SCH4U Organic Chemistry	Unit 1 Test: Organic Chemistry Name: _____	/78

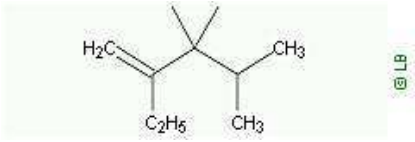
Knowledge and Understanding (16 marks)

1. Carbon atoms bonded to four other atoms form what shape?
   a. Linear
   b. Square
   c. Tetrahedral
   d. Triangular planar
   e. None of the above

2. Which molecule could form a structural isomer?
   a. CH_4
   b. C_2H_3F
   c. C_2H_6O
   d. C_2H_5Cl
   e. CH_2Cl_2

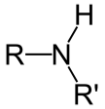
3. Which of the following hydrocarbons has the highest boiling point?
   a. Cyclohexane
   b. Propyne
   c. Ethane
   d. Ethane
   e. Ethyne

4. Which is the correct root name for the molecule shown below?



   a. Hept-
   b. Hex-
   c. Meth-
   d. Pent-
   e. Pro-

5. The following molecule is an example of a:



   a. Primary amine
   b. Secondary amine
   c. Tertiary amine
   d. Primary amide
   e. Tertiary amide

6. Which can be thought of as the product of a carboxylic acid and an alcohol?
   a. Ether
   b. Amide
   c. Amine
   d. Aldehyde
   e. Ester

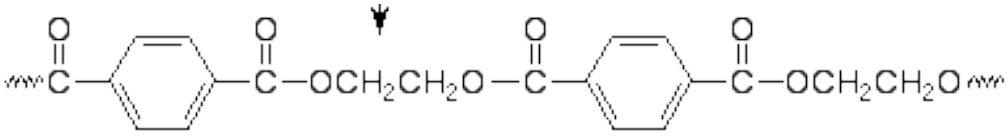
7. In which type of reaction is a molecule broken apart by adding the hydroxyl group from a water molecule to one side of a bond and the hydrogen atom of a water molecule to the other side of the bond?
   a. Oxidation
   b. Reduction
   c. Elimination
   d. Polymerization
   e. Hydrolysis

8. Which is an example of a synthetic polymer?
   a. Cellulose
   b. DNA
   c. Polyethylene
   d. Starch
   e. Hemoglobin

9. Identify each type of reaction listed below: (6 marks)
    a. Haloalkane + hydroxide ion → _____
    b. Alkyne + hydrogen $\xrightarrow{\text{Pt or Pd}}$ _____
    c. Water + ester → _____
    d. Alkane + oxygen → _____
    e. Alcohol + [O] → _____
    f. Carboxylic acid + amine → _____
10. Which would you expect to be most soluble in water: primary, secondary, or tertiary amides? Explain your reasoning. (2 marks)

Thinking/Inquiry (36 marks)

11. State the name of the product(s) formed in each of the following reactions. (4 marks)
    a. Ethanoic acid and butan-1-amine
    b. Butanoic acid and cyclopentanoic acid
12. Explain why the following molecules are named incorrectly. Give the correct IUPAC name: (6 marks)
    a. 3,4-dimethylpentane
    b. 2-ethyloctan-6-ol
    c. butoxyethane
13. Determine the monomers for the following polymer. (1 mark)



14. Suppose that you are working with four unknown compounds in a chemistry laboratory. Your teacher tells you that these compounds are ethane, ethanol, ethyl ethanoate, and ethanoic acid.
    a. Use the table of physical properties shown below to identify each unknown compound. (4 marks)

A: _____ C: _____

B: _____ D: _____

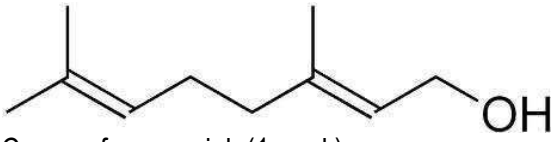
Compound	Solubility in Water	Hydrogen Bonding	Boiling Point	Odour	Molecular polarity
A	Not soluble	None	-89°C	Odourless	Non-polar
B	Soluble	Accepts hydrogen bonds from water but cannot form hydrogen bonds between its own molecules	77°C	Sweet	Polar
C	Infinitely Soluble	Very strong	78°C	Sharp, antiseptic smell	Very polar
D	Infinitely soluble	Extremely strong	118°C	Sharp, vinegar smell	Very polar

    b. Draw a complete **structural formula** for each compound. (4 marks)

A: B:

C: B:

15. In the past, perfumes were made of extracts from flowers, but the organic molecules used in perfumes today are often produced synthetically. Shown below is geraniol, which has the fragrance of roses.



a. Give the correct IUPAC name for geraniol. (1 mark)

b. What physical properties would you expect geraniol to have? (2 marks)

c. What solvent would you expect geraniol to be used in as a perfume? (1 mark)

16. Bromine water ($Br_2(aq)$) can be used to test for double bonds.
    a. Design a brief lab procedure to test oils and fats for the presence of double bonds. (5 marks)

_____

_____

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    b. When bromine water is added to but-2-ene, the colour of the bromine water solution changes. What type of reaction has occurred? (1 mark)

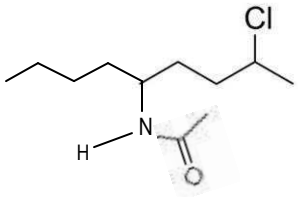
_____

    c. Draw the structure (line diagram) for the product of the reaction in part c. (1 mark)

    d. Potassium permanganate ($KMnO_4$) can also be used to test for unsaturated hydrocarbons. If $KMnO_4(aq)$ is added to ethane, the colour of the $KMnO_4$ solution changes from purple to clear. What type of reaction has occurred? (1 mark)

_____

17. Starting with ethanol and non-1-en-5-amine, propose a synthesis for the compound below. Be sure **explain** thoroughly and let me know the types of reactions involved. (6 marks)



Communication (12 marks)

18. Draw the simplest method for showing the 3-dimensional shape of chloromethane. Identify which atoms are above, below, or on the plane of the paper. (2 marks)

19. Draw and name the simplest hydrocarbon that could form geometric isomers (1 mark)

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20. Using diagrams, show that the molecule 1-bromo-1-chloro-1-fluoroethane could or could not form enantiomers. (4 marks)

21. How are the organic compounds important to your health and lifestyle? Write a short paragraph that describes any benefits you obtain from an organic compound. (5 marks)

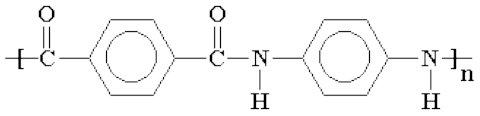
Application (14 marks)

22. Compare the two polymers below. Which one would you expect to be stronger? Explain your answer. (2 marks)

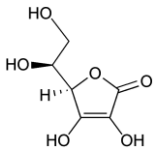
Polymer A

$-CH_2-CH_2-CH_2-CH_2-CH_2-$

Polymer B



23. Vitamin C, also known as ascorbic acid, is a necessary nutrient for the prevention of scurvy. Its structure is shown below.



a. What physical properties would you expect ascorbic acid to have and why? (2 marks)

b. Does your answer in part b confirm the fact that vitamin C cannot be stored in human fatty tissues? (2 marks)

24. What substances in your home or body might contain the following functional groups? Be as specific as possible. (8 marks)
    a. Alkanes

    b. Alcohols

    c. Esters

    d. Carboxylic acids