Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(Assay questions) Answer all of the questions.**

**Q1. What is opsonization? (20 Marks)**

**Q2. How does bacteria escape complement system? (20 Marks)**

**Q3. Answer the following by choosing the correct answer: (10 Marks)
1. Which of the following statements about staphylococci is true?**

 a) They typically form chains

 b) They are flagellate and motile

 c) They produce catalase

 d) They lack a gram-positive cell wall structure

**2. What distinguishes Staphylococcus aureus from other staphylococci?**

 a) Production of catalase

 b) Formation of white colonies on blood agar

 c) Ability to produce coagulase

 d) Lack of surface proteins such as Clfs and FnBPs

**3. Which surface protein of Staphylococcus aureus binds to the Fc portion of IgG molecules?**

a) Clumping factors (Clfs)

 b) Fibronectin-binding proteins (FnBPs)

 c) Surface protein A (SpA)

 d) α-toxin

**4. What is the most important laboratory test used to distinguish Staphylococcus aureus from other staphylococci?**

 a) Formation of white colonies on blood agar

 b) Production of catalase

 c) Coagulase production

 d) Presence of surface proteins

**5. Which toxin produced by Staphylococcus aureus is a pore-forming cytotoxin that lyses cytoplasmic membranes?**

 a) α-toxin

 b) β-toxin

 c) δ-toxin

 d) γ-toxin

**Q4. Short answer questions: (50 Marks)**

1. Explain the mechanism of action of Exfoliating Toxin produced by *staph. aureus* bacteria.
2. How are superantigen different from normal antigens?
3. Count Toxin-mediated diseases caused by Staphylococci and mention the role of toxins in these diseases.
4. Count the diagnostic methods used for detection of staphylococci.
5. Why Toxic shock syndrome is more prevalent in women during menstruation, explain?

**BONUS QUESTION:**

**Case study: treatment of a bicycle fall**

A 14-year-old boy presented with a 3-day history of vomiting, diarrhea, sore throat, headache, weakness, and fever. His temperature was 39.9°C. He had pharyngeal inflammation, and his blood pressure was 60/0 mm Hg while supine and unobtainable when sitting. Initial laboratory findings included white blood cell (WBC) count of 13 600L/mL with a pronounced left shift (ie, many immature forms), blood urea nitrogen (BUN) of 24 mg/dL (normal up to 15 mg/dL), and abnormal urinalysis, with 20 to 30 WBCs and 8 to 10 red blood cells (RBC) per

high-power field.

He was treated with large volumes of intravenous fluids and with penicillin; his blood pressure rose, but he had multiple episodes of disorientation, and diffuse erythroderma developed. On admission, a small, crusted wound had been noticed on the dorsum of his left foot (the result of a bicycle injury 1 week earlier); 45 hours later the wound became red, warm, and pustular, and a left femoral lymph node became tender and enlarged. A culture of the pustule grew S aureus coagulase-positive resistant to penicillin. Several cultures of blood and a throat swab taken before antibiotic therapy was started had been negative. He improved with cephalexin therapy. He had extensive desquamation of the skin of the palms and soles 2 weeks after discharge.

**QUESTIONS**

**1**. Which one of the following is most responsible for the nature of the lesion on this boy’s foot?

**A**. Coagulase

**B**. Catalase

**C.** Superantigen toxin (StaphSAg)

**D.** Exfoliatin

**E**. α-Toxin

**2.** The desquamation of the skin is most probably due to the action of:

**A.** Exfoliatin

**B**. Coagulase

**C**. Superantigen toxin (StaphSAg)

**D.** Penicillin

**E**. Fibronectin binding protein (FnBP)

**3.** The blood culture was negative. What is the best explanation for this?

**A**. The penicillin may have caused a false-negative.

**B**. There must have been a problem with the blood collection.

**C**. There must have been an error in the laboratory.

**D**. This is typical in staphylococcal TSS. Only the StaphSAg needs to circulate.