CHEMISTRY DEPARTMENT OF SCIENCE



Name: ANSWERS () Class: SEC 4

OC: MOLECULAR STRUCTURES (EXTENSIONS) – ASSIGNMENT

Multiple-Choice Questions [20 Marks]

TOTAL SCORE / 30

Write in your selected answer for the multiple-choice questions in the boxes provided.



- 1. Which of the following statements about isomers is false?
 - **A** Isomers have the same relative molecular mass.
 - **B** Isomers have the same strength of intermolecular forces.
 - **C** Isomers may have the same chemical properties as each other.
 - **D** Isomers have the same percentage composition of elements.
- 2. Two molecules are isomers. It follows that these two molecules
 - **A** contain the same elements.
- **C** have different molecular formulae.
- **B** contain the same functional group.
- **D** have the same structural formula.
- 3. Butanoic acid has a formula C₄H₈O₂. It can be concluded that an isomer of this molecule
 - **A** must be able to react with carbonates.
 - **B** must combust to form carbon dioxide and water.
 - **C** must contain the –COOH functional group.
 - **D** must **not** contain a C=C bond in its structure.
- 4. What property do methylpropane and butane **not** have in common?
 - **A** combustion products
 - B empirical formula
 - **C** melting and boiling points
 - **D** relative molecular mass
- 5. The smallest alkane to have more than one structural isomer is

A butane B ethane C pentane D	propane
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- 6. How many structural isomers exist for C₂H₆O?
 - A one B two C three D four
- 7. Which of the following molecules have the greatest number of structural isomers?
 - **A** C_3H_7CI **B** $C_3H_6CI_2$ **C** $C_3H_4CI_4$ **D** $C_3H_2CI_6$
- 8. A compound with the formula C_4H_9F has
 - A 2 isomers. B 3 isomers. C 4 isomers. D 5 isomers.
- 9. Which, of the four molecules below, is a different structure from the other three molecules?



10. Which of the following pairs of molecules are **not** isomers?



11. Three molecules, **X**, **Y** and **Z**, are shown below.



Which of the following statements are true?

- **A** Molecules **X** and **Y** have different molecular formula.
- **B** Molecules **X** and **Z** are isomers of each other.
- **C** Molecules **X** and **Z** have the same structural formula.
- **D** Molecules **Y** and **Z** have the same melting and boiling points.
- 12. The structure of a chloroalkane **P** is shown below.



molecule P

Which of the molecules below are identical to **P**?



- 13. Which of the following molecules only exist as one isomer?
 - **A** $C_2H_4F_2$ **B** $C_2H_3F_3$ **C** $C_2H_2F_4$ **D** C_2HF_5

14. Two molecules, pentene and cyclopentane, are shown below.



Which of the following statements about these two molecules are true?

- **A** Pentene and cyclopentane are isomers of each other.
- **B** Pentene and cyclopentane have the same chemical properties.
- **C** Pentene is a hydrocarbon while cyclopentane is not.
- **D** Pentene requires more oxygen for combustion compared to cyclopentane.
- 15. The diagrams below show five fluoroalkanes with the formula $C_5H_{11}F$.





molecule 4

Which two molecules are the same?

- A molecules 1 and 2
- **B** molecules 2 and 4

- **C** molecules 3 and 5
- **D** molecules 4 and 5
- 16. Which of the following molecules contain exactly three chlorine atoms?
 - **A** 1,1,3,3-tetrachlorohexane
 - **B** 1-bromo-1,1,2-trichloroethane
- **C** 1-chloro-3-fluorobutane
- **D** 2,3-dichloro-1,3-difluoropentane

molecule 5

17. The structure of an organic molecule is shown below.



Which of the following names best describe this molecule?

- A ethylbutane B ethylpentane C methylbutane D propylpropane
- 18. The structure of an organic molecule is shown below.





19. Which of the following molecules is 1,2,2-trichloropropane?



20. Which of the following pairs of molecules are isomers?

- **A** chloromethylpropane and dichloromethylpropane
- **B** dichlorobutane and dichloropropane
- **C** dimethylpropane and methylbutane
- **D** ethylbutane and methylpropane

Structured Questions [10 Marks]

- 21. Ethane can undergo a chemical reaction with chlorine to form gaseous trichloroethane, $C_2H_3Cl_3$, with hydrogen chloride as a byproduct. This product has two isomers.
 - (a) Construct a chemical equation, including state symbols, for this reaction. [1]

$$C_2H_6$$
 (g) + 3 Cl_2 (g) $\longrightarrow C_2H_3Cl_3$ (g) + 3 HCl (g)

(b) Explain what is meant by the term 'isomers'.

Two or more molecules with the same molecular formula, but different structural

formula.

(c) In the space below, write down the names of the two isomers of trichloroethane and draw their full-structural formula. [4]

Isomer #1

Name: 1,1,1-trichloroethane

Isomer #2

Name: 1,1,2-trichloroethane

Full Structural Formula:



Full Structural Formula:



(d) Propane can undergo a similar reaction with chlorine to form trichloropropane, C₃H₅Cl₃. How many structural isomers does trichloropropane have? [1]

five

22. From the list of names provided below, identify the molecules shown.

[3]

[1]



END