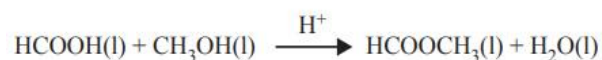


Revision of organic and digestion.

Some questions may have appeared in previous VCAA exams.

1) The equation on the right is an example of what type of reaction?

- A. condensation
- B. denaturation
- C. hydrolysis
- D. addition



2) Pentane, hexane, heptane and octane are non-branched alkanes. Which one of the following statements gives a valid comparison?

- A. Octane has a greater viscosity and a higher boiling point than hexane.
- B. Pentane has a greater viscosity and a lower boiling point than octane.
- C. Heptane has a lower viscosity and a higher boiling point than octane.
- D. Heptane has a lower viscosity and a lower boiling point than pentane.

3) The semi-structural formula for an isomer of $\text{C}_5\text{H}_{13}\text{NO}$ is

$\text{NH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$ The correct systematic name for this molecule is

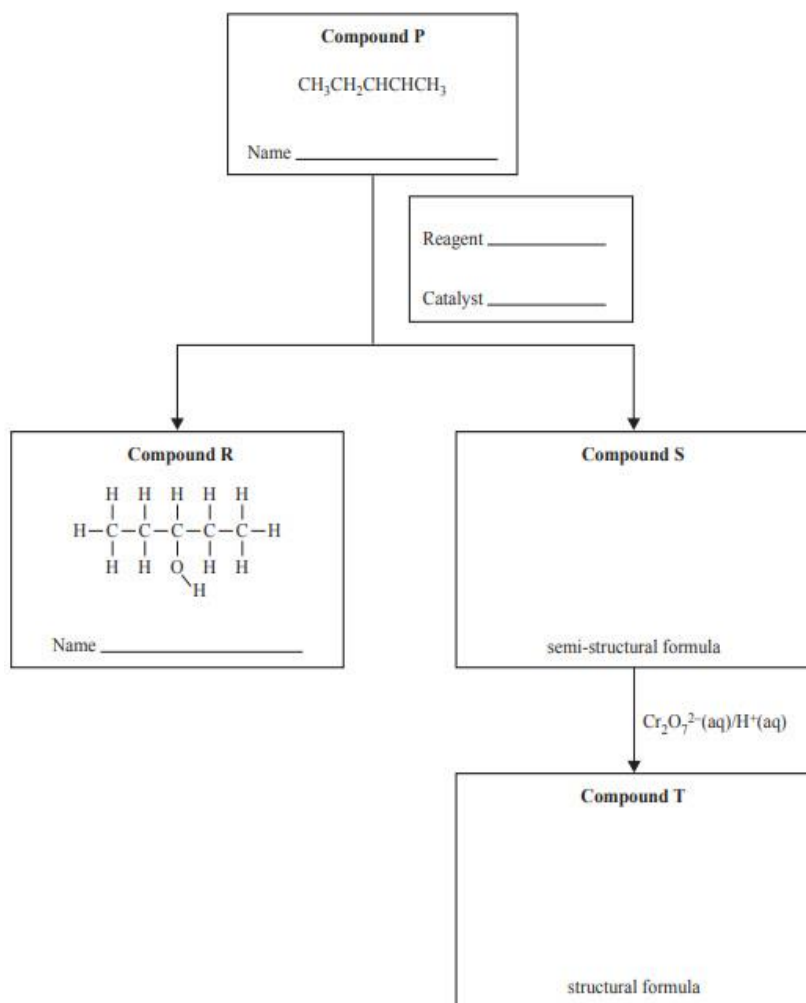
- A. 4-amino-pentan-1-ol
- B. 4-amino-2-methyl-butan-1-ol
- C. 4-hydroxy-3-methyl-butan-1-amine
- D. 1-hydroxy-2-methyl-4-amino-butane

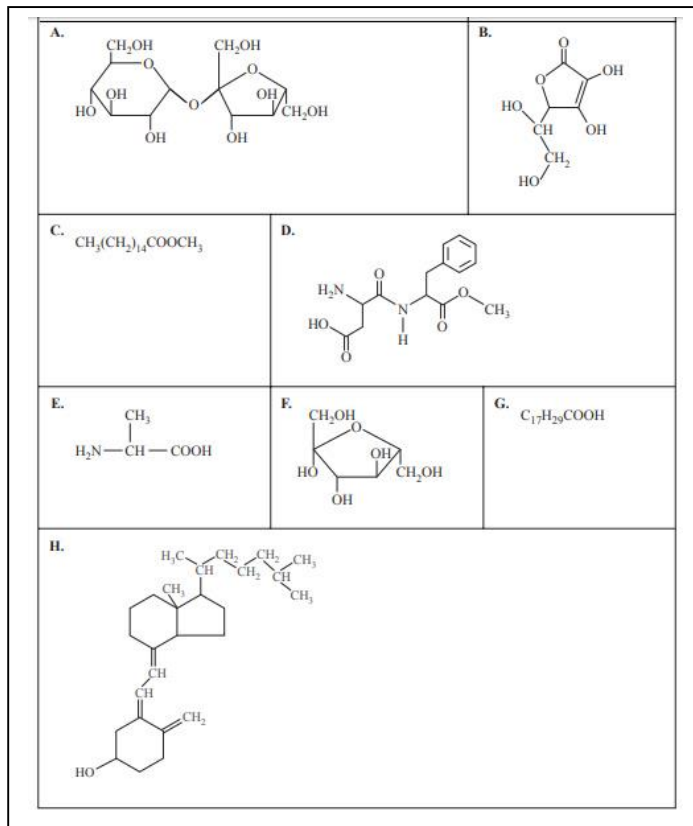
4) A meal containing a mixture of carbohydrates, fats and protein is eaten. The biomolecules in this meal are broken down into smaller molecules in the body before they can be absorbed. Which of the following summarises the chemical reactions that would occur prior to the smaller molecules being absorbed by the body?

	Type of reaction	H ₂ O is a reactant	Possible product
A.	hydrolysis	yes	glycine
B.	condensation	yes	glycogen
C.	hydrolysis	no	glucose
D.	condensation	no	glycerol

5) Alkenes can be used to manufacture a range of products. The reaction pathway diagram below represents one example of the use of an alkene. In this reaction pathway, Compound P is used to produce Compound R and Compound S. Compound S can then be used to produce Compound T. Complete the following in the appropriate boxes in the reaction pathway diagram provided.

- Give the IUPAC systematic names for Compound P and Compound R.
- Write the formulas of the reagent and the catalyst required to produce Compound R and Compound S from Compound P.
- Write the semi-structural formula of Compound S.
- Draw the structural formula of Compound T





6) The structures or formulas of a number of important biomolecules are shown on the left. In the table below, for each of the following characteristics of biomolecules, write the letter or letters in the space provided for the corresponding biomolecule or biomolecules shown on the left. Each biomolecule may be used more than once or may not be used at all.

Characteristic	Biomolecule letter(s) (A.–H.)
contains a glycosidic linkage	
is a product of fat digestion in the human digestive system	
is soluble in water (give letters for two examples)	
is able to form a zwitterion	
contains an ester linkage (give letters for two examples)	
can be a key constituent of biodiesel	
has phenylalanine as a component	
is likely to be stored in fat tissue within the body.	

7) Enzymes are crucial for the reactions involved in the metabolism of food in the human body. Even when conditions vary in the human body, there are enzymes that function to ensure the chemical reactions needed to sustain life take place. In the digestive tract, there is a variation in pH. The stomach can have a pH in the range of 1 to 4, while in the intestines, the pH can vary from 5 to 7. Describe the tertiary structure of enzymes and explain the chemistry that enables enzymes to function in different parts of the digestive tract. Your response should:

- describe the chemical bonding that enables the tertiary structure to be maintained
- comment on the significance of chemical bonding to the correct functioning of the enzyme
- explain how the enzyme chemically interacts with the substrate. Diagrams may be used to support your answer.

8) The carbohydrate in a cereal is mainly cellulose with a small amount of starch.

i. Name the monosaccharide unit that makes up both cellulose and starch molecules in the cereal.

ii. A small section of the label on the cereal pack is shown on the right. It clearly mentions the mass of the carbohydrates per 100 g of cereal.

What is the total amount of energy available to the person who consumes 250 grams of the cereal?

Total Carbohydrate 22g
Dietary Fiber 13g
Sugar 4.4g

iii. Explain the difference between dietary fibre and sugar?

iv. Why is dietary fibre and sugar placed under the heading "Total Carbohydrates"?

9) Tristearin (molar mass 891.48 g/mol), a triglyceride, is the primary fat found in beef and it contains stearic acid as the only fatty acid. 5.00 g of a pure sample of tristearin is completely broken down into its component molecules

a) Name the type of reaction that occurs during the digestion of tristearin and the products of this reaction.

b) The enzyme breakdown of tristearin involves a small molecule. What mass of this small molecule needs to be supplied to break down 5.00 grams of tristearin?

10) A 20.00 mL sample of an unlabelled solution of glutamic acid ($C_5H_9NO_4$) was pipetted into a 200mL volumetric flask and filled to the mark with distilled water. Five 20.00 mL samples of the solution in the volumetric flask were placed in 5 separate conical flasks and titrated against a 0.100 M NaOH solution. The average titre obtained was 14.56 mL .

- a) Write a balanced chemical equation for the reaction between glutamic acid and NaOH?

- b) Calculate the mol of glutamic acid in the conical flask.

- c) Calculate the mol of glutamic acid in the volumetric flask.

- d) Calculate the concentration, in %w/v, of glutamic acid (molar mass 147.13 g/mol) that should be placed on the bottle of the original sample of glutamic acid.

- e) Is the equivalence point for the completion of the titration between glutamic acid and NaOH, above pH 7 , below pH 7 or pH 7? Justify your answer.