

CHM 3342

Homework Set 1

TUD Department of Chemistry

Spring 2017

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SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

1) Atoms with the same number of protons but different numbers of neutrons are called _____ 1) _____

2) Rank the following compounds in order of increasing acidity: CH_3OH , HCl , NH_3 , and CH_4 . 2) _____

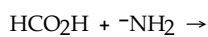
3) Provide the products of the following acid-base reaction. 3) _____
 $(\text{CH}_3)_3\text{NH}^+ + \text{HO}^- \rightarrow$

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

4) Draw a proper Lewis structure for H_2SO_4 .

5) Draw a correct Lewis structure for acetaldehyde, CH_3CHO .

6) Write a completed equation for the acid-base pair shown below.

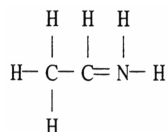


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

7) A carbon-hydrogen bond in ethane (CH_3CH_3) is best described as _____. 7) _____
A) highly polar
B) resonance stabilized
C) essentially nonpolar
D) a multiple bond
E) ionic

8) The formal charge on oxygen in dimethyl ether, CH_3OCH_3 , is: 8) _____
A) +2 B) +1 C) 0 D) -1 E) -2

9) The formal charge on nitrogen in the compound below is _____. 9) _____

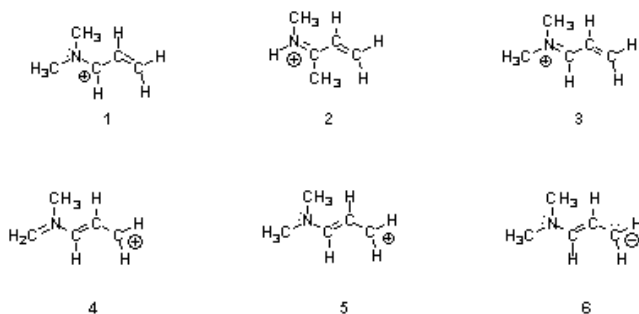


A) +2 B) +1 C) 0 D) -1 E) -2

10) When methanol (CH_3OH) acts as a base, its conjugate acid is _____. 10) _____

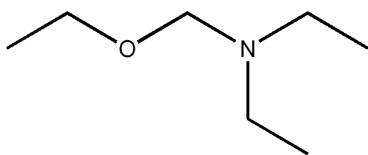
- A) CH_4OH
- B) CH_3OH_2^+
- C) $^-\text{CH}_2\text{OH}$
- D) CH_4O^+
- E) CH_3O^-

11) Structures _____, shown below, are resonance structures, and structure _____ is the major contributor to the overall resonance hybrid. 11) _____



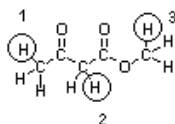
- A) 1, 3 & 5; 3
- B) 4 & 6; 6
- C) 1, 3, 4 & 5; 3
- D) 2 & 4; 2
- E) 1, 3 & 5; 1

12) Which of the following condensed formulas represents the same compound as the line-angle structure shown? 12) _____



- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_2\text{N}(\text{CH}_2\text{CH}_2\text{CH}_3)_2$
- B) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{N}(\text{CH}_2\text{CH}_2\text{CH}_3)_2$
- C) $\text{CH}_3\text{ON}(\text{CH}_3)_2$
- D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{N}(\text{CH}_2\text{CH}_3)_2$
- E) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{N}(\text{CH}_2\text{CH}_3)_2$

13) Which sequence correctly ranks the indicated protons in order of increasing acidity? 13) _____



- A) $3 < 1 < 2$ B) $2 < 3 < 1$ C) $1 < 3 < 2$ D) $1 < 2 < 3$ E) $2 < 1 < 3$

14) The hydroxide ion (HO^-) cannot function well as which of the following? 14) _____

- A) a Lewis base
B) a proton acceptor
C) a Bronsted-Lowry base
D) a nucleophile
E) an electron-pair acceptor

15) Which of the molecules below can hydrogen bond to another of the same compound? 15) _____

- A) $(\text{CH}_3\text{CH}_2)_2\text{CHOH}$
B) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
C) $\text{CH}_3\text{CH}_2\text{COOCH}_3$
D) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
E) all of the above

16) What name is given to a hydrocarbon that contains a carbon-carbon triple bond? 16) _____

- A) aromatic
B) alkyne
C) alkene
D) alkane
E) none of the above

17) Which of the molecules below is an ester? 17) _____

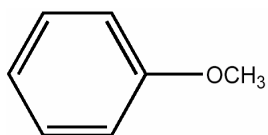
- A) CH_3COOH
B) $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$
C) $\text{HC}\equiv\text{CCH}_3$
D) $\text{CH}_3\text{COOCH}_3$
E) $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$

18) Which of the functional groups below contain a hydroxyl group as a part of their structure? 18) _____

- A) aldehyde
B) alcohol
C) carboxylic acid
D) amine
E) B and C only

19) Anisole, the compound shown below, is an example of _____.

19) _____



- A) an ester
- B) a ketone
- C) an ether
- D) an aldehyde
- E) an alcohol

20) Which of the molecules below can be properly called an amine?

20) _____

- A) CH_3COOH
- B) CH_3CN
- C) $\text{CH}_3\text{CH}_2\text{NHCH}_3$
- D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- E) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NO}_2$