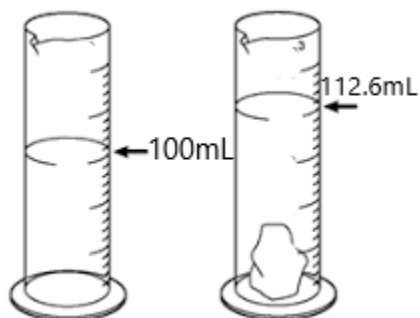


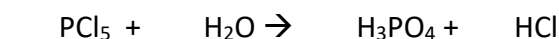
1. Convert 1600m to Mm. Give your answer in scientific notation.
2. Convert 26.80 kg to  $\mu\text{g}$ . Give your answer in scientific notation.
3. Convert 65 miles per hour to meters per second
4. Acetone has a density of 0.7857 g/mL.
  - a. What is the mass in grams of 28.56 mL of acetone?
  - b. What is the volume in milliliters of 6.54 g of acetone?
5. A book has the dimensions of 5.8 inches by 2.0 inches by 7.85 inches. What is its volume in  $\text{cm}^3$ ?
6. In lab, a graduated cylinder is filled with 100.0mL of water. When a piece of metal weighing 37.02 g is added to the cylinder, it displaces water so the new volume is 112.6mL. What's the density of the metal in g/mL?



7. Complete the table:

Symbol	Number of protons	Number of neutrons	Number of electrons
${}_{13}^{27}\text{Al}^{3+}$			
	20	21	20
${}_{35}^{80}\text{Br}^{-}$			

8. Balance the following equations:



9. Consider magnesium chloride for the following questions:

- Is it an ionic or covalent compound?
- What is the chemical formula for magnesium chloride?
- What is its molar mass?
- How many molecules of magnesium chloride are in a sample weighing 27.88 g?
- How many atoms of *just* chloride are in that sample?

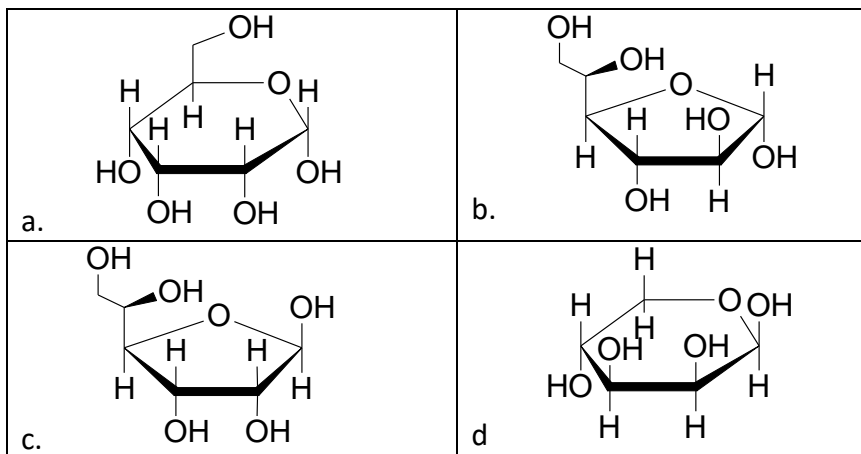
10. Give the name or formula for the following compounds

- |                               |  |                       |                          |
|-------------------------------|--|-----------------------|--------------------------|
| a. $\text{Ca}(\text{NO}_3)_2$ | e. $\text{K}_2\text{SO}_4$                       | j. Silver phosphate   | n. Nickel(III) hydroxide |
| b. $\text{PCl}_5$             | f. $\text{Fe}_2(\text{SO}_4)_3$                  | k. Copper(II) bromide | o. Zinc iodide           |
| c. $\text{Pb}(\text{CO}_3)_2$ | g. $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$ | l. Sodium sulfate     | p. Strontium phosphide   |
| d. $\text{S}_2\text{Br}_2$    | h. $\text{AlF}_3$                                | m. Silicon dioxide    |                          |

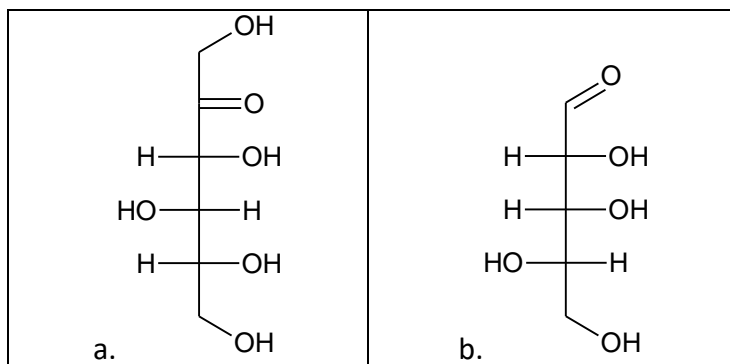
11. Write a balanced equation with phase labels for the reaction of barium nitrate with sodium sulfate. Use a solubility table from your notes or textbook to determine the phase labels.

For questions 11-13, consider these four sugars:

12. Label each one as an  $\alpha$  or  $\beta$  anomer.
13. Label each one as a furanose or pyranose.
14. Circle the anomeric carbon on each sugar.



For questions 15-18, consider these two sugars:



15. Label each one as an aldose or ketose.
16. Indicate which carbons in each structure are chiral.
17. Label each one as a D or L anomer.
18. Label each one as a tetrose, pentose or hexose.
19. Complete the following table:

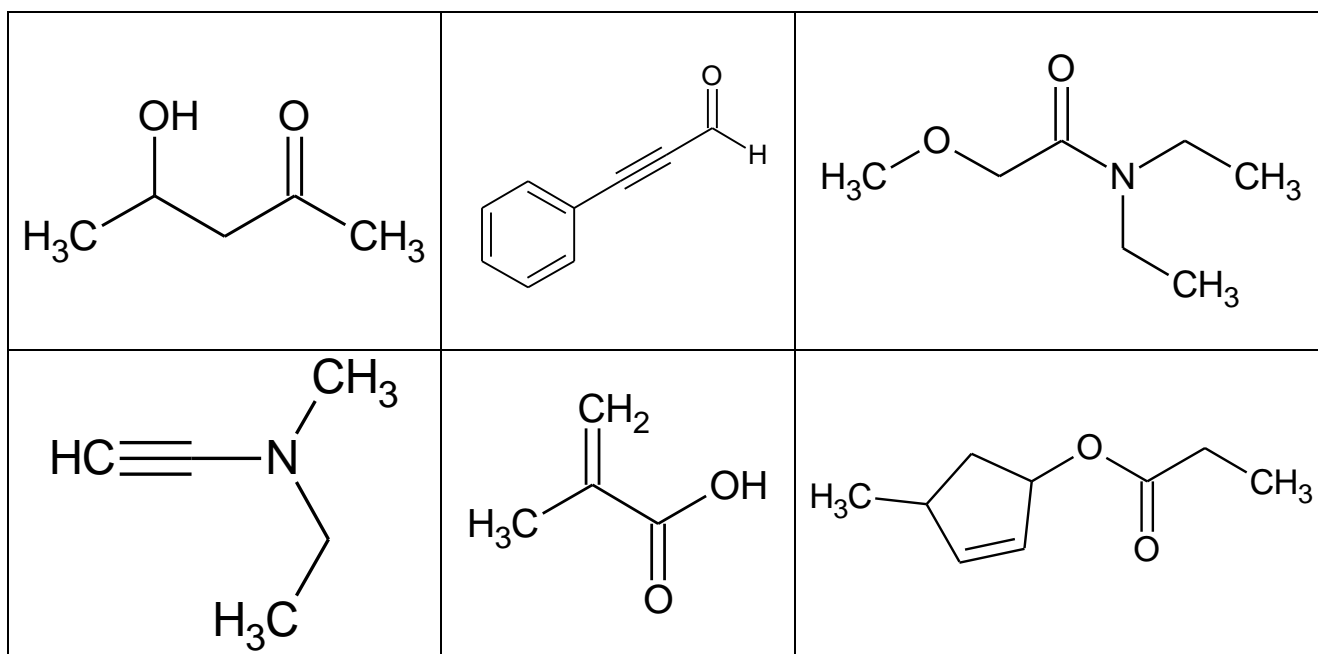
Formula	Lewis structure	Electron Geometry	Molecular Geometry	Polar or nonpolar?
CO <sub>2</sub>				
PCl <sub>3</sub>				
CINO				

20. True or false: A molecule that contains polar bonds must be polar. If false, explain why.

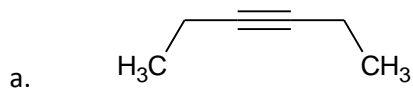
21. Rank the following molecules from lowest to highest boiling point:  $\text{CHF}_3$ , propane, ethanol, pentane.

22. Draw the molecule ethanol and show all possible hydrogen bonds it can form with water.

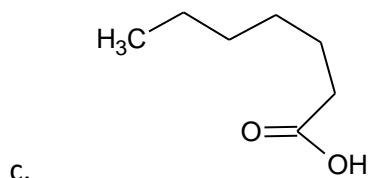
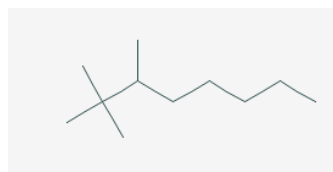
23. Circle and label all the functional groups in these molecules.



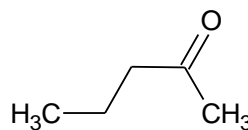
24. Name the following compounds:



b.



d.

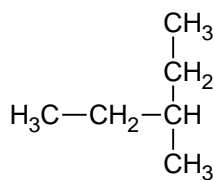
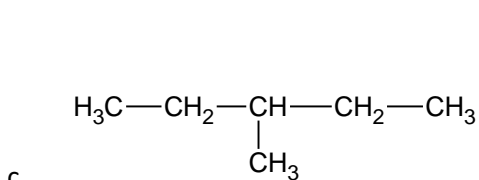
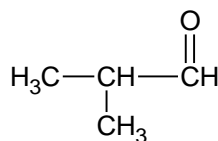
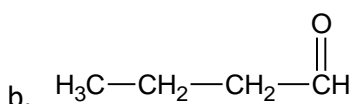
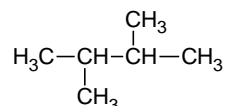
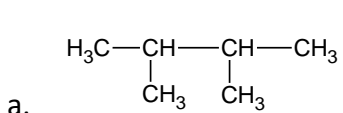


25. Draw the structure for the following compounds:

a. 4-methyl-2-pentene

b. 6,6-dimethylheptanal

26. For each of the following, determine whether the two structures are isomers or the same molecule drawn in two different ways.



27. How many grams of sodium chloride do you need to make 50.0mL of 0.12M sodium chloride solution?

28. What is the concentration of a solution if 0.8 moles of sucrose are dissolved in 0.75L of water?

29. How many milliliters of 1.6M copper (II) sulfate stock solution do you need to dilute if you want to create 25.0mL of 0.255M copper (II) sulfate?

30. How many grams of sucrose are in .685mL of a solution that is 15.00% m/v?

31. Fill in the following table

$[H_3O^+]$	$[OH^-]$	pH	pOH	Acidic, basic, or neutral
$1.0 \times 10^{-3}$				
	$1.0 \times 10^{-7}$			
		8.35		
			3.83	
$1.0 \times 10^{-5}$				
	$1.5 \times 10^{-7}$			

32. Write a reaction for the neutralization of  $NH_3$  with  $CH_3COOH$ . Label the acid, base, conjugate base, and conjugate acid.

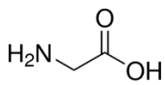
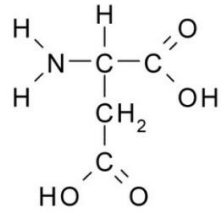
33. The three dimensional structure of the whole protein is the \_\_\_\_\_.

- hydrophobic side chain
- primary structure
- c-terminus
- tertiary structure

34. What force helps keep alpha helices from uncoiling and beta sheets together?

- Hydrogen bonding
- London forces
- Ion-dipole attraction
- Cell membranes

35. Classify the following amino acids as polar or nonpolar and as acidic, basic, or neutral based on their side chains.

Amino Acid	Polar or nonpolar?	Acidic, basic, or neutral?
		
		
Amino Acid	Polar or nonpolar?	Acidic, basic, or neutral?

$\begin{array}{c} \text{H} \\   \\ \text{H}_2\text{N}-\text{C}-\text{COOH} \\   \\ \text{CH}_2 \\   \\ \text{CH}_2 \\   \\ \text{CH}_2 \\   \\ \text{CH}_2 \\   \\ \text{NH}_2 \end{array}$		
$\begin{array}{c} \text{O}-\text{H} \\   \\ \text{CH}_2 \\   \\ \text{H}_2\text{N}-\text{C}-\text{COOH} \\   \\ \text{H} \end{array}$		

### Solutions

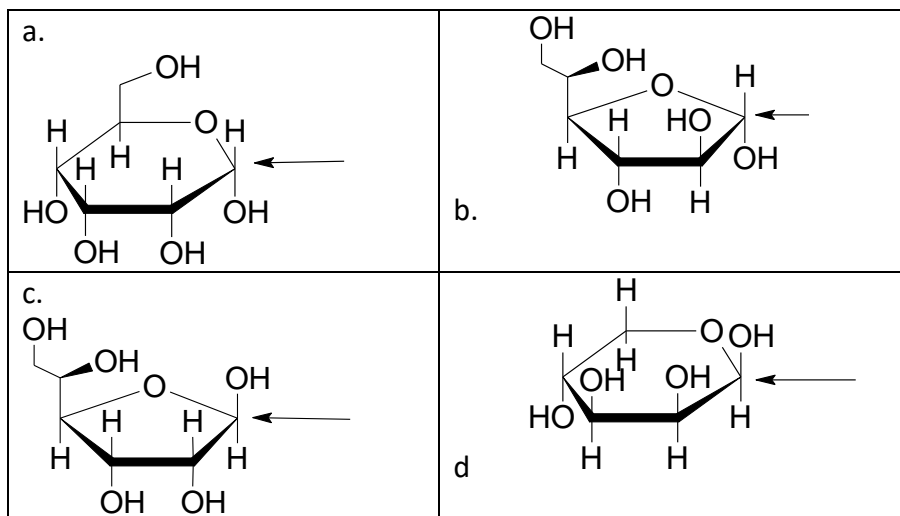
- $1.6 \times 10^{-6}$  Mm (Megameters)
- $2.680 \times 10^{-8}$   $\mu\text{g}$
- 29 m/s
- a. 22.44 g b. 8.32 mL
- $1500 \text{ cm}^3$
- $2.94 \text{ g/cm}^3$
- 

Symbol	Number of protons	Number of neutrons	Number of electrons
${}_{13}^{27}\text{Al}^{3+}$	13	14	10
${}_{20}^{41}\text{Ca}$	20	21	20
${}_{35}^{80}\text{Br}^{-}$	35	55	36

- $2 \text{ C}_2\text{H}_6 + 7 \text{ O}_2 \rightarrow 4 \text{ CO}_2 + 6 \text{ H}_2\text{O}$   
 $\text{PCl}_5 + 4 \text{ H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + 5 \text{ HCl}$
- a. ionic    b.  $\text{MgCl}_2$     c. 98.211 g/mol (answers may vary slightly with periodic table)  
 d.  $1.763 \times 10^{23}$  molecules of  $\text{MgCl}_2$     e.  $3.527 \times 10^{23}$  atoms of  $\text{Cl}^-$
- (a) Calcium nitrate                      (e) Potassium sulfate                      (j)  $\text{Ag}_3\text{PO}_4$                       (n)  $\text{Ni}(\text{OH})_3$   
 (b) Phosphorous pentachloride                      (f) Iron(III) sulfate                      (k)  $\text{CuBr}_2$                       (o)  $\text{ZnI}_2$   
 (c) Lead(IV) carbonate                      (g) Barium acetate                      (l)  $\text{Na}_2\text{SO}_4$                       (p)  $\text{Sr}_3\text{P}_2$   
 (d) Disulfur dibromide                      (h) Aluminum fluoride                      (m)  $\text{SiO}_2$
- $\text{Ba}(\text{NO}_3)_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaNO}_3(\text{aq})$
- $\alpha$ : a and b;  $\beta$ : c and d

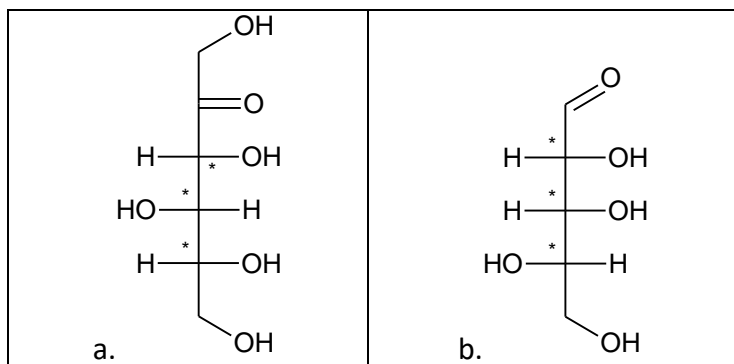
13. Pyranoses: a and d; furanoses: b and c

14.



15. a. Ketose b. Aldose

16. Chiral carbons indicated with an asterisk



17. a. D b. L

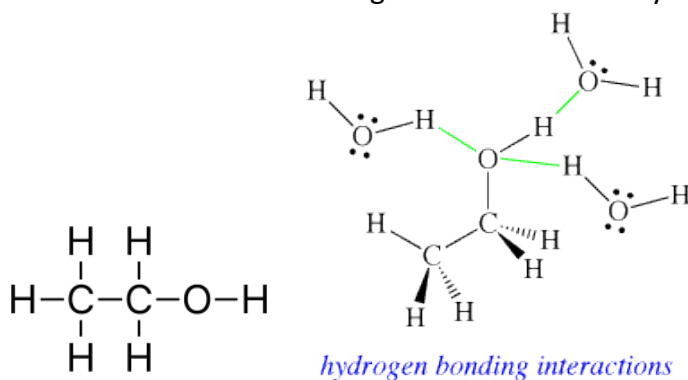
18. a. hexose b. pentose

19.

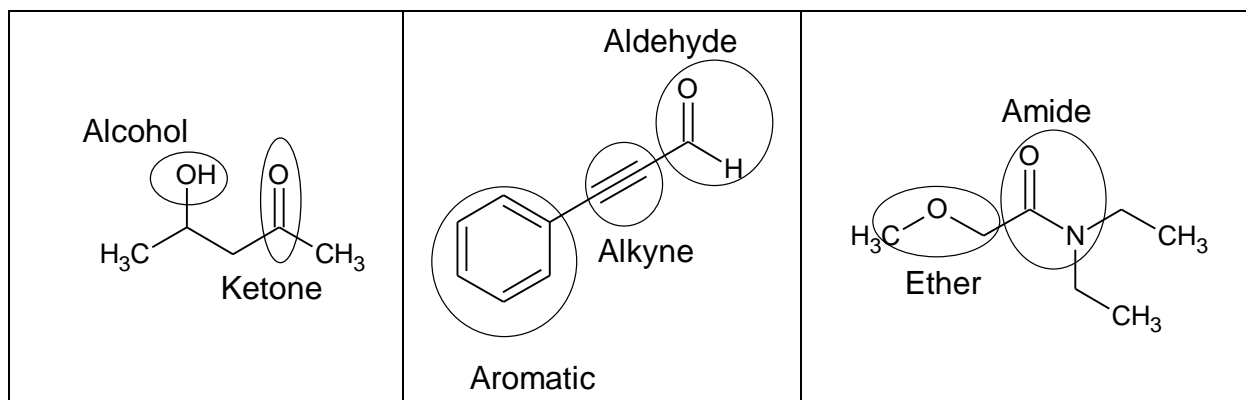


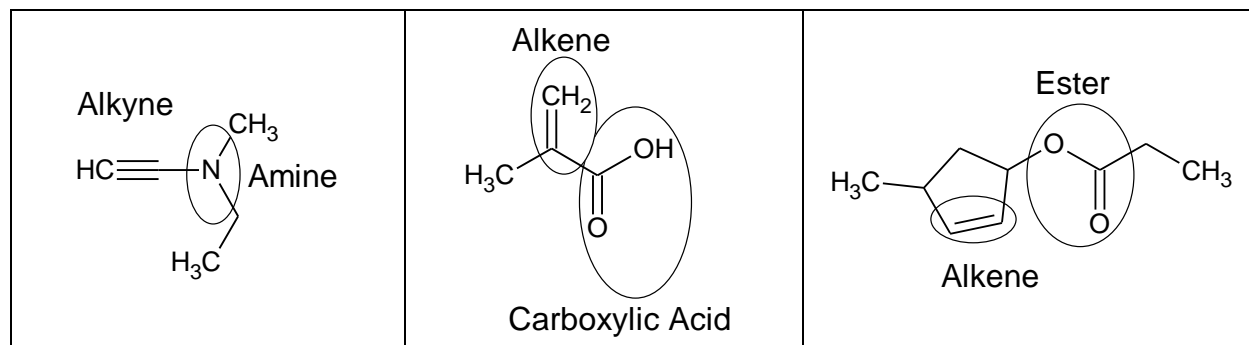
Formula	Lewis structure	Electron Geometry	Molecular Geometry	Polar or nonpolar?
CO <sub>2</sub>		Linear	Linear	Nonpolar
PCl <sub>3</sub>		Tetrahedral	Trigonal pyramidal	Polar
CINO		Trigonal planar	Bent	Polar

20. False, a molecule can contain polar bonds and still be polar due to symmetry. For example, in the tetrahedral molecule CCl<sub>4</sub>, the carbon-chlorine bond is polar, but due to its tetrahedral shape, the 'pull' on each of the bonds cancels each other out.
21. propane (CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub>) < pentane (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>) < CHF<sub>3</sub> < ethanol (CH<sub>3</sub>CH<sub>2</sub>OH)
22. Left: structure of ethanol. Right: ethanol's three hydrogen bonds with water.

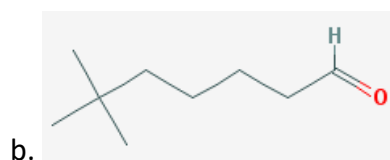
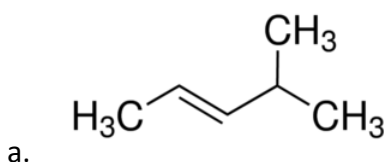


23.





24. a. 3-hexyne    b. 2,2,3-trimethyloctane    c. heptanoic acid    d. 2-pentanone  
25.



26. a. same    b. isomer    c. same  
27. 0.35g NaCl  
28. 1M  
29. 4.0mL  
30. 0.103g sucrose

31.

[H <sub>3</sub> O <sup>+</sup> ]	[OH <sup>-</sup> ]	pH	pOH	Acidic, basic or neutral
$1.0 \times 10^{-3}$	$1.0 \times 10^{-11}$	3.00	11.00	Acidic
$1.0 \times 10^{-7}$	$1.0 \times 10^{-7}$	7.00	7.00	Neutral
$4.5 \times 10^{-9}$	$2.2 \times 10^{-6}$	8.35	5.65	Basic
$6.8 \times 10^{-11}$	$1.5 \times 10^{-4}$	10.17	3.83	Basic
$1.0 \times 10^{-5}$	$1.0 \times 10^{-9}$	5.00	9.00	Acidic
$7.0 \times 10^{-6}$	$1.5 \times 10^{-7}$	5.15	8.85	Acidic

32.  $\text{NH}_3(\text{aq}) + \text{CH}_3\text{COOH}(\text{aq}) \rightarrow \text{NH}_4^+(\text{aq}) + \text{CH}_3\text{COO}^-(\text{aq})$ , **Acid:** CH<sub>3</sub>COOH(aq), **Base:** NH<sub>3</sub>(aq),  
**Conjugate Base:** CH<sub>3</sub>COO<sup>-</sup>(aq), **Conjugate Acid:** NH<sub>4</sub><sup>+</sup>(aq)  
33. d.  
34. a.  
35. (Amino acid name given instead of structure for the sake of space)

Amino Acid	Polar or nonpolar?	Acidic, basic, or neutral?
Glycine	Nonpolar	Neutral
Aspartic Acid	Polar	Acidic
Lysine	Polar	Basic
Serine	Polar	Neutral