

Sample Written Exam – Infectious Diseases

Question 1

A patient presents with methicillin-resistant *Staphylococcus aureus* (MRSA) pneumonia. The isolate is resistant to trimethoprim-sulfamethoxazole and macrolides. The patient is intolerant to vancomycin. The treatment was changed to daptomycin. After 72 hours of daptomycin therapy, there is a significant clinical deterioration.

- a. What is the **MOST** likely reason for this patient's clinical deterioration?

MODEL ANSWER (1 mark)

- Daptomycin is inactivated by surfactant. It is contraindicated for the treatment of pneumonia.
- b. Name **TWO** other antibiotics that may be used in this patient, assuming the bacteria are susceptible.

MODEL ANSWER (0.5 marks each, 1 mark total)

- Linezolid
- Clindamycin
- Doxycycline
- Telavancin

Do not accept tigecycline, quinupristin/dalfopristin (Synercid®), ceftobiprole, ceftaroline, teichoplanin or fusidic acid.

Question 2

You are asked for your opinion on the performance of a new diagnostic test. You are provided with data from a side-by-side in-house comparison of the new test with a gold standard test in 100 consecutive specimens as follows:

	Gold Standard Positive	Gold Standard Negative
New test positive	40	20
New test negative	10	30

- a. What is the sensitivity of the new test?

MODEL ANSWER (1 mark)

- $40/50 = 80\%$



b. What is the specificity of the new test?

MODEL ANSWER (1 mark)

- $30/50 = 60\%$

c. What is the positive predictive value of the new test?

MODEL ANSWER (1 mark)

- $40/60 = 67\%$

d. What is the negative predictive value of the new test?

MODEL ANSWER (1 mark)

- $30/40 = 75\%$

Question 3

a. Why does the National Advisory Committee on Immunization (NACI) recommend live attenuated influenza vaccine (LAIV) as the preferred influenza vaccine for children aged 2-17 years?

MODEL ANSWER (0.5 marks)

- LAIV is more efficacious in this age group compared to the trivalent inactivated vaccine (TIV). (Can accept: 'more efficacious', or 'better efficacy')

b. What is the route of administration of LAIV?

MODEL ANSWER (0.5 marks)

- Intranasal spray (0.1 mL per nostril) (Do not need to specify dose for full marks.)

c. Why is LAIV **NOT** recommended for use in children less than 24 months of age?

MODEL ANSWER (0.5 marks)

- Risk of wheezing

d. Is a reported egg allergy a contraindication to influenza vaccination?

MODEL ANSWER (0.5 marks)

- No



- e. Other than a history of anaphylaxis to a previous dose of influenza vaccine or its components, list **FOUR** additional contraindications to LAIV in patients aged 2-17 years.

MODEL ANSWER (0.5 marks each, 2 marks total)

- Children with immune compromising conditions
- Pregnancy
- Severe asthma (on oral steroids or active wheezing), or wheezing requiring medical attention in the past 7 days (can accept 'severe asthma')
- Children receiving aspirin or aspirin-containing therapy within the past 4 weeks (can accept 'aspirin therapy')
- Nasal congestion
 - Association with immunosuppressed person (eg family member) not a contraindication but should avoid direct contact for two weeks after vaccination

Question 4

State the **MOST** likely mechanism of resistance in **EACH** of the following susceptibility scenarios:

- a. *Serratia marcescens* resistant to ertapenem, imipenem and meropenem, but susceptible to ceftriaxone

MODEL ANSWER (1 mark)

- *Serratia marcescens* enzyme (SME carbapenemase [0.5 carbapenemase, 0.5 SME]); do not accept class A carbapenemase.

- b. *Pseudomonas aeruginosa* resistant to meropenem, but susceptible to imipenem

MODEL ANSWER (1 mark)

- Change in porin linked to efflux pump (imipenem and meropenem use different porins) (OprM linked to MexAB [i.e. MexAB-OprM] but not OprD (for imipenem))

- c. *Staphylococcus aureus* resistant to daptomycin

MODEL ANSWER (1 mark)

- Thickened cell wall (accumulation of d-ala-d-ala residues)

- d. *Enterococcus gallinarum* resistant to vancomycin, but susceptible to teicoplanin

MODEL ANSWER (1 mark)

- Replacement of the d-ala-d-ala peptidoglycan precursors to d-ala-d-ser which has decreased affinity for vancomycin. (accept: vanC phenotype)

- e. *Enterobacter cloacae* resistant to ertapenem, but susceptible to imipenem and cefepime

MODEL ANSWER (1 mark)

- AmpC hyperproducer with concurrent porin change (requires both!)



Question 5

A 23-year-old man arrived in Canada 1 week ago; he is a government-sponsored refugee from Somalia. He is currently healthy and has had no significant past medical history. He has no recollection of receiving vaccinations in the past.

- a. List **FOUR** latent or subclinical infections that this man should be screened for and state the specific test(s) you would order to determine the presence of **EACH** infection.
 - i. Infection and Test(s) 1:
 - ii. Infection and Test(s) 2:
 - iii. Infection and Test(s) 3:
 - iv. Infection and Test(s) 4:

MODEL ANSWER (1 mark each, 4 marks total)

- Hepatitis B (HBsAg, anti-HBs, anti HBe)
 - Hepatitis C (anti-HCV)
 - HIV (anti-HIV)
 - Tuberculosis - TST or IGRA + CXR
 - Strongyloides (serology)
 - Schistosomiasis (serology)
 - (NOT malaria)
 - (any infection/stool O&P as an answer = 0.5 marks)
- b. List **THREE** vaccinations that are recommended for this man. Assume there are no contraindications.

MODEL ANSWER (0.5 marks each, 1.5 marks total)

- MMR
- Tetanus
- Diphtheria
- Acellular pertussis
- IPV