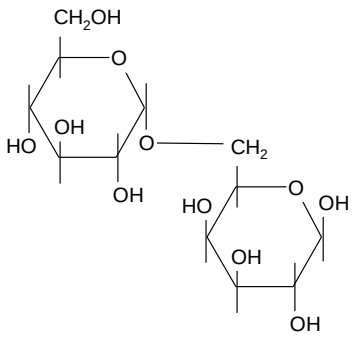
Problem Set 2 Answers

MCDB 108B

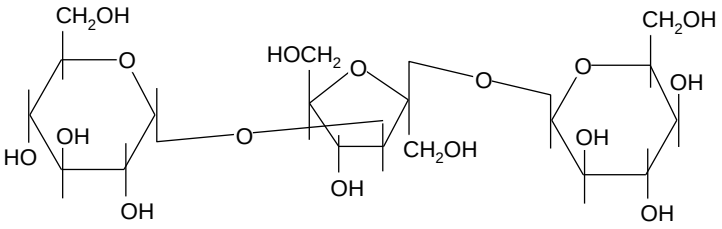
1a.



b.i. Only C2 and C3 are free to be methylated at a branch point glucose. C1,4,6 are linked to other glucosyl residues. C5 is linked to C1, as always. Question: What would be the methylated products corresponding to non-branch point glucosyl residues? How 'bout the single glucosyl residue at the reducing end of glycogen?

b.ii. 10% of glucosyl residues are at branch points.

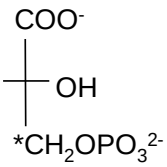
2.



This structure will not reduce Tollen's reagent.

3. The liver glucose transporter has a high K_m (≥20 mM), while that of brain has a low K_m (< 1 mM). This allows the velocity of glucose uptake by liver to respond nearly proportionally to blood glucose concentrations over the physiological range (5-20 mM). Thus the liver acts as an effective glucose "buffer". In contrast, the velocity of the brain glucose transporter will be near maximal at all glucose concentrations above ~5 mM.

4.



5a. False; b. True

6a. F→G→D→A→E→C; b. F→G; c. F→G; d. E→C; e. F→G or G→D

7a-c. Discuss in section

d. P_i – no effect, ADP – no effect, NAD^+ - increased CO_2 production, pyruvate - increased CO_2 production.

8. See lectures on regulation of PFK.

9. See lectures on mechanism of phosphorylation of glyceraldehyde-3P by oxidation.

10. step 1: oxidize primary alcohol at C2 to a ketone by an NAD+ -dependent enzyme (see lectures on biological oxidations involving NAD+/NADH. Step 2: cleavage - see lectures on chemical mechanism of aldolase.