Short Answer Questions (5 minutes each)

Q1. A 19 year old male presents to the emergency department with an infected wound. A swab of pus was collected for culture. The following results were obtained.

Gram Stain: Leucocytes +++ Red cells ++ Gram-positive cocci ++

Culture:

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<th>Penicillin</th>
<th>Cefoxitin</th>
<th>Cefalothin</th>
<th>Erythromycin</th>
<th>Clindamyacin</th>
<th>Ciprofloxacin</th>
<th>Vancomycin</th>
<th>Rifampicin</th>
<th>Fusidic acid</th>
<th>Tetracycline</th>
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<tr>
<td><em>Staphylococcus aureus</em> 3+</td>
<td>R</td>
<td>R</td>
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a) What is the clinical significance of these results?
b) What is the typical epidemiology of this category of *Staphylococcus aureus* and how does it compare with MRSA that has been traditionally found in hospital settings.
c) Name a toxin associated with this category of *Staphylococcus aureus*.

Q2. Write short notes on

The following media are used for cultivation of faecal pathogens. Describe the colonial morphology and reactions of the following organisms.

a) XLD agar
   - *Salmonella enteritidis*
   - *Salmonella paratyphi A*
   - *Shigella sonnei*

b) Campylobacter agar (Charcoal containing)
   - *Campylobacter jejuni*

c) CIN agar
   - *Yersinia enterocolitica*

d) TCBS agar
   - *Vibrio cholerae*
   - *Vibrio parahaemolyticus*
Q3. *Erysipelothrix rhusiopathiae* is a Gram-positive bacillus often acquired following exposure to animals or animal products.

Briefly discuss the identification of *E. rhusiopathiae* and its differentiation from other Gram-positive rods.

Q4. Discuss the sensitivity testing and reporting of *Streptococcus pneumoniae* by CLSI methods in the following cases.

a. A sputum isolate.

b. A cerebrospinal fluid isolate.

Q5. Briefly discuss the optimum collection for blood culture from a patient with suspected endocarditis. In your answer consider the volume of blood, timing of collection, and the number of blood culture sets collected.

Q6. Compare the set-up of a microscope for light, phase contrast and dark ground microscopy and the use of these techniques in a diagnostic laboratory setting.

Q7. Describe the contents of X and V factors used to differentiate *Haemophilus* species and describe the pitfalls and the likely reactions of this test when identifying haemophilus-like organisms. What other tests may be employed to differentiate *Haemophilus* species.

Q8. What laboratory requirements should be considered when planning to introduce a molecular biology facility into a diagnostic pathology laboratory.

Q9. Your laboratory is reviewing transport media for faecal bacterial culture and parasitology. As this laboratory services all of urban and rural Queensland and the Torres Strait Islands, list the options available and describe the situations in which they would be most effective.

Q10. List the treatment of choice for infections in immunocompetent individuals with the following organisms:

a) *Listeria monocytogenes* septicemia in an adult.

b) *Gardnerella vaginalis* vaginosis.

c) Legionella pneumonia.

d) Pin worm.

e) Rat bite fever.

f) Chlamydial urethritis in an adult male.

g) Salmonella gastroenteritis.

h) *Neisseria meningitidis* carrier state.

i) Cryptococcal meningitis.

j) Q fever.
Essay Questions (20 minutes each)

Q1. Laboratory workers are known to be at risk of laboratory acquired infections. Briefly discuss the classification of microbiology laboratories based on physical containment levels and the practices and procedures to be observed for each level. Give examples of organisms that may be appropriately handled at each level. What precautions should be taken when handling a blood culture suspected of containing *Brucella* species.

Q2. Discuss resistance mechanisms due to $\beta$ lactamases in the family *Enterobacteriaceae*. In your answer consider the classification of these $\beta$ lactamases within the classification schemes of Bush et al and the Ambler system. Discuss the detection and reporting of these $\beta$ lactamase mediated resistance mechanisms in the routine laboratory.

Q3. Chlamydiae cause a range of infection in man. Describe this group of organisms, the diseases they are associated with, the methods for their detection and identification and the treatment of the infections caused.

Q4. Investigation of urinary tract infections is common in diagnostic microbiology laboratories.
   a) Describe the routes of urinary tract infection and the organisms commonly associated with each mode of transmission.
   b) Briefly describe rapid tests employed to identify infectious agents.
   c) What are the common causes of sterile pyuria.

Q5. A 52 year old male Northern Territory farmer/abattoir worker presented at the local general practitioner complaining of intermittent fever and malaise. He had a lesion on his foot and localized cellulitis on his arm. Further clinical investigations showed mild pulmonary symptoms, mild hepatomegaly and lymphadenopathy. Describe the differential diagnoses, the laboratory investigations used to differentiate each causative organism and the expected results for these investigations. How is each potential infective agent in the differential diagnosis treated.