A thin 46 year old with a 7 year history of type 2 diabetes requiring insulin has been having difficulty adjusting glargine insulin to achieve fasting plasma glucose levels consistently less than 130 mg/dl, while trying to avoid overnight episodes of hypoglycemia. He is currently injecting 18 units of glargine at bedtime, and takes repaglinide 2 mg before meals, and metformin 1000 mg daily. He is resistant to going on 2 injections of insulin per day. You discuss with him the potential future option of using an ultra-long acting basal insulin, which might provide 24-hour coverage with one daily injection.

Concerns have been raised regarding ultra long-acting insulin preparations. What is the main determinant of the duration of biologic activity following an injection of insulin?

a) Insulin adsorption from the subcutaneous depot
b) Duration of insulin residence on the insulin receptor
c) Insulin clearance following receptor activation
d) Renal function

An ultra-long acting basal insulin with a duration of biologic action of over 40 hours will necessarily be associated with which of the following?

a) Greater risk of stacking and subsequent hypoglycemia
b) Greater peaks and troughs (variability) over a 24-hour period
c) More effective lowering of A1C
d) More consistent biologic activity over a 24-hour period

Which of the following is used as a “stabilizer” to facilitate formation of hexamers when insulin is in solution (prior to subcutaneous administration)?

a) Phenol
b) Zinc
c) Glycine
d) Ethylene glycol