

Name KEY

University of Louisville

Chem 105 Day

Fall 2016

Exam I

September 28

(MC score 26 FR score 74 Total raw 152 total % 78)   
 *page 1 - 32* *page 2 - 42* *78 MC + 74 FR* *divide your "total raw" by 152 & record as a %*

Free-Response ANSWER SHEET. Write your answers in the spaces provided.

1. Give the correct chemical formula for each substance named. [2 each]

- section totals* Na<sub>3</sub>N sodium nitride *Na<sup>+</sup> NO<sub>3</sub><sup>-</sup>*
- CH<sub>4</sub> methane
- 12* Ca(OH)<sub>2</sub> calcium hydroxide *Ca<sup>2+</sup> OH<sup>-</sup>*
- Fe<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub> iron(II) phosphate *Fe<sup>2+</sup> PO<sub>4</sub><sup>3-</sup>*
- PCl<sub>5</sub> phosphorus pentachloride
- N<sub>2</sub>O nitrous oxide *Dany NO*

4. Give a correct systematic name for each formula. [2 each]

- disulfur hexachloride S<sub>2</sub>Cl<sub>6</sub>
- copper(I) oxide Cu<sub>2</sub>O
- 12* aluminum nitrate Al(NO<sub>3</sub>)<sub>3</sub> *ammonium*
- ammonia NH<sub>3</sub> *nitrogen trihydride*
- magnesium fluoride MgF<sub>2</sub>
- ethyne H-C≡C-H *dicarbon dihydride or dihydrogen diacetylide*

2. Give a reasonable estimate, with appropriate metric unit, for each of the following. [2 each]

- 6* a. the volume of your phone. accepted: 30 mL - 500 mL 1.5 dl *0.3 dl - 5 dl*
- b. the thickness of your textbook. accepted: 0.5 cm - 10 cm 3 cm
- c. the mass of a pair of sunglasses. accepted: 10 g - 400 g 50 g *0.01 kg - 0.4 kg*

5. Give the symbol of an element that fits each description. In some cases, there may be more than one acceptable answer; choose one. [2 each]

- 8* B a nonmetal in the same group with aluminum *1*
- Li a main group metal *2 any metal in groups 1A, 2A, 3A, 4A, 5A, 6A*
- C an element whose neutral atoms have 4 valence electrons *1 Be (4e<sup>-</sup>)*
- H an element that can form both covalent and ionic compounds *2 any Group 4A element*
- 1* B, C, Si *2 any nonmetal except Group 8A, B, C, Si*
- 1* B, C, Si

3. [4 pts] Complete the structure: Add lone pair electrons, or turn single bonds into double or triple bonds, to complete the following structure so that every atom has its normal electron arrangement. (Do not add any atoms to the molecule.)

:N≡C—Ö—H

42 ← page total

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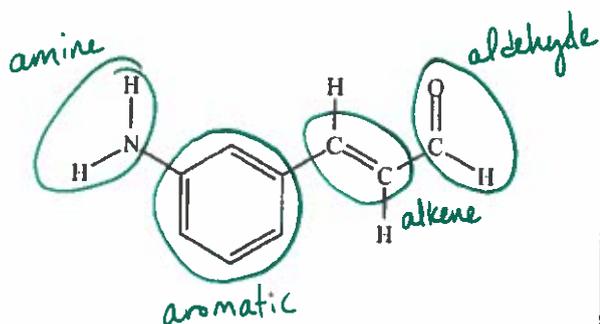
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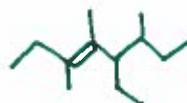
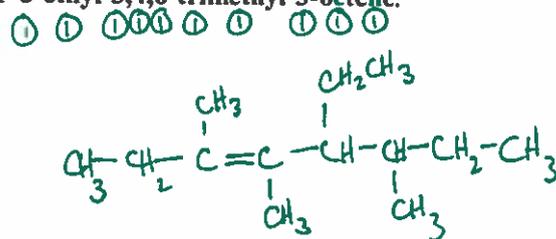
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6. In the structure below, circle and appropriately label all functional groups. [8 pts]



7. [11 pts] In the space below, draw the structure of 5-ethyl-3,4,6-trimethyl-3-octene.



8. Fill in the blanks in the table below. [1 point each]

13

formula	atomic number	mass number	# of protons	# of electrons	# of neutrons	charge
O	8	8+9 = 17	8	8	9	0
Zn <sup>2+</sup>	30	30+37 = 67	30	28	37	+2
V <sup>3+</sup>	23	50	23	20	50-23 = 27	+3

32 ← page total

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Exam 1

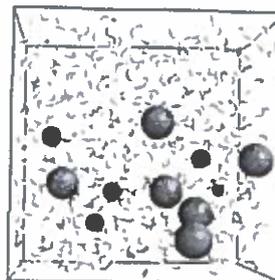
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Part B. Multiple Choice [3 points each]. Choose the best answer and record it on your Scantron card.

- 1 Which of the following is a characteristic of a sample of an element?
- A Can be broken down into two or more other substances by heating *compound*
  - B Is made up of other, simpler substances in a fixed ratio *compound*
  - C Is made up of other, simpler substances in a variable ratio *mixture*
  - D All atoms have the same number of protons
  - E Name typically ends in "-ide"

- 2 The sample pictured is best classified as:

- A an element.
- B a covalent/molecular compound.
- C an ionic compound.
- D a mixture.



*multiple components  
no fixed ratio*

- 3 Which of the following properties is generally true of a noble gas?
- A conducts electricity
  - B combines with metals to form ionic compounds
  - C forms anions in ionic compounds
  - D combines with nonmetals to form covalent compounds
  - E relatively unreactive and does not form compounds

- 4 Which of the following is the name of an ionic compound?

- A carbon disulfide
- B silicon carbide
- C propane
- D potassium sodium carbonate
- E sodium carbonate

- 5 From the following list, which statement could possibly be correct based on the size of the measurement?

- A A computer mouse weighs 160  $\mu\text{g}$ .
- B My coffee cup holds 220 mL of coffee.
- C This exam paper is 9 cm long.
- D A penny has a diameter of 19 dm.

- 6 How many protons are in an atom of sulfur?

- A 11
- B 14
- C 16
- D 23
- E 32

- 7 What is the most likely mass number for a single atom of sulfur?

- A -2
- B 16 *↳ whole #*
- C 17
- D 32
- E 32.07

- 8 Which of the following statements is the most accurate description of the substance  $\text{PbO}_2$ ?

- A  $\text{PbO}_2$  is an ionic compound, containing  $\text{Pb}^{2+}$  and  $\text{O}^-$  ions.
- B  $\text{PbO}_2$  is an ionic compound, containing  $\text{Pb}^{4+}$  and  $\text{O}^{2-}$  ions.
- C  $\text{PbO}_2$  is an ionic compound, containing  $\text{Pb}^{4+}$  and  $\text{O}_2^{4+}$  ions.
- D  $\text{PbO}_2$  is a covalent compound, containing Pb atoms and  $\text{O}_2$  molecules.
- E  $\text{PbO}_2$  is a covalent compound, in which Pb and O are connected through covalent bonds to form molecules.

*$\text{Pb}^{4+}$   $\text{O}^{2-}$*

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Problems 9-17 refer to the following five options. You may use each option once, more than once, or not at all.

A Si

B S

C Sc

D Sr

E Sn

- B 9 Which element forms a  $-2$  ion?  $S^{2-}$  (group 6A)
- C 10 Which of the elements is a transition metal? Sc (group 3B)
- B 11 Which element combines in a 1:1 ratio with magnesium to form an ionic compound?  $S^{2-} : MgS$   
 $Mg^{2+}$
- B 12 Which element can form BOTH covalent and ionic compounds? nonmetals
- D 13 Which element is in the same Group with calcium?  $Ca$  Group 2A
- E 14 If you have a 1-mole sample of each element, which sample has the greatest mass? heaviest atoms - Sn  
 $\rightarrow$  same # of atoms
- D 15 Which element is an alkaline earth element? Group 2A, Sr
- B 16 Which element has 6 valence electrons in its neutral atoms? Group 6A, S
- D 17 Which element forms a  $+2$  ion exclusively? Group 2A

The descriptions in the next few items refer to the following five options. You may use each option once, more than once, or not at all.

A  $F_2$

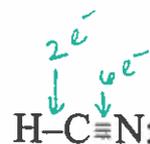
B  $OF_2$

C Fe

D Fr

E  $FeF_2$

- E 18 An ionic compound metal + nonmetal
- A 19 A diatomic molecule  $2$  atoms covalent
- B 20 A substance with a molar mass of 54 g B: 
$$\begin{array}{r} O \\ F \\ F \\ \hline 16 \\ 19 \\ 19 \\ \hline 54 \text{ g/mol} \end{array}$$
- A 21 A nonmetal element
- B 22 A molecular/covalent compound  $2$  or more elements  
 $\rightarrow$  2 nonmetals
- C 23 How many bonding electrons are there in a molecule of hydrocyanic acid (shown)?



A 4

B 5

C 8

D 10

E 14

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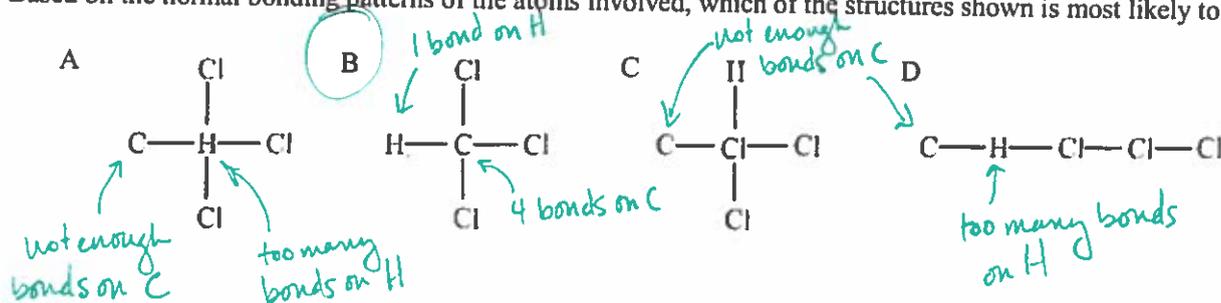
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24 Based on the normal bonding patterns of the atoms involved, which of the structures shown is most likely to exist?



25 How many carbon atoms are there in the organic molecule shown at right?

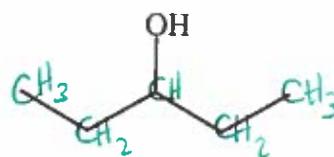
A 0 (this molecule does not contain carbon)

**B 5**

C 6

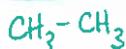
D 10

E 22



26 Which of these is a saturated organic molecule?

~~A~~ cyclobutene   
**D** ethane



~~B~~ carbon monoxide CO   
~~C~~ 2-pentene



~~D~~ propyne  $\text{CH}_3-\text{C}\equiv\text{CH}$

→ all C-C bonds are single bonds

→ C & H, with or without other elements

27 Mark both the "A" and "D" spaces on your Scantron card. (This item is a form identifier and will not be scored.)

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50	40	30	20	10
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4	3	2	1	0

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6	A	B	C	D
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46	A	B	C	D
47	A	B	C	D
48	A	B	C	D
49	A	B	C	D
50	A	B	C	D

**IMPORTANT**

USE NO. 2 PENCIL ONLY

- MAKE DARK MARKS
- ERASE COMPLETELY TO CHANGE
- EXAMPLE: A B C D E

**TO USE SUBJECTIVE SCORE FEATURE:**

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- 163 points maximum

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43	A	B	C	D	E
44	A	B	C	D	E
45	A	B	C	D	E
46	A	B	C	D	E
47	A	B	C	D	E
48	A	B	C	D	E
49	A	B	C	D	E
50	A	B	C	D	E

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