

15. Based on the solubility rules, which one of these compounds should be insoluble in water?

- (a) Na_2SO_4 (b) $CuSO_4$ (c) $MgSO_4$ (d) $BaSO_4$ (e) $ZnSO_4$

16. Which of these choices is the correct *net ionic equation* for the reaction that occurs when solutions of $\text{Pb}(\text{NO}_3)_2$ and NH_4Cl are mixed?

- (a) $\text{NH}_4^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow 2\text{NH}_4\text{NO}_3(\text{s})$
- (b) $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
- (c) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{NH}_4\text{Cl}(\text{aq}) \rightarrow \text{NH}_4\text{NO}_3(\text{aq}) + \text{PbCl}_2(\text{s})$
- (d) $\text{Pb}^{2+}(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + 2\text{NH}_4^+(\text{aq}) + 2\text{Cl}^- \rightarrow 2\text{NH}_4^+(\text{aq}) + 2\text{NO}_3^-(\text{aq}) + \text{PbCl}_2(\text{s})$
- (e) No reaction occurs when the solutions are mixed.

17. How many grams of sodium are in 500 mL of 0.600 M Na_2CO_3 (aq) solution? The molar masses are (Na=23.00, C=12.00, O=16.00)

- (a) 6.90
- (b) 13.1
- (c) 11.9
- (d) 10.4
- (e) 13.8

Handwritten calculations for question 17:

$$M = \frac{n}{V} \Rightarrow 0.6 = \frac{n}{0.5} \Rightarrow n = 0.3$$

$$M = \frac{n}{V} \Rightarrow 0.3 = \frac{n}{0.5} \Rightarrow n = 0.15$$

$$0.3 = \frac{m}{106} \Rightarrow m = 31.8$$

Final calculation: $31.8 \times 2 = 63.6$ (Note: The handwritten work shows 13.8, which is $31.8 / 2$, indicating the student correctly identified that only sodium is being asked for.)

18. Which one of these equations describes a *redox* reaction?

- (a) $2\text{KBr}(\text{aq}) + \text{Pb}(\text{NO}_3)_2(\text{aq}) \rightarrow 2\text{KNO}_3(\text{aq}) + \text{PbBr}_2(\text{s})$
- (b) $\text{CO}_3^{2-}(\text{aq}) + \text{HSO}_4^-(\text{aq}) \rightarrow \text{HCO}_3^-(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$
- (c) $2\text{Al}(\text{s}) + 3\text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + 3\text{H}_2(\text{g})$
- (d) $\text{CaBr}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CaSO}_4(\text{s}) + 2\text{HBr}(\text{g})$
- (e) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$

19. A 34.62 mL of 0.1510 M NaOH was needed to neutralize 75.0 mL of an H_2SO_4 solution. What is the concentration of the sulfuric acid solution (M)?

- (a) 0.03478
- (b) 0.075
- (c) 0.131
- (d) 0.209
- (e) 0.0523

Handwritten calculations for question 19:

$$M_1 V_1 = M_2 V_2$$

$$0.1510 \times 34.62 = M_2 \times 75.0$$

$$M_2 = \frac{0.1510 \times 34.62}{75.0} = 0.075$$

20. The temperature of a metal bar is 50°C , what is the temperature in $^\circ\text{F}$?

- (a) 230
- (b) 0.075
- (c) 86
- (d) 122
- (e) 194

Handwritten calculation for question 20:

$$F^\circ = \frac{9}{5} C^\circ + 32$$

$$= \frac{9}{5} 50 + 32 = 90 + 32 = 122$$

16

General Chem. 101
First Exam

Date: 3/4/2013
Time: 60 min

Name: *محمد محمد عبد الرحمن* Reg. No.: *0129415*

Instructor Name: *د. منير حبيب* Seat No.:



$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$

(For molar masses always use the provided periodic table)



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 |
| | 17. a b c d e |

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1. Perform the following operations and choose the answer with the correct number of significant figures

$$\begin{array}{r} 4 \qquad \qquad 3 \\ (5.673 \times 3.42) + 2.0 \\ 19.4 \quad + 2.0 \end{array}$$

- a) 20.4 b) 2.0×10^1 c) 21.41 d) 21.412 e) 21.4

2. Convert 3.78×10^5 mg to pound (lb). (1 lb = 453.6 g)

$$\begin{array}{l} 3.78 \times 10^5 \text{ mg} \times \frac{1 \text{ lb}}{453.6 \text{ g}} \times \frac{1 \text{ g}}{1000 \text{ mg}} \\ \textcircled{3} \frac{3.78 \times 10^5}{453.6} = 8.34 \times 10^1 = 0.833 \end{array}$$

- a) 0.0833 b) 0.833 c) 8.33 d) 83.3 e) 833

3. Sugar is an example of a(n):

- a) element b) homogeneous mixture c) heterogeneous mixture
d) compound e) physical property

4. The name of Na_2HPO_4 is:

- a) Sodium hydrogenphosphate b) Sodium phosphate c) Sodium (II) phosphate
d) Sodium perphosphate e) Disodium hydrogenphosphate

5. Write the formula of disulfur dinitride:

- a) S_2N b) S_3N_2 c) S_2N_2 d) S_4N_2 e) $\text{S}_4(\text{NO})_4$



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clo_2^- ite \rightarrow oys

6. The name of HClO_2 is:

- a) Hydrochloric acid ~~b) Chlorous acid~~ c) Chloric acid
d) Perchloric acid e) Hypochlorous acid

7. An element (X) has two isotopes that exist in nature in the following masses and relative abundances: ^{28}X (mass = 27.977⁵ amu, abundance = 92.223%) and ^{29}X \rightarrow 2530.1 (mass = 28.976⁵ amu, abundance = 7.777%). The average atomic mass (in amu) of the element X is: 28.054

- a) 27.977 b) 28.098 c) 28.976 d) 28.000 ~~e) 28.055~~

8. Which of the following atoms has the same number of protons, neutrons and electrons?

- a) $^{37}_{17}\text{Cl}$ b) $^{35}_{17}\text{Cl}$ c) $^{22}_{12}\text{Mg}$ ~~d) $^{24}_{12}\text{Mg}$~~ e) $^{47}_{24}\text{Cr}$
- Handwritten notes: a) 17, 20; b) 18, 17; c) 10, 12; d) 12, 12; e) 23, 24*

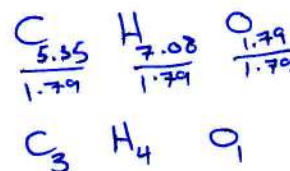
9. What is the mass of one argon (^{36}Ar) atom in grams? Given that the atomic mass of argon is 35.968 amu and Avogadro's number is $6.02 \times 10^{23} \text{ mol}^{-1}$.

- ~~a) 5.97×10^{-23}~~ b) 5.9748×10^{-22} c) 5.97×10^0
d) 1.6737×10^{22} e) 1.67×10^{22}

$$n = \frac{\text{mass}}{m_u} \quad , \quad n = \frac{N_0}{A_r} = \frac{1}{6.02 \times 10^{23}} = 0.166 \times 10^{-23} \text{ mol}$$

$$0.166 \times 10^{-23} (35.968) = 5.97 \times 10^{-23}$$

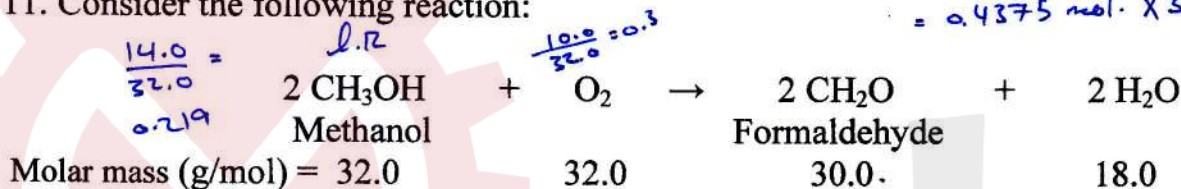
$$\begin{aligned} \% C = 64.3\% &\rightarrow \frac{64.3 \text{ g}}{12.011} = 5.35 \text{ mol} \\ \% H = 7.14\% &\rightarrow \frac{7.14 \text{ g}}{1.0079} = 7.08 \text{ mol} \\ \% O = 28.6\% &\rightarrow \frac{28.6 \text{ g}}{15.999} = 1.79 \text{ mol} \end{aligned}$$



10. An unknown organic compound was analyzed and the mass percent of the constituent atoms were: 64.3% carbon; 7.14% hydrogen; 28.6% oxygen The empirical formula of this compound is

- a) $C_3H_4O_2$ b) C_6H_3O c) C_3H_4O d) C_3H_6O e) $C_3H_6O_2$

11. Consider the following reaction:



$$\begin{aligned} \frac{1}{2} \text{ mol CH}_3\text{OH} &\rightarrow \frac{1}{2} \text{ mol CH}_2\text{O} \\ 0.4375 &\rightarrow ? \\ &= 0.4375 \text{ mol} \times 30.0 = 13.125 \text{ g} \end{aligned}$$

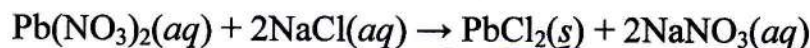
In a test, 14.0 g of methanol and 10.0 g of oxygen were put into the reaction. The amount (in g) of formaldehyde that can be produced by this mixture is:

- a) 13.1 b) 14.1 c) 6.55 d) 7.50 e) 15.0

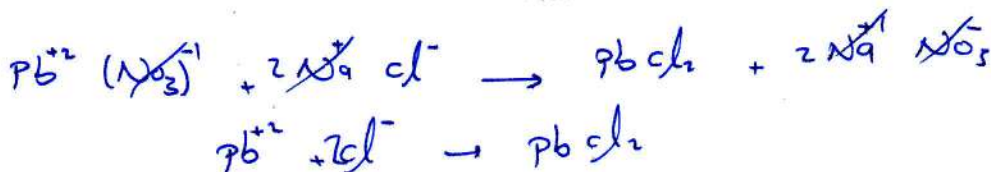
12. Which of the following solutions has the least electrical conductance?

- a) $\text{KNO}_3(aq)$ b) sucrose, $\text{C}_{12}\text{H}_{22}\text{O}_{11}(aq)$ c) $\text{NaCl}(aq)$
d) $\text{LiOH}(aq)$ e) $\text{H}_2\text{SO}_4(aq)$

13. In the following reaction, what are the spectator ions?



- a) $\text{Na}^+(aq)$, $\text{Cl}^-(aq)$ b) $\text{Pb}^{2+}(aq)$, $\text{Cl}^-(aq)$ c) $\text{Pb}^{2+}(aq)$, $\text{NO}_3^-(aq)$
d) $\text{Na}^+(aq)$, $\text{NO}_3^-(aq)$ e) $\text{NO}_3^-(aq)$, $\text{Cl}^-(aq)$



$$\boxed{S = +6}$$

$$2S = 12$$

$$2S + 2 + (-4) = 0$$

$$2 + 2S + (-2)7 = 0$$

14. Calculate the oxidation number of sulfur, S, in the formula: $\text{Na}_2\text{S}_2\text{O}_7$.

- a) -2 b) +2 c) +4 d) +5 e) +6

15. How much of 1.20 M NaOH will be needed to neutralize 168 mL of 3.0 M H_2SO_4 ?
 $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Na}_2\text{SO}_4(\text{aq})$

- a) 1.8 L b) 0.42 L c) 0.84 L d) 0.90 L e) 1.1 L

$$1 \text{ H}_2\text{SO}_4 \rightarrow 2 \text{ NaOH}$$

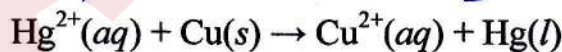
$$0.504 \rightarrow 2.4 \times 2$$

$$1 \text{ M } \text{H}_2\text{SO}_4 = 2 \text{ M } \text{NaOH}$$

$$0.504 \rightarrow 2.4 \text{ L}$$

$$1.008$$

16. The **oxidizing agent** in the following redox reaction is,



- a) $\text{Hg}(\text{l})$ b) $\text{Hg}^{2+}(\text{aq})$ c) $\text{Cu}^{2+}(\text{aq})$ d) $\text{Cu}(\text{s})$ e) $\text{Hg}^{2+}(\text{aq})$ and $\text{Cu}^{2+}(\text{aq})$

17. In balancing the following reaction in a acidic medium



The of coefficients of As_2O_3 is

- a) 12 b) 6 c) 2 d) 3 e) 1

$$12e^- + 12\text{H}^+ + \text{As}_2\text{O}_3 \rightarrow 2\text{AsH}_3 + 3\text{H}_2\text{O}$$

$$6\text{Zn} + 6\text{H}^+ \rightarrow 6\text{Zn}^{2+} + 6e^-$$

$$12\text{H}^+ + \text{As}_2\text{O}_3 + 6\text{Zn} \rightarrow 2\text{AsH}_3 + 3\text{H}_2\text{O} + 6\text{Zn}^{2+}$$

$$(12 = 12)$$

$$12e^- + 12\text{H}^+ + \text{As}_2\text{O}_3 \rightarrow 2\text{AsH}_3 + 3\text{H}_2\text{O}$$

$$\text{H}_2\text{O} + \text{Zn} + 2\text{H}^+ \rightarrow \text{Zn}^{2+} + \text{H}_2\text{O}$$