Laboratory test results are dependent on the quality of the specimen submitted. This reference manual presents instructions for proper submission of specimens which assure specimen stability. It is essential that these instructions be followed exactly to assure delivery of a specimen that is adequate for testing. This enables the laboratory to report reliable results back to you. Please be sure to submit the quantity of sample designated in the specimen requirements.

Piedmont Medical Laboratory (PML) depends upon your care, skill, and knowledge when preparing the patient and the specimen for testing. If there is any doubt regarding the type of specimen that should be collected, it is imperative that you call PML Customer Service to clarify the order and specimen requirements.

Irretrievable Specimens
When submitting specimens which cannot easily be replaced, PML encourages the use of our Irretrievable Specimen Protocol which provides a mechanism for tracking the specimen from pickup at the physician’s office to delivery to the testing department at our laboratory. To obtain materials, information or to arrange for pickup of this type of specimen, please contact Customer Service at 540-536-5500 or 800-786-9259.

Blood Collection
Most laboratory tests are performed on anticoagulated whole blood, plasma, or serum. The laboratory has established standards for specimen integrity to provide optimal reliability of patient test results. Prior to specimen collection, review the specimen requirements in this reference manual. Note the proper specimen to be collected, the collection procedures, and handling required. In general, specimens should be refrigerated until placed in the courier box for transport to the laboratory. Please contact PML with any questions or concerns prior to specimen collection.

Collection of a blood specimen is obtained by using the usual venipuncture technique. New gloves must be worn for each and every venipuncture procedure.

Apply a tourniquet to the patient’s extended arm and select the best vein. Swab the site with an alcohol prep pad (sterile alcohol 70%). “Fix” the vein in position; and with the needle at an acute angle, quickly penetrate the skin and vein. Puncture the tube stopper by pushing the tube forward. This initiates the vacuum suction.

The tourniquet should be released as soon as possible. Never leave the tourniquet on for more than 60 seconds. Otherwise, hemoconcentration will occur. Values for tests such as cholesterol, proteins, and hematology assays increase significantly from 3 to 5 minutes of tourniquet application.

Allow the tube to fill until the vacuum is exhausted before withdrawing the tube from the holder. If only a single collection tube is required, remove the entire assembly from the arm when the vacuum is exhausted. Place a dry, sterile gauze pad over the venipuncture site; and carefully withdraw the needle.

- **Plasma**: Draw a sufficient amount of blood with indicated anticoagulant to yield necessary plasma volume. Gently mix blood collection tube by inverting 6 to 10 times immediately after draw. If required, separate plasma from cells by centrifugation within 15 to 20 minutes.

- **Serum**: Draw a sufficient amount of blood to yield necessary serum volume. Allow blood to clot at ambient temperature, and then, separate serum from clot by centrifugation within 15 to 20 minutes. Caution: avoid hemolysis by over-centrifugation, not allowing blood to clot, or improper venipuncture.

- **Whole Blood**: Draw a sufficient amount of blood with indicated anticoagulant. Gently mix blood collection tube by inverting 6 to 10 times immediately after draw.

When multiple specimens are required, follow the proper order of draw. Sterile blood culture specimens are drawn first, followed by specimens that require no preservatives (serum separator tubes), then coagulation studies (light blue-top tubes), and finally specimens with additives (eg, green- and lavender-top tubes). Mix all tubes containing additives as soon as each is filled.

ALL SPECIMENS SUBMITTED TO THE LABORATORY MUST BE PROPERLY IDENTIFIED BY INDICATING THE PATIENT’S COMPLETE NAME OR IDENTIFICATION CODE ON EVERY SPECIMEN TUBE, SLIDE, OR CONTAINER SUBMITTED.
Number which provides unique patient identification.
Place the requisition form and specimens, FROM A SINGLE PATIENT, in an individual plastic specimen bag for courier pickup and transport to Piedmont Medical Laboratory (PML). To facilitate handling and to eliminate possible confusion between specimens, please do not combine different patient’s specimens in the same specimen bag.

Specimen Collection Tubes Available
The following is a list of tubes referred to in specimen requirements:

- **Green-Top Tube (Sodium Heparin):** This tube contains sodium heparin—used for collection of heparinized plasma or whole blood for special tests.
  
  **Note:** After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.

- **Grey-Top Tube (Potassium Oxalate/Sodium Fluoride):** This tube contains potassium oxalate as an anticoagulant and sodium fluoride as a preservative—used to preserve glucose in whole blood and for some special chemistry tests.
  
  **Note:** After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.

- **Lavender-Top Tube (EDTA):** This tube contains EDTA as an anticoagulant—used for most hematological procedures.
  
  **Note:** After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.

- **Light Blue-Top Tube (Sodium Citrate 3.2%):** This tube contains sodium citrate as an anticoagulant—used for drawing blood for coagulation studies.
  
  **Note:** It is imperative that tube be completely filled. Ratio of blood to anticoagulant is critical for valid prothrombin time results. Immediately after draw, invert tube 6 to 10 times in order to activate anticoagulant.

- **Light Green-Top Tube (Lithium Heparin):** This tube contains lithium heparin and plasma gel separator—used for collection of heparinized plasma or whole blood for chemistry tests.
  
  **Note:** After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.

- **Pink-Top, 7.0-mL Tube (EDTA):** This tube contains EDTA as an anticoagulant—used for most Blood Bank procedures. Tube must be full.

- **Red-Top Tube:** This tube is a plain VACUTAINER® containing no anticoagulant—used for collection of serum for selected chemistry tests as well as clotted blood for immunohematology and therapeutic drug monitoring. When a test is designated “to be drawn in a plain, red-top tube,” a serum gel tube should not be substituted. The gel barrier in the serum gel tube may interfere with the analysis.

- **Royal Blue-Top Tube:** There are 2 types of royal blue-top Monoject® tubes—1 with the anticoagulant EDTA and the other plain. These are used in drawing whole blood or serum for trace element analysis. Refer to individual metals in individual test listings to determine tube type necessary.

- **Serum Separator Tube:** This tube contains a clot activator and serum gel separator—used for various laboratory tests. See next page for “Serum Gel Tube Troubleshooting Guide.”
  
  **Note:** Invert tube to activate clotting; let stand for 15 to 20 minutes before centrifuging for 10 minutes. If frozen serum is required, pour off serum into plastic vial and freeze. Do not freeze VACUTAINER(S)®.

- **Special Collection Tubes:** Some tests require specific tubes for proper analysis. Please contact PML prior to patient draw to obtain correct tubes for metal analysis or other tests as identified in individual test listings.

- **Yellow-Top Tube (ACD):** This tube contains ACD—used for drawing whole blood for special tests.
## Serum Gel Tube Troubleshooting Guide

### Symptoms affecting test quality (if correct technique is not used):

<table>
<thead>
<tr>
<th>Poorly Sealed Barrier Containing Red Cells</th>
<th>No Gel Flow</th>
<th>Partial Gel Flow</th>
<th>Tube Breakage in Centrifuge</th>
<th>Red Cells on Top of Barrier</th>
<th>Fibrin in Serum</th>
<th>Correct Technique and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>After drawing specimen, invert tube gently 5 to 6 times. This allows clot activator to mix properly. Vigorous inversion may damage red cells and promote leakage of cell constituents into the serum.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>Allow tube to clot for 30 minutes in a vertical position. This ensures complete clot formation for specimens. An incomplete clot will allow latent fibrin to contaminate the serum and inhibit flow of gel.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>Centrifuge for 10 to 15 minutes (after 30-minute clotting time). This is needed to provide complete barrier formation.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>Check centrifuge sleeves for debris and remove if detected. This may cause the tube to break.</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Centrifuge sleeves should be balanced to assure proper performance. Place an equivalent size tube filled to the same level in the sleeve opposite the patient’s specimen.</td>
</tr>
</tbody>
</table>