

**Test Unit #1**  
**Organic Chemistry**

**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question and write it on the multiple choice answer sheet provided..

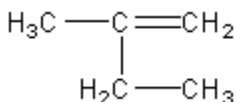
1. When two alcohols undergo a self condensation, what is formed?

- |                   |                |
|-------------------|----------------|
| a. liquid alcohol | d. an aldehyde |
| b. a ketone       | e. an ether    |
| c. an ester       |                |

2. How many actual double bonds does the benzene ring possess?

- |      |      |
|------|------|
| a. 4 | d. 1 |
| b. 3 | e. 0 |
| c. 2 |      |

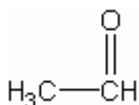
3.



The correct name for the compound given above is which of the following?

- |                      |                      |
|----------------------|----------------------|
| a. 2-methyl-1-butene | d. 3-methyl-2-butene |
| b. pentene           | e. 2-ethyl-1-pentene |
| c. 2-ethyl-1-propene |                      |

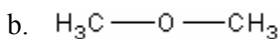
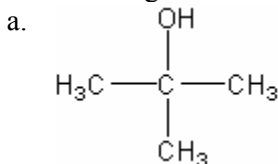
4.



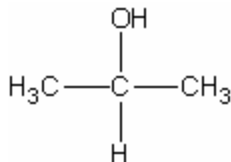
The compound above is classified as a(n)

- |                    |           |
|--------------------|-----------|
| a. alkane          | d. ketone |
| b. carboxylic acid | e. alkene |
| c. aldehyde        |           |

5. Which of the following is a secondary alcohol?



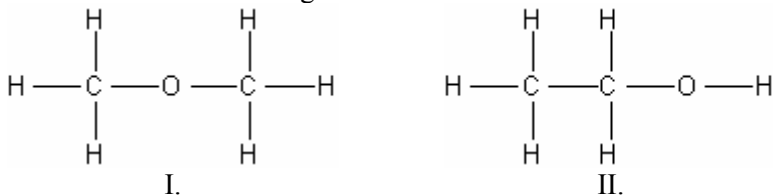
c.



6. What results when a secondary alcohol is oxidized?

- a. a ketone
- b. an amine
- c. an aldehyde
- d. an acid
- e. no reaction

7. Which statement is incorrect concerning these two molecules with the same formula,  $\text{C}_2\text{H}_6\text{O}$ ?

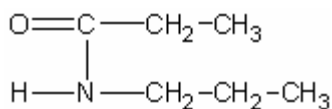


- a. compound (II) will more likely be soluble in water than compound (I)
- b. compound (I) will have a lower boiling point than compound (II)
- c. hydrogen bonding will be the most likely for compound (II)
- d. the vapour pressure of compound (II) will be lower than that of compound (I) at a given temperature
- e. compound (I) would be a better solvent

8. The general formula for a cycloalkane can be represented by which of the following?

- a.  $\text{C}_n\text{H}_n$
- b.  $\text{C}_n\text{H}_{2n+2}$
- c.  $\text{C}_n\text{H}_{2n}$
- d.  $\text{C}_n\text{H}_{2n-2}$

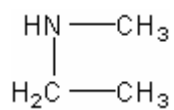
9.



The correct name for the compound given above is which of the following?

- a. 3-amino-3-hexanone
- b. ethyl ethanamide
- c. N-propylpropanamide
- d. N-ethylethanamide

10. The product formed by the reaction of  $\text{CH}_3\text{CO}_2\text{H}$  with

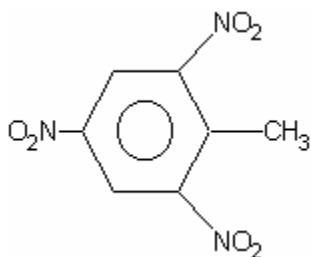


is properly named

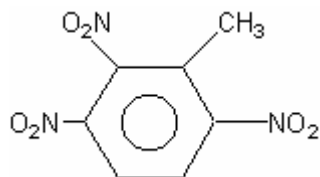
- a. N-ethyl-N-methylethanamide      c. N,N-diethylmethanamide  
 b. N,N-diethylaminomethane      d. N-ethyl-N-methylmethamide

11. The correct structure for 1-methyl-2,4,6-trinitrobenzene(TNT) is which of the following?

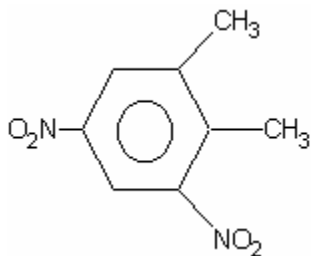
a.



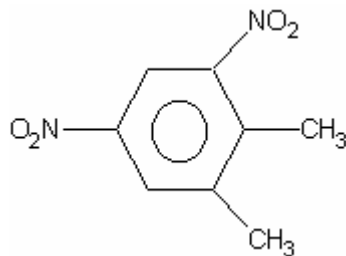
c.



b.

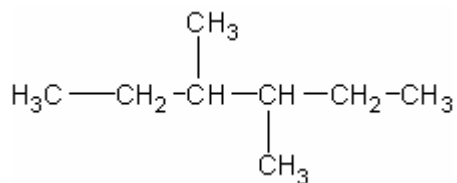


d.

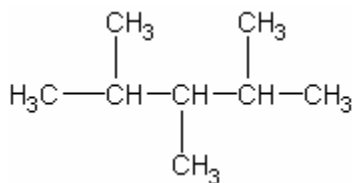


12. The condensed formula of 2,3,4-trimethylpentane is which of the following?

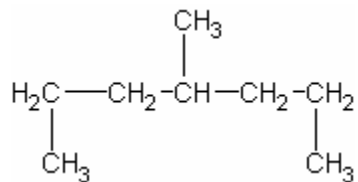
a.



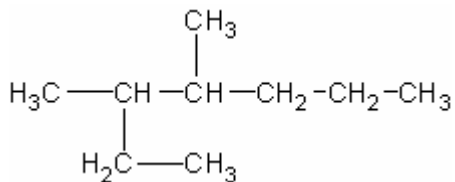
c.



b.



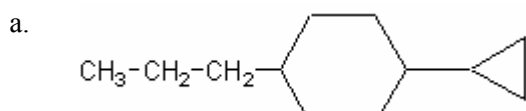
d.



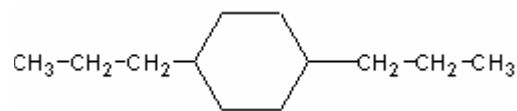


18. The correct structure for 1,4-dicyclopropylcyclohexane is which of the following?

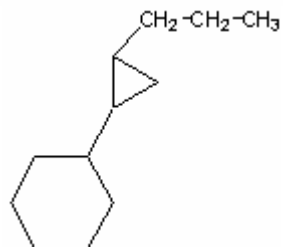
a.



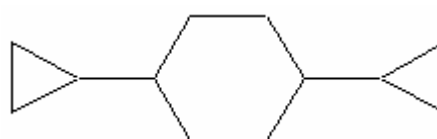
c.



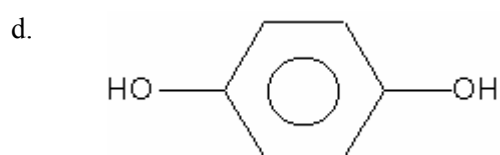
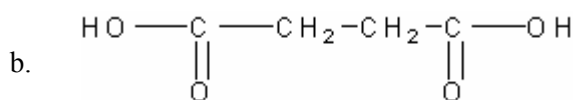
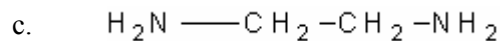
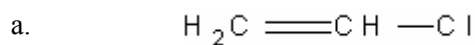
b.



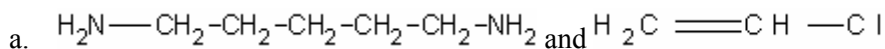
d.



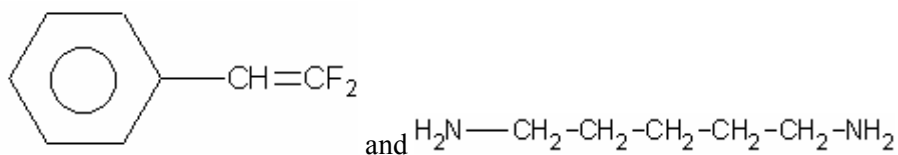
19. Which of the following compounds can produce an addition polymer?



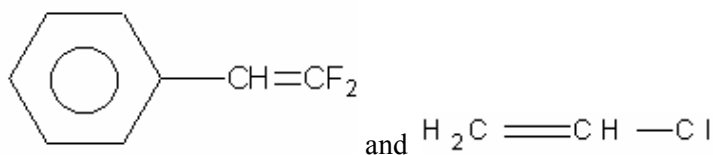
20. Which one of the following contains compounds from which a condensation polymer can be produced?



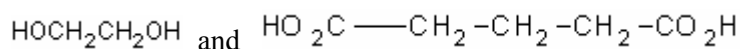
b.



c.



d.



**True/False****[10]**

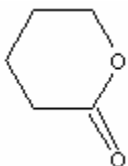
Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.

- \_\_\_\_\_ 1. The reaction of an ester *with a strong acid* is known as saponification.  
\_\_\_\_\_
- \_\_\_\_\_ 2. Carbon-carbon double and triple bonds are more *reactive* than carbon-carbon single bonds.  
\_\_\_\_\_
- \_\_\_\_\_ 3. CH<sub>4</sub> has a *higher* melting point than CH<sub>3</sub>OH. \_\_\_\_\_
- \_\_\_\_\_ 4. *Alkanes* react with halogens in an addition reaction at room temperature.  
\_\_\_\_\_
- \_\_\_\_\_ 5. When benzene reacts with bromine gas, the bromine atom *replaces* one of the hydrogens on the benzene. \_\_\_\_\_

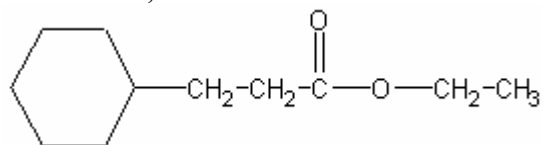
**Short Answer****[25]**

Answer to the following questions on the paper provided.

1. A chemist is required to make the compound below for her company. Propose a **one step** synthesis that will save the company time and money.



2. As a chemical supplier, list the what points should be on a general warning label for containers of diethylether you are shipping to a customer. Include the condensed formula of the compound. Specific values for physical properties are not required.
3. When a worker-bee stings, it emits a substance with the molecular formula C<sub>7</sub>H<sub>14</sub>O<sub>2</sub>. This acts as a signal, attracting other bees to the site and prompts them to sting too. When this sweet smelling compound is treated with a strong acid (H<sub>2</sub>SO<sub>4</sub>), acetic acid and 2-methyl-1-butanol are formed. Draw the structure and provide the IUPAC name of the emitted compound.
4. Moth balls prevent many insects and small rodents from eating/nesting in certain locations. Paradichlorobenzene is present in high quantities in moth balls. Draw the chemical structure for this compound and suggest reasons why it is an effective repellent.
5. In the future, you are employed as an organic chemist in a petrochemical company. The work day is almost finished when you realize that you forgot your perfume/cologne for your date that evening. You decide to quickly prepare the ester,



, from 3-phenyl-1-propene and ethene.

Describe the process you would use.

## Essay

[25]

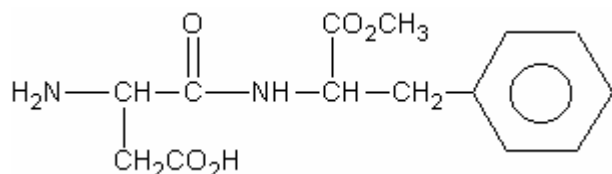
Answer to the following questions on the paper provided.

1. Since their introduction, plastics have revolutionized modern manufacturing. With modifications in their chemical structure, they can be utilized in thousands of products. Discuss the variety of plastic usages in our society and the complications associated with their eventual disposal. [10]
2. Polymers are often thought to be manufactured in immense chemical plants. Although many are, there is a large group of *polymers which are natural*. Describe several natural polymers and how they are utilized in our society. [5]
3. Make a summary table of organic functional groups using the heading: Name, Functional Group, IUPAC Suffix. [10]

## Bonus

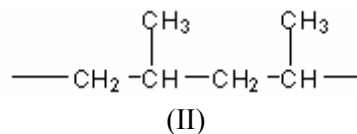
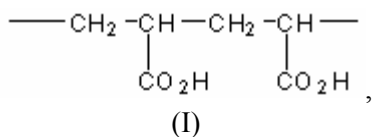
[4]

1. Aspartame, marketed under the trade name Nutra-Sweet, has the following structure:



It is made from 2 compounds known as amino acids by the production of an amide bond. What are the structures of these 2 amino acids? [2]

2. In the design of a new baby diaper, the manufacturer uses two polymers. The structure of these molecules is given below. Which polymer is best suited to the outside of the diaper and which to the inside? [2]



Name: \_\_\_\_\_

Organic TEST-9/03/04

1. \_\_\_\_
2. \_\_\_\_
3. \_\_\_\_
4. \_\_\_\_
5. \_\_\_\_

6. \_\_\_\_
7. \_\_\_\_
8. \_\_\_\_
9. \_\_\_\_
10. \_\_\_\_

11. \_\_\_\_
12. \_\_\_\_
13. \_\_\_\_
14. \_\_\_\_
15. \_\_\_\_

16. \_\_\_\_
17. \_\_\_\_
18. \_\_\_\_
19. \_\_\_\_
20. \_\_\_\_



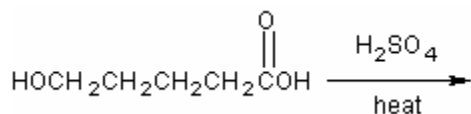
## Organic chemistry test Answer Section

### MODIFIED TRUE/FALSE

- |   |          |          |
|---|----------|----------|
| 1. ANS: F, use a strong base<br>LOC: OC1.03 | REF: K/U | OBJ: 1.7 |
| 2. ANS: T<br>LOC: OC2.01                    | REF: K/U | OBJ: 1.1 |
| 3. ANS: F, lower<br>LOC: OC1.02             | REF: K/U | OBJ: 1.1 |
| 4. ANS: F, Alkenes<br>LOC: OC1.03           | REF: K/U | OBJ: 1.3 |
| 5. ANS: T<br>LOC: OC1.03                    | REF: K/U | OBJ: 1.4 |

### SHORT ANSWERS

1. esterification reaction

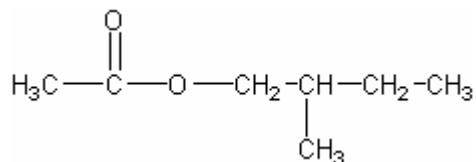


- water is removed by taking -OH from the acid, H from the alcohol
- C in carbonyl, bonds to O in the alcohol, forming a ring

2. condensed formula is:  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$

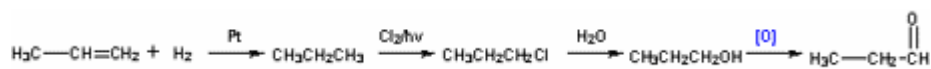
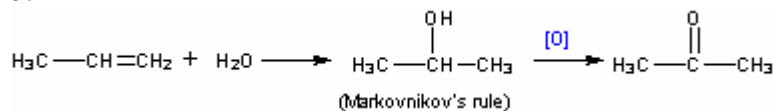
- label should include the following:
  - highly flammable
  - keep away from sparks and sources of heat
  - high volatility
  - low melting point, low boiling point
  - avoid fumes, inhalation may cause unconsciousness

3. - is an ester



- 2-methylbutylethanoate

5.



## ESSAY

1. ANS:

answers may vary

- plastic usage includes:
- packaging, insulation on wires, storage containers (e.g., food), construction materials, household items such as furniture, disposable cutlery, diapers, car components, safety packaging on food and drugs, contact lenses, etc.
- various plastics differ in substitutions on monomers of ethene
- different substituted groups allow hydrogen bonding, cross-linking (-S-S-bonds, and dienes), and various strengths of Van der Waals forces
- characteristics such as strength, rigidity, waterproofing can be altered as a result
- common plastics include polyethylene, polypropylene, polystyrene and polyvinylchloride
- these are identified by a number inside the recycling triangle on containers
- 30% of all landfill content is plastics
- poor biodegradability is a problem
- incineration of plastics creates less ash and creates less CO<sub>2</sub> than the equivalent mass of paper
- incineration of some plastics such as polyvinylchloride creates HCl
- other plastics are not easily recycled creating an enormous waste problem (e.g., plastic in older computers)

REF: C

OBJ: 2.1

LOC: OC2.01

2. ANS:

answers may vary

- cellulose: occurs in plants as a polymer of glucose
- since it is insoluble in water and strong, it is used as a building material (i.e., wood), often pressure-treated to increase its life span; paper products are also made from cellulose
- silk is spun by the silk worm: it is dyed and used as a fabric
- cotton is produced by the cotton plant: it is dyed and used as a fabric
- rubber is from the sap of a rubber tree: it is vulcanized to increase stiffness by cross-linking
- DNA in our cells: genetic scientists study the blue prints of life; biotechnologists manipulate DNA in other organisms to create medicines, hormones, etc.
- protein in living organisms: replacement proteins are synthesized to cure diseases, help nutrition
- keratin in nails and hair: cosmetic changes in hair with perms, etc.
- amber is a natural resin: fossil records, jewelry
- wool from sheep: dyed and made into fabrics
- glycogen is a glucose polymer in humans, for storage of energy
- starch is a glucose polymer found in many plants: provides a source of energy for the human body

REF: MC

OBJ: 2.2

LOC: OC3.01

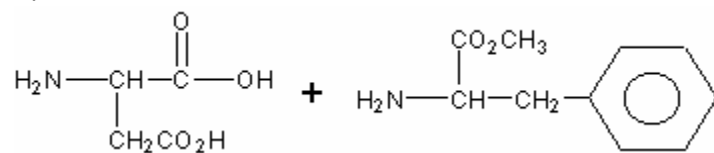
3.

Name	Functional Group	IUPAC Suffix
alcohol	R — OH	-ol
ether	R — O — R'	-ether

aldehyde	$\begin{array}{c} \text{O} \\    \\ -\text{CH} \end{array}$ or $-\text{CHO}$	-al
ketone	$\begin{array}{c} \text{O} \\    \\ -\text{C}- \end{array}$	-one
carboxylic acid	$-\text{CO}_2\text{H}$ or $\begin{array}{c} \text{O} \\    \\ -\text{C}-\text{OH} \end{array}$	-oic acid
ester	$\begin{array}{c} \text{O} \\    \\ \text{R}-\text{C}-\text{O}-\text{R} \end{array}$	-oate
amine	$\text{R}-\text{NH}_2$	-amine
amide	$\begin{array}{c} \text{O} \\    \\ \text{RC}-\text{NH}-\text{R}' \end{array}$	-amide

### BONUS

1.



2. (II) is hydrophobic (non-polar), so it would prevent leakage of water to the outside

- (I) will allow water to mix with the lining to absorb water
- (I) should be on the inside
- (II) should be on the outside