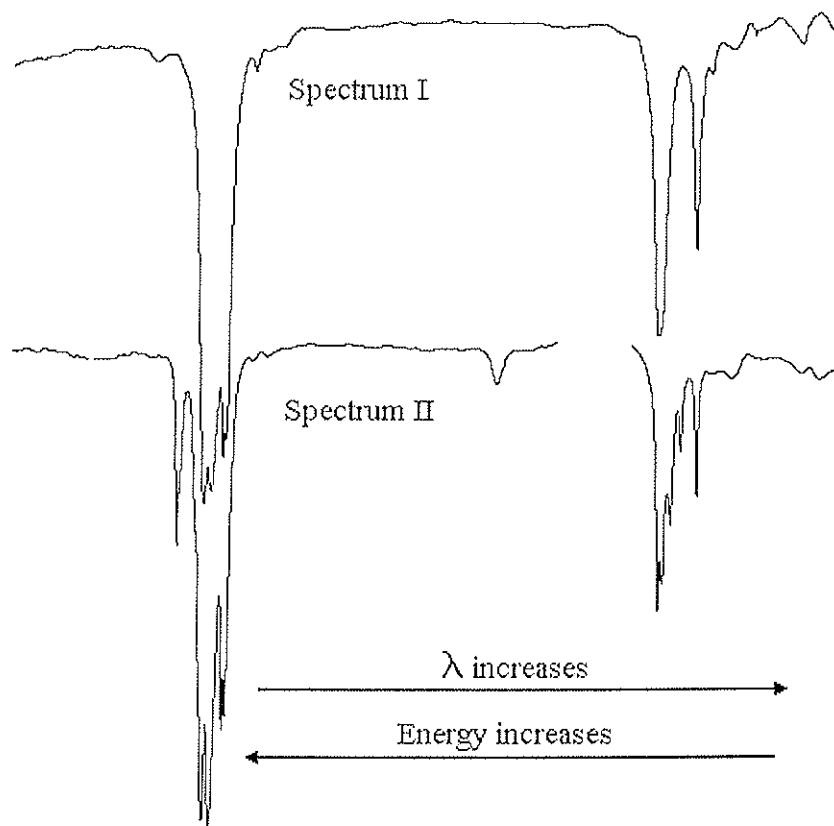


1. The analysis of organic molecules using infrared spectroscopy allow scientists to:

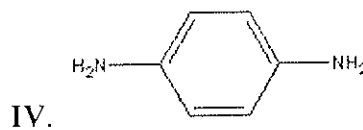
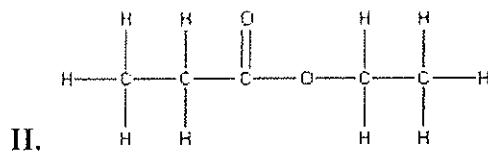
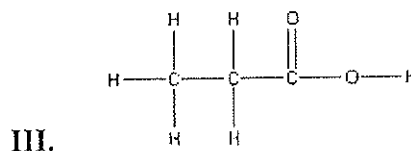
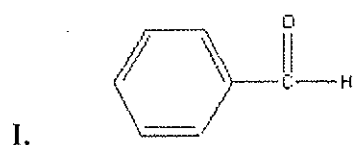
- determine the molecular weight of a molecule.
- determine the exact structure (all the bonds and atom placements) of the molecule.
- separate a mixture of organic molecules.
- determine the functional groups that are present in a molecule.
- determine the exact number of carbon atoms present in a molecule.

2. Infrared Spectrum I to the right is very similar to the spectrum of four of the following compounds listed below. Spectrum II is that of the fifth compound. Which compound Produced Spectrum II?



- $(-\text{CH}_2\text{CH}_2-)_n$
- CH_3CH_3
- $\text{CH}_3\text{CH}_2\text{CH}_3$
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}=\text{CHCH}_3$

3. Hydrogen bonding would be expected to occur in which of the following pure substances?



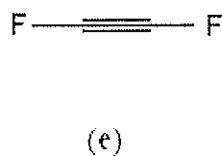
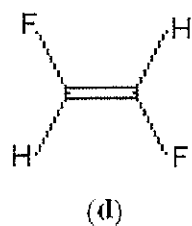
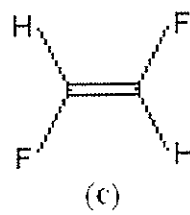
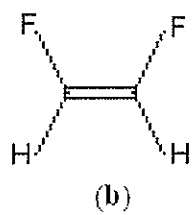
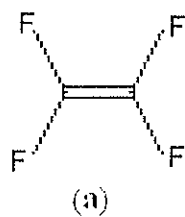
- (a) In all of these substances
 (b) In substance III only
 (c) In substances II and III
 (d) In substance III and IV
 (e) In substance I, II and III

4. The drawing represents the formation of



- (a) Dipole induced dipole attractions
 (b) Dipole-dipole attractions
 (c) Dispersion forces
 (d) Hydrogen bonds
 (e) Ion-induced dipole attractions

5. Which of the following molecules has a net dipole moment?

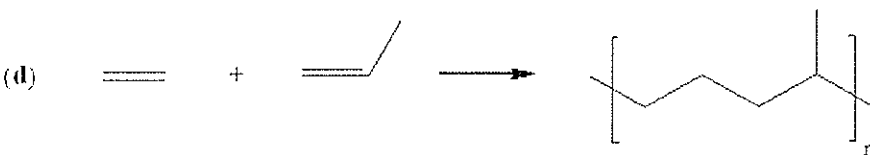
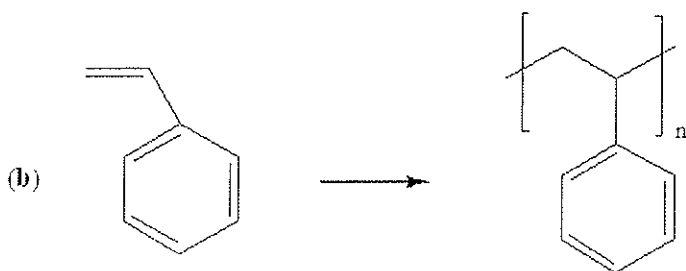
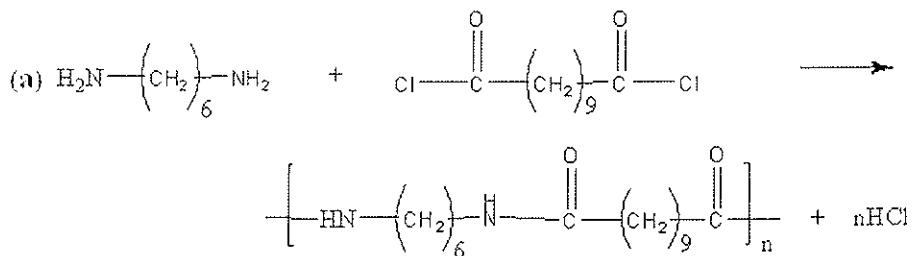


- _____ 6. The fuel most commonly used in portable lighters is butane (C_4H_{10}). What types of intermolecular forces would you predict for this molecule?
- (a) Hydrogen bonding and dispersion forces
 - (b) Dipole-dipole forces and dispersion forces
 - (c) Ion-dipole forces and dispersion forces
 - (d) Hydrogen bonding, dipole-dipole forces, and dispersion forces
 - (e) Dispersion forces
- _____ 7. A beaker contains 100 mL of salt water. If 25 mL of water evaporates, the number of moles of NaCl:
- (a) does not change.
 - (b) increases by 75%.
 - (c) increases by 25%.
 - (d) decreases by 25%.
 - (e) decreases by 75%.
- _____ 8. A 0.05 m aqueous solution of a salt in a semipermeable membrane is placed in an aqueous solution containing sugars in a concentration of 0.025 m. Which statement is true?
- (a) The salt solution is in osmotic equilibrium with the sugar solution because they have the same concentration when you consider that $i=2$ for a salt.
 - (b) Water will flow **into the salt solution** from the sugar solution. The osmotic pressure of the salt solution will **increase**.
 - (c) Water will flow **into the salt solution** from the sugar solution. The osmotic pressure of the salt solution will **decrease**.
 - (d) Water will flow **out of the salt solution** into the sugar solution. The osmotic pressure inside salt solution will **increase**.
 - (e) Water will flow **out of the salt solution** into the sugar solution. The osmotic pressure inside salt solution will **decrease**.
- _____ 9. What volume of 0.153 M KCl solution is needed to provide 4.28 g of KCl?
- (a) 376 mL
 - (b) 48.8 mL
 - (c) 22.4 mL
 - (d) 8.78 mL
 - (e) 1.04 mL
- _____ 10. A solution of an unknown nonvolatile non-electrolyte was prepared by dissolving 0.328 g of the substance in 40.0g of $CCl_4(l)$. The boiling point of the resultant solution was $0.468^\circ C$ higher than the pure solvent. Calculate the molar mass of the solute.
[K_b for $CCl_4 = 5.02^\circ C/m$]
- (a) 0.0114 g/mol
 - (b) 179 g/mol
 - (c) 1.31 g/mol
 - (d) 818 g/mol
 - (e) 87.9 g/mol

- _____ 11. The osmotic pressure of blood is 7.65 atm at 37 °C. What mass of glucose ($C_6H_{12}O_6$, molar mass = 180.2 g/mol) is needed to prepare 5.00 L of solution for intravenous injection? The osmotic pressure of the glucose solution must equal the osmotic pressure of blood. [R = 0.08206 L·atm/mol·K]

- (a) 1.50 g
 (b) 54.2 g
 (c) 126 g
 (d) 271 g
 (e) 2270 g

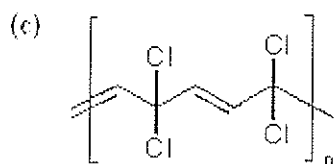
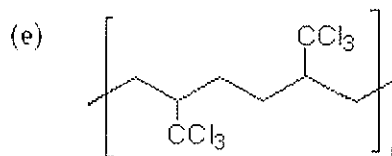
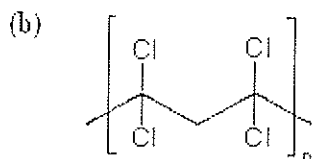
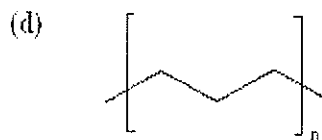
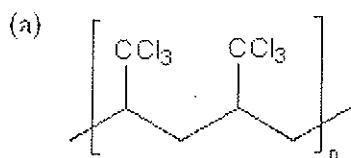
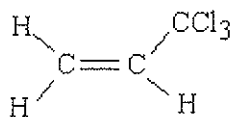
- _____ 12. Which reaction describes formation of a condensation polymer?



_____ 13. Which of the following is *not* a polymer?

- (a) a protein
- (b) DNA
- (c) Cellulose
- (d) a lipid
- (e) PVA

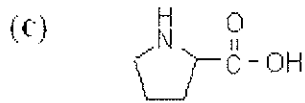
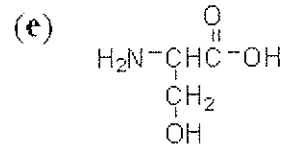
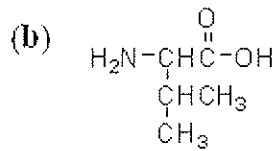
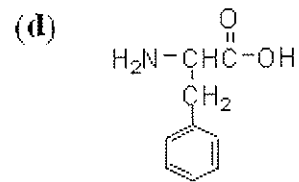
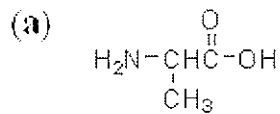
_____ 14. Identify the structure of the addition polymer formed from the monomer with the structure:



_____ 15. A consequence of the cell membrane being composed of lipids is that the membrane is:

- (a) a nonpolar molecule.
- (b) nonpolar on the inside and outside of the cell; polar in the middle of the membrane.
- (c) polar on the inside and outside of the cell; nonpolar in the middle of the membrane.
- (d) a polymer.
- (e) high in energy.

_____ 16. Which is the amino acid with a polar side chain?



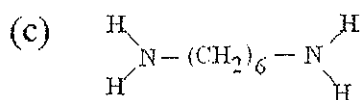
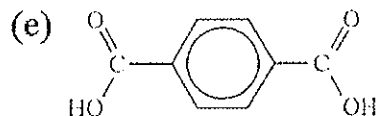
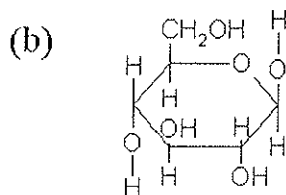
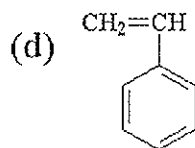
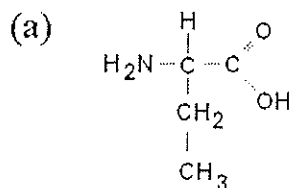
_____ 17. A beta pleated sheet (β -sheet) is an example of what level of protein structure?

- (a) Primary structure
- (b) Secondary structure
- (c) Tertiary Structure
- (d) Quaternary Structure
- (e) All of the above

_____ 18. A DNA molecule (a double helix) contains 20% A. Which of the following sequences of nucleotides could be one of the two strands of DNA in the double helix?

- (a) AAAAGGGGTC
- (b) AAAAGGGGTT
- (c) AAAGGGTTCC
- (d) AAAGGGGCCT
- (e) AAAATTTTGC

_____ 19. Which monomer is involved in formation of a polyester?



_____ 20. The compound that was modified by cross-linking in lab was:

- (a) aspirin.
- (b) nylon.
- (c) PVA.
- (d) $\text{Fe}(\text{phen})_3^{2+}$.
- (e) acetic acid.

