ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2022
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR PHARMACY

Date : October 9, 2022
Total Marks : 100
Writing Time : 150 minutes (2.5 hours)
Reading Time : 15 Minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
   - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
     Part II - 4 Short Answer Questions
     All questions under SECTION A are **COMPULSORY**.
   - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the correct Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **9 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. A genotyping of HLA-B*1502 is beneficial in preventing a severe drug allergy such as SJS (Steven Johnson Syndrome) while initiating:
   a) Allopurinol
   b) Carbamazepine
   c) Abacavir
   d) Warfarin

2. Select the correct order of nephrotoxicity from most toxic to least toxic caused by aminoglycosides antibiotics.
   a) Gentamycin ≥ tobramycin ≥ amikacin ≥ streptomycin
   b) Tobramycin ≥ gentamycin ≥ amikacin ≥ streptomycin
   c) Gentamycin ≥ amikacin ≥ tobramycin ≥ streptomycin
   d) Tobramycin ≥ amikacin ≥ gentamycin ≥ streptomycin

3. Morphine has a highest affinity towards _____ opiate receptor.
   a) Delta
   b) Kappa
   c) Mu
   d) Nicotinic

4. Increased risk of neural tube defects in children born to women living with HIV is associated with a pregnant woman exposed to:
   a) Efavirenz
   b) Tenofovir
   c) Dolutegravir
   d) Lamivudine

5. Which of the following drug possess the highest affinity towards serum albumin?
   a) Phenytoin
   b) Valproic acid
   c) Ceftriaxone
   d) Warfarin

6. The clinical benefit of NAT-2 (n-acetyl transferase-2) genotyping guides the dose selection of:
   a) Isoniazid
   b) Abacavir
   c) Efavirenz
   d) Codeine

7. Use of cotrimoxazole 960mg poq8 hourly in people living with HIV until CD4 cell count is stable over 200 cells/mm^3 is recommended as a prophylaxis against:
   a) PJP (Pneumocystis jiroveci pneumonia)
   b) MAC (Mycobacterium avium complex)
   c) TB (tuberculosis)
   d) Candidiasis

8. A drug of choice for the treatment-resistant schizophrenia is
   a) Aripiprazole
   b) Olanzapine
   c) Quetiapine
   d) Clozapine

9. Carbapenem antibiotics has the widest spectrum of activity including Gram-negatives, Gram-positive and anaerobes **EXCEPT**
   a) MRSA
   b) Pseudomonas aeruginosa
   c) ESBL (extended spectrum beta-lactamase)
   d) Acinetobacter

10. Which of the following is a correct antidote for benzodiazepine toxicity?
    a) Naloxone
    b) Flumazenil
    c) N-acetylcysteine
    d) Atropine

11. A drug of choice for the treatment of staphylococcal endocarditis due to MRSA (Methicillin-Resistant Staphylococcus aureus) is:
    a) Meropenem
    b) Piperacillin/tazobactam
    c) Vancomycin
    d) Gentamycin

12. A second dose of antibiotics as a surgical prophylaxis may be considered in all of the following conditions **EXCEPT**
    a) Operation is prolonged beyond 3 hours (for cephazolin)
    b) Excessive blood loss (≥1500ml) during operation
    c) Significant delay (60 minutes) in starting the operation after initial dose given
    d) Poor surgical technique

13. A drug of choice for the treatment of bipolar disorder is:
    a) Chlorpromazine
    b) Fluoxetine
    c) Quetiapine
    d) Lithium

14. Which of the following antibiotic is contraindicated in neonates (<28days) for the treatment of UTI (urinary tract infection)?
    a) Nitrofurantoin
    b) Ciprofloxacin
    c) Amoxicillin
    d) Gentamicin

15. Therapeutic drug monitoring is recommended for all of the following drugs **EXCEPT**
    a) Tacrolimus
    b) Gabapentin
    c) Vancomycin
    d) Phenytoin

16. As per the FDA, the pregnancy category of valproic acid is:
    a) B
    b) C
    c) D
    d) X

17. Hypokalemia is induced by which of the following drugs?
    a) Furosemide
    b) Hydrochlorothiazide
    c) Digoxin
    d) Losartan

18. Which of the following antihypertensive induces *cough* as an adverse drug reaction?
    a) Metoprolol
    b) Losartan
    c) Amlodipine
    d) Nifedipine

19. All of the following hepatic CYP450 enzymes are involved in metabolism of warfarin **EXCEPT**
    a) CYP1A2
    b) CYP219
    c) CYP2C9
    d) CYP2D6

20. Intravenous thrombolysis with *alteplase* in acute ischemic stroke (AIS) is recommended up to_____after onset.
    a) 2.5 hours
    b) 3 hours
    c) 4.5 hours
    d) 6 hours

21. Inhibition of dihydrofolate reductase, thereby blocking the production of tetrahydro-folic acid from dihydro-folic acid is the mechanism of action of:
    a) Piperacillin/tazobactam
    b) Levofloxacin
    c) Trimethoprim
    d) Sulfamethoxazole

22. Anti-retroviral agent which causes tubular dysfunction is:
    a) Zidovudine
    b) Tenofovir
    c) Lamivudine
    d) Emtricitabine

23. An adverse drug reaction caused by ergotamine + caffeine includes:
    a) Localized edema and itching.
    b) TEN (toxic epidural necrosis).
    c) Hypoglycemia.
    d) Thrombocytopenia.

24. Which one of the following drugs is contraindicated with ceftriaxone use?
    a) Calcium gluconate
    b) Doxycycline
    c) Erythromycin
    d) Ringer lactate solution

25. Among the calcium supplements listed below, which possess is the highest concentration of elemental calcium?
    a) Calcium citrate
    b) Calcium lactate
    c) Calcium gluconate
    d) Calcium carbonate

26. Which of the following is not a pro-drug?
    a) Levodopa
    b) Azathioprine
    c) Diazepam
    d) Linezolid

27. Which of the following drug is a LAMA (Long-Acting Muscarinic Agent) used in the treatment of asthma?
    a) Salmeterol
    b) Budesonide
    c) Tiotropium
    d) Ipratropium

28. A correct combination of "Triple Therapy" recommended for the treatment of H. pylori is:
    a) Amoxycillin 500mg + clarithromycin 500mg + omeprazole 20mg poq12hourly for 14 days.
    b) Amoxycillin 1gram + clarithromycin 250mg + omeprazole 20mg poq12hourly for 14 days.
    c) Amoxycillin 650mg + clarithromycin 500mg + omeprazole 20mg poq12hourly for 14 days.
    d) Amoxycillin 1gram + clarithromycin 500mg + omeprazole 20mg poq12hourly for 14 days

29. Which of the following drug is associated with extrapyramidal symptoms (akathisia, dystonia and muscle stiffness)?
    a) Haloperidol
    b) Fluoxetine
    c) Amitriptyline
    d) Diazepam

30. Among the following benzodiazepines, identify the one with the longest duration of action.
    a) Lorazepam
    b) Alprazolam
    c) Midazolam
    d) Diazepam

PART II – Short Answer Questions [20 marks]

This part has FOUR Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

1. Explain the clinical benefits of levodopa-carbidopa combination.

2. Discuss on three pillars of evidence-based medicine (EBM).

3. Explain the methods involved in safe handling of cytotoxic agents in the hospital.

4. Discuss the clinical significance of half-life ($t_{1/2}$), volume of distribution (v_d) and protein bound of medicine.

SECTION B: Case Study [50 marks]

Choose either CASE I OR CASE II from this section. Each case carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

Mrs. Tshomo, a 60-year-old Bhutanese woman visited a tertiary clinic with a chief complaint of wheezing and dyspnea. She was diagnosed with asthma one year ago and was well controlled with salbutamol MDI 200mcg as required and Beclomethasone dipropionate - hydrofluoroalkane (BDP-HFA) MDI 80mcg twice daily (160mcg/day). She had a severe asthma attack 7 days before her visit to the hospital and persisted for several days. She was previously diagnosed with hypertension and hyperlipidemia. She smokes about 4-5 sticks per day and is an occasional drinker.

Her vitals were; SpO_2, 94%; heart rate, 74bpm; body temperature, 36.6°C; blood pressure, 138/88 mmHg; respiration rate, 25/min. She is currently on following medications;

- Salbutamol 100mcg MDI (2 puffs when required)
- Beclomethasone 80mcg MDI (2 puffs twice daily)
- Hydrochlorothiazide 25mg poq24 hourly
- Losartan 25mg poq12 hourly
- Atorvastatin 20mg poq24 (HS)
- Aspirin 75mg poq24 hourly
- Omeprazole 20mg poq12 hourly

Answer the following questions;

1. What are the risk factors of asthma? **(2 Marks)**
2. Explain the mechanism of action of salbutamol and why it is recommended to be used as and when required in asthma attack? **(2+2 Marks)**
3. What are the differences between BDP-HFA and BDP-CFC? **(3 Marks)**
4. In a pharmacological management goal of asthma, what are seven treatment outcomes of "Complete Control" of asthma? **(7 Marks)**
5. Since Mrs. Tshomo's symptoms were not well controlled by salbutamol MDI and beclomethasone MDI, mention the name of the drug, category and recommended daily dose of metered-dose inhaler as an initial add-on therapy. **(4 Marks)**
6. Discuss the pharmacotherapy of inadequate (poor control after increasing the dose of inhaled steroids to the maximum daily dose) control of asthma? **(4 Marks)**
7. Provide clinical justification on combination of inhaled corticosteroids with long-acting beta agonist? **(3 Marks)**

8. Provide detailed patient education on use of MDI and specify the adverse effect of steroid inhalers? **(3+2 Marks)**
9. What is an exercise induced asthma and mention its preventative treatment? **(2+2 Marks)**
10. What are the specific indications of aspirin and omeprazole for this patient and enlist the CYP450 enzyme involved in metabolism omeprazole? **(2+1 Marks)**
11. Explain why atorvastatin is advised to be taken as HS (at night)? **(2 Marks)**
12. Explain the mechanism of action of losartan and hydrochlorothiazide? **(2+2 Marks)**
13. Discuss the non-pharmacologic management of asthma? **(5 Marks)**

CASE II

A 75-year-old woman admitted at medical ward suddenly develops shortness of breath and hemoptysis. She has a past medical history of type-2 diabetes mellitus (T2DM), for which she takes metformin 500 mg poq8 hourly and glipizide 5mg poq12 hourly. She is also a smoker of 10 cigarettes per day and she had been treated recently for lower limb cellulitis with cloxacillin 500mg poq6 hourly for 5 days. From initial assessment, she is in respiratory distress with SpO2 of 84%, arterial blood gas shows a PaO2 of 6.5kPa and a PaCO of 3.8KPa. Her chest X-ray shows cardiomegaly and there was a tachycardia of 120bpm with poor R wave progression on her ECG. Respiratory distress and hypoxemia necessitate emergent intubation and ventilatory support. She became severely hypotensive post-induction requiring fluid boluses and commencement of peripheral adrenaline infusion. She was thrombolyzed for suspected pulmonary embolus, started on a heparin infusion and transferred to ICU. During her stay at ICU, she received following medications;

- Metformin 500mg po q8 hourly
- Glipizide 5mg po q12 hourly
- Omeprazole 20mg po q12 hourly
- Meropenem 500mg IV q8 hourly
- Adrenaline 0.05mcg/kg/minute IV infusion
- Heparin 12units/kg/hr IV infusion

Her current vitals, laboratory investigation and physical examination reports are as follows;

SpO_2, 83%; BP, 75/55; RR, 27/minute; HR, 55bpm; temperature, 38.3°C; BW, 80kg; height, 155cm.

Total cholesterol	320	<200 mg/dL
Triglycerides	189	<200 mg/dL
HDL	44	>35 mg/dL
LDL	156	<130 mg/dL
AST	18	5 – 40 IU/L
Alkaline phosphatase	10	5 – 40 IU/L
Urea	16	15 – 45 mg/dL
Creatinine	1.4	0.6 – 1.2 mg/dL
Sodium	141	133 – 146mEq/L
Potassium	4.0	3.8 – 5.4 mEq/L
RBC	3.84	3.76 – 4.84 10^6/ul
Hemoglobin	8.5	11.3 – 14.9 g/dL
FBS	148	70 – 110 mg/dL
PPBS	280	120 – 130 mg/dL
HbA1C	8.5	4 – 5.6 %
WBC	11,000	5,000 – 10,000/mm^3
Neut/Gran%	6.5	40 – 60 %

Answer the following questions

1. Define septic shock? **(2 Marks)**
2. Enlist the types of HAI (healthcare associated infections) and explain the risk factor and type of HAI in the above case? **(3+2 Marks)**
3. Discuss the spectrum of activity of cloxacillin and meropenem? **(2+3 Marks)**
4. Discuss on empiric and targeted therapy in the above case? **(2+3 Marks)**
5. What is the indication of adrenaline and calculate the MAP (mean arterial pressure)? **(1+2 Marks)**
6. Calculate the creatinine clearance of the patient using Cockcroft-Gault equation? **(3 Marks)**
7. Comment on the dosing adjustment of meropenem in renal impairment and in above patient? **(2+2 Marks)**
8. Explain the importance of AWaRe (A, access; Wa, watch; Re, reserve) classification of antibiotics with examples? **(5 Marks)**
9. Explain the mechanism of action of metformin and glipizide? **(2+2 Marks)**
10. What is the clinical significance of HbA1C and LDL? **(2+2 Marks)**
11. What are the drivers of antimicrobial resistance and explain the mechanism of resistance against beta-lactam, aminoglycosides, macrolides and fluoroquinolone antibiotics? **(2+8 Marks)**

TASHI DELEK