Faculty of Medicine - University of Ruhuna

Third Examination for Medical Degrees (Part II) – March 2026

Pharmacology Paper I

Wednesday 4th March 2026 9.00 am to 11.30 am **Two and half hours for all five (05) questions**

Answer **ALL FIVE** questions.
Answer each part in the given space.

Index Number:

1.

1.1. A 45 year-old male patient with a history of epilepsy has been well controlled on a stable dose of phenytoin for two years. Recently he was diagnosed with pulmonary tuberculosis and started a regimen containing rifampicin. Two weeks later, he presented to the emergency treatment unit with generalized tonic-clonic seizures.

1.1.1. Explain how this drug-drug interaction between phenytoin and rifampicin alters the plasma concentration of phenytoin and leads to the recurrence of seizure. **(20 marks)**

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1.1.2. List **four (04)** factors (excluding the drug interactions) that can reduce the bioavailability of an orally administered drug. **(10 marks)**

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Index Number:

1.1.3. Which type of elimination kinetics does phenytoin exhibit at high doses? **(05 marks)**

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1.2.

1.2.1. Calculate the therapeutic index of a drug with the details given below.

Toxic Dose 50 (TD 50) = 200 mg, Effective Dose 50 (ED 50) = 20 mg **(10 marks)**

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1.2.2. Name **three (03)** drugs with a narrow therapeutic index. **(10 marks)**

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1.2.3. Explain "receptor down-regulation" stating **one (01)** clinical example where this limits the long-term use of a drug. **(15 marks)**

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1.2.4. State **three (03)** mechanisms that tolerance develops for a drug. **(10 marks)**

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Index Number:

1.2.5. State **two (02)** types of antagonists. **(10 marks)**

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1.2.6. State **two (02)** types of agonists. **(10 marks)**

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2.

2.1. A 45 year-old male patient is brought to the Emergency treatment unit, presenting with miosis, bradycardia, profuse salivation, and muscle fasciculations.

2.1.1. State the most likely toxicological agent responsible for this clinical presentation. **(05 marks)**

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2.1.2. State the specific enzyme inhibited by the agent you mentioned in 2.1.1. **(05 marks)**

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2.1.3. Explain why this patient experienced muscle fasciculations. **(20 marks)**

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2.1.4. State the specific antidote required to reverse the muscle fasciculations. **(05 marks)**

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2.1.5. State **one (01)** other antidote indicated in this patient's management. **(05 marks)**

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2.2. A 32 year-old female patient, diagnosed with depression, is prescribed fluoxetine.

2.2.1. State the class of antidepressants to which fluoxetine belongs to. **(05 marks)**

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Index Number:

2.2.2. State **two (02)** other antidepressants classified under the drug class mentioned in 2.2.1. **(10 marks)**

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2.2.3. Describe the mechanism of action of fluoxetine. **(25 marks)**

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2.2.4. What is the fatal condition that can occur if fluoxetine is combined with tramadol or monoamine oxidase inhibitors. **(05 marks)**

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2.2.5. State **three (03)** clinical signs of the condition stated in 2.2.4. **(10 marks)**

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2.2.6. What is the specific drug we administer to treat the condition stated in 2.2.4. **(05 marks)**

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3. A 25 year-old previously healthy female presented with vomiting, epigastric pain and shortness of breath. She is clinically dehydrated.
Her vital signs are as below.
Blood Pressure 100/70 mmHg, Heart Rate 96 bpm, Respiratory Rate 26 breaths/min

The following bedside investigations were performed.
Capillary blood glucose level - 450mg/dL (normal < 140 mg/dL)
pH - 7.2 (7.35 - 7.45)
Venous bicarbonate level - 12 mmol/L (22 - 26 mmol/L)
Serum potassium level - 3.1 mmol/L (3.5 - 5.1 mmol/L)
Urine dipstick - ketone bodies 2+

3.1. What diabetic emergency has this patient developed? **(05 marks)**

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3.2. Write the pharmacological treatment (drug, dose, route of administration) for the following problems in this patient. **(18 marks)**

3.2.1. Dehydration

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3.2.2. Hyperglycemia

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3.2.3. Hypokalemia

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Index Number:

It was decided to discharge this patient with insulin therapy following clinical recovery.

3.3. Write **two (02)** regimens of insulin therapy this patient can be prescribed with the route and the frequency of administration. **(18 marks)**

Insulin regimen	Route of administration	Frequency of insulin administration

3.4. List the types of insulin, included in **one (01)** regimen stated in 3.3 with an example to each. **(12 marks)**

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3.5. Write **two (02)** adverse effects of insulin therapy. **(12 marks)**

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A 55 year-old mother of this patient with diabetes mellitus presented to you with a fasting blood glucose of 220 mg/dL. She has a strong family history of diabetes. She is currently on metformin 1 g two times a day with good adherence to treatment.
You decided to add another antidiabetic drug.

3.6. Write **three (03)** oral antidiabetic drugs you may consider adding to her regimen. **(15 marks)**

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3.7. Describe the mechanism of action of **one (01)** antidiabetic drug stated in 3.6. **(20 marks)**

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4. A 56 year-old male patient with diabetes mellitus and hypertension was admitted with fever, productive cough and shortness of breath for three days. Clinical examination revealed a right lower lobe consolidation. Chest radiograph confirmed the clinical diagnosis of right lobar pneumonia. It was decided to start co-amoxiclav and clarithromycin in this patient. Co-amoxiclav is the combination of amoxicillin and clavulanic acid.

4.1. Write the antibiotic drug class, target of action on the bacteria and the mechanism of action of amoxicillin and clarithromycin. **(30 marks)**

Antibiotic	Drug Class	Target of action on the bacteria	Mechanism of action
Amoxicillin			
Clarithromycin			

4.2. Explain the reason why amoxicillin is combined with clavulanic acid. **(15 marks)**

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Clarithromycin is prescribed empirically to cover atypical bacteria such as *Mycoplasma pneumonae*.

4.3. What is the pharmacological basis of prescribing clarithromycin to act against *Mycoplasma* infection rather than amoxicillin therapy? **(15 marks)**

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4.4. Amoxicillin is a bactericidal antibiotic, whereas clarithromycin is bacteriostatic.

4.4.1. Explain the terms bactericidal and bacteriostatic. **(20 marks)**

4.4.1.1. Bactericidal

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4.4.1.2. Bacteriostatic

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4.5. This patient developed urticaria, lip swelling and hypotension following intravenous administration of co-amoxiclav.

4.5.1. What adverse drug reaction of co-amoxiclav has this patient developed? **(05 marks)**

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4.5.2. What is the type of adverse drug reaction **(from types A to E)** stated in 4.5.1? **(05 marks)**

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4.5.3. Write the drug and the route of administration of the drug that is immediately given to treat the condition stated in 4.5.1. **(10 marks)**

Drug :……

Route of administration :……..

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5.

5.1. A 60 year-old male patient with hypertension presented with acute onset of chest pain for 6 hours. Examination of the patient is normal. Electrocardiogram (ECG) showed ST elevations in the V1–V6 chest leads.

5.1.1. State **three (03)** oral drugs with their loading doses, to start in this patient as the first step of treatment. **(15 marks)**

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5.1.2. Write the definitive pharmacological treatment for this patient with the example drug, route of administration and recommended dose. **(15 marks)**

Name of the drug : ……

Route of administration : ……

Recommended dose : ……

5.1.3. Describe the pharmacological basis of the treatment stated in 5.1.2. **(15 marks)**

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5.1.4. State **three (03)** absolute contraindications to the treatment stated in 5.1.2. **(15 marks)**

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Following the definitive treatment, it was decided to continue an anticoagulant until patient is discharged home.

5.1.5. State the preferred anticoagulant to start in this patient with the route of administration. **(10 marks)**

Name of the anticoagulant : ……

Route of administration : ……

5.2. A 50 year-old female patient was detected to have repeated blood pressure measurements of 160/100 mmHg. She was started on dual antihypertensive therapy.

5.2.1. State **two (02)** antihypertensive drug classes with **one (01)** example to each. **(20 marks)**

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5.2.2. Describe the mechanism of action of **one (01)** drug class stated in 5.2.1. **(10 marks)**

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