



National  
Qualifications  
2018

**X707/77/11**

**Biology  
Supplementary Sheet**

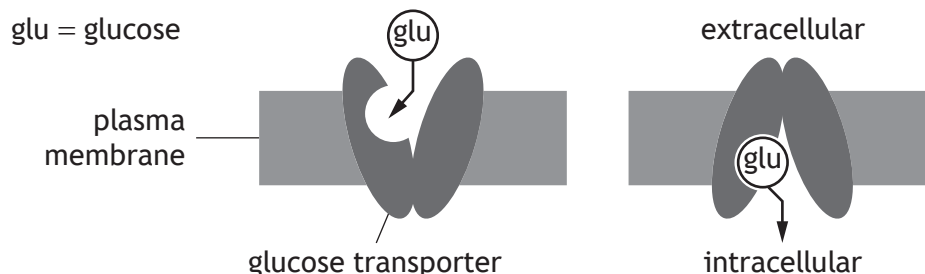
TUESDAY, 15 MAY  
9:00 AM – 11:30 AM

Supplementary sheet for question 1



1. The diffusion of glucose across the plasma membrane of mammalian cells is facilitated by a family of related proteins called GLUT transporters. GLUT transporters have a specific binding site for glucose which alternately faces inside and outside the cell. The orientation of the binding site is brought about by a change in conformation as shown in Figure 1.

Figure 1

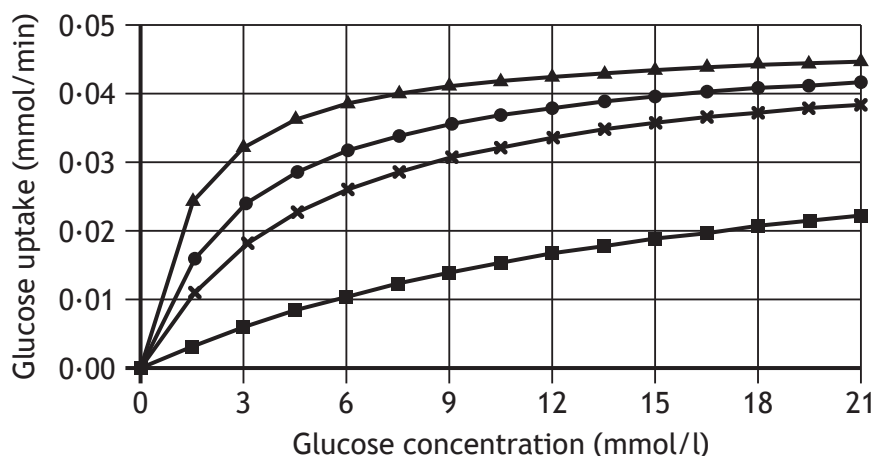


Several studies have measured the changes in rates of glucose uptake by GLUT transporters as the concentration of glucose is increased.

Results for four different GLUT transporters are shown in Figure 2.

For each type of GLUT transporter, the rate of transport levels off to a maximum value that is termed  $V_{max}$ . The glucose concentration at which the rate of transport is half  $V_{max}$  is defined as the  $K_M$  of the transporter.  $K_M$  values for four types of GLUT are shown in Figure 2.

Figure 2



Key

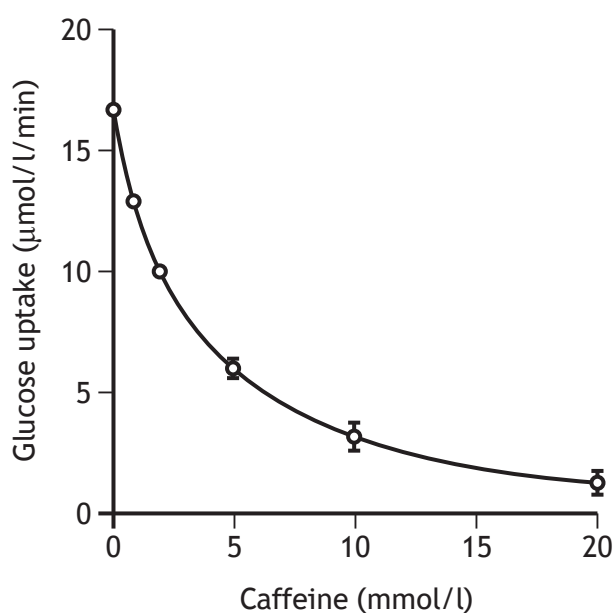
- ▲—▲ GLUT3 ( $K_M = 1.4 \text{ mmol/l}$ ) ●—● GLUT1 ( $K_M = 3.0 \text{ mmol/l}$ )
- ×—× GLUT4 ( $K_M = 5.0 \text{ mmol/l}$ ) ■—■ GLUT2 ( $K_M = 17.0 \text{ mmol/l}$ )

1. (continued)

Studies have suggested that the chemical caffeine is an inhibitor of glucose transport by GLUT1.

Figure 3 shows data obtained from a recent study of the effect of increasing caffeine concentration on the uptake of glucose by GLUT1. The uptake of glucose in these experiments was measured per litre of intracellular fluid.

Figure 3



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