UNIVERSITI KUALA LUMPUR
ROYAL COLLEGE OF MEDICINE PERAK

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE	: RPD11902
COURSE NAME	: INTRODUCTION TO PHARMACOLOGY
PROGRAMME NAME	: DIPLOMA IN PHARMACY
DATE	: 01 JULY 2026
TIME	: 9.00 AM – 11.00 AM
DURATION	: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) sections; Section A and Section B.
4. Answer ALL questions in Section A and THREE (3) questions in section B.
5. Please mark/write your answers on the OMR answer script and answer booklet provided.
6. Answer all questions in English language ONLY.

THERE ARE 13 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 25 marks)

INSTRUCTION: Answer ALL questions.

Please use the objective answer sheet provided.

1. Which of the following mineral-based compounds is commonly used as an antacid?
   A. Magnesium sulfate
   B. Aluminium hydroxide
   C. Selenium sulfide
   D. Ferrous sulfate

2. Synthetic drugs are primarily produced through
   A. extraction from plant sources
   B. chemical reactions conducted in laboratories
   C. use of genetically modified cells or microorganisms
   D. chemical modification of natural products

3. Which of the following statements best describes generic drugs?
   A. They are more expensive than brand-name drugs
   B. They contain a new chemical entity
   C. They have the same active ingredient as the original drug
   D. They are produced exclusively by a single manufacturer

4. Which of the following therapeutic effects are commonly associated with marine-derived compounds?
   A. Antidiabetic activity
   B. Anti-inflammatory properties
   C. Broad-spectrum anti-infective action only
   D. Rapid bone fracture regeneration

5. Which statements correctly differentiate semi-synthetic drugs from biosynthetic drugs?
   I. Semi-synthetic drugs require chemical modification
   II. Biosynthetic drugs rely on biological systems for production
   III. Both are entirely synthetic with no biological origin
   IV. Semi-synthetic drugs start from natural drug molecules
   A. I and III
   B. II and IV
   C. I, II and IV
   D. I, III and IV

6. A drug has a strong bitter taste and is unstable in acidic gastric conditions but needs to act in the intestine. Which formulation best meets all these requirements?
   A. Syrup formulation
   B. Enteric-coated tablet
   C. Sublingual tablet
   D. Injectable solution

7. The most significant medicinal plants used for prescription drugs commonly contain
   A. proteins
   B. vitamins
   C. alkaloids
   D. amino acids

8. Secondary metabolites in plants mainly function to
   A. support photosynthesis
   B. provide energy
   C. protect the plant
   D. produce oxygen

9. Artemisinin is mainly used to treat
   A. hypertension
   B. malaria
   C. tuberculosis
   D. diabetes

10. Which alkaloid from opium acts as a potent analgesic?
   A. Codeine
   B. Morphine
   C. Digoxin
   D. Ephedrine

11. Vinblastine and Vincristine are used mainly in the treatment of
   A. diabetes
   B. hypertension
   C. lymphomas
   D. asthma

12. Chamomile is commonly used for
    A. hypertension
    B. stomach discomfort
    C. malaria
    D. cancer

13. The natural source that led to the discovery of Aspirin is
    A. Willow bark
    B. Opium capsule
    C. Ephedra stem
    D. Periwinkle leaves

14. Ginkgo biloba medicinal compounds are mainly obtained from
    A. roots
    B. leaves
    C. seeds
    D. bark

15. Which pair of drug and therapeutic use is correct?
    A. Ephedrine — decongestant
    B. Digoxin — antimalarial
    C. Codeine — antihistamine
    D. Morphine — antihypertensive

16. Identify the correct statement regarding Orphan Drug Act of 1983.
    A. Encourage the development of drugs for critical illness
    B. Encourage the development of drugs for rare diseases
    C. Orphan drugs are granted forever without generic competition
    D. Orphan drugs are granted easier pathway for approval in clinical trials

17. Which of the following describes a Class II recall?
    A. A product that is unlikely to cause any adverse health reaction but violates NPRA labeling or manufacturing laws.
    B. A product that was recalled due to an expiry date misprint.
    C. A dangerous or defective product that could cause serious health problems or death.
    D. A product that might cause a temporary health problem or pose a slight threat of a serious nature.

18. Which of the following best explains why pharmaceutical companies are often reluctant to develop drugs for rare diseases?

A. Existing treatments are already highly effective
B. These conditions lack scientific relevance
C. The potential return on investment is low
D. Regulatory bodies restrict research in this area

19. What is one of the reasons why orphan drug market exclusivity is beneficial for pharmaceutical companies?

A. It enables them to manufacture drugs without FDA oversight
B. It allows them to market the drugs without generic competition
C. It guarantees long-term funding from the government
D. It removes the requirement for clinical trials

20. What is the primary purpose of a Phase 1 clinical trial?

A. To determine the drug's effectiveness in treating a disease
B. To assess the safety and dosage of the drug
C. To compare the new drug with existing treatments
D. To test the drug on a large patient population

21. What must be submitted to the Food Drug Administration (FDA) before starting a clinical trial?

A. A new drug marketing plan
B. An investigational new drug (IND) application
C. A request for patient recruitment
D. A pricing strategy for the drug

22. Select the main objective of Phase 2 clinical trials.

A. Evaluate long-term safety
B. Determine the drug's market potential
C. Assess drug efficacy
D. Study drug interactions

23. What could happen if blinding is not used in a clinical trial?

A. The trial becomes more ethical

B. Data collection is faster

C. Results may be biased

D. More participants will be recruited

24. Usually, the first step in development of drug during pre-clinical study is

A. to find a disease

B. to find a drug target

C. to find a bioassay

D. to find a lead compound

25. Select the advantage of using non-human primate model.

A. Relatively cheap

B. Easy to handle

C. Most closely matching human physiology

D. Have different genetic lines

SECTION B (Total: 75 marks)

INSTRUCTION: This section consists of FOUR (4) short answer question (SAQ).
You are required to answer THREE (3) questions in the answer booklet provided.
Question 1 and Question 2 are COMPULSORY.
Answer either Question 3 OR Question 4.

Question 1

(a) Company S has developed two formulations of Drug M for the management of hypertension.

Based on the plasma drug concentration vs time graph in **Appendix 1**, answer the following questions.

Attach **Appendix 1** with your answer booklet.

i. Define the following pharmacokinetic parameters:

- maximum plasma concentration (C_{max})
- time to reach maximum plasma concentration (T_{max})
- area under the curve (AUC)

(3 marks)

ii. Using the graph for Product 2:

- mark the C_{max} point
- mark the T_{max} point
- shade the area representing the AUC

(3 marks)

iii. State **TWO (2)** differences between Product 1 and Product 2.

(4 marks)

iv. Suggest which product is more suitable for prolonged control of blood pressure. Justify your answer.

(2 marks)

(b) Explain how gastric motility affects drug absorption.

(2 marks)

(c) List **TWO (2)** organs with high blood supply.

(2 marks)

(d) Explain the clinical importance of plasma protein binding.

(3 marks)

(e) Explain the impact of drug action if a drug is highly protein binding.

(2 marks)

(f) A 28-year-old patient with epilepsy is admitted to the hospital after experiencing repeated seizures. The doctor decides to administer a loading dose of Phenytoin to rapidly achieve the therapeutic plasma concentration. Phenytoin has a volume of distribution (Vd) of 40 L, and the desired plasma concentration is 15 mg/L.

Based on the scenario above, answer the following questions:

i. Calculate the loading dose required.

(2 marks)

ii. Interpret the Vd value of Phenytoin.

(2 marks)

Question 2

(a) Name **TWO (2)** main mechanisms of drug action.

(2 marks)

(b) Explain **TWO (2)** differences between therapeutic effects and adverse effects.

(4 marks)

(c) A patient takes a drug that acts as a competitive antagonist.
Explain how this drug affects the action of an agonist drug at the receptor level.

(4 marks)

(d) A patient takes the same dose of sleeping medication every night. After several weeks, the medication becomes less effective.
Explain this situation.

(4 marks)

(e) Two patients receive the same dose of medication. However, one patient experiences a much stronger drug effect than expected compared with the other patient. Predict **TWO (2)** pharmacodynamic reasons that may explain the stronger drug response.

(2 marks)

(f) Two drugs have the following information:

Drug	TD_{50} (mg)	ED_{50}(mg)
C	400	80
D	150	50

i. Calculate the therapeutic index (TI) for Drug C and Drug D.

(2 marks)

ii. Based on your answer in (f) i, describe what the results mean for each drug.

(2 marks)

iii. Identify which drug has a better safety profile.

(1 mark)

(g) Explain how receptor upregulation can affect a patient's response to a drug.

(4 marks)

Answer either Question 3 OR Question 4

Question 3

(a) State **ONE (1)** reaction involved in Phase I drug metabolism.

(1 mark)

(b) Explain **TWO (2)** importance of drug metabolism.

(2 marks)

(c) Describe **TWO (2)** differences between Phase I and Phase II drug metabolism.

(4 marks)

A 28-year-old woman is diagnosed with pulmonary tuberculosis and started on anti-TB therapy consisting of Rifampicin, Isoniazid, Pyrazinamide, and Ethambutol. She is also taking oral contraceptive pills regularly for birth control. After a few weeks of treatment, she experiences breakthrough bleeding.

(d) Based on the scenario above, predict the effect of the drug interaction.
Justify your answer.

(4 marks)

(e) A patient receives drug M with a half-life of 4 hours. The initial plasma concentration is 80 mg/L. If Drug M follows first order kinetic of elimination, calculate the plasma concentration after 12 hours.

(2 marks)

(f) State **ONE (1)** non-renal route of drug excretion.

(1 mark)

(g) Explain why protein-bound drugs are poorly filtered at the glomerulus.

(2 marks)

(h) Explain the process of glomerular filtration in renal drug excretion.

(3 marks)

(i) A patient with an estimated Glomerular Filtration Rate (eGFR) of 53 mL/min/1.73 m^2 is prescribed Drug B.
Predict how this condition affects drug excretion and plasma drug concentration.
(Normal eGFR: 90–120+ mL/min/1.73 m^2; Mildly decreased: 60–89 mL/min/1.73 m^2; Kidney disease risk: <60 mL/min/1.73 m^2)

(3 marks)

(j) A patient with Aspirin toxicity is treated with sodium bicarbonate ($NaHCO_3$).
Explain the rationale for this treatment.

(3 marks)

Question 4

(a) Name **ONE (1)** organ other than the liver that is responsible for drug metabolism.

(1 mark)

(b) Explain how age affects drug metabolism.

(2 marks)

(c) Describe **TWO (2)** differences between zero-order kinetics and first-order kinetics.

(4 marks)

A 65-year-old man with atrial fibrillation has been taking Warfarin regularly for stroke prevention. Recently, he developed epigastric pain and is diagnosed with gastritis. The doctor prescribed Omeprazole for his condition.

(d) Based on the scenario above, predict the effect of the drug interaction.
Justify your answer.

(4 marks)

(e) A patient receives 1000 mg of a drug that follows zero-order kinetics. The drug is eliminated at a rate of 50 mg/hour.
Calculate the amount of drug remaining after 8 hours.

(2 marks)

(f) Explain how urine pH affects drug excretion.

(2 marks)

(g) Describe **TWO (2)** differences between active tubular secretion and passive tubular reabsorption.

(4 marks)

(h) An 80-year-old patient with reduced kidney function has been receiving a renally excreted antibiotic for one week. The patient later develops signs of drug toxicity. Explain why this condition occurs in the patient.

(3 marks)

(i) A patient with a bacterial infection is treated with Penicillin. The doctor also prescribes Probenecid to be taken together with the antibiotic.
Explain how Probenecid affects the excretion of Penicillin.

(3 marks)

END OF EXAMINATION PAPER

Appendix 1