Question 1

ATP and phosphocreatine are energy sources for our muscles. During muscle contraction phosphocreatine [] drops while that of ATP [] remains roughly constant.

1) How do you explain this?
2) When treated with a creatine kinase inhibitor a contracting muscle shows a rapid drop in [ATP] with little effect on [phosphocreatine]. How do you explain this?

Question 2

Patients affected by acute pancreatitis are treated with IV injection of a solution containing glucose and NaCl, while they are asked to avoid proteins in their diet.

1) Can you explain the basis of this treatment?
2) While treated these patients develop hyperglycaemia. Can you explain why?

Question 3

While resting a human being consumes 0.05 L of oxygen in 10 sec. During a 100 m sprint run this consumption raises to 1L in 10 sec. After the run in some minutes the sprinter consumes 4L of oxygen more than he/she would have consumed if in resting conditions.

1) Why during the sprint the consumption of oxygen raises so dramatically?
2) Why the oxygen demand remains high also after the run is over?

Question 4

The half-life of the hormones in the blood is relatively short. Insulin for instance survives in the blood stream for little more than 30 min.

1) What is the importance of having a short half-life for hormones
2) How are the hormone levels are kept constant in the light of their short half-lives
3) How does the organism manages to rapidly increase the circulating [] of an hormone on demand?

Question 5

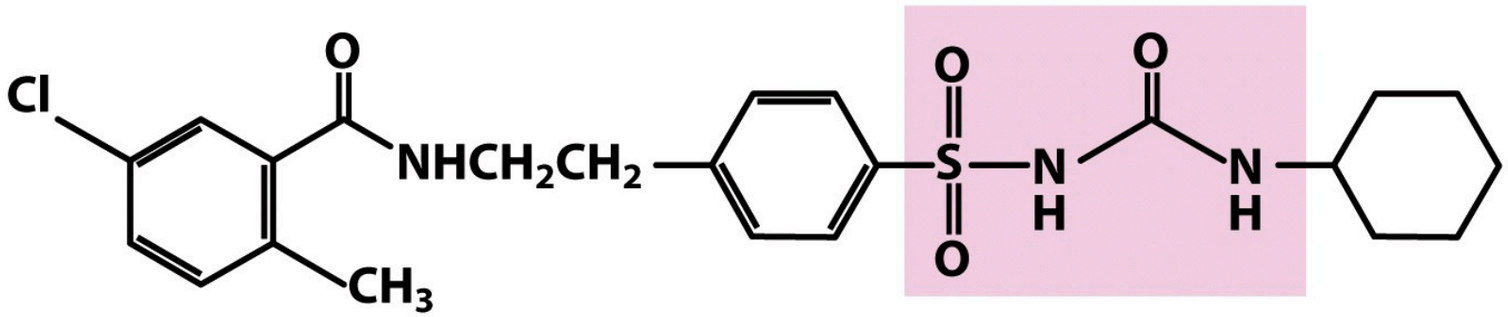
Some pancreatic cancers lead to excessive insulin production/ secretion by beta-cells. Patients affected by these cancers experience tremors, weakness, sweating and hunger. If prolonged this condition can lead to brain damage.

1) what is the effect of excessive insulin secretion on the metabolism of (a) sugars; (b) lipids; (c) amino acids in the liver?
2) what are the causes of the observed symptoms? Why this condition can lead to brain damage?

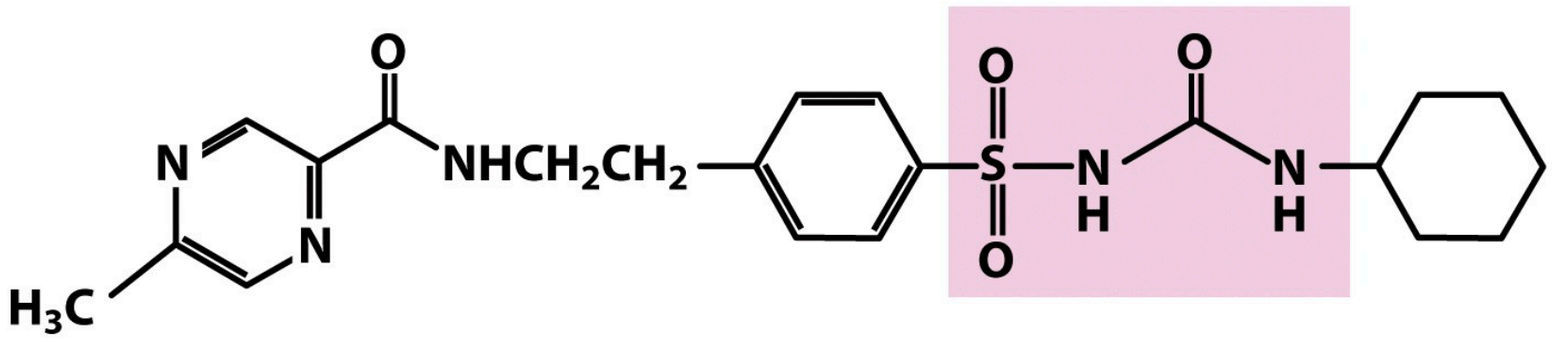
Question 6

Glyburide and Glipizide are molecules that bind to SUR1 leading to the inhibition of the function of KATP channels in pancreatic beta- cells.

Which condition can be treated with these drugs? Explain your answer.



Glyburide



Glipizide