Bilirubin - <1 mg/dL (jaundice occurs if it is 2.5 or greater) - byproduct of RBC breakdown

PT – 11-12.5 seconds – measures clotting ability; cirrhosis causes deficiency of clotting factors, so this prolongs PT. **(>46 is critical)**

INR – 0.8-1.1 (2-3 if anti coagulated) – used to measure accuracy of PT **(>5 is critical)**

AST (sensitive to heart and liver) – 0-35 units/L – when the liver is diseased or damaged, AST is released into the blood stream within 6-10 hours and lasts about 4 days. The amount directly relates to degree of tissue damage. **ALT** (sensitive to liver, kidneys, heart, pancreas and muscles) – 4-36 units/L – measured to see if liver is damaged or diseased. ****AST/ALT often above 10,000 in acetaminophen OD**

Glucose – 74-106 mg/dL - Serum glucose levels may be **dangerously low**. This decrease results from impairments in glycogen release. The liver stores glucose for when your body needs it later, so if the liver is in failure, it does not release glucose but the pancreas continues to secrete insulin, therefore blood glucose levels decrease.

WBC – 5-10/mm3 (5,000-10,000) – elevates in **ACUTE** liver injury such as infection, trauma, stress or inflammation; decreases in **splenomegaly (CHRONIC FAILURE/CIRRHOSIS)** - as the spleen retains WBC's and platelets, making the patient more susceptible to infection/bleeding (especially meningitis and pneumonia), **less than 2 is considered critically low, greater than 40 is considered critically high.**

CMP – electrolyte imbalances occur frequently, especially if hepatorenal syndrome is present especially with the use of diuretics; **hypokalemia** – 3.5-5.0 mEq/L (lost through kidneys)
and **hypomagnesemia** 1.3-2.1 mEq/L (follows potassium; occurs in renal impairment); **hyponatremia** – 135-145mEq/L – results from kidney impairment, the body is unable to release free water, so the sodium in the body becomes diluted, resulting in a low serum sodium level.

Platelets – 150-400/mm3 – **less than 50 or greater than 1 million are considered critical values – if count falls below 20, serious danger of bleeding is present**, petechiae and ecchymosis are often present – The spleen stores platelets and WBC's so sequestration occurs with hypersplenism which can occur in liver failure but mostly occurs with cirrhosis.

Ammonia – 10-80 mcg/dL– byproduct of protein metabolism in the gut, buildup results in hepatic encephalopathy

Lactic Acid –0.6-2.2 mmol/L – normally glucose is metabolized into CO2 and H20 for energy – when oxygen to the tissues is diminished, anaerobic metabolism of glucose occurs and lactate is formed instead of CO2 and H20 – when the liver fails, it fails to excrete lactate and further compounds the problem of lactate build up = lactic acidosis = tissue hypoxia.

Creatinine – 0.5-1.21 mg/dL – **greater than 4 indicates severe renal impairment**

Alkaline Phosphatase – 30-120 units/L – greatly increased in cirrhosis; hepatic tumors, hepatotoxic drugs and hepatitis cause lesser elevations; very sensitive to metastatic cancer to the liver

Hgb – 12-18 g/dL – reflects number of RBC's in the blood and is the transporter of O2 and CO2; decreased in anemia/bleeding; **less than 7** indicates need for transfusion, is considered critical

Hct – 0.42-0.52 in males and 0.37-0.47 in females – 3X's the hgb concentration; percentage of total blood volume made up of RBC's; decreased in anemia/bleeding; **less than 21% is considered critical**