

CHEMISTRY DEPARTMENT OF SCIENCE

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itution	Name:	ANSWERS	()	Class:	SEC 4
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OC: MOLECULAR STRUCTURES – ASSIGNMENT

Multiple-Choice Questions [20 Marks]

TOTAL SCORE / 30

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



- 1. All members of an homologous series
 - **A** contain the same number of bonds.
 - **B** contain the same number of carbon atoms.
 - **C** share a general formula.
 - **D** share the same melting and boiling points.
- 2. Which of the following statements about an homologous series is **false**?
 - **A** Members of a homologous series contain a different number of hydrogen atoms.
 - **B** Members of a homologous series have different melting and boiling points.
 - **C** Members of a homologous series share the same empirical formula.
 - **D** Members of a homologous series undergo similar chemical reactions.
- 3. Down a homologous series, the boiling points of each successive member increases because
 - **A** the intermolecular forces between the molecules increases.
 - **B** the number of hydrogen atoms increases.
 - **C** there are a larger number of bonds to be broken.
 - **D** there covalent bonds are get increasingly stronger.
- 4. Which of the following is **not** a trend across a homologous series, in order of increasing number of carbon atoms?
 - **A** Increasing density.

- **C** Increasing mass.
- **B** Increasing flammability.
- **D** Increasing viscosity.
- 5. Which of the following is a possible general formula for carboxylic acids?
 - **B** $C_nH_{2n}CO_2H$ **A** $C_nH_{2n+1}COH$ $\mathbf{C} \quad C_n H_{2n} O_2$ **D** $C_nH_{n+1}CO_2H$

6. What is the molecular formula for propanoic acid and butanol?

	propanoic acid	butanol
Α	C ₂ H ₅ COOH	C ₃ H ₇ OH
В	C ₂ H ₅ COOH	C₄H₀OH
С	C ₃ H ₇ COOH	C₃H ₈ O
D	C ₃ H ₇ COOH	$C_4H_{10}O$

7. Which of the following correctly states the molecular formula, empirical formula and simplified structural formula of propene?

	molecular formula	empirical formula	structural formula
A	CH ₂	C ₃ H ₆	CH ₂ CHCH ₃
В	CH ₂ CHCH ₃	CH ₂	C_3H_6
С	C ₃ H ₆	CH ₂	CH₂CHCH ₃
D	C ₃ H ₆	CH ₂ CHCH ₃	CH ₂

8. Cycloalkanes are compounds with a 'ring' carbon chain. Two examples of cycloalkanes are cyclopentane and cyclohexane:





cyclopentane



Which of the following correctly shows the general formula for alkanes, alkenes and cycloalkanes?

	alkanes	alkenes	cycloalkanes
Α	C_nH_{2n}	C_nH_{2n}	C_nH_{2n+2}
В	C_nH_{2n}	C_nH_{2n+2}	C_nH_{2n}
С	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n}
D	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n+2}

- 9. Which of the following statements about the alkene homologous series is true?
 - **A** All members are gaseous at room temperature.
 - **B** All members have the same empirical formula.
 - **C** All members have the same molecular mass.
 - **D** All members have the same structural formula.
- 10. Which of the following statements about the alcohol homologous series is true?
 - **A** All members are hydrocarbons.
 - **B** All members are liquid at room temperature.
 - **C** All members have different empirical formulae.
 - **D** All members have different chemical properties.

- 11. A member of a homologous series has a molecular formula of C_8H_{10} . What is the molecular formula of the preceding member (i.e. the member just before it)?
 - **A** C_4H_{10} **B** C_6H_9 **C** C_7H_8 **D** C_7H_9
- 12. A member of a homologous series has a formula of C_2H_5N . What is the formula of the following member (i.e. the member just after it)?
 - **A** $C_{3}H_{6}N$ **B** $C_{3}H_{7}N$ **C** $C_{3}H_{7}N_{2}$ **D** $C_{4}H_{10}N_{2}$
- 13. Which one of the following molecules contains a C=C bond?
 - **A** C_3H_8 **B** C_4H_8 **C** C_2H_6O **D** CH_3COOH
- 14. Eicosapentaenoic acid is a type of fatty acid and has a formula of $C_{19}H_{29}COOH$. How many C=C bonds are there in its structure?
 - A none B three C five D ten
- 15. The structure of an organic compound **X** is shown below.



Identify X.

- A butanoic acid B butanol C propene D propanoic acid
- 16. A molecule has the formula $C_4H_8O_2$. It follows that the molecule
 - **A** combusts completely to produces carbon dioxide and water only.
 - **B** contains a C=C double bond in its structure.
 - **C** must be miscible with water and other polar solvents.
 - **D** must have a –COOH functional group in its structure.

17. Which of the following statements is **false**?

- **A** Both ethane and ethene are insoluble in water.
- **B** Both ethanol and ethanoic acid are soluble in water.
- **C** Ethane contains only C–H bonds in its structure.
- **D** Ethanoic acid contains a double bond in its structure.
- 18. Which of the following statements is **true**?
 - A Any compound with a C=C bond will have chemical properties of an alkene.
 - **B** Members of a homologous series must share the same empirical formula.
 - **C** Molecular size is the only factor affecting the boiling point of an organic compound.
 - **D** The first four alcohols are gaseous at room temperature and pressure.

19. The structure of an organic compound **Y** is shown below.



Which of the following best describes Y?

- **A Y** is an alcohol.
- **B Y** is an alkane.
- **C Y** is both an alcohol and an acid.
- **D Y** is both an alkene and an alcohol.
- 20. The structure of an organic compound **Z** is shown below.



Which of the following best describes **Z**?

- **A Z** has the properties of an alkene, an alcohol and an acid.
- **B Z** has the properties of both an alcohol and an acid.
- **C Z** has the properties of both an alkene and an acid.
- **D Z** has the properties of both an alkene and an alcohol.

Structured Questions [10 Marks]

21. Amines refer to a homologous series of molecules with the $-NH_2$ group in its structure. The first member of this homologous series is methylamine, as shown:



(a) In the space below, write down the name and structural formula of the next member in the homologous series. [2]



(b)	(i)	State the general formula for this homologous series.	[1]		
		$C_nH_{2n+1}NH_2$ or $C_nH_{2n+3}N$			
	(ii)	Hence state the formula of the amine with 28 atoms in its structure.	[1]		
		C ₈ H ₁₇ NH ₂ or C ₈ H ₁₉ N			
22. (a)	Def	ine the term 'homologous series'.	[2]		
	It is a group/family of organic compounds which have the same functional group,				
	share a general formula and show a gradation in physical properties.				
(b)	Exp	plain what is meant by a 'functional group'.	[1]		
	It is an atom or group of atoms within the structure of an organic molecule v				

gives the compound its characteristic properties.

23. Complete the table below.

molecule name simplified structural formula full structural formula ethanoic acid CH₃COOH Н Η Η H-C Н $CH_3CH(CH_3)CH_3$ methylpropane HH ΗН C Η CH₂CHCH₃ н Η propene or Н CH₃CHCH₂ H Ĥ Н ÇI H H -H chlorobutane $CH_3CHCICH_2CH_3$ Н Ĥ Ĥ Н Н

END

[3]