Charles Darwin University

Final Examination

Family Name						
Given Name/s						
Student Number						
Teaching Period	Semester 2, 2017					

PHA312 – Infectious Diseases	DURATION	
	Reading Time:	10 minutes
	Writing Time:	180 minutes

INSTRUCTIONS TO CANDIDATES

The examination has TWO (A and B) Sections:

Section A contains short essay questions: Answer All questions. Total marks allocated: 75
Suggested time allocation: Ninety (90) minutes

Section B contains case studies questions: Answer All questions. Total marks allocated: 75
Suggested time allocation: Ninety (90) minutes

EXAM CONDITIONS

You may begin writing from the commencement of the examination session. The reading time indicated above is provided as a guide only.

This is a CLOSED BOOK examination

Any non-programmable calculator is permitted

No handwritten notes are permitted

No dictionaries are permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
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: 75

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 mode of action, spectrum of antimicrobial activity and any special considerations for use of any THREE of the following antimicrobial agents:

a. Flucloxacillin
b. Doxycycline
c. Gentamycin
d. Aciclovir

(Marks 5 + 5 + 5 = 15)

Question 2

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

a. Sulfonamide
b. Piperacillin
c. Ciprofloxacin
d. Vancomycin

(Marks 5 + 5 + 5 = 15)

Question 3

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

(Marks 10)

Question 4

Outline the factors that are important in selecting antimicrobials to treat central nervous system infections, giving relevant examples.

(Marks 10)

Question 5

a. Briefly discuss the pathogenesis of infectious endocarditis.
b. Suggest a first line empirical regimen for infectious endocarditis, and justify your choice.

(Marks 5 + 5 = 10)

Question 6

a. Briefly discuss the pathogenesis of *Clostridium difficile* Infection (CDI).
b. Outline the approach to the management of this condition.

(Marks 5 + 10 = 15)

END OF SECTION A

Section B
Case Study Questions
Answer all questions
Total No of Marks for this Section: 75

This section should be answered in the Answer Booklet provided.

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

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Case 1

A 68 years old male living on a remote station has been referred, complaining of pain in the right leg associated with a wound oozing pus for 6 months. He was involved in a road traffic accident, in which he sustained an open fracture to the right tibia 6 months ago. He was treated for the fracture in hospital and discharged 3 months ago.

He has a history of type II DM, hypertension and chronic kidney disease.

He has had at least two courses of antibiotics (flucloxacillin) from his local GP.

He is diagnosed with osteomyelitis and samples of pus sent for MCS. He is commenced on empirical antibiotics.

Questions

A. Discuss the pathogenesis of osteomyelitis in this patient.

(Discussion of pathogenesis should include relevant risk factors, pathogens and prognosis of the infection.)

(Marks: 5)

B. Discuss the approach to the management of osteomyelitis with first line empirical therapy.

(Marks: 5)

The pus MCS result has become available:

Organism: Staphylococcus aureus +++

Drug	Susceptibility
Amoxicillin/Clavulanic acid	R
Clindamycin	I
Cephalotin	R
Flucloxacillin	R
Rifampicin	S
Ticarcillin	I
Vancomycin	S

Susceptibilities (S = susceptible; R = resistant; I = intermediate; N = not performed)

The doctor decides to change his antibiotic therapy to IV vancomycin 2 g daily, with a target trough level of 10-15 mcg/mL.

Three days after the initiation of new antibiotic, his pre- and post-vancomycin levels and other test results are:

Date	26/07	22/07	04/03	01/03	18/02
Cr (umol/L)	123	93	98	84	106
eGFR	51	70	66	79	60
ALT		19		22	
Vancomycin (mcg/mL)		18			

C. Taking his condition into consideration and the laboratory findings, what would be your recommendation regarding the vancomycin use in this patient? Justify your recommendation and outline any additional monitoring that may be required.

Patient Height: 162 cm
Patient Weight: 61 kg

(Marks 15)

(Total Marks 25)

Case 2

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
$SatO_2$ 87%

Full Blood Count		U/E	
RCC	4.05	Na	134
Plt	168	K	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

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

(Marks 5)

B. Briefly 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: 5)

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: 5)

(Total: 25 marks)

Case 3

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 10)

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

(Marks 5)

D. What follow up would you suggest for the patient?

(Marks 5)

(Total: 25 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^2
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
$PO4^{3-}$	0.8-1.5 mmol/L
Mg	0.8-1.0 mmol/L

Arterial blood gas (ABG)

pH	7.35-7.45
pO2	80-110 mmHg
pCO2	35-45 mmHg
Bicarbonate (HCO3-)	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 $x10^{12}$/L (male) 4.0- 5.0 $x10^{12}$/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 $x10^{9}$/L)
WCC	4.0-11.0 ($x10^{9}$ /L)
Neutrophil	40-80% 2.0-7.5 $x10^{9}$ /L
Lymphocytes	20-40% 1.5-4.0 $x10^{9}$ /L
Monocytes	2-10% 0.2-0.8 $x10^{9}$/L
Eosinophils	1-6% 0.0-0.4 $x10^{9}$ /L
Basophils	<2% 0.0-0.1 $x10^{9}$ /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