Chem 131 practice exam

Note; for the exam a chart of the linear hexose sugars (as on the carbohydrate worksheet) will be provided (glucose will be omitted however). Table 21.2 on the codons will also be provided. The structure of the 5 bases in RNA and DNA will also be given (ACTGU)

1. Draw the cyclic (pyranose) form of α-D-glucose.

2. a. Circle the sugar(s) depicted below that are considered 'D' sugars? 1, 2, 3
   b. Which one is Glucose?

3. Draw the structure of a disaccharide of D-talose and D-glucose
   --For this structure the talose C1 carbon is connected to the C4 of glucose
   --The 1,4 Glycoside linkage is α
   --The anomeric carbon of glucose is in the β position.
4. a) For the disaccharide below what are the 2 mono saccharide units it contains?

b) Draw an arrow to any anomeric carbon(s) that are present.

c) Describe glycosidic link - choose one from a-f:

(a) \( \alpha-1,4 \)  
(b) \( \beta-1,4 \)  
(c) \( \alpha-1,1 \)  
(d) \( \beta-1,1 \)  
(e) \( \beta-1,5 \)  
(f) \( \beta-1,6 \)

\[ \text{Disaccharide structure} \]

\[ \text{Anomeric carbon(s)} \]

d) Does the disaccharide drawn above have an open chain aldehyde form that it is in equilibrium with? (yes or no)? (you do not need to draw it).

5. a) Below is a compound that is considered a ‘sugar alcohol’. Does it have a cyclic pyranose form?

b) Would this be considered a reducing sugar?

\[ \text{Sugar alcohol structure} \]

\[ \text{Reducing sugar?} \]

5. Draw the cyclic structure of D-ribose and D-deoxy ribose

\[ \text{D-ribose} \]

\[ \text{D-deoxy ribose} \]
6 Shown below are the 4 bases that are present in the DNA molecules.

a. Which bases are complementary base pairs. \( \text{G:C, A:T} \)

b. Draw the hydrogen bonding interactions between the base pairs listed below.

7. Draw the product of the following reaction. What is the product of this reaction known for? — Saponification: soap making

\[
\begin{align*}
\text{CH}_2\text{O} & \quad \text{O} \quad \text{C-} \quad (\text{CH}_3)_4 \quad \text{CH}_3 \\
\text{CH-O} & \quad \text{C-} \quad (\text{CH}_3)_2 \quad \text{CH} \equiv \text{CH} \quad (\text{CH}_3)_2 \quad \text{CH}_3 \\
\text{CH}_2\text{O} & \quad \text{C-} \quad (\text{CH}_3)_4 \quad \text{CH}_3
\end{align*}
\]

\[\text{NaOH, heat} \quad \rightarrow \quad \text{CH}_2\text{OH} \quad \text{O} \quad \text{C-} \quad (\text{CH}_3)_4 \quad \text{CH}_3\]
8 Determine which class of compounds each of the following chemicals belongs to. A list of possible choices is given on the left. Just write the name below or next to each compound. (5 pts, 1 pt each)

- Phospholipid
- Fat/Oil
- Glycolipid
- Nucleotide
- Triglyceride
- Fatty Acid
- Amino acid
- Dipeptide
- Monosaccharide
- Disaccharide
9. For the DNA segment shown below identify:
   - All phosphodister links
   - All anomeric carbons present.
Label which is the 5' end and the 3' end.
Give the base sequence (ACGT etc) going from the 5' end to the 3' end.

\[
\text{CT}
\]

What would be the complimentary sequence for this strand shown below? (going from top to bottom)

\[
\text{TGA}
\]

Draw the complimentary base pair hydrogen bonding interaction between one of the base pairs.
10. Answer the following:

The secondary structure of DNA is called a **Double Helix**

What is responsible for holding the secondary structure together? **Hydrogen bonds**

The complimentary base pair to Adenine is **Thymine (T)**

In RNA, the complimentary base to Uracil is **Adenine (A)**

Which sugar is present in RNA? **Ribose**

Which sugar is present in DNA? **Deoxyribose**

What are the 3 components that make up DNA? **Sugar, Base, Phosphate Linkage**

What components of RNA are structurally different than DNA? The sugar (ribose) Base Uracil instead of Thymine.

11. Circle which compounds human can digest:

- Starch
- Amylose
- Cellulose
- Fat
- Glycogen (has β 1-4 linkage)

12. Which compounds from the list below is the most highly reduced? The most oxidized?

An oil

- A carbohydrate (hexane, no oxygen)

13. How many hydrogen bonds would be formed between the following strand of DNA and its complementary pair:

- CG have 3 bonds
- AT have 2 bonds

CCAAGT **= total**

14. What would be the mRNA sequence that would be synthesized by the following DNA sequence

- GTT TGG CAA

3’ CUU UAC G 5’

15. What is the primary structure of the polypeptide produced during translation of the following mRNA sequence: **AUG-CAC-UUU-CAU-GUA-GUC-UAG**

Note: you will have table 21.2 available during the exam.

**Hist-Phe-Hist-Val-Val**
16. Show the digestion/hydrolysis products of the following disaccharides.

\[
\begin{align*}
\text{Glycosidase} & \quad \text{Product 1} + \text{Product 2}
\end{align*}
\]