INSTRUCTIONS: Each question is worth one point. Answer the questions on this paper as appropriate: short answer, fill in the blank, true-false, and multiple choice.

1. Select the correct combination of time and speed to be used when preparing a urine specimen for microscopic examination.
   A. at least 5 minutes at 1500 - 2000 RPM
   B. 10 or more minutes at 1800 - 2500 RPM
   C. 5 minutes at full speed
   D. 15 minutes at 1000 - 1200 RPM

2. When evaluating urine sediment under the microscope, you use low power to get an over-all impression. The minimum number of microscopic fields that should be evaluated under low power (lpf) are ________________.

3. Every normal urine will have at least five (5) different elements in it.
   A. True
   B. False

4. What type of epithelial cell is most frequently seen in a urine sediment?

5. List two (2) formed elements which are looked for and quantitated under low power.
   1. 
   2. 

6. List two (2) formed elements which are looked for and quantitated under high power.
   1. 
   2. 

7. What gelatinous-like substance makes up casts? ________________

8. What is the most frequently found cast? ________________

9. State one crystal that can be found in acid (pH < 7.0) urine from a normal patient.

10. State one crystal that can be found in alkaline (pH > 7.0) urine from a normal patient.
Microscopic Urinalysis

Points: Points are awarded for Pre-test, Skills, including general lab requirements, as well as successful and timely completion of Study Questions.

Objectives: According to the standards set by the instructor, the student will be able to perform microscopic examinations of five specimens within ± 20% accuracy.

Equipment & Supplies:
1. Urine specimens
2. Centrifuge tubes racks, marking pencils, Kim-wipes, microscope slides and cover glasses.
3. Centrifuge, AO TS Meter
4. Microscope
5. Color reference pictures of urinary sediment

References:
- Graff, Laurine, A Handbook of Routine Urinalysis, pp. 69-239.

Principle: The formed elements suspended in the urine are concentrated by centrifugation and analyzed under the microscope. Careful interpretation of the findings observed in examination of the urine sediment can provide rather accurate localizing information of pathologic processes in the urinary tract, or on occasion, point to a specific diagnosis of clinical problem.

Normal urine sediment contains a limited number of formed elements including:
- 1-2 RBC
- Few WBC
- Few epithelial cells (squamous epithelial cells are most frequently identified, especially in females)
- Occasional hyaline cast

In performing a microscopic examination of the urine, at least 10-15 fields of vision should be examined and averaged to enumerate each cellular element. This method is only a semiquantitative method, but generally provides enough information to satisfy diagnostic needs.

Procedure: Preparation of Slide for Microscopic Examination
EXERCISE 2: Microscopic Urinalysis

1. Mix urine specimen thoroughly.

2. Pour approximately 10 ml of the urine into a urine centrifuge tube.

3. Centrifuge for at least 5 minutes at 1500-2000 RPM (low speed). Note: make sure the centrifuge is properly balanced.

4. Decant off all supernatant (this can be used for protein tests).

5. Resuspend the sediment by one of the methods demonstrated by the instructor.

6. Using a pipette, place a small drop of sediment onto a clean microscope slide. Coverslip, being careful to avoid bubbles. Or load a Urinalysis Microscopic cartridge. Ex. "Count 10"

*You need to do these steps on your own specimen (SPECIMEN # 5) only; they have been performed for you on the other specimens.

**Examination**

1. Place slide on the mechanical stage of the microscope. Use the low power objective to get the field into focus.

2. Scan the slide under low power to get an “over-all impression.” Then observe 10-15 low power fields, including the coverslip edges and center. Check for casts and mucous threads.

3. Using high power, check another 10-15 fields for epithelial cells, red and white blood cells, crystals, sperm, bacteria, yeast and parasites. Check with available pictures and diagrams to aid in identification.

4. Use the following to aid in quantitation and reporting of urine microscopic sediment. Remember not every urine is going to have every element in it. The vast majority of urines are relatively clean and contain only a couple of elements. Call conservatively.
**Color:** colorless, light yellow, yellow, dark yellow, amber, orange, red, brown, black, blue, or green

clear, slightly hazy, hazy, slightly cloudy, cloudy, turbid (has a thick obvious sediment upon standing), or bloody

**Appearance:**

**Microscopic Elements:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Counted on LPF count</th>
<th>HPF Identify</th>
<th>Rare</th>
<th>Occ</th>
<th>0-2</th>
<th>3-5</th>
<th>6-10</th>
<th>11-20</th>
<th>21-50</th>
<th>51-100</th>
<th>TNTC</th>
<th>Pkd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cast</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBC</td>
<td>**</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epithelial Cells</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crystals</strong></td>
<td>*</td>
<td>**</td>
<td>1+</td>
<td>2+</td>
<td>3+</td>
<td>4+</td>
<td>Pkd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yeast</td>
<td></td>
<td>Enumerated As</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mucous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amorphous</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sperm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichomonas</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC clumps</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epi clumps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When reporting urine crystals you must identify the type of crystal in addition to its enumeration. See textbook or handout for descriptions of acid, alkaline, and pathological crystals.

Note:

Different laboratories may use different criteria when reporting urine sediment. We have chosen to use this system to standardize reporting in our labs. When at a clinical site, you must use the reporting system of that site.

**Urine Standardization Criteria**
**EXERCISE 2: Microscopic Urinalysis**

**Extra Report Sheet**

<table>
<thead>
<tr>
<th>Name &amp; ID #</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucous (LP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casts (LP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epithelial cells (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBC (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crystals (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Instructions:** Use the Urine Standardization Criteria page to quantitate the urine sediments and determine proper reporting style. For example: if you find an average of 4 RBCs in each of 10 or more HPF (high power fields), report it as 3-5 RBCs /hpf.

Items reported under casts, crystals or other must be identified as well as quantitated. For example: 1+ mucous threads, 0-2 hyaline casts /lpf, 2+ CaOx, rare Trichomonas seen.
EXERCISE 2: Microscopic Urinalysis

Urine Microscopic Report Sheet

Name ___________________________ Date ________________

Instructions: Use the Urine Standardization Criteria page to quantitate the urine sediments and determine proper reporting style. For example: if you find an average of 4 RBCs in each of 10 or more HPF (high power fields), report it as 3-5 RBCs /hpf.

Items reported under casts, crystals or other must be identified as well as quantitated. For example: 1+ mucous threads, 0-2 hyaline casts /lpf, 2+ CaOx, rare Trichomonas seen.

<table>
<thead>
<tr>
<th>Microscopic</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name &amp; ID #</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mucous (LP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casts (LP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epithelial cells (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBC (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crystals (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria (HP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Study Questions

Unless otherwise noted, each question is worth one point. Using lecture notes, reading assignments and information presented in this lab, answer the following questions.

1. Describe the appearance of red blood cells in urine.

2. List two structures that are frequently confused with RBC?

3. Describe the appearance of white blood cells in urine.

4. Why is the presence of a few red blood cells in an urine microscopic considered more significant than finding a similar number of WBCs?

5. What type of epithelial cell most frequently seen in a randomly collected urine specimen?

6. Where do these epithelial cells originate?

7. What part of the urinary tract do renal epithelial cells originate?

8. What is the significance of renal epithelial cells?

9. From what substance are casts formed?

10. What three conditions must exist in the kidney tubules before cast formation can occur?
11. What is the significance of cylindroids?

12. What is the most frequently found cast?

13. List at least four (4) conditions in which the cast listed above is found.

(5 pts)
14. Name and briefly describe at least 5 types of casts other than the one listed above.

<table>
<thead>
<tr>
<th>Type of Cast</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. List three normal crystals found in *acid* urine.
   1. ______________________
   2. ______________________
   3. ______________________

16. List three normal crystals found in *alkaline* urine.
   1. ______________________
   2. ______________________
   3. ______________________

17. Name at least three (3) urinary crystals considered to be pathological regardless of the amount or number found.
   1. ______________________
   2. ______________________
   3. ______________________