Case 1

A CBC is ordered on a 32-year old healthy man as part of a life-insurance policy evaluation.

Case 1

What type of “test tube” is used to submit a blood sample for CBC analysis?
CBC w/Diff

<table>
<thead>
<tr>
<th>CBC w/Diff</th>
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<th>Ranges</th>
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</table>
| WBC        | 7.3   | 4.0-10.0 x 10^12/L |*
| Hb          | 15.1  | 12.0-16.0 g/dL    |*
| Hct         | 45.3  | 24.0-34.0 %       |*
| MCV         | 82    | 80-100 fL          |*
| MCH          | 29.3  | 28.0-32.0 pg    |*
| MCHC        | 10.3  | 32.0-36.0 g/dL    |*
| RDW         | 11.5  | 11.0-15.0 %       |*
| Platelet Count | 305 | 150-400 x 10^12/L |*

**Define “automated differential” and summarize how it is performed.**

**Define “manual differential” and summarize how it is performed.**

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**Case 1**

Describe how a peripheral blood smear slide is made.

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**Case 1**

Evaluate and describe the normal peripheral blood smear below. Identify and describe the red blood cells, white blood cells, and platelets.

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Case 1 – Name the type of leukocytes in the images below

Case 1
Normal Bone Marrow Biopsy (Low power).
Summarize the findings and labels

Case 2
A 45-year-old woman from Washington presents to a physician because she is feeling “off” and very tired. On review of systems she reports having an unintentional 10 pound weight loss over the last several months and looser stools. She has been a sushi enthusiast for years.

Vitals: T 97.6 F, Pulse 90, RR 16 , BP 130/80
Physical exam reveals a thin woman. HEENT – pale conjunctiva. She has mild diffuse tenderness to palpation of the abdomen without masses or organomegaly. There is mild decreased vibration sense of the feet bilaterally.

CBC
RBC 3.1 m/l
Hemoglobin 9.1 g/dl
Hematocrit 27.3%
MCV 110 fl
Platelet 130 k/l
Reticulocyte index 1.2%
Case 2
Interpret the laboratory data.

What is the differential diagnosis for these findings?

Case 2
Interpret the peripheral blood smear.

Case 2 – Comment on the RBC size
Case 2

Two days later the patient arrives at the physician's office frantic because she passed the following (which measured 75 cm in length)

What is your diagnosis?

Correlate the clinical with the pathologic findings.

Case 3

A 49-year-old woman with perimenopausal menometrorrhagia is being evaluated by her gynecologist. She has generalized fatigue.

CBC:
- WBC 8500/µL
- Hgb 7.8 g/dL
- Hct 23.5%
- RDW 22.1
- MCV 73 fl
- Platelet count 290,000/µL

Reticulocyte index 1.1%
Case 3

Interpret the laboratory data.

Develop a differential diagnosis for the findings.

Case 3

Compare and contrast the low and high power peripheral blood smears from a healthy patient in A and our patient in B.

Case 3

Interpret the studies.

Iron 12 mcg/dl
TIBC 499 mcg/dl
Ferritin 5ng/ml
Case 3
What is your final diagnosis?
Correlate the pathologic findings with the clinical findings.

Case 4
A 22-year-old African-American man presents with severe pain in several joints and diffuse abdominal pain. He states he is active physically and participates in different sports several times a week. He has had no fevers or chills. Review of systems is negative for any symptoms of infection.

CBC:
- WBC: 13.2x10^3/uL
- Hemoglobin: 7.9g/dL
- Hematocrit: 22.8%
- MCV: 91.4 femtoliters (fL)
- RDW: 24.1
- Platelets: 481,000/uL

Case 4
Compare and contrast the low and high power peripheral blood smears from a healthy patient in A and our patient in B.
Case 4

Describe and explain the morphology of the RBCs

What is your diagnosis?

Define “poikilocytosis” and how it is demonstrated on the smear.

Case 4

Correlate the clinical findings with the disease process.

Case 4

Normal organ in A. Our patient’s organ in B. Compare and contrast the gross morphologic findings. What is the pathogenesis?
Case 4

Patients with this disease process are at risk for infections with what types of micro-organisms?

Case 5

A 5-year old presents to the ED with fever and bloody diarrhea. He has recently been at a picnic, where they served rare hamburgers.

Vitals: T 102.1 F, pulse 150, BP 90/42, RR 40

Physical exam reveals a fatigued child with pallor, abdominal tenderness, and petechiae.

The CBC demonstrates RBC, hemoglobin and hematocrit <5\textsuperscript{th} percentile for age; platelets 50,000. Creatinine is 2.6mg/ml

Case 5

Compare and contrast the low and high power peripheral blood smears from a healthy patient in A and our patient in B.
Case 5
Describe the organisms seen on gram stain from patient’s stool culture.

Case 5
What is your diagnosis?
Correlate the clinical and histologic findings.

Case 6
A 5-year old child, who lives in an old home in Chicago, presents to an urgent care clinic with irritability, poor appetite, weight loss, abdominal pain and reduced attention span.
Vital signs: T 98.6 F, BP 110/79, RR 50, Pulse 150.
Physical exam demonstrates an irritable, thin child with mild diffuse abdominal pain to palpation.
Laboratory evaluation reveals a hypoproliferative microcytic anemia.
Case 6 – Peripheral Blood Smear
Describe the pathologic changes seen below.

Case 6 - Radiology
Compare and contrast the knee X-rays from a healthy patient in A and our patient in B.

Case 6
What is your diagnosis?
Correlate the clinical with the pathologic findings.