

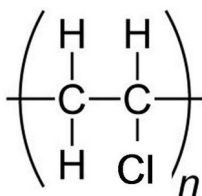
Name: _____

Mark = _____ / 42

Part One: Multiple Choice Section**10 marks**

Answer by placing a cross through, or a circle around, the letter of the most correct answer.

1. The structure below represents a polymer commonly used to make gutters and records.



The monomer from which this polymer is made could be:

- A. $\text{CH}_3\text{CH}_2\text{Cl}$
B. $\text{ClCH}=\text{CH}_2$
C. $\text{ClCH}=\text{CHCl}$
D. $\text{ClCH}=\text{CHCH}=\text{CHCl}$
2. The formula of 2,2-dimethylpropane may be written as:
A. $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$
B. $\text{CH}_3\text{CH}(\text{CH}_3)_2$
C. $\text{C}(\text{CH}_3)_4$
D. $(\text{CH}_3)_2\text{CHCH}_2\text{CH}(\text{CH}_3)_2$
3. One mole of an alkane requires 8 moles of oxygen for complete combustion. The molecular formula of the alkane is, therefore:
A. C_3H_8
B. C_4H_{10}
C. C_5H_{12}
D. C_6H_{14}

4. Which one of the following compounds would you expect to have the highest boiling point?
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
 - $\text{CH}_3\text{CH}_2\text{COCH}_3$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
5. Which of the following could be used as a soap?
- propan-1,2,3-triol
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$
 - $\text{CH}_3\text{COO}^-\text{Na}^+$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COO}^-\text{K}^+$
6. Which of the following molecules will exhibit hydrogen bonding?
- propanone
 - propanal
 - propan-2-ol
 - 1-propyl propanoate
 - propanamine
- all of them
 - II, III and V only
 - III and V only
 - II and III
7. Much of the household cleaning that was once performed using soap is now performed using synthetic detergents. A major advantage of synthetic detergents over soap is that they:
- have a lower resistance to bacterial decomposition.
 - are non-polar and dissolve more readily in grease.
 - form soluble compounds with common metal ions such as Ca^{2+} .
 - are more readily synthesized from common fats and oils.
8. An acidified solution of potassium dichromate would be least likely to react with:
- $\text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{OH}$
 - $\text{CH}_3(\text{CH}_2)_3\text{CH}(\text{OH})\text{CH}_3$
 - $\text{CH}_3\text{C}(\text{C}_2\text{H}_5)_2\text{OH}$
 - $\text{CH}_3\text{CH}_2\text{CH}(\text{C}_2\text{H}_5)\text{CH}_2\text{OH}$

9. Which of the following pairs of compounds are most likely to react to form a polyester?
- A. $\text{CH}_3\text{CHOHCHOHCH}_3$ and CH_3CHO
 - B. CH_3COCH_3 and $\text{HOOCCH}_2\text{COOH}$
 - C. $\text{HOOCCH}_2\text{CH}_2\text{COOH}$ and $\text{HOCH}_2\text{CH}_2\text{OH}$
 - D. $\text{CH}_3\text{CH}_2\text{OH}$ and CH_3COOH
10. Which of the following can exhibit cis-trans isomerism?
- I. $\text{CH}_2\text{ClCH}_2\text{Cl}$
 - II. CHI=CHBr
 - III. $\text{CH}_2=\text{CCl}_2$
 - IV. $\text{CH}_3\text{CH=CHCH}_3$
- A. I, II, and III
 - B. II, III, and IV
 - C. II and IV
 - D. I, II, and IV

End of Part One

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

	Description	Full structural formula
(a)	a cyclic compound with molecular formula C_4H_6	Name: _____
(b)	a compound with molecular formula C_4H_8O that can be oxidised to form butanoic acid	Name: _____
(c)	a molecule that reacts rapidly with bromine to form 1,2,3,4-tetrabromobutane	Name not required.
(d)	a cyclic tertiary alcohol with 4 carbon atoms	Name: _____
(e)	the product of oxidising cyclopentanol with acidified potassium permanganate solution	Name: _____
(f)	an organic product that can be formed when propene undergoes a reaction with bromine	Name: _____

(11 marks)

12. A sweet smelling liquid **A** ($\text{C}_6\text{H}_{12}\text{O}_2$) can be hydrolysed by hydrochloric acid to form **B** and **C**. **B** can be converted into **C** by reaction with an excess of acidified aqueous potassium dichromate. Draw structural formulae for **A**, **B** and **C** and name them.

A	<div style="height: 100px; border: 1px solid black; margin-bottom: 5px;"></div> Name: _____
B	<div style="height: 100px; border: 1px solid black; margin-bottom: 5px;"></div> Name: _____
C	<div style="height: 100px; border: 1px solid black; margin-bottom: 5px;"></div> Name: _____

(6 marks)

13. Consider the two alcohols, propan-1-ol and octan-1-ol. Two common solvents are water and hexane. Predict and account for the relative solubilities of each of these alcohols in the two solvents.

(a) Solubility in water

_____ is more soluble than _____

Explanation: _____

(3 marks)

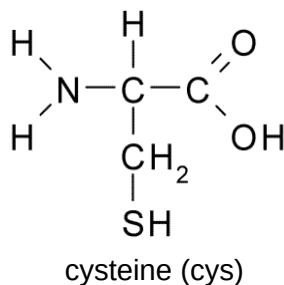
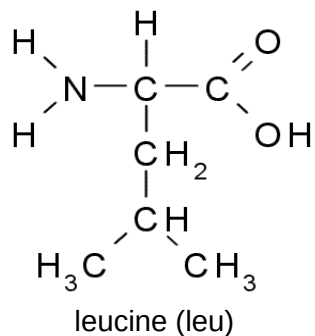
(b) Solubility in hexane

_____ is more soluble than _____

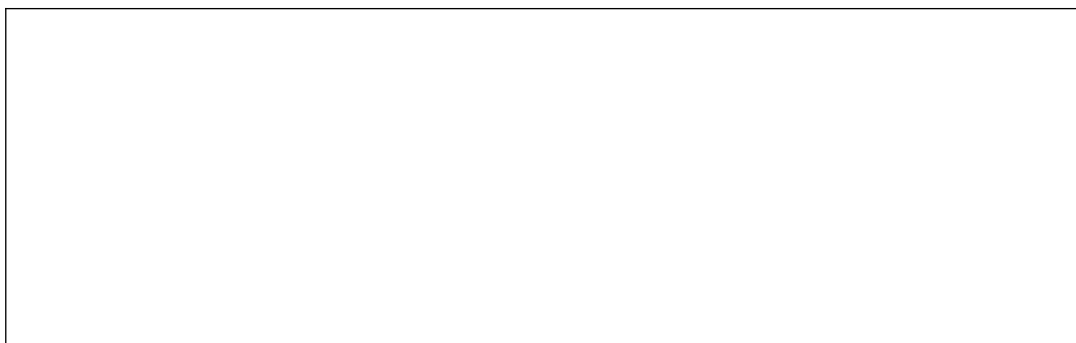
Explanation: _____

(3 marks)

14. Two amino acids are shown below.



- (a) Assuming that leucine and cysteine are able to form a polymer with alternating monomer units (i.e. leu-cys-leu-cys), carefully draw ONE repeating unit of the polymer chain.



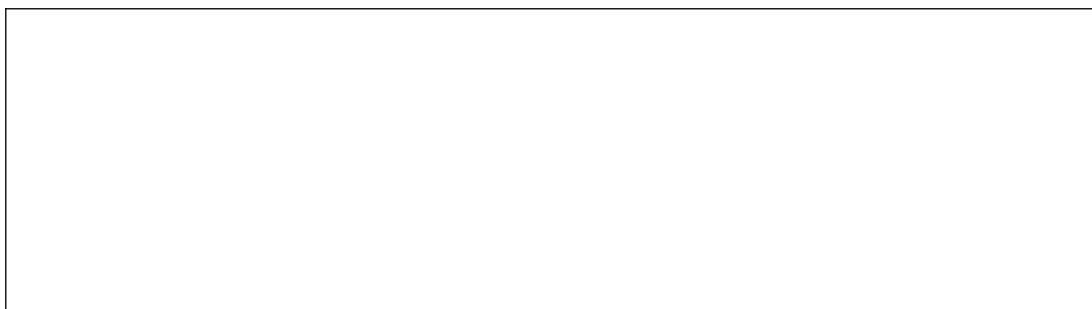
(1 mark)

- (b) During digestion, proteins are broken down into amino acids. Different parts of the digestive system have different pH's. For example, the human stomach has a pH of about 3 whilst the intestine has a pH of about 9. Draw the structure of cysteine that you would expect in the stomach and the intestine.

stomach	intestine

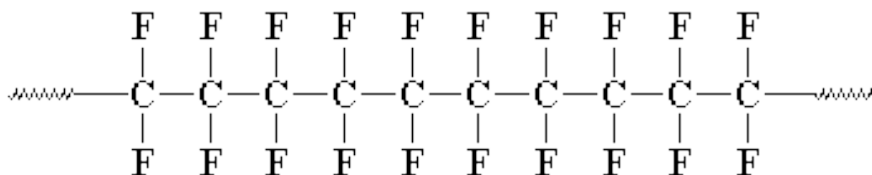
(2 marks)

- (c) Using leucine as an example, draw a zwitterion.



(1 mark)

15. A common polymer is 'PTFE', a section of which is shown below.



- (a) Draw the monomer from which it is made.



(1 mark)

- (b) What type of polymersiation is this? _____

(1 mark)

16. An abbreviated structural formula of 5-hydroxypentanoic acid is $\text{HO}(\text{CH}_2)_4\text{COOH}$. In the box beneath, draw its full structural formula.



(1 mark)

5-hydroxypentanoic acid has a molar mass of approximately 118 g mol^{-1} .

When a few drops of concentrated sulfuric acid is added to it, a new compound can be formed, which has a molar mass of approximately 218 g mol^{-1} . Draw a possible structure of this compound.



(2 marks)

End of Test