

Voorbeeldtoets Chemie5b

Auteur: Philip de Groot

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Introductie

Deze toets bevat voor een deel meerkeuzevragen en voor een deel open vragen. De meerkeuzevragen zijn in deze voorbeeldtoets Engelstalig, maar zullen tijdens de werkelijk toets in het Nederlands zijn. Er is een bijlage met de verschillende aminozuren, maar de 3 letterafkortingen en de 1-letterafkortingen moet je wel uit je hoofd kennen! Verder zijn er veel vragen gezien de beschikbare tijd. De werkelijke toets zal meer in evenwicht zijn. Het gaat nu met name om de soort vragen die jullie kunnen verwachten en dat je de inhoudelijke kennis kan toetsen.

Meerkeuzevragen (iedere vraag is 2 punten)

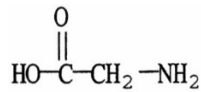
Aminozuren en proteïnen

- 1) The protein configuration that is primarily determined from interactions between R groups is the
 - A) primary structure.
 - B) secondary structure.
 - C) tertiary structure.
 - D) quaternary structure.
 - E) none of the above

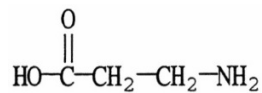
- 2) The reaction of amino acids to give peptides involves which pair of functional groups?
 - A) two amino groups
 - B) two carboxyl groups
 - C) an amino and a carboxyl group
 - D) a carboxyl and an alcohol group

3) Which molecule is an alpha amino acid?

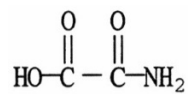
A)



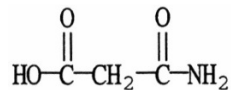
B)



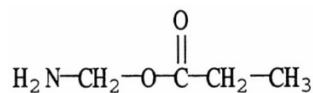
C)



D)



E)



4) Non-polar R groups on amino acids are said to be _____ because they are not attracted to water molecules.

- A) hydrophilic
- B) hydrophobic
- C) ionized
- D) unreactive
- E) none of these

5) Which of these amino acids has a thiol group as part of its side chain?

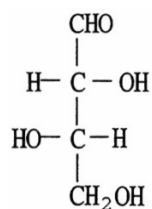
- A) cysteine
- B) tyrosine
- C) histidine
- D) threonine
- E) methionine

Koolwaterstoffen

6) A carbohydrate can be defined as a molecule

- A) composed of carbon atoms bonded to water molecules.
- B) composed of amine groups and carboxylic acid groups bonded to a carbon skeleton.
- C) composed mostly of hydrocarbons and soluble in non-polar solvents.
- D) that is an aldehyde or ketone and that has more than one hydroxyl group.
- E) whose name ends in "-ase".

7) Classify the molecule shown according to the location of its carbonyl group and the number of carbon atoms.

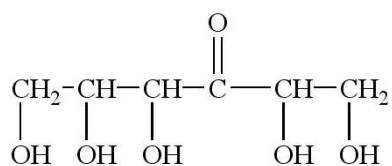


- A) aldotriose
- B) aldotetrose
- C) aldopentose
- D) ketotriose
- E) ketotetrose

8) How many stereoisomers of an aldotetrose can exist?

- A) 2
- B) 4
- C) 8
- D) 16
- E) 32

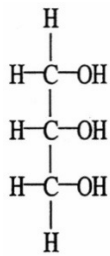
9) How many stereoisomers are possible for the following molecule?



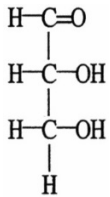
- A) 1
- B) 2
- C) 4
- D) 8
- E) 16

10) Which molecule shown is D-glyceraldehyde?

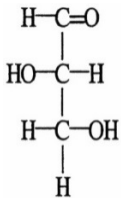
A)



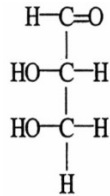
B)



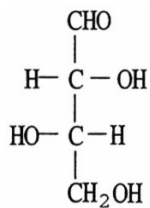
C)



D)



E)



Vetten

11) The biochemical roles of lipids are

A) short-term energy storage, transport of molecules, and structural support.

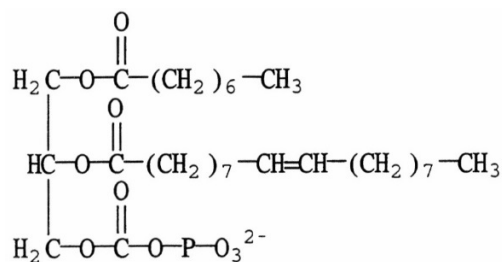
B) storage of excess energy, component of cell membranes, and chemical messengers.

C) catalysis, protection against outside invaders, motion.

D) component of cell membranes, catalysis, and structural support.

E) neurotransmitters, hormones, transport of molecules.

12) The molecule shown can be classified as a(an)



- A) steroid.
- B) eicosanoid.
- C) wax.
- D) glycerophospholipid.
- E) sphingolipid.

13) Which molecule is a **saturated** fatty acid?

- A) lauric acid
- B) linoleic acid
- C) arachidonic acid
- D) butyric acid
- E) oleic acid

14) Which molecule is a **polyunsaturated** fatty acid?

- A) $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
- B) $\text{CH}_2=\text{CHCH}=\text{CHCOOH}$
- C) $\text{CH}_3\text{CH}_2(\text{CH}=\text{CHCH}_2)_3(\text{CH}_2)_6\text{COOH}$
- D) $\text{HOOCCH}_2(\text{CH}=\text{CHCH}_2)_3\text{CH}_2\text{COOH}$
- E) none of the above

15) The product of an esterification reaction between which of the following molecules would be a fat?

- I. $\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$
- II. $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
- III. $\text{HOCH}_2\text{CH}_2\text{OH}$
- IV. $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$

- A) I and IV
- B) II and III
- C) II and IV
- D) I and III
- E) I and II

DNA

16) Which of the following is a major function of nucleic acids?

- A) storage and transfer of genetic information
- B) storage and intracellular transfer of energy
- C) catalysis of virtually all biochemical reactions
- D) structural support in both plants and animals
- E) long-term storage of energy

17) A region on the DNA strand that carries the information needed for the synthesis of a specific protein is called a

- A) codon.
- B) gene.
- C) chromosome.
- D) complementary base unit.
- E) chromatid.

18) When a β -N-glycosidic bond forms between guanine and deoxyribose, the resulting molecule is called

- A) riboguanine.
- B) deoxyriboguanine.
- C) deoxyriboguanosine.
- D) guanosine.
- E) deoxyguanidine.

19) Which base is normally found in RNA but **not** in DNA?

- A) thymine
- B) adenine
- C) guanine
- D) uracil
- E) cytosine

20) Which of the following is a nucleoside which would be found in DNA?

- A) adenosine triphosphate
- B) UMP
- C) deoxyguanosine
- D) deoxyribose
- E) deoxythymidine diphosphate

Open vragen

Vraagstuk 21 {1,3,4,4,2}

Gegeven het aminozuur *leucine* ($pK_{a1} = 2,33$, $pK_{a2} = 9,74$).

- Geef** de 1 en 3 lettercode van *leucine*.
- Leg uit** tot welke ‘chemische groep’ de restgroep van *leucine* behoort.
- Teken** alle mogelijke ionstructuren van *leucine* van lage pH (links) naar hoge pH (rechts).
- Bereken** de procentuele samenstelling van de zure vorm en z’n geconjugeerde base bij $pH = 1,00$, $pH = 2,33$ en $pH = 11$.
- Schets** het existentiediagram van *leucine*. Maak hierbij gebruik van een aantal slim gekozen **berekende** punten.
- Geef in het diagram aan** welke structuur van het (geprotoneerde of gedeprotoneerde) aminozuur aanwezig is.
- Leg uit** waar (en waarom daar) je de pK_a ’s van *leucine* in het diagram terugvindt.

Vraagstuk 22 {4}

Een eiwit bevat oorspronkelijk op positie 187 het aminozuur S.

Mutant 1 bevat 187T en mutant 2 bevat 187R.

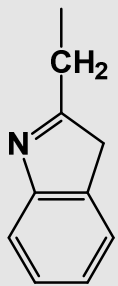
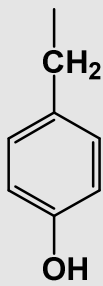
Leg uit welke puntmutatie de grootste verandering in de structuur van het gemuteerde eiwit zal geven.

Vraagstuk 23 {2,2,2,2,2}

- Teken** de Fischerprojectie van een willekeurig ketohexose.
- Leg uit** hoeveel chirale koolstofatomen dat molecuul heeft.
- Leg uit** of je de D- of L-configuratie getekend hebt.
- Teken** een epimeer van deze suiker.

BIJLAGE TOETS BI5b chemie

$ \begin{array}{c} \text{H} \\ \\ \text{H}_2\text{N}-\text{C}-\text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \quad \quad \quad \text{O} \quad \text{OH} \end{array} $			
Alanine	Arginine	Asparagine	Asparaginezuur
$ \begin{array}{c} \\ \text{CH}_3 \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{NH} \\ \\ \text{H}_2\text{N}-\text{C} \\ \\ \text{NH} \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{O}=\text{C}-\text{NH}_2 \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{O}=\text{C}-\text{OH} \end{array} $
Cysteïne	Glutamine	Glutaminezuur	Fenylalanine
$ \begin{array}{c} \\ \text{CH}_2 \\ \\ \text{SH} \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{O}=\text{C}-\text{NH}_2 \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{O}=\text{C}-\text{OH} \end{array} $	$ \begin{array}{c} \\ \text{CH}_2 \\ \\ \text{C}_6\text{H}_5 \end{array} $
Glycine	Histidine	Isoleucine	Leucine
$ \begin{array}{c} \\ \text{H} \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{C}_4\text{H}_3\text{N} \\ \\ \text{HN} \end{array} $	$ \begin{array}{c} \text{H}_3\text{C}-\text{CH} \\ \\ \text{CH}_2 \\ \\ \text{CH}_3 \end{array} $	$ \begin{array}{c} \text{H}_3\text{C}-\text{CH} \\ \\ \text{CH}_3 \end{array} $
Lysine	Methionine	Proline	Serine
$ \begin{array}{c} \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{NH}_2 \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{CH}_2 \\ \\ \text{S} \\ \\ \text{CH}_3 \end{array} $	$ \begin{array}{c} \text{H} \\ \\ \text{HN}-\text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \quad \quad \quad \text{O} \quad \text{OH} \end{array} $	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{OH} \end{array} $
Threonine	Tryptofaan	Tyrosine	Valine

$\begin{array}{c} \\ \text{HO}-\text{CH} \\ \\ \text{CH}_3 \end{array}$			$\begin{array}{c} \\ \text{CH}_2 \\ \\ \text{H}_3\text{C}-\text{CH} \\ \\ \text{CH}_3 \end{array}$
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