

Sample Written Exam – Clinical Pharmacology and Toxicology

Question 1

A 70-kg man is seen to ingest 100 mL of 50% ethylene glycol in a self-harm attempt. He arrives at the hospital 30 minutes after ingestion.

a. For EACH of the following laboratory tests, state whether this man's result will be normal, increased or decreased at hospital presentation:

i. serum osmolality:

MODEL ANSWER (0.5 marks)

- Increased

ii. arterial pH:

MODEL ANSWER (0.5 marks)

- Normal

iii. anion gap:

MODEL ANSWER (0.5 marks)

- Normal

iv. serum creatinine:

MODEL ANSWER (0.5 marks)

- Normal

b. Name the **TWO** antidotes that are available to treat this man, and state the mechanism of action of each antidote.

MODEL ANSWER (0.5 marks for each antidote, and 0.5 for the mechanism)

- fomepizole (4MP) and ethanol; they each inhibit alcohol dehydrogenase/prevent bioactivation of EG to toxic metabolite.
- (no marks for hemodialysis)



- c. If both antidotes are available, which antidote would you select for this man? Justify your answer.

MODEL ANSWER

- Fomepizole (0.5 marks)
- For safety, ease of use/dosing, convenience, less behavioural/metabolic toxicity, less use of ICU/intubation, less difficult to transfer pt (0.5 marks for any of these answers)
- Can assign 0.5 marks if state both "ethanol" and "cost" (but not availability)

Reference: Goldfrank's

Question 2

A patient is found to have a 1 mg/L concentration of "arcepsine" (a fictional drug). The drug's half-life is 7 hours and its volume of distribution is 100 L.

- a. What is the clearance rate of this drug for this patient (assume that $\ln(2) = 0.7$)? Provide value and units.

MODEL ANSWER (1 mark)

- Clearance = 10L/h
($k = \ln(2)/T_{1/2} = 0.1/h$ or 0.1-h and Clearance = $kV_d = 10$ L/h)

- b. What is the fractional elimination rate of this drug at this moment? Provide value and units.

MODEL ANSWER (1 mark)

- Fractional elim rate = concentration*clearance = 1 mg/L*10 L/h = 10 mg/h

Question 3

An 85-year-old woman who is receiving donepezil for dementia is brought to hospital with increasing confusion of 5 days' duration. Her other medications are hydrochlorothiazide, ramipril, alendronate, diphenhydramine, simvastatin and omeprazole.

- a. Name the medication on this list that is MOST likely to cause confusion in geriatric patients.

Model Answer (1 mark)

- Diphenhydramine

- b. Her creatine kinase (CK) level on admission is five times the upper limit of normal. Name the medication that is MOST likely responsible for this abnormal laboratory test result.

MODEL ANSWER (1 mark)

- Simvastatin



- c. History reveals that her family administers her medications with grapefruit juice. Name the specific drug-metabolizing enzyme that is inhibited by components of grapefruit juice.

MODEL ANSWER (1 mark)

- CYP3A4 (Cytochrome P450 is not an acceptable answer)

- d. Her potassium level is 5.8 mmol/L. Name the medication that is MOST likely responsible for this abnormal laboratory test result.

MODEL ANSWER (1 mark)

- ramipril