

Name: _____ Block: _____ Date: _____ 2019

Carbohydrate Review

Match the following metabolic pathways and hormones to their correct description.

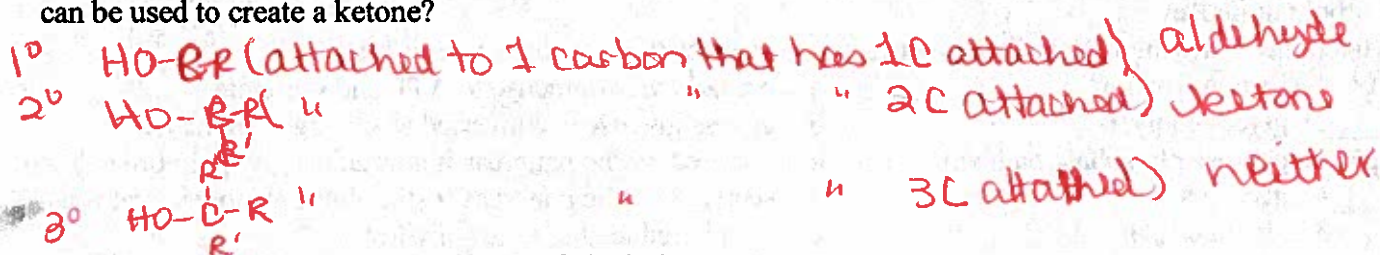
- | | |
|---------------------------------------|--|
| <u>e</u> 1. carbon fixation | a. breakdown of glucose to ATP and pyruvate |
| <u>f</u> 2. glycogenolysis | b. excess glucose is converted to glycogen in the liver |
| <u>h</u> 3. pentose phosphate pathway | c. secreted by the pancreas it stimulates glycogen breakdown |
| <u>a</u> 4. glycolysis | d. secreted by the pancreas it stimulates glycogen synthesis |
| <u>b</u> 5. glycogenesis | e. CO_2 is reduced to a carbohydrate |
| <u>c</u> 6. glucagon | f. glycogen is changed back into glucose |
| <u>g</u> 7. adrenaline | g. secreted by the adrenals it stimulates glycogen breakdown |
| <u>d</u> 8. insulin | h. hexose is converted into a 5 carbon sugar and NADPH |

Complete the following short answer questions.

9. Define the following:

- a. alcohol – a compound containing a hydroxyl as its functional group.
- b. aldehydes – a compound with terminal carbonyl
- c. ketones – a compound with an interior carbonyl as its functional group.
- d. carbohydrates – a polyhydroxyaldehyde or polyhydroxyketose
- e. monosaccharide – a simple sugar, cannot be hydrolyzed to a simpler carb.
- f. disaccharide – two monosaccharides combined w/ glycosidic linkage
- g. oligosaccharide – ~6-10 monosaccharides joined together (polymer)
- h. polysaccharide – polymer containing many monosaccharides joined together
- i. carboxyl group – $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ acid functional group carbonyl = $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-$
- j. hydroxyl group – $\text{R}-\text{OH}$
- k. anomeric carbon – a carbon bonded to one OH, one $-\text{O}-\text{R}'$ the linkage point of a monosacch. (one H and another carbon)
- l. glycosidic bond – the bond from the anomeric carbon of a glycoside to an $-\text{O}-\text{R}'$ group.

10. Describe the difference between 1°, 2°, and 3° alcohols. Which can be used to create an aldehyde, which can be used to create a ketone?



11. List two important physical properties of alcohols.

soluble in H₂O, High BP.

12. Describe how the sweetness changes between mono and disaccharides to polysaccharides.

Sweetness decreases → mono → di → poly

13. List the monosaccharides that bond together to form the following disaccharides.

a. sucrose: glucose + fructose

b. maltose: glucose + glucose

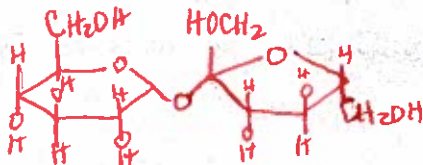
c. lactose: glucose + galactose

14. Using Benedict's reagent is one of the most common testing methods for glucose. Describe how the reaction works and what does a positive result look like.

Cu²⁺ ions in Benedict's Rgt is reduced to Cu⁺ as Cu₂O a red ppt.

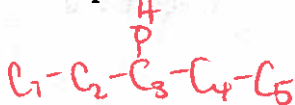
The more ⊕ the result the more brown/red the color

15. Illustrate a disaccharide made from glucose and fructose. Indicate with a bracket where the glycosidic linkage is



Complete the following illustrations.

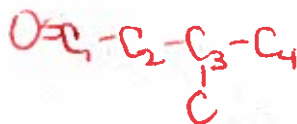
16. 3-pentanol



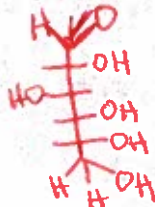
17. cyclohexanone



18. 3-methyl butanal

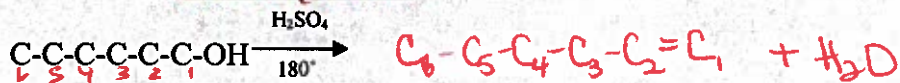


19. glucose (aliphatic)

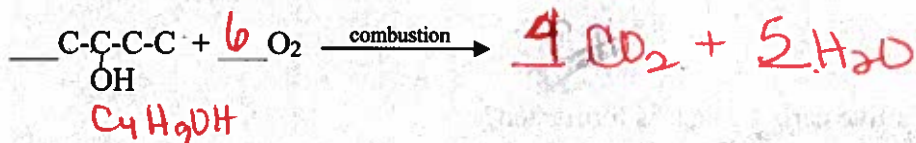


Identify and complete the following reactions.

20. type: Dehydration



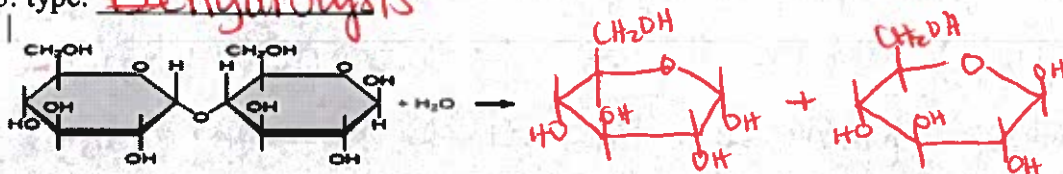
21. type: Combustion



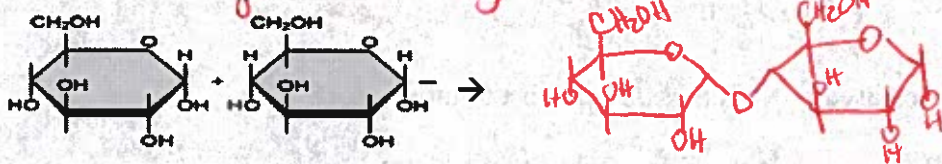
22. type: reduction



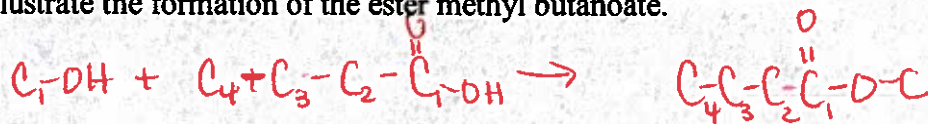
23. type: Hydrolysis



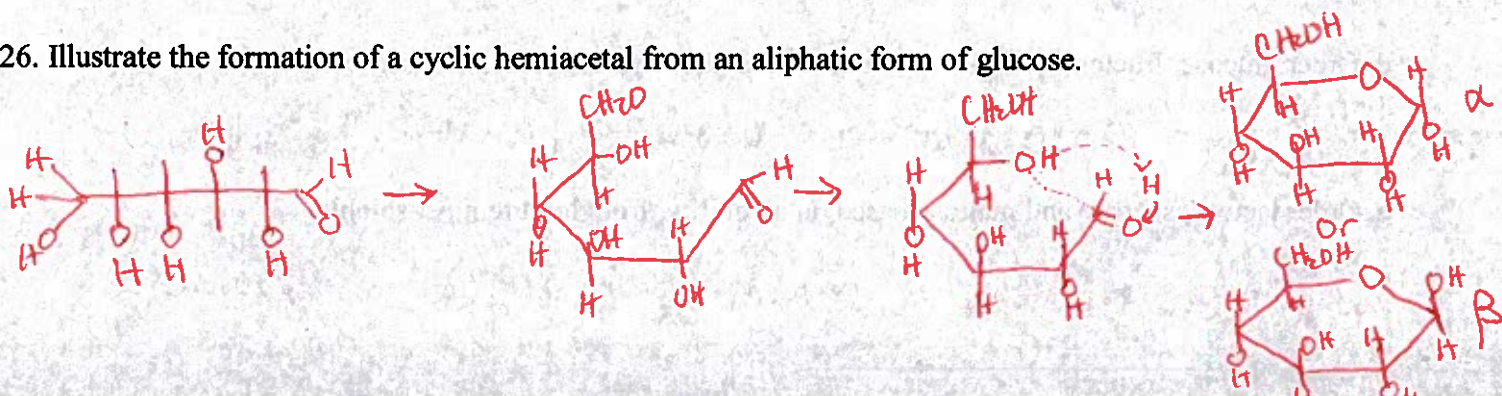
Formation of a glycosidic bond
24. type: Dehydration Synthesis (Condensation)



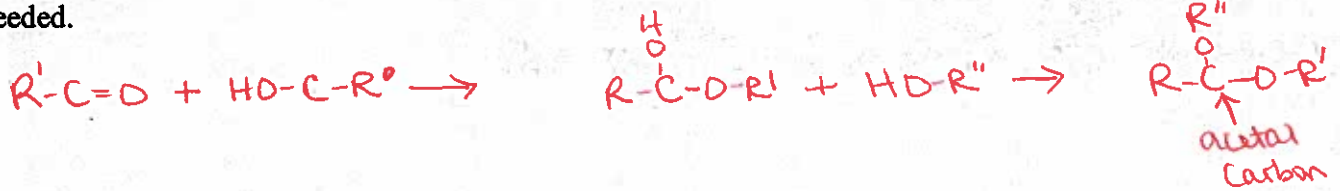
25. Illustrate the formation of the ester methyl butanoate.



26. Illustrate the formation of a cyclic hemiacetal from an aliphatic form of glucose.



27. Illustrate the process of going from an alcohol and an aldehyde coming together to form a hemiacetal and then the addition of another alcohol to form an acetal? Please use "R, R' and R''" to represent the parent chains as needed.



28. What organic product is formed when a five carbon sugar is fermented?

ethanol (+ CO₂ + energy)

29. Describe the reaction process by which monosaccharides are linked together to form a polysaccharide.

Dehydration synthesis, also called formation of a glycoside and condensation, allows the connection of C₁ and ~~carbon~~ carbon of the 2nd molecule (the linkage position varies between aldose + ketose). As the linkage is formed H₂O is released.

30. a. Order glucose, fructose and galactose based on sweetness, from least to most sweet.

least sweet galactose → glucose → fructose most sweet

b. Order lactose, sucrose and maltose based on sweetness, from least to most sweet.

least sweet lactose → maltose → sucrose most sweet

c. Does the order of the disaccharides make sense based on what you know about the monosaccharides?

if you consider they all are half glucose + only focus on the 2nd monosaccharide it matches perfectly.

d. Order glucose, fructose and galactose based on solubility, from least to most soluble.

least soluble galactose → glucose → fructose most soluble

e. Order lactose, sucrose and maltose based on solubility, from least to most soluble.

least soluble lactose → maltose → sucrose most soluble