CHEMISTRY ONLINE
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CHEMISTRY

INORGANIC CHEMISTRY II

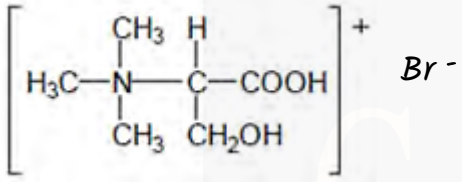
Level & Board	AQA (A-LEVEL)
TOPIC:	AMINO ACIDS, PROTEIN & DNA
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	10
TOTAL MARKS	31

Amino Acids, Protein and DNA

1.

(a)

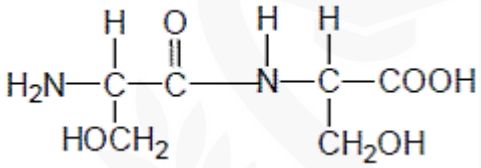
Following is the product formed when serine reacts with an excess of CH_3Br :



(1)

(b)

Structure of the dipeptide:



(1)

2. D

(1)

3.

(a)

The general formula of an α-amino acid:

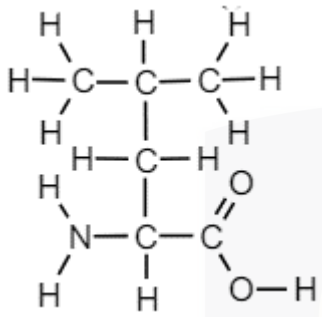
$RCH(NH_2)COOH$

(1)

(b)

Leucine has a structural formula of $(CH_3)_2CHCH_2CH(NH_2)COOH$.

Displayed formula of leucine

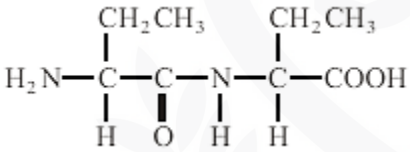


(1)

4.

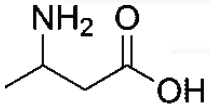
(a)

Dipeptide:



Name of the single amino acid.

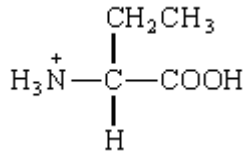
2-aminobutanoic (acid)



(1)

(b)

Following is the amino acid that is present in the acidic solution.



(1)

5. D

(1)

6.

(a)

Kevlar has applications in various fields where a tough, flexible material is needed.

For example:

- Body armor and bulletproof vests for military and law enforcement personnel.
- Fire-resistant clothing for firefighters and industrial workers.
- Cut-resistant gloves for chefs and butchers.
- Protective gear for motorcyclists and extreme sports enthusiasts.
- High-strength ropes and cables for industrial, marine, and climbing applications.

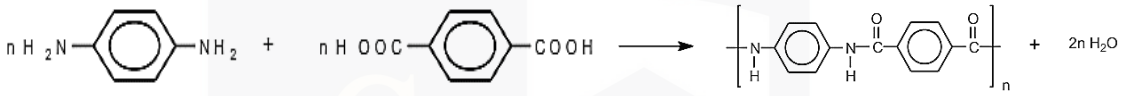
(1)

(b)

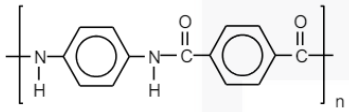
Condensation Polymerization Reaction for Kevlar:

Kevlar is formed through a condensation polymerization reaction, where two monomers undergo a chemical reaction to form a polymer, accompanied by the elimination of a small molecule, usually water.

Equation for the reaction:



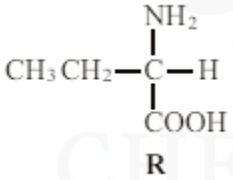
Repeating unit :



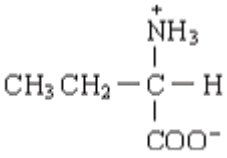
(5)

7.

(a)



The zwitterion formed by R.

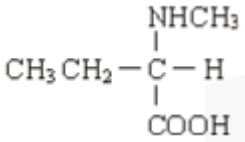


(1)

(b)

R is reacted with bromomethane

Organic product formed:



(1)

(c)

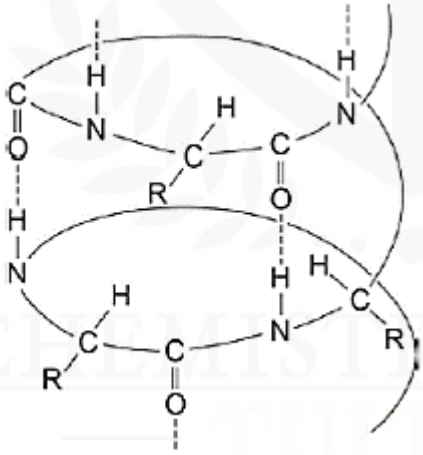
Name of the mechanism:

Nucleophilic substitution

(1)

8.

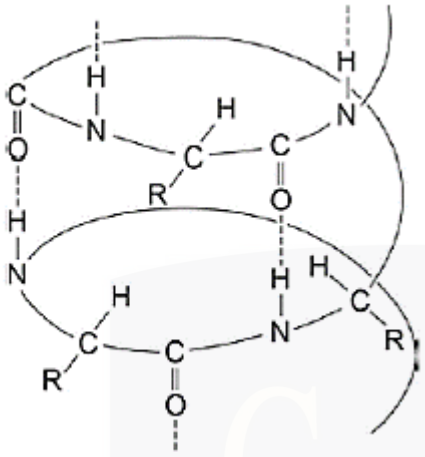
(a)



Type of protein structure: *Secondary*

(1)

(b)



The interaction involve the formation of hydrogen bonds between molecules containing oxygen (O) and hydrogen (H) atoms.

- ***Electronegativity***:

  Nitrogen (N) and oxygen (O) are highly electronegative elements, so, they have a strong tendency to attract electrons towards themselves.

- ***Polarity***:

  When nitrogen forms a bond with hydrogen (N–H) or oxygen forms a bond with carbon (C=O), these bonds become polar due to the electronegativity difference between the atoms involved.

  This polarity results in partial positive (δ^+) and partial negative (δ^-) charges on the atoms.

- ***Hydrogen Bond Formation***:

  In molecules where oxygen is bonded to hydrogen (O–H), the lone pair of electrons on the oxygen atom is strongly attracted to the partially positively charged hydrogen atom ($H^{\delta+}$) of another molecule.

  This attraction leads to the formation of hydrogen bonds between the oxygen and hydrogen atoms.

(4)

9. D

(1)

10.

(a)

To break down proteins into amino acids:

- Heat/warm/reflux.
- Strong acid HCl
- Enzyme (A protease or peptidase)

(2)

(b)

Type of reaction occurring: hydrolysis

(1)

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