
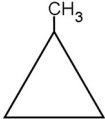
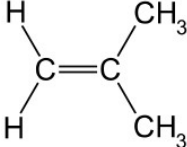
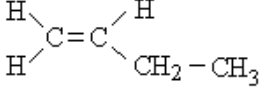
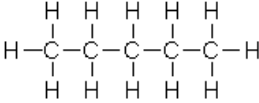
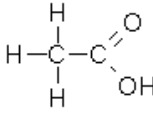
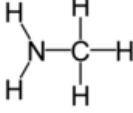
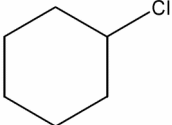


Name: **ANSWERS**

Mark = ____ / 57

Part 1: Multiple Choice Section**10 marks**1. **D** 2. **C** 3. **A** 4. **C** 5. **B** 6. **B** 7. **A** 8. **C** 9. **A** 10. **A****Part 2: Short Answer Section****47 marks**

11. Name and draw full structural formula to represent the following substances;

A saturated isomer of C_4H_8		
	cyclobutane	methylcyclopropane
An alkene with 4 carbon atoms that does not exhibit geometric (cis/trans) isomerism		
	methylpropene	1-butene
The product of reacting cis-pent-2-ene with hydrogen		
	pentane	
A structural isomer of methyl methanoate that fizzes when added to sodium carbonate solution		
	ethanoic acid	
An amine with 5 hydrogen atoms		
	methanamine	
The organic product formed when one molecule of cyclohexane reacts with one molecule of chlorine in the presence of UV light		
	chlorocyclohexane	

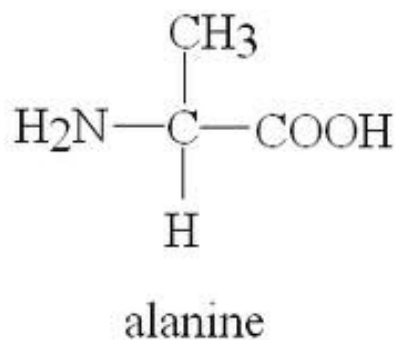
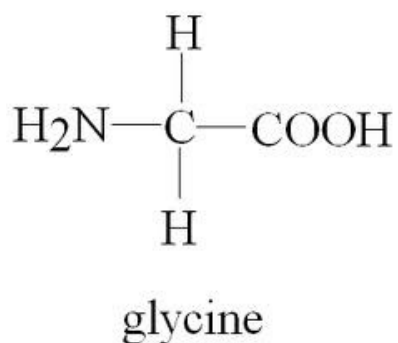
✓ each (12 marks)

12. Complete the following table.

Molecule	Major type of intermolecular attraction (choose from dispersion forces, dipole-dipole or hydrogen bonding)	Boiling point ranking (1 = highest, 5 = lowest)
$ \begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{OH} & \text{H} \end{array} $	hydrogen bonding	2
$ \begin{array}{c} \text{H} & & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{O} & \text{H} \end{array} $	dipole-dipole forces	3
$ \text{CH}_3-\text{CH}_2-\text{C} \begin{array}{l} \nearrow \text{O} \\ \searrow \text{O}-\text{H} \end{array} $	hydrogen bonding	1
$ \begin{array}{c} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $	dispersion forces	4
$ \begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{C} & \text{H} \\ \\ \text{H} \end{array} $	dispersion forces	5

✓ each (8 marks)

13. The structures of glycine and alanine are shown below:



- (a) To which class of compounds do they both belong?

Amino acids

✓

(1 mark)

- (b) What is the main intermolecular force between alanine molecules?

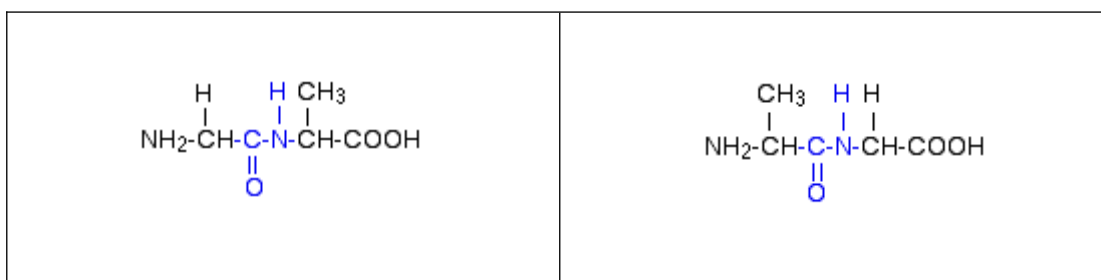
Hydrogen bonding

✓

(1 mark)

- (c) A glycine molecule and an alanine molecule can react with each other in a condensation reaction to form a new substance called a dipeptide.

Draw one of the two possible dipeptides that could be formed below.



✓✓✓

(3 marks)

14. There are four isomeric alcohols, all of which have the molecular formula, C₄H₁₀O.

Draw each of these alcohols, and draw their oxidation product(s) when reacted with acidified potassium dichromate solution.

Alcohol	Oxidation product(s)	
CH₃CH₂CH₂CH₂OH (1-butanol)	CH₃CH₂CH₂CHO	CH₃CH₂CH₂COOH
CH₃CH₂CHOHCH₃ (2-butanol)	CH₃CH₂COCH₃	
CH₃CH(CH₃)CH₂OH (methyl-1-propanol)	CH₃CH(CH₃)CHO	CH₃CH(CH₃)COOH
CH₃CH(OH)(CH₃)CH₃ (methyl-2-propanol)	none	

✓ each

(10 marks)

15. 2.19 g of an organic compound X is completely burnt in excess oxygen, forming 3.21 g of carbon dioxide and 1.32 g of water.

(a) Calculate the empirical formula of X.

C	H	O
$m(\text{C}) = \frac{12.01}{44.01} \times m(\text{CO}_2)$	$m(\text{H}) = \frac{2.016}{18.016} \times m(\text{H}_2\text{O})$	$m(\text{O}) = 2.19 - m(\text{C}) - m(\text{H})$
$= 0.876 \text{ g} \quad \checkmark$	$= 0.148 \text{ g} \quad \checkmark$	$= 1.166 \text{ g} \quad \checkmark$
$n(\text{C}) = \frac{0.876}{12.01}$ $= 0.0729 \quad \checkmark$	$n(\text{H}) = \frac{0.148}{1.008}$ $= 0.1465 \quad \checkmark$	$n(\text{O}) = \frac{1.166}{16}$ $= 0.0729 \quad \checkmark$
<hr/>		
	0.0729	
1	2	1
$\therefore \text{EF} = \text{CH}_2\text{O} \quad \checkmark$		

(7 marks)

In a second experiment it was found that 0.473 g of X occupied 278 mL (= **0.278 L**), measured at 200°C (= **473.1 K**) and 1.10 atm (= **1.10/1 x 101.3 = 111.4 kPa**).

(b) Calculate the molecular formula of the compound.

$$n = PV/RT = (111.4 \times 0.278)/(8.315 \times 473.1) = 0.00787 \text{ mol} \quad \checkmark$$

$$M = m/n = 0.473 / 0.00787 = 60.1 \text{ g mol}^{-1} \quad \checkmark$$

$$M/\text{EFM} = 60.1 / 30.026 \approx 2$$

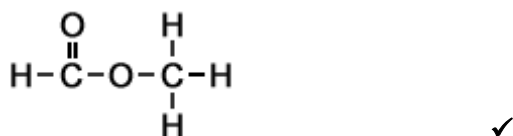
$$\therefore \text{MF} = 2 \times \text{EF} = \text{C}_2\text{H}_4\text{O}_2 \quad \checkmark$$

(3 marks)

(c) Given that, at STP, X is a sweet smelling liquid, draw the structural formula of X and name it.

\therefore ester

methyl methanoate \checkmark



(2 marks)

End of Test