

## Formulas

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| <p>1 Which term represents the fixed proportion of elements in a compound?</p> <p>(1) atomic mass                      (3) chemical formula<br/>(2) molar mass                        (4) density formula</p> <p>2 Which two terms represent types of chemical formulas?</p> <p>(1) mechanical and structural<br/>(2) mechanical and thermal<br/>(3) molecular and structural<br/>(4) molecular and thermal</p> <p>3 Which two terms represent types of chemical formulas?</p> <p>(1) fission and fusion<br/>(2) oxidation and reduction<br/>(3) empirical and structural<br/>(4) endothermic and exothermic</p> | <p>4 Which two terms represent types of chemical formulas?</p> <p>(1) empirical and molecular<br/>(2) polar and nonpolar<br/>(3) synthesis and decomposition<br/>(4) saturated and concentrated</p> <p>5 The empirical formula for butene is</p> <p>(1) CH<sub>2</sub>                                      (3) C<sub>4</sub>H<sub>6</sub><br/>(2) C<sub>2</sub>H<sub>4</sub>                                      (4) C<sub>4</sub>H<sub>8</sub></p> <p>6 Which formula is an empirical formula?</p> <p>(1) N<sub>2</sub>O<sub>4</sub>                                      (3) C<sub>3</sub>H<sub>6</sub><br/>(2) NH<sub>3</sub>                                        (4) P<sub>4</sub>O<sub>10</sub></p> |
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Base your answers to questions 7 on the information below and on your knowledge of chemistry.

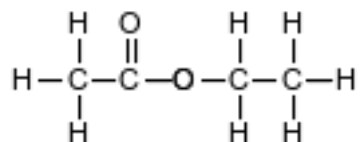
A metal worker uses a cutting torch that operates by reacting acetylene gas, C<sub>2</sub>H<sub>2</sub>(g), with oxygen gas, O<sub>2</sub>(g), as shown in the unbalanced equation below.



7 Write the empirical formula for acetylene.

Base your answers to questions 8 on the information below and on your knowledge of chemistry.

Ethyl ethanoate is used as a solvent for varnishes and in the manufacture of artificial leather. The formula below represents a molecule of ethyl ethanoate.



8 Write the empirical formula for this compound.

Base your answers to questions 9 on the information below and on your knowledge of chemistry.

Crude oil, primarily a mixture of hydrocarbons, is separated into useful components in a fractionating tower. At the bottom of the tower, the crude oil is heated to about 400°C. The gases formed rise and cool. Most of the gases condense and are collected as liquid fractions. The table below shows the temperature ranges for collecting various hydrocarbon fractions.

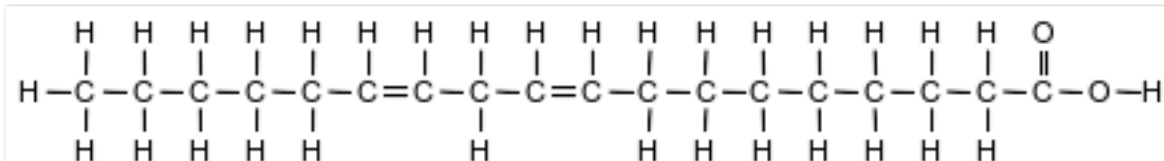
Hydrocarbon Fractions Collected

Number of Carbon Atoms per Molecule	Temperature Range (°C)
1-4	below 40
5-12	40-200
12-16	200-300
16-20	300-370
>20	above 370

9 Draw a structural formula for 3-ethylhexane.

Base your answers to questions 10 on the information below and on your knowledge of chemistry.

Fatty acids, a class of compounds found in living things, are organic acids with long hydrocarbon chains. Linoleic acid, an unsaturated fatty acid, is essential for human skin flexibility and smoothness. The formula below represents a molecule of linoleic acid.



10 Write the molecular formula of linoleic acid.

Base your answer to question 11 on the information below and on your knowledge of chemistry.

Tetrachloroethene,  $\text{C}_2\text{Cl}_4$ , is a solvent used in many dry cleaning processes.

11 Write the empirical formula for tetrachloroethene.

Base your answers to questions 12 on the information below and on your knowledge of chemistry.

The table below contains selected information about chlorine and two compounds containing chlorine. One piece of information is missing for each of the substances in the table.

Chlorine and Two Compounds Containing Chlorine

Name	Formula	Molar Mass (g/mol)	Phase at STP
chlorine	Cl <sub>2</sub>	71	?
calcium chloride	CaCl <sub>2</sub>	?	solid
1,2-dichloroethene	?	97	liquid

- 12 The liquid compound has an empirical formula of CHCl. Write the molecular formula for this compound.

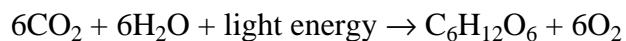
Base your answers to questions 13 on the information below and on your knowledge of chemistry.

Fruit growers in Florida protect oranges when the temperature is near freezing by spraying water on them. It is the freezing of the water that protects the oranges from frost damage. When H<sub>2</sub>O(l) at 0°C changes to H<sub>2</sub>O(s) at 0°C, heat energy is released. This energy helps to prevent the temperature inside the orange from dropping below freezing, which could damage the fruit. After harvesting, oranges can be exposed to ethene gas, C<sub>2</sub>H<sub>4</sub>, to improve their color.

- 13 Write the empirical formula for ethene.
- 14 What is the empirical formula for C<sub>6</sub>H<sub>12</sub>?

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

During photosynthesis, plants use carbon dioxide, water, and light energy to produce glucose, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>, and oxygen. The reaction for photosynthesis is represented by the balanced equation below.



- 15 Write the empirical formula for glucose.

## Answer Keys

1 3

2 3

3 3

4 1

5 1

6 2

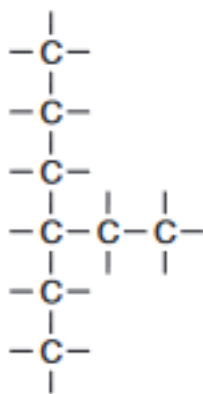
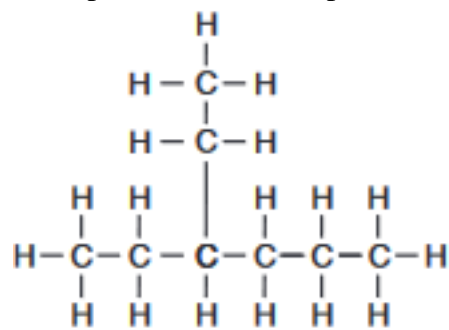
7 Allow 1 credit for CH or HC.

8 Allow 1 credit for C<sub>2</sub>H<sub>4</sub>O. The order of the elements may vary.

9 Allow 1 credit.

- Examples of 1-credit responses:

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10 Allow 1 credit for C<sub>18</sub>H<sub>32</sub>O<sub>2</sub>. The order of the elements may vary.

11 Allow 1 credit for CCl<sub>2</sub>. The order of the elements may vary.

12 Allow 1 credit for C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>. The order of the elements may vary.

13 Allow 1 credit for CH<sub>2</sub>. The order of the elements may vary.

14 Allow 1 credit for CH<sub>2</sub>. The order of the elements can vary.

15 Allow 1 credit for CH<sub>2</sub>O. The order of the elements may vary.