Show All Calculations Where Appropriate

Multiple Choice Questions (6 points each). Circle the single best answer for each question.

1. How many significant digits does 0.0013060 have?
   (A) 1  (B) 2  (C) 3  (D) 4  (E) 5

2. How many valence electrons does a neutral B atom have?
   (A) 11  (B) 3  (C) 5  (D) 6  (E) 7

3. Which of the following is a sulfate ion?
   (A) SO₂⁻  (B) SO₃²⁻  (C) SO₄²⁻  (D) CO₃²⁻  (E) PO₄³⁻

4. A compound X has a MW of 150.0 amu. Calculate the number of moles of X in 5.00 g of X.
   (A) 0.0333  (B) 0.0621  (C) 0.200  (D) 5.00  (E) 30.0

5. Which of the following will not exhibit hydrogen bonding?
   (A) CH₃OH  (B) H₂O  (C) NH₂CH₃  (D) CHCl₃  (E) HF

6. Which of the following is insoluble in water?
   (A) NaOH  (B) HNO₃  (C) Ba(NO₃)₂  (D) (NH₄)₃PO₄  (E) PbCl₂

7. What is the pH of a solution which has [OH⁻] = 1.0x10⁻¹²?
   (A) 7.00  (B) 1.00  (C) 2.00  (D) 13.00  (E) 14.00

8. Which of the following functional groups is most characteristic of ethers?
   (A) C≡C  (B) R–OH  (C) R–O–R  (D) –SH  (E) –NH₂

9. Which of the following is 1-hexene?
   (A) CH₃CH=CHCH₂CH₂CH₃  (B) CH₃CH₂CH=CHCH₂CH₂CH₃
   (C) CH₂CH₂CH₂CH₂CH₂CH₂CH₃  (D) CH₂=CHCH₂CH₂CH₂CH₃
   (E) CH₂CH₂CH₂CH₂CH₂CH₂CH₃

10. What is produced when propanol (CH₃CH₂CH₂OH) oxidized?
    (A) CH₃CH₂CH₃OH₂  (B) CH₃CH=CH₂  (C) CH₃CH₂CO₂H
     (D) CH₃CH₂CH₂OH  (E) CH₃CH₂CH(OCH₂CH₂CH₂)OH
11. What is produced when an aldehyde is reduced completely?
   (A) alkene   (B) 1° alcohol   (C) 2° alcohol   (D) ketone   (E) carboxylic acid

12. Which of the following is a disaccharide?
   (A) starch   (B) ethanol   (C) glucose   (D) sucrose   (E) acetone

13. Which of the following are not elements/properties of most phospholipids.
   (A) phosphate   (B) steroid rings   (C) fatty acids   (D) ester linkage   (E) saponifiable

14. Which of the following is a non-polar sidechain amino acid?
   (A) tyrosine   (B) aspartic acid   (C) leucine   (D) cysteine   (E) uracil

15. What base pairs with adenine in RNA?
   (A) adenine   (B) thymine   (C) guanine   (D) cytosine   (E) uracil

16. How many nucleotides make up a codon?
   (A) 1   (B) 2   (C) 3   (D) 4   (E) 5

17. Give the electron configuration for C⁺⁺ and Na. (10 points)

18. Calculate the concentration (in Molarity) of a solution prepared by dissolving 0.3215 g of
   NH₄ClO₄ in 100.0 mL of distilled water. What will be the resulting concentration (in Molarity)
   if 10.0 mL of this solution are diluted to 1000.0 mL? (20 points)
19. Write the RNA sequence formed when the following strand of DNA is transcribed for peptide synthesis. (10 points)

3’ GTAACAAACCGTGTTAAGC 5’

20. Describe using words and generalized reactions how inhibitors are used to regulate enzyme activity. (10 points)

21. Describe using words and pictures the structure of a DNA double helix. (10 points)
22. Name the following ionic compounds and describe their solubility as soluble or insoluble in water. (16 points)

<table>
<thead>
<tr>
<th>Compound</th>
<th>Name</th>
<th>Solubility</th>
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</thead>
<tbody>
<tr>
<td>Fe(NO$_2$)$_2$</td>
<td></td>
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<tr>
<td>NaOH</td>
<td></td>
<td></td>
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<tr>
<td>(NH$_4$)$_3$PO$_4$</td>
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<tr>
<td>KCl</td>
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23. Write the structure of the major product when 1-propyl thiol is oxidized and give the name(s) of functional group(s) in the product molecule. (10 points)

$$\text{CH}_3\text{CH}_2\text{CH}_2\text{SH} + [\text{O}] \rightarrow ?$$

24. Draw a molecule which both an alcohol and an alkene. (15 points)

25. Describe what acid/base buffer is and how it works in words and generalized reactions. (10 points)
26. Draw three different structural isomers of $C_7H_{14}O$ (including at least one cyclic molecule and one branched non-cyclic molecule). (15 points)

27. Draw a steroid ring system (without substitutions or multiple bonds). (5 points)

28. Balance the following equation and then write the net ionic equations. (18 points)

\[
\text{Mg(NO}_3\text{)}_2 (aq) + \text{NaClO (aq)} \rightarrow
\]

\[
\text{NH}_4\text{Cl (aq) + Pb(NO}_3\text{)}_2 (aq) \rightarrow
\]