

**ROYAL CIVIL SERVICE COMMISSION  
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2020  
EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALISATION PAPER FOR PHARMACY**

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<b>Date</b>	: February 27, 2021
<b>Total Marks</b>	: 100
<b>Writing Time</b>	: 150 minutes (2.5 hours)
<b>Reading Time</b>	: 15 Minutes (prior to writing time)

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**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 the 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 on 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 **10 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. Which of the following type of COVID-19 vaccine is produced by Pfizer-BioNTech?
  - a) Live attenuated
  - b) Viral subunit
  - c) Viral vector
  - d) mRNA
  
2. As per the Anatomical Therapeutic Chemical (ATC) system, which of the following code represent antibacterials for systemic use?
  - a) J01
  - b) J02
  - c) J03
  - d) J04
  
3. All the following causes discolouration of urine EXCEPT
  - a) Rifampicin
  - b) Sulfasalazine
  - c) Senna
  - d) Lactulose
  
4. Which of the following DMARDs does not require monitoring of renal function?
  - a) Hydroxychloroquine
  - b) Methotrexate
  - c) Leflunomide
  - d) Sulfasalazine
  
5. All the following about cyclosporine are true, EXCEPT
  - a) It suppresses the cellular and humoral immunity through inhibition of calcineurin.
  - b) It is used to prevent graft rejection in organ transplant recipients.
  - c) It is an inducer of p-glycoprotein.
  - d) It is associated with increased risk for development of lymphomas.
  
6. Which of the following tyrosine kinase inhibitors is NOT used for treatment of Chronic Myeloid Leukemia?
  - a) Dasatinib
  - b) Imatinib
  - c) Lenvatinib
  - d) Nilotinib

7. Which of the following calcium salts provide the highest elemental calcium per gram of salt?
- Calcium carbonate
  - Calcium citrate
  - Calcium gluconate
  - Calcium lactate
8. Which of the following bisphosphonates is suitable for once a month dosing?
- Alendronate
  - Ibandronate
  - Pamidronate
  - Zoledronic acid
9. Which of following form of vitamin A is biologically active?
- Retinol
  - Retinal
  - Retinoic acid
  - Retinyl ester
10. Which of the following retinoid has a role in treatment of psoriasis?
- Acitretin
  - Adapalene
  - Tretinoin
  - Isotretinoin
11. Which of the following antipsychotics is LEAST likely to cause weight gain?
- Olanzapine
  - Quetiapine
  - Risperidone
  - Ziprasidone
12. Fluconazole has activity against all the following species of fungi, EXCEPT
- Aspergillus sp*
  - Blastomyces sp*
  - Candida sp*
  - Histoplasma sp*
13. R-CHOP is a chemotherapy combination used to treat non-Hodgkin's lymphoma. What does the letter 'C' in the abbreviation stands for?
- Carmustine
  - Cisplatin
  - Cyclophosphamide
  - Cytarabine

14. Trastuzumab is a monoclonal antibody used to treat breast cancer. Which receptor does it target?
- a) Estrogen receptor
  - b) Human epidermal growth factor receptor 1
  - c) Human epidermal growth factor receptor 2
  - d) Vascular endothelial growth factor receptor
15. Which of the following agents is used for treatment and prophylaxis of neutropenia in patients undergoing chemotherapy?
- a) ESA
  - b) G-CSF
  - c) NK<sub>1</sub> inhibitor
  - d) TPO-RA
16. Which of the following leukaemias is the gene BCR-ABL implicated?
- a) Acute myeloblastic leukaemia
  - b) Acute lymphoblastic leukaemia
  - c) Chronic myeloid leukaemia
  - d) Chronic lymphocytic leukaemia
17. All the following are indications of GnRH analogues, EXCEPT
- a) Acromegaly
  - b) Endometriosis
  - c) Medical castration
  - d) Uterine fibroid
18. Which of the following about latanoprost is NOT TRUE?
- a) It is a prostaglandin analogue used to treat glaucoma.
  - b) It is commercially available as 0.005% eye drop.
  - c) It requires to be stored at 2 – 8 °C.
  - d) It needs to be administered at least twice a day.
19. What is the maximum daily dose of pioglitazone?
- a) 15mg
  - b) 30mg
  - c) 45mg
  - d) 60mg
20. What type of liver injury is caused by paracetamol?
- a) Fatty liver
  - b) Fibrosis
  - c) Granulomatous hepatitis
  - d) Hepatocellular necrosis

21. If a constant amount of a drug is being eliminated each hour, which type of eliminations kinetics is being followed?
- Zero order
  - First order
  - Second order
  - Non-linear kinetics
22. Which of the following trimesters of pregnancy are NSAIDs not recommended?
- First
  - Second
  - Third
  - None of the above
23. Which of the following equation is used to calculate pH of the pharmaceutical buffer system?
- Arrhenius equation
  - Briggs-Haldane equation
  - Henderson-Hasselbalch equation
  - Michaelis-Menten equation
24. In which type of liquid does the viscosity decrease when agitated?
- Dilatant liquids
  - Newtonian liquids
  - Pseudoplastic liquids
  - Thixotropic liquids
25. Which of the following mill is suitable for micronization?
- Ball mill
  - Cutter mill
  - Fluid energy mill
  - Hammer mill
26. Which of the following test is used for identification of anthraquinone glycoside?
- Keller-Kiliani test
  - Modified Borntrager test
  - Salkowaski test
  - Vanillin hydrochloride test
27. Following are the statements about Kurchi:
- It consist of dried stem bark of *Halarrhena antidysenterica*
  - It is used as stomachic and astringent
  - Conimine is the main chemical constituent
- Which of the above statements about Kurchi are correct?
- I & II
  - I & III
  - II & III
  - I, II & III

28. Following are the botanical names of plants:

- I. *Colchicum autumnale*
- II. *Strychnos nux-vomica*
- III. *Thevetia nerofolia*
- IV. *Vinca rosacea*

Which of the above plants' seeds are the main biological sources of drugs?

- a) I, II & III
  - b) II, III & IV
  - c) I, III & IV
  - d) I, II & IV
29. Abridged registration is applicable to which of the following?
- a) New drug application
  - b) Neutraceuticals
  - c) Products registered with reference regulatory agency
  - d) All of the above
30. Outcomes of which phase of clinical trial is the regulatory approval usually based on?
- a) Phase I
  - b) Phase II
  - c) Phase III
  - d) Phase IV

**PART II – Short Answer Questions [20 marks]**

**This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.**

1. *Immunotherapy is being explored as a therapeutic option for many of the diseases.* Discuss the approach of immunotherapy and its role in treatment of cancers. (5 marks)
2. In the context of drug utilization studies, what does the abbreviation ATC and DDD stand for? What is the main purpose of ATC/DDD methodology in drug utilization studies? How is DDD different from therapeutic dose? (2+2+1 marks)
3. What is Therapeutic Drug Monitoring (TDM)? Which drugs are suitable for monitoring? Describe the roles of pharmacists in TDM. (1+2+2 marks)
4. Describe at least 5 test parameters used for quality control testing of tablets. (5 marks)

**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**

Ms Tshomo is a 42 year old woman with diabetes mellitus who had come to see a physician for routine review. Her laboratory tests revealed a serum creatinine (SCr) of 1.5mg/dl and spot urine albumin-to-creatinine ratio (ACR) of 310mg albumin/gram of creatinine. These values were higher than her baseline of SCr 1.1 mg/dl and ACR of 220 mg/gram a year ago. Her urine analysis also showed 1+ glucose, 3+ protein and (+) ketones.

Her past medical histories other than diabetes mellitus include hypertension for last 5 years and hypercholesterolemia. She is currently on following medications:

- a) Metformin 1g PO twice daily
- b) Glipizide 5mg PO once daily
- c) Hydrochlorothiazide 25mg PO once daily
- d) Atorvastatin 20mg PO once daily
- e) Ferrous sulphate + Folic acid (200mg+ 0.5mg) PO twice daily

Except for occasional dizziness, she had no other complaints. Her blood pressure was 155/89mmHg and her heart sounds were normal. Following are some of the recent laboratory test results:

Haemoglobin	11g/dL	(13.0-18.0)
WBC	$7.8 \times 10^3/\mu\text{L}$	(4.0 – 11 x 10 <sup>3</sup> )
Platelets	$140 \times 10^3/\text{L}$	(150 – 450 x 10 <sup>3</sup> )
Plasma sodium	144mEq/L	(135 -145)
Plasma potassium	4.8mEq/L	(3.5 – 4.5)
Plasma urea	12mg/dL	(15 – 45)
Plasma creatinine	1.5mg/dL	(0.8 – 1.4)
Fasting glucose	131mg/dL	(90-140)
Post-prandial glucose	192mg/dL	(110 - 160)
HbA1C	6.9%	<6.5
T. cholesterol	224mg/dL	<200mg/dL

She was diagnosed as a case of diabetic nephropathy complicated by inadequately controlled co-morbidities.

Answer the following questions:

1. What are the common symptoms of diabetic nephropathy? How does persistent hyperglycaemia lead to nephropathy? (2+3 marks)

2. Using Cockcroft-Gault equation, calculate her creatinine clearance (in mL/min) using the latest SCr value. Discuss whether the Cockcroft-Gault equation and the urine ACR give a fair estimate of the patient's eGFR. (3+2 marks)
3. Going by her estimated eGFR, what stage of chronic kidney disease (CKD) is Ms Tshomo at? (2 marks)
4. What are the other known causes of CKD? (3 marks)
5. What are the goals of pharmacotherapy for her current clinical conditions? (2 marks)
6. What drug therapy issues can you identify for Ms Tshomo? What changes would you recommend in her drug therapy, if any? (3+2 marks)
7. Discuss pharmacotherapeutic alternatives for preventing renal disease progression and at the same time managing her diabetes mellitus, hypertension and dyslipidemia. (5 marks)
8. Taking into consideration her new diagnosis of diabetic nephropathy and the ongoing drug therapy issues, reproduce the revised prescription for Ms Tshomo. (5 marks)
9. Outline the clinical and laboratory parameters necessary to evaluate the outcomes of therapy for her. (2 marks)
10. Should she require insulin therapy, what information should be provided as part of the patient education to ensure treatment success and minimize the adverse effects? (3 marks)
11. SGLT2 inhibitors are being increasingly recommended by the international guidelines for management of diabetes mellitus. What is the evidence of their benefit in patients with CKD? Describe their mechanism of action. (3+2 marks)
12. How is the blood pressure control target for patients with diabetes different from those with hypertension alone? Discuss at least two pharmacological categories of antihypertensives with compelling indication for diabetes. (2+3 marks)
13. Discuss the non-pharmacological interventions Ms Tshomo can consider to improve the outcomes of her current clinical conditions. (3 marks)



**CASE II**

A 45-year-old security guard was found to be HIV positive through voluntary counselling. He was also found to have hepatitis B co-infection. He was initiated on Antiretroviral Therapy (ART) 6 months ago. He is on a fixed-dose combination tablet comprising of three antiretroviral agents (Tenofovir 300mg + Lamivudine 300mg + Dolutegravir 50mg).

He has come to the pharmacy for refill of medication after review by a physician. He looked healthy and has no new issues. His laboratory investigations revealed the following data:

Haemoglobin	15.5g/dL	(13.0-18.0)
WBC	9.2 x 10 <sup>9</sup> /L	(4.0 – 11 x 10 <sup>9</sup> )
Platelets	260 x 10 <sup>9</sup> /L	(150 – 450 x 10 <sup>9</sup> )
Plasma sodium	142mmol/L	(135 -145)
Plasma potassium	4.5mmol/L	(3.5 – 4.5)
Plasma urea	6mmol/L	(3.3 – 6)
Plasma creatinine	1.1mg/dL	(0.8 – 1.4)
Plasma glucose (random)	131mg/dL	(110 - 160)
Alkaline phosphatase	210IU/L	(<140)
Alkaline aminotransferase	60IU/L	(<59)
Bilirubin	62µmol/L	(<59)
CD <sub>4</sub> cell count	420 cells/mm <sup>3</sup>	

Answer the following questions:

1. What are the goals of ART in management of HIV? (2 marks)
2. Which class of the antiretroviral agents form the backbone of combination therapy? Describe how they are combined with other class of antiretroviral agents. (1+2 marks)
3. As per the latest National Guideline for Management of HIV in Adults and Children, initiation of treatment is recommended in all individuals with HIV regardless of CD<sub>4</sub> cell count. What is the rationale behind “treat all policy”? (2 marks)
4. To which pharmacological category does lamivudine belong? Describe in brief its mechanism of action. (1+2 marks)
5. Efavirenz has been replaced by dolutegravir in the fixed dose combination? What are the advantages of dolutegravir over efavirenz? (3 marks)
6. The patient also has Hepatitis B co-infection. Will he require a separate treatment for the co-infection? (2 marks)

7. Give the mechanism of action of dolutegravir. Enlist the adverse effects associated with it.  
(2+2 marks)
8. What are the scenarios in which the use of NRTIs should be discontinued? Which are the other antiretroviral agents that can be used in such scenario? (3+2 marks)
9. What is purpose of pharmacokinetic boosting of Protease Inhibitors? (2 marks)
10. Discuss the drug interaction issues associated with each category of antiretrovirals? (5 marks)
11. What do you understand by the term opportunistic infection? What does opportunistic infection in patients with HIV indicate? (2+3 marks)
12. What is the level of CD<sub>4</sub> count below which prophylaxis for *Pneumocystis jirovecii* pneumonia (PCP) is initiated? Name the drug recommended for PCP prophylaxis and give its dosage regime. (2+3 marks)
13. “Immune Reconstitution Inflammatory Syndrome (IRIS) is seen in some patients after initiation of ART”. Who are the patients most likely to experience IRIS? Why is patient education on IRIS important in ensuring medication adherence? (2+3 marks)
14. Enlist the advantages of fixed-dose combinations over single formulation oral dosage forms.  
(4 marks)

**TASHI DELEK**