**Esters Questions** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ # \_\_\_\_\_\_

1.

Which of the molecules below would be considered to be an ester?

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | /ilrn/books/beinl8/images/img515.png |

|  |  |  |
| --- | --- | --- |
|  | b. | /ilrn/books/beinl8/images/img516.png |

|  |  |  |
| --- | --- | --- |
|  | c. | /ilrn/books/beinl8/images/img517.png |

|  |  |  |
| --- | --- | --- |
|  | d. | /ilrn/books/beinl8/images/img518.png |

 |

2. The IUPAC name for the molecule below would be: 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | methyl propanoate |

|  |  |  |
| --- | --- | --- |
|  | b. | ethyl ethanoate |

|  |  |  |
| --- | --- | --- |
|  | c. | ethyl propanoate |

|  |  |  |
| --- | --- | --- |
|  | d. | ethanol ethanoic acid |

 |

3. Identify the ester linkage in acetylsalicylic acid (aspirin) shown below. 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | A |

|  |  |  |
| --- | --- | --- |
|  | b. | B |

|  |  |  |
| --- | --- | --- |
|  | c. | C |

|  |  |  |
| --- | --- | --- |
|  | d. | D |

 |

4. Which of the following is a product of the saponification reaction shown below? 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | phenol |

|  |  |  |
| --- | --- | --- |
|  | b. | sodium benzoate |

|  |  |  |
| --- | --- | --- |
|  | c. | benzoic acid |

|  |  |  |
| --- | --- | --- |
|  | d. | sodium acetate |

FYI- Back to Biology: The below molecule is produced in the first step of Glycolysis in Cellular Respiration (oxidation of glucose), as ATP 🡪ADP to start the process, and the phosphate bonds to glucose (see p. 750) |

5. Phosphate esters are important biological molecules. Shown below is the structure of glucose 6-phosphate. Which of the statements below is true? 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | This is a monoester of phosphoric acid. |

|  |  |  |
| --- | --- | --- |
|  | b. | This is a diester of phosphoric acid. |

|  |  |  |
| --- | --- | --- |
|  | c. | This is a triester of phosphoric acid. |

|  |  |  |
| --- | --- | --- |
|  | d. | This is a tetraester of phosphoric acid. |

 |

6. Predict the product from the reaction shown below. 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | /ilrn/books/beinl8/images/img526.png |

|  |  |  |
| --- | --- | --- |
|  | b. | /ilrn/books/beinl8/images/img527.png |

|  |  |  |
| --- | --- | --- |
|  | c. | /ilrn/books/beinl8/images/img528.png |

|  |  |  |
| --- | --- | --- |
|  | d. | /ilrn/books/beinl8/images/img529.png |

 |

7. The carbonyl group in the carbohydrate fructose is that of a(n): 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | aldehyde |

|  |  |  |
| --- | --- | --- |
|  | b. | carboxylic acid |

|  |  |  |
| --- | --- | --- |
|  | c. | ketone |

|  |  |  |
| --- | --- | --- |
|  | d. | ester |

 |

8. Phosphate esters are important biological molecules. Shown below is the structure of glucose 6-phosphate. Identify the ester linkage. 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | A |

|  |  |  |
| --- | --- | --- |
|  | b. | B |

|  |  |  |
| --- | --- | --- |
|  | c. | C |

|  |  |  |
| --- | --- | --- |
|  | d. | D |

 |

9. Choose the molecule that would have the highest boiling point.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | butanal |

|  |  |  |
| --- | --- | --- |
|  | b. | 1-butanol |

|  |  |  |
| --- | --- | --- |
|  | c. | butane |

|  |  |  |
| --- | --- | --- |
|  | d. | 2-butanone |

 |

10. The IUPAC name for the molecule below would be: 

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | 1-hexanone |

|  |  |  |
| --- | --- | --- |
|  | b. | hexanal |

|  |  |  |
| --- | --- | --- |
|  | c. | heptanal |

|  |  |  |
| --- | --- | --- |
|  | d. | pentanal |

 |

11. Esters can be produced by the acid catalyzed reaction of:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | an aldehyde and an alcohol |

|  |  |  |
| --- | --- | --- |
|  | b. | a carboxylic acid and an alcohol |

|  |  |  |
| --- | --- | --- |
|  | c. | two alcohols |

|  |  |  |
| --- | --- | --- |
|  | d. | a carboxylic acid and an amine |

 |

12. A reaction in which water is removed from a compound is known as:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | addition |

|  |  |  |
| --- | --- | --- |
|  | b. | hydrolysis |

|  |  |  |
| --- | --- | --- |
|  | c. | dehydration |

|  |  |  |
| --- | --- | --- |
|  | d. | hydrogenation |

 |

13. Saponification is:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | the formation of an ester |

|  |  |  |
| --- | --- | --- |
|  | b. | the basic cleavage of an ester linkage |

|  |  |  |
| --- | --- | --- |
|  | c. | the removal of water from a molecule |

|  |  |  |
| --- | --- | --- |
|  | d. | the reaction of sugars to produce ethanol and carbon dioxide |

 |

14. A wax is an ester of a long chain acid and a long chain alcohol. Choose the molecule below that would be considered a wax.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|

|  |  |  |
| --- | --- | --- |
|  | a. | /ilrn/books/beinl8/images/img537.png |

|  |  |  |
| --- | --- | --- |
|  | b. | /ilrn/books/beinl8/images/img538.png |

|  |  |  |
| --- | --- | --- |
|  | c. | /ilrn/books/beinl8/images/img539.png |

|  |  |  |
| --- | --- | --- |
|  | d. | /ilrn/books/beinl8/images/img540.png |

 |

15. What is the name of the molecule shown in #1? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16. What is the name of the answer you chose from #6? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17. Use your book (Ch 19 p. 503) to help with the following question: The reaction of 2 carboxylic acids produces an anhydride via dehydration synthesis. Show the reaction of 2 propanoic acids below and name the product.

18. To prepare for tomorrow’s lab, read p. 502 and answer the following:

A. What compound in willow bark relieved pain?

B. The hydrolysis of this compound yielded:

C. What were the side effects of the above compound?

D. Explain (give reactants and product) what chemists of the Bayer Corp. did to the compound to make aspirin.