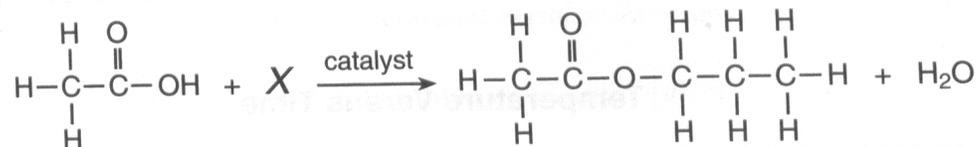


Base your answers to questions 1 through 3 on the information below.

The incomplete equation below represents an esterification reaction. The alcohol reactant is represented by X.



1. Draw the structural formula for the alcohol represented by X.
2. Write an IUPAC name for the reactant represented by its structural formula in this equation.
3. On the structural formula below, circle the acid functional group, only.

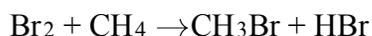


Base your answers to questions 4 and 5 on the information below

Ozone gas, O₃, can be used to kill adult insects in storage bins for grain without damaging the grain. The ozone is produced from oxygen gas, O₂, in portable ozone generators located near the storage bins. The concentrations of ozone used are so low that they do not cause any environmental damage. This use of ozone is safer and more environmentally friendly than a method that used bromomethane, CH₃Br. However, bromomethane was more effective than ozone because CH₃Br killed immature insects as well as adult insects.

Adapted From: The Sunday Gazette(Schenectady, NY) 3/9/03

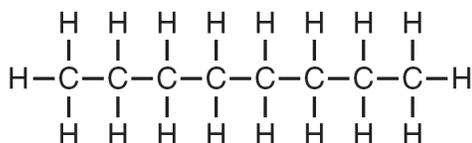
4. Given the balanced equation for producing bromomethane.



Identify the type of organic reaction shown.

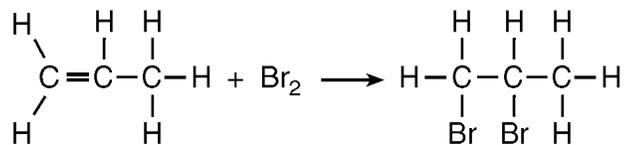
5. Determine the total number of moles of CH₃Br in 19 grams of CH₃Br (gram-formula mass = 95 grams/mol).

6. A gasoline engine burns gasoline in the presence of excess oxygen to form carbon dioxide and water. The main components of gasoline are isomers of octane. A structural formula of octane is shown below.



Draw a structural formula for 2,2,4-trimethylpentane.

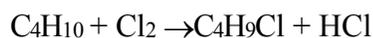
Base your answers to questions 7 through 9 on the equation below, which represents an organic compound reacting with bromine.



7. What is the gram-formula mass of the product in this reaction?
8. What type of organic reaction is represented by this equation?
9. What is the IUPAC name for the organic compound that reacts with Br₂?

Base your answers to questions 10 through 12 on the information below.

Given the balanced equation for an organic reaction between butane and chlorine that takes place at 300.°C and 101.3 kilopascals:



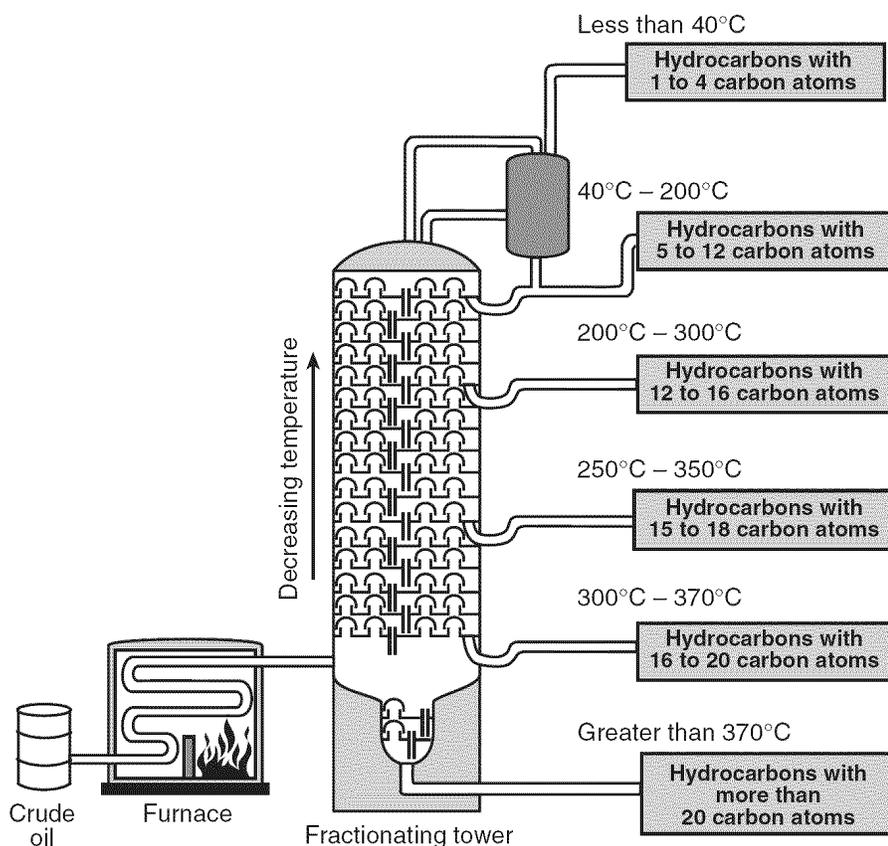
10. Explain, in terms of collision theory, why the rate of the reaction would decrease if the temperature of the reaction mixture was lowered to 200.°C with pressure remaining unchanged.
11. Draw a structural formula for the organic product.
12. Identify the type of organic reaction shown.

-
13. To which homologous series does CH₃CH₂CH₂CH₃ belong?

Base your answers to questions **14** through **16** on the information and diagram below and on your knowledge of chemistry.

Crude oil is a mixture of many hydrocarbons that have different numbers of carbon atoms. The use of a fractionating tower allows the separation of this mixture based on the boiling points of the hydrocarbons.

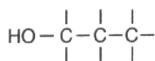
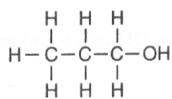
To begin the separation process, the crude oil is heated to about 400°C in a furnace, causing many of the hydrocarbons of the crude oil to vaporize. The vaporized mixture is pumped into a fractionating tower that is usually more than 30 meters tall. The temperature of the tower is highest at the bottom. As vaporized samples of hydrocarbons travel up the tower, they cool and condense. The liquid hydrocarbons are collected on trays and removed from the tower. The diagram below illustrates the fractional distillation of the crude oil and the temperature ranges in which the different hydrocarbons condense.



- How many hydrogen atoms are present in one molecule of octane?
- Write an IUPAC name of *one* saturated hydrocarbon that leaves the fractionating tower at *less than* 40°C .
- Describe the relationship between the strength of the intermolecular forces and the number of carbon atoms in the different hydrocarbon molecules.

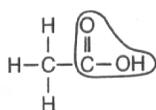
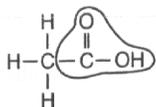
Unit 12 Organic Chemistry Constructed Response practice 2014-2015

1.



2. *Examples:* – ethanoic acid – acetic acid

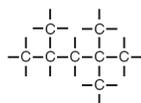
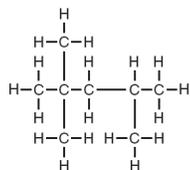
3.



4. *Examples:* – substitution – bromination – halogenation

5. 0.20 mol

6.



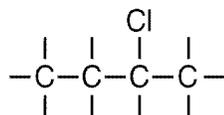
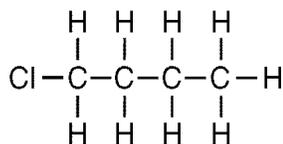
7. *Examples:* – 202 g/mol – 201.9 g/mol

8. *Examples:* – addition – halogenation – bromination

9. propene

10. *Examples:* – Particles move slower and collide less frequently – fewer effective collisions between molecules

11.



12. *Examples:* – substitution – chlorination – halogenation

13. *Examples:* – alkanes – $\text{C}_n\text{H}_{2n+2}$

14. 18

15. methane; ethane; propane; methyl propane; butane

16. The intermolecular forces are weaker for molecules that have fewer carbon atoms.