Chemistry 121	Fall 2006	Oregon State University
Exam 1	October 19, 2006	Dr. Richard Nafshun

Instructions: You should have with you several number two pencils, an eraser, your 3" x 5" note card, a calculator, and your University ID Card. If you have notes with you, place them in a sealed backpack and place the backpack OUT OF SIGHT or place the notes directly on the table at the front of the room.

Fill in the front page of the Scantron answer sheet with your test form number (listed above), last name, first name, middle initial, and student identification number. **Leave the class section number and the test form number blank.**

This exam consists of 25 multiple-choice questions. Each question has four points associated with it. Select the best multiple-choice answer by filling in the corresponding circle on the rear page of the answer sheet. If you have any questions before the exam, please ask. If you have any questions during the exam, please ask the proctor. Open and start this exam when instructed. When finished, place your Scantron form and note card in the appropriate stacks. You may keep the exam packet, so please show your work and mark the answers you selected on it.

1 inch = 2.54 cm (exact)	10 dm = 1 m	100 cm = 1 m
1000 mm = 1 m	1000 m = 1 km	1000 mL = 1 L
1 mole = 6.022×10^{23}		

1. A student measures the time of a reaction to be 0.70230 seconds.

(5)

(A) There are two significant figures in this measured quantity.
(B) There are three significant figures in this measured quantity.
(C) There are four significant figures in this measured quantity.
(D) There are five significant figures in this measured quantity.
(E) There are six significant figures in this measured quantity.

2. A student combines 4.304 g of sodium sulfate and 120.20 g of potassium carbonate. The mass of the mixture (with the proper number of significant figures) is:

(A) 124.5040 g
(B) 124.504 g
(C) 124.50 g
(D) 124.5 g
(E) 125. g

$$\begin{array}{rr} 4.304 & g \\ + \quad 120.20 & g \\ \hline 124.50 & 4\ g \end{array}$$

3. Which of the following statements is **FALSE?**

(A) Electrons are located outside of the nucleus. True
(B) About 99.9% of the atom consists of the nucleus.
(C) Electrons carry a negative charge; protons carry a positive charge. True
(D) A neutral atom has an equal number of protons and electrons. True
(E) An electron ~~are~~ is roughly 1/2000th the mass of a proton. True

4. Which of these pairs of elements would be most likely to form an ionic compound?

(A) P and Br
(B) Cr and K
(C) C and O
(D) O and Mg
(E) Al and Rb

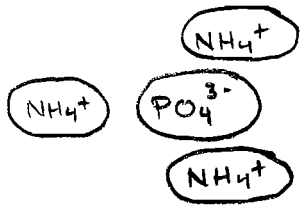
↓
Metal + Non-metal ions
(+) (−)

5. Which of these pairs of elements would be most likely to form a molecule?

(A) O and N
(B) Al and Si
(C) Ca and Li
(D) Al and B
(E) Xe and K

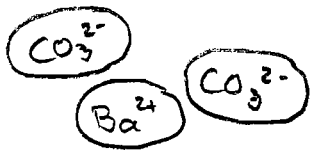
↓
Non-metals

6. Consider $(NH_4)_3PO_4$. Each unit contains:



(A) One nitrogen ion, four hydrogen ions, one phosphorous ion, and four oxide ions
(B) Twelve ammonium ions, one phosphorous ion, and four oxide ions
(C) Three sodium ions, one phosphorus ion, and four oxide ions
(D) Three ammonium ions and one phosphate ion
(E) Three ammonium ions and four phosphate ions

7. Which of the following chemical formulae is **incorrect**?



(A) $Mg_3(PO_4)_2$
(B) SrO
(C) $Ba(CO_3)_2$
(D) Li_2O
(E) $Ca(NO_3)_2$

8. $^{208}Bi^{2+}$ has:

Element 83 ⇒ 83 p
208 p+n ⇒ 125 n
$e^- = 83 - 2 = 81\ e^-$

(A) 83 **protons**, 83 **neutrons**, 85 **electrons**
(B) 83 **protons**, 125 **neutrons**, 81 **electrons**
(C) 125 **protons**, 83 **neutrons**, 81 **electrons**
(D) 125 **protons**, 83 **neutrons**, 85 **electrons**
(E) 83 **protons**, 125 **neutrons**, 85 **electrons**

9. A student measures the volume of a Potassium Trioxalatoferrate (III) crystal to be 0.0282 inches^3. Expressed in m^3, this volume is:

$0.0282\ in^3 \left(\frac{2.54\ cm}{1\ in}\right)^3 \left(\frac{1\ m}{100\ cm}\right)^3 = 4.62 \times 10^{-7}\ m^3$

(A) 7.16×10^{-4} m^3
(B) 7.26×10^{4} m^3
(C) 1.72×10^{-9} m^3
(D) 7.16×10^{-5} m^3
(E) 4.62×10^{-7} m^3

10. Consider the production of Ca_3N_2 from the elements: 3 Ca (s) + N_2 (g) → Ca_3N_2 (s)
Which of the following statements is true?

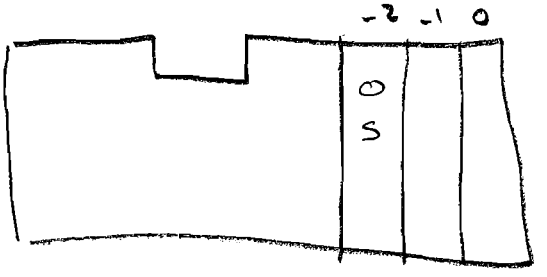
Ca^{2+}
↑
lost 2e⁻

(A) Calcium metal gained one electron
(B) Calcium metal gained two electrons
(C) Calcium metal gained three electrons
(D) Calcium metal lost one electron
(E) Calcium metal lost two electrons

11. Two elements that will form 2- ions in ionic compounds are:

(A) N and P
(B) O and S
(C) Cl and Br
(D) Ba and Ca
(E) Na and K

lose 2 e⁻



12. The mass percent compositions of the elements in lithium acetate, $LiCH_3COO$ are:

(A)	Li = 12.50 %	C = 25.00 %	H = 37.50 %	O = 25.00 %
(B)	Li = 10.52 % ✓	C = 36.40 % ✓	H = 4.59 % ✓	O = 48.49 % ✓
(C)	Li = 6.94 %	C = 24.02 %	H = 3.03 %	O = 32.00 %
(D)	Li = 6.94 %	C = 12.01 %	H = 1.01 %	O = 16.00 %
(E)	Li = 19.30 %	C = 33.40 %	H = 2.81 %	O = 44.49 %

Li C C H H H O O

6.941 g/mol + 2 × 12.01 g/mol + 3 × 1.01 g/mol + 2 × 16.00 g/mol

Molar Mass = 65.99 g/mol

$$\%\,Li = \frac{6.941\ g/mol}{65.99\ g/mol}(100\%) = 10.52\%$$

$$\%\,C = \frac{2 \times 12.01\ g/mol}{65.99\ g/mol}(100\%) = 36.40\%$$

$$\%\,H = \frac{3 \times 1.01\ g/mol}{65.99\ g/mol}(100\%) = 4.59\%$$

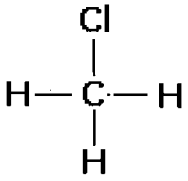
$$\%\,O = \frac{2 \times 16.00\ g/mol}{65.99\ g/mol}(100\%) = 48.49\%$$

13. Which of the following pairs are isotopes?

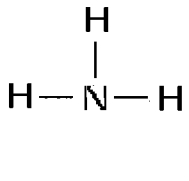
(A) ^{12}C and ^{12}C.
(B) ^{14}C and ^{14}N.
(C) ^{12}C and ^{14}N.
(D) ^{14}N and ^{15}N.
(E) ^{14}C and ^{28}Si.

Same number of p
Different number of n

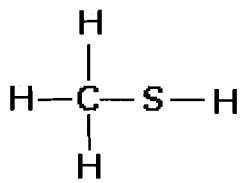
14. Which of the following compounds contains an element with the incorrect number of bonds?



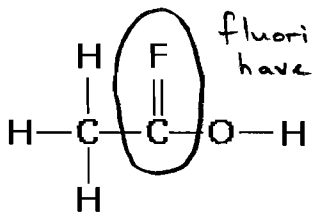
(A)



(B)

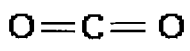


(C)



fluorine should have one bond - Group 17

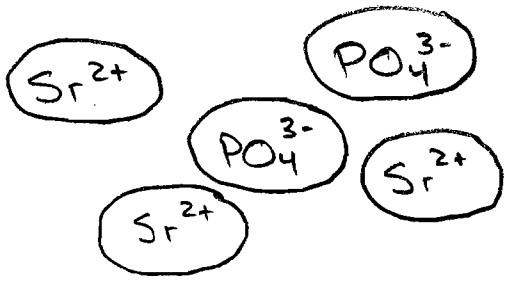
(D)



(E)

15. The chemical formula of strontium phosphate is:

(A) $Sr_3(PO_4)_2$
(B) $Sr_2(PO_4)_3$
(C) $SrPO_8$
(D) Sr_3P_2
(E) Sr_2P_3



16. The name of PCl_5 is?

(A) Phosphorous chloride
(B) Phosphorous carbonate
(C) Potassium chloride
(D) Phosphorous pentachloride
(E) Monopotassium pentachloride

PCl5
phosphorous pentachloride
5

17. Beerium has two naturally occurring isotopes. ^{151}Bm has a mass of 150.92 g/mol and is 18.82% abundant. ^{153}Bm has a mass of 152.97 g/mol and is 81.18% abundant. What is the average atomic mass of Beerium?

(A) 151.31 g/mol
(B) 152.97 g/mol
(C) 150.92 g/mol
(D) 151.95 g/mol
(E) 152.58 g/mol

$(150.92\ g/mol \cdot 0.1882) + (152.97\ g/mol \cdot 0.8118) = 152.58\ g/mol$

18. The mass of a single potassium atom is:

(A) 6.022×10^{23} grams
(B) 1.54×10^{-22} grams
(C) 1.54×10^{22} grams
(D) 6.49×10^{-23} grams
(E) 39.10 grams

$39.10\ g/mol \left(\frac{1\ mol}{6.022 \times 10^{23}\ atoms}\right) = 6.49 \times 10^{-23}\ \frac{g}{atom}$

19. How many grams of LiCl are required to make 250.0 mL of 0.1500 M LiCl (aq)?

(A) 3.750 grams
(B) 37.50 grams
(C) 1.590 grams
(D) 0.6291 grams
(E) 2.090 grams

$6.94\ g/mol + 35.45\ g/mol = 42.39\ g/mol$

$M = \frac{mol}{L}$

$0.1500\ \frac{mol}{L} = \frac{(mol)}{0.2500\ L}$

$mol = 0.03750\ mol$

$0.03750\ mol \left(\frac{42.39\ g}{1\ mol}\right) = 1.590\ g$

20. Which of the following is a non-metal?

(A) Oxygen.
(B) Francium.
(C) Aluminum.
(D) Lithium.
(E) Magnesium.

21. When the reaction C_5H_{12} (l) + 8 O_2 (g) → 5 CO_2 (g) + 6 H_2O (g) is correctly balanced,

(A) 5 H_2O are produced
(B) 8 H_2O are produced
(C) 6 H_2O are produced
(D) 2 H_2O are produced
(E) 10 H_2O are produced

22. A student obtains 360.0 grams of NaCl. How many moles of NaCl are present?

(A) 6.160 mol NaCl
(B) 0.1623 mol NaCl
(C) 5.978×10^{-22} mol NaCl
(D) 1.384 mol NaCl
(E) 3.494×10^{-20} mol NaCl

22.99 g/mol + 35.45 g/mol

58.44 g/mol

$$360.0\ g\ NaCl \left(\frac{1\ mol}{58.44\ g}\right) = 6.160\ mol$$

23. A student obtains 36.04 grams of water, H_2O. How many ~~oxygen atoms~~ water molecules are present?

↑ 18.02 g/mol

(A) 7.22×10^{24} ~~oxygen~~ atoms.
(B) 2.40×10^{24} ~~oxygen~~ atoms.
(C) 3.60×10^{24} ~~oxygen~~ atoms.
(D) 6.68×10^{23} ~~oxygen~~ atoms.
(E) 1.20×10^{24} ~~oxygen~~ atoms.

$$36.04\ g \left(\frac{1\ mol}{18.02\ g}\right) = 2.000\ mol\ H_2O$$

$$2.000\ mol\ H_2O \left(\frac{6.022 \times 10^{23}\ H_2O\ molecules}{1\ mol\ H_2O}\right) = 1.204 \times 10^{24}\ H_2O\ molecules$$

24. A student obtains 60.16 grams of ethane, C_2H_6. How many hydrogen atoms are present?

↑ 30.08 g/mol

(A) 7.226×10^{24} ~~oxygen~~ H atoms.
(B) 2.40×10^{24} ~~oxygen~~ atoms.
(C) 3.60×10^{24} ~~oxygen~~ atoms.
(D) 6.68×10^{23} ~~oxygen~~ atoms.
(E) 1.20×10^{24} ~~oxygen~~ atoms.

$$60.16\ g \left(\frac{1\ mol}{30.08\ g}\right) = 2.000\ mol\ C_2H_6$$

$$2.000\ mol\ C_2H_6 \left(\frac{6.022 \times 10^{23}\ C_2H_6\ molecules}{1\ mol\ C_2H_6}\right) = 1.204 \times 10^{24}\ C_2H_6\ molecules$$

$$1.204 \times 10^{24}\ C_2H_6\ molecules \left(\frac{6\ H\ atoms}{1\ C_2H_6\ molecules}\right) = 7.226 \times 10^{24}\ H\ atoms$$

25. Because of Chemistry 121...

(A) I get invited to way more parties. I'm headed to one right now  .
(B) I live with constant abdominal discomfort.
(C) I discovered Skill Builder and wish it was available for *all* my courses.
(D) I have attained a level of confidence that will allow me to succeed in all I attempt.
(E) I am changing my major to chemistry... 8am tomorrow morning!

[Any response will receive full credit; even no response.]