

## **WARNING**

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Family Name					
Given Name/s					
Student Number					
Teaching Period	Semester 2, 2018				

<b>PHA312 – Infectious Diseases</b>	<b>DURATION</b>	
	Reading Time:	<b>10 minutes</b>
	Writing Time:	<b>180 minutes</b>
<b>INSTRUCTIONS TO CANDIDATES</b>		
<p>The examination has TWO (A and B) Sections:</p> <p>Section A contains short answer questions: Answer All questions. Total marks allocated: 50 Suggested time allocation: Ninety (90) minutes</p> <p>Section B contains case studies questions: Answer All questions. Total marks allocated: 50 Suggested time allocation: Ninety (90) minutes</p>		
<b>EXAM CONDITIONS</b>		
<p><b><u>You may begin writing from the commencement of the examination session.</u></b> The reading time indicated above is provided as a guide only.</p>		
This is a CLOSED BOOK examination		
Any non-programmable calculator is permitted		
No handwritten notes are permitted		
No dictionaries are permitted		
<b>ADDITIONAL AUTHORISED MATERIALS</b>	<b>EXAMINATION MATERIALS TO BE SUPPLIED</b>	
No additional printed material is permitted	1 x 8 Page Book 1 x 20 Page Book 1 x Scrap Paper Reference Information	

**THIS EXAMINATION IS PRINTED  
DOUBLE-SIDED.**

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**Section A**  
**Short Answer Questions**  
**Answer All Questions**

**Total No of Marks for this Section: 50**

This section should be answered on the 20-page Answer Booklet provided. Please ensure that your name and student number have been written on the completed Answer Booklet.

Marks for each question are indicated. Suggested time allocation for Section A: 90 mins

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**Question 1**

Briefly discuss the mechanisms by which microorganisms develop resistance to any **TWO** of the following antimicrobial agents:

- a. Sulfonamide
- b. Ciprofloxacin
- c. Vancomycin

(Marks 4 + 4 = 8)

**Question 2**

- a. Name **ONE** virus and **ONE** bacterium which are the most common pathogens causing otitis media. List **THREE** indications for which antibiotics treatment should be considered. What antibiotic treatment is recommended if drug-resistance is present?
- b. Name **THREE** conditions in which antibiotic prophylaxis is recommended to prevent infective endocarditis.

(Marks 3 + 3 = 6)

**Question 3**

Prophylaxis may be an appropriate form of therapy in certain situations.

- a. Define what is meant by prophylactic therapy and contrast prophylactic therapy with pre-emptive and empiric therapy.
- b. Discuss the key factors to consider when deciding if prophylactic therapy is appropriate for an individual.
- c. Give **TWO** examples of situations in which prophylactic therapy would be appropriate.

(Marks 3 + 3 + 2 = 8)

#### Question 4

- a. Outline the factors that are important in selecting antimicrobials to treat central nervous system infections.
- b. List **TWO** most common causative organisms for meningitis and describe their pathogenesis (your answer should include mode of infection, risk factors and prognosis).

(Marks 8)

#### Question 5

Briefly discuss the pathogenesis and key management principles of urinary tract infection. (Pathogenesis should include common pathogens, risk factors and prognosis.)

(Marks 6)

#### Question 6

Sepsis resulting from a bacterial infection can be a life-threatening illness.

Describe the key features of bacterial sepsis including a clinical definition, early general symptoms that may help identify cases, most common sources of infection and possible pathogens, pathogenesis, prognosis, and key management principles.

(Marks 8)

#### Question 7

- a. Name **TWO** bacterial species that primarily cause sexually transmitted infections.
- b. For each species, give the full genus and species name of the causative organism, describe the symptoms and possible complications associated with urogenital infection, describe the high incidence population groups, and describe the key management principles. (You can use a table to elaborate your answer).

(Marks 2 + 4 = 6)

## END OF SECTION A

**Section B**  
**Case Study Questions**  
**Answer all questions**

**Total No of Marks for this Section: 50**

This section should be answered in the 20-page Answer Booklet provided.  
Marks for each question are indicated. Suggested time allocation for Section B: 90 mins

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**Case 1**

A 75-year old female presents to hospital upon experiencing influenza-like symptoms and generally feeling unwell for one week. She has non-productive cough and describes pain in her chest. She has a past medical history of hypertension and high cholesterol, diagnosed 20 years ago; she suffered from a mild stroke 2 years ago, which has left her with slurred speech. She also has arthritis in both knees. Her current regular medications include Ramipril, low dose aspirin, atorvastatin, paracetamol and oxycodone. She lives in her own home independently but requires assistance with some activities of daily living such as shopping and cleaning.

On examination, she is found to be moderately dehydrated. Physical examination and chest X-ray (CXR) show evidence of right middle lobe consolidation but the remainder of the chest is clear. Vital signs are as follows:

BP = 118/63  
HR 90 bpm  
RR 18 breath/min  
Temperature 37.4°C  
SatO<sub>2</sub> 87%

Full Blood Count		U/E	
RCC	4.05	Na <sup>+</sup>	134
Platelets	168	K <sup>+</sup>	3.6
WCC	14.2	eGFR	37
Neutrophil	11.90	CRP	280
Lymphocytes	0.65		
Monocytes	0.13		

A sputum sample is collected and sent for MCS testing. Preliminary results indicated a mixed growth and normal oral flora. A second sputum sample was ordered.

She is diagnosed with pneumonia.

**Questions (for case 1)**

**A.** Briefly discuss the severity of her condition with reference to specific parameters.

(Marks 4)

**B.** Describe the pathogenesis of pneumonia in this patient.

(Discussion of pathogenesis should include route of infection, risk factors and pathogens involved.)

(Marks 5)

**C.** What empirical therapy would you recommend for the treatment of this patient? (Your answer should also include the rationale for your recommendation and any specific considerations.)

(Marks 5)

Three days after the initiation of empirical therapy, the symptoms of pneumonia are improving, and the second sputum MCS test finds no growth after 48 hours.

However, the patient develops a sudden onset of painful skin rash on the right side of her chest. She is diagnosed with shingles.

**Questions**

**D.** Discuss the pathogenesis of shingles in this patient.

(Discussion of pathogenesis should include route of infection, risk factors and pathogens involved.)

(Marks: 3)

**E.** Outline the treatment plan you would recommend for managing the shingles.

(Your answer should also include the rationale for your recommendation and any specific considerations.)

(Marks: 3)

**(Total: 20 marks)**

## Case 2

A 33-year old female presents to her GP complaining of pain during urination (dysuria) and lower abdominal pain for 2 days. She has a history of recurrent urinary tract infections. She has type I diabetes diagnosed when she was 15 years old. Her diabetes is well controlled by insulin and lifestyle modifications. She is allergic to penicillin (severe rash and laryngeal oedema develop if she is exposed to chemically related agents.) She cannot recall the date of her last menstrual period; a home pregnancy test done 2 days ago was positive.

On examination, the patient is visibly uncomfortable but afebrile to touch. BP = 134/68, HR 81 bpm.

Urine dipstick test:

Appearance: sample is cloudy

Protein +1

Nitrite positive

pH 7.1

WBC  $10^4$

RBC negative

She is diagnosed with cystitis. Empirical therapy was commenced with cephalexin

### Questions

A. Outline the risk factors for urinary tract infection in this patient. (Marks 5)

B. Outline a management plan (further investigations, treatment and prophylaxis) that you would recommend for this patient. (Marks 5)

C. Discuss the appropriateness of cephalexin given her history of penicillin allergy. What is the risk of cross-reactivity? (Marks 3)

D. What follow up would you suggest for the patient? (Marks 2)

**(Total: 15 marks)**



### Case 3

Mr EB is a Darwin resident, originally from Papua New Guinea (PNG). He has presented with a history of three days of fever, headache, and mild nausea.

A clinical history revealed that Mr EB had returned to Darwin from a trip to PNG 9 months ago. He had originally planned a holiday to Argentina and had been prescribed chloroquine as malaria prophylaxis. At the last minute he had to cancel that trip to return to PNG to visit a sick family member. As he already had the chloroquine, he used it for prophylaxis for his PNG trip.

A peripheral blood sample is taken, and thick and thin blood smears are prepared in the pathology laboratory. As it is a Sunday, a technician views the slide, however a pathologist will not be able to view the slide and prepare a report until the following day. By telephone, the technician reports that she observed malaria parasites at 4 parasites per 1000 red blood cells, with ring and schizont forms with 20 merozoites are visible. She indicates that some of the infected red blood cells are enlarged and deformed.

### Questions

A. What species of malaria is likely responsible for this patient's infection and which of the above information indicates this? How does this rule out other possible species?

(Marks 5)

B. What are appropriate anti-malarial drugs for treatment for this patient, and what stages of the parasite's life cycle do they target?

(Marks 5)

C. What important laboratory test must be carried out before the treatment can be initiated and why?

(Marks 2)

D. Why was the prescribed chloroquine not effective as prophylaxis in this case?

(Marks 3)

**(Total: 15 marks)**

# END OF EXAM

## Reference Ranges

### Urea and electrolytes (U&E)

Na	135.0-145.0 mmol/L
K	3.50-4.50 mmol/L (plasma) 3.8-4.9 mmol/L (serum)
Cl	95-110 mmol/L
Urea	3.8-8.0 mmol/L
Creatinine	60-100 micromol/L
eGFR	> 90 mL/min/1.73 m <sup>2</sup>
Osmolality (serum)	275-295 mOsm/kg
Anion gap	13-17 mEq/L

### Calcium, magnesium and phosphate (CMP)

Ca (total)	2.1-2.6 mmol/L
Ca (ionised)	1.16-1.3 mmol/L
PO <sub>4</sub> <sup>3-</sup>	0.8-1.5 mmol/L
Mg	0.8-1.0 mmol/L

### Arterial blood gas (ABG)

pH	7.35-7.45
pO <sub>2</sub>	80-110 mmHg
pCO <sub>2</sub>	35-45 mmHg
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	22-33 mmol/L

### Liver function test (LFT)

ALT	<30 U/L
AST	<40 U/L

ALP	30-100 U/L
GGT	<30 U/L (female) <50 U/L (male)
Bilirubin (total)	<20 umol/L
Bilirubin (conjugated)	<4.0 umol/L
Albumin	32-45 g/L
Total protein	63-80 g/L
Pancreatic lipase	8 – 78 U/L

### Carbohydrate metabolism

BSL (random)	3.0-7.7 mmol/L
BSL (fasting)	3.0-5.5 mmol/L
HbA1c(non-DM)	4.3-5.7% (NGSP) 23-39 mmol/mol (IFCC)
HbA1c (DM)	therapeutic target <7% *

### Fasting lipid biochemistry

Total cholesterol	<5.5 mmol/L
LDL	2-3.4 mmol/L
HDL	>1 mmol/L
Non-HDL cholesterol	<2.5 mmol/L
Triglyceride (TG)	<1.7 mmol/L

### Full blood examination (FBE)

Hb	140-174 g/L (male) 120-160 g/L (female)
RCC	$4.50-5.50 \times 10^{12}/L$ (male)

	4.0- 5.0 x10 <sup>12</sup> /L (female)
Haematocrit	0.42-0.52 or 42-52 % (male) 0.36-0.48 or 36-48%(female)
MCV	80.0-100.0 fL
RDW	11.5-14.5 %
Platelets	150-450 x10 <sup>9</sup> /L)
WCC	4.0-11.0 (x10 <sup>9</sup> /L)
Neutrophil	40-80% 2.0-7.5 x10 <sup>9</sup> /L
Lymphocytes	20-40% 1.5-4.0 x10 <sup>9</sup> /L
Monocytes	2-10% 0.2-0.8 x10 <sup>9</sup> /L
Eosinophils	1-6% 0.0-0.4 x10 <sup>9</sup> /L
Basophils	<2% 0.0-0.1 x10 <sup>9</sup> /L

### Thyroid function test (TFT)

TSH	0.4-5.0 mU/L
T4 (free)	10-25 pmol/
T3 (free)	3.0-6.5 pmol/L

### Iron Studies

Serum Iron	227mcg/dL	Men 50 to 150mcg/dL Women 35-145mcg/dL
Total Iron Binding Capacity	350 mcg/dL	250-400mcg/dL
Serum Ferritin	4500g/L	Men 20-300ng/L

		Women 20-200ng/L
Transferrin saturation	85%	14-50%

**Others**

Troponin T	<0.01 µg/L
CRP	<3 mg/L
D-dimer	<500 µg/L
BNP	<20 nmol/L