**TRAINING UPDATE**

| | | | |
|---|---|---|---|
| **Lab Location:** | GEC, SGMC & WAH | **Date Distributed:** | 8/3/2015 |
| **Department:** | Core & Processing | **Due Date:** | 8/31/2015 |
| | | **Implementation:** | **9/1/2015** |

**DESCRIPTION OF PROCEDURE REVISION**

**Name of procedure:**

## Hemolysis, Icteria and Lipemia Interference
## GEC.L04, SGAH / WAH.L05 v3

## HIL Index Alert Values AG.F247.1

**Description of change(s):**

Section 5: refer to related documents in step 7
Section 6: updated SOP list, moved HIL Index from section 9 and updated

This revised SOP will be implemented on September 1, 2015

Document your compliance with this training update by taking the quiz in the MTS system.

**Approved draft for training (version 3)**

Non-Technical SOP

| | | |
|---|---|---|
| **Title** | **Hemolysis, Icteria and Lipemia Interference** | |
| **Prepared by** | Hannah Tran | Date: 12/8/2008 |
| **Owner** | Robert SanLuis | Date: 4/1/2013 |

| **Laboratory Approval** | | |
|---|---|---|
| **Print Name and Title** | **Signature** | **Date** |
| *Refer to the electronic signature page for approval and approval dates.* | | |
| | | |
| | | |
| Local Issue Date: | Local Effective Date: | |

| **Review:** | | |
|---|---|---|
| **Print Name** | **Signature** | **Date** |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Form revised 3/31/00

## TABLE OF CONTENTS



## 1. PURPOSE

The presence of hemolysis, icteria and lipemia in serum or plasma may lead to erroneous laboratory test results. This procedure outlines how specimens, which have visible hemolysis, icteria or lipemia or which have been measured for hemolysis, icteria or lipemia by the Siemens Dimension System, should be handled in this laboratory.

## 2. SCOPE

Applies to all test procedures.

## 3. RESPONSIBILITY

All specimen processing and technical staff must be competent in identifying hemolyzed, icteric and lipemic samples and follow appropriate procedures.

## 4. DEFINITIONS

Hemolysis – alteration or destruction of red blood cells in such a manner that hemoglobin is liberated into the medium in which the cells are suspended

Hemolysis Grading System (see Appendix A)

| | |
|---|---|
| Slight: | ≈ 100 mg/dL hemoglobin |
| Moderate**:** | ≈ 200 mg/dL hemoglobin |
| Gross: | ≈ or > 500 mg/dL hemoglobin |

Icteria – The yellow greenish color of the serum or plasma cause by bilirubin, a byproduct of old red cells.

Lipemia – Is manifested by a milky appearance of the serum or plasma caused by an excess of lipids in the blood.

Form revised 3/31/00

## 5. PROCEDURE

Handling visible hemolysis:

1. Remove the specimen from the centrifuge. Make a visual assessment of the specimen's integrity, before testing.

2. If the plasma or serum portion of the specimen has an obvious pink to reddish appearance, compare it to the Hemolysis chart (Appendix A) to estimate the degree of hemolysis. Borderline readings should be reported to the next higher category.

3. If the hemolysis is slight (~100-200 mg/dL) the specimen should be given to the technical staff for testing in all the departments.

4. If moderate or gross hemolysis is observed, the specimen should be handled in the following manner
   Moderate - All coagulation specimens must be recollected
   - Chemistry specimens should be given to the department for testing.
   Gross - All specimens should be recollected

   **Note**: The Dimension chemistry system will calculate the HIL and Auto-verification rules in Data Innovation (Instrument Manager will flag appropriate action).

5. The staff member handling the sample will query the computer system to determine if other blood specimens have been drawn on the patient at the same time. Each specimen drawn will be located and examined for hemolysis. If moderate (for coagulation only) or gross hemolysis exists in any of the primary tubes, these must also be recollected.
   **Note**: *Staff should exercise due diligence in determining if an alternate, acceptable specimen, might be available for testing before requesting recollection. For example: a green top tube might have been drawn in addition to a red top tube and could be an acceptable alternative for various chemistry assays.*

   <u>For nurse-collected specimens</u>:
   a) Notify the nurse that the specimen is being canceled due to hemolysis.
   b) Nursing needs to reorder for a re-draw.

   <u>For Lab-collected specimens</u>:
   a) Notify the nurse that a specimen is being canceled due to hemolysis.
   b) The Lab will order for a re-draw and a phlebotomist will be notified to re-collect the specimen.

6. Specific specimens
   a) For coagulation specimens, analyze the slightly hemolyzed specimen and report with the comment @HMS (Slight Hemolysis). Lipemia and icteria do not affect coagulation testing.

b) For chemistry specimens, analyze the specimen and report according to section 8 below.

7. Grossly hemolyzed specimens (500 mg/dL or greater) should not be analyzed without the express permission of the Medical Director, or pathologist on call (example: post-mortem analysis) except when hemolysis does not effect a specific analyte. *For chemistry values refer to related document HIL Index Alert Values ~~appendix B.~~*

8. The Siemens Dimension clinical chemistry analyzer is set to measures HIL with every analyte tested, which is based on the spectral characteristics of a serum or plasma sample. The HIL provides an index to alert the user to potential interference from hemolysis, icterus, and lipemia in the sample, where:

   H = hemoglobin resulting from lysis of red blood cells
   I = icterus resulting from endogenous bilirubin
   L = lipemia or turbidity caused by insoluble lipids

   The HIL Index appears on the report slip as a three-digit value where:

   1st digit = H index
   2nd digit = I index
   3rd digit = L index

   a) When instrument reports are printed the technologists must check the instrument printouts for "HIL interference" codes. Under normal operation the Data Innovation (Instrument Manager) will flag HIL interference and guide the technical staff with appropriate result commenting or remedial action instruction.

   b) Append the canned comment HIR (Results may be inaccurate due to specimen hemolysis) to all analytes that have the "HIL interference" code for hemolysis.

   c) Append the canned comment IIR (Results may be inaccurate due to specimen icteria) to all analytes that have the "HIL interference" code for icteria.

   d) If the "HIL interference" code for lipemia is displayed, repeat the test(s) after ultra-centrifuging the specimen for all tests except AMON ($NH_3$).

      **Note**: At GEC, if the "HIL interference" code for lipemia is displayed, the specimen is referred to SGMC Laboratory for testing.

   e) For LDH and K results with the "HIL interference" code for hemolysis, remove the numeric results and result with the canned comment HLK (unable to analyze due to hemolysis).

   f) For $NH_3$ results with the "HIL interference" code for lipemia, remove the numeric results and result with the canned comment LLK (unable to analyze due to lipemia), then send out the specimen for testing.

g) The ordering doctor should be notified every time a $NH_3$ result is removed.

9. For the processing of lipemic and icteric hematology specimens see the procedure Coulter LH750 Operation for Complete Blood Count and Reticulocyte Automated Tests ~~and Coulter HmX Operation for Complete Blood Count as applicable.~~

## 6. RELATED DOCUMENTS

Coulter LH750 Operation for Complete Blood Count and Reticulocyte Automated Tests
~~Coulter HmX Operation for Complete Blood Count~~
Airfuge Ultracentrifuge (Beckman Coulter™)
Data Innovations Instrument Manager
HIL Index Alert Values (AG.F247)

## 7. REFERENCES

None

## 8. REVISION HISTORY

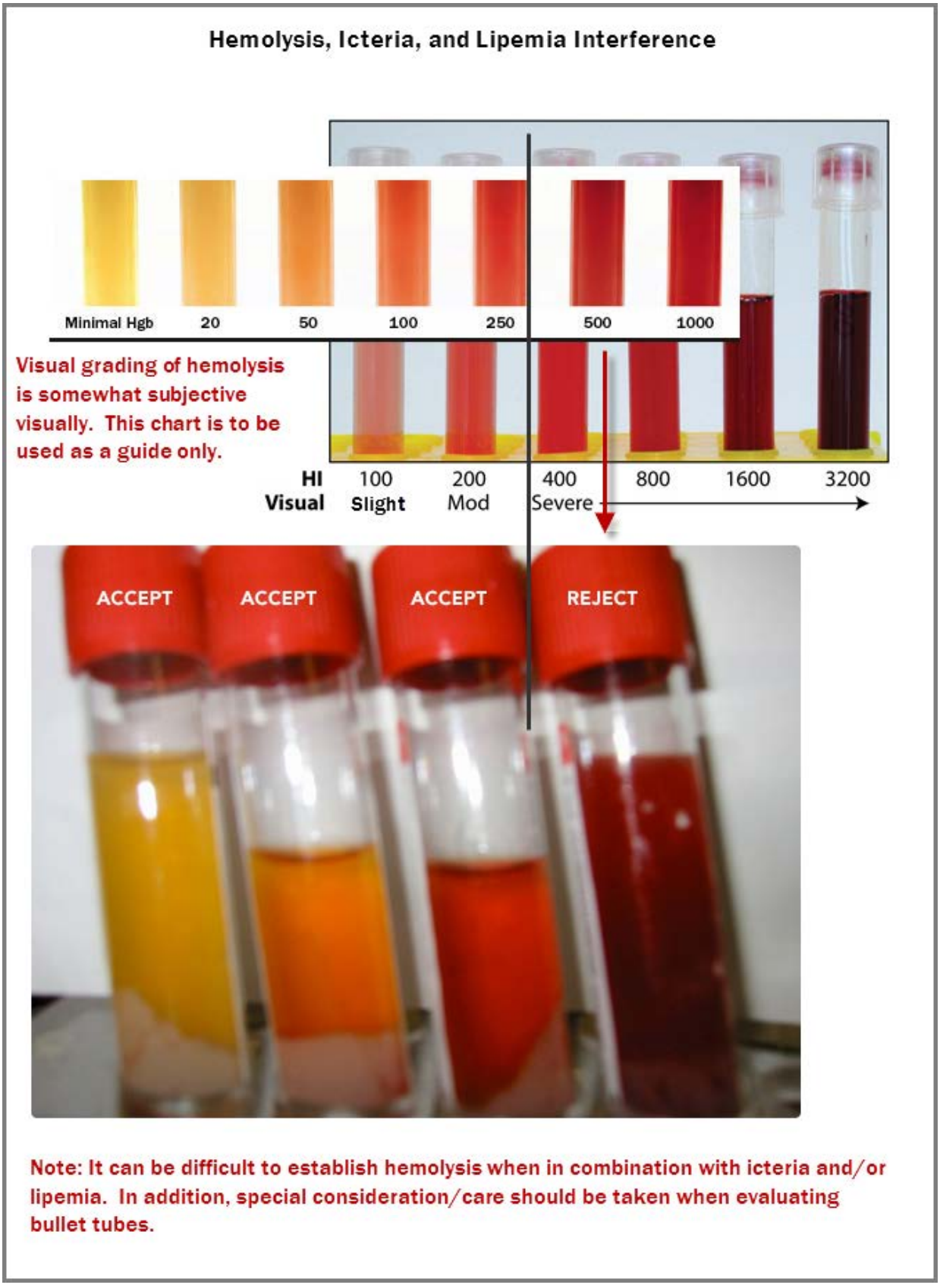
| Version | Date | Reason for Revision | Revised By | Approved By |
|---|---|---|---|---|
| | | Supersedes SOP L010.002 | | |
| 000 | 4/16/2010 | Updated owner | L. Barrett | L. Loffredo |
| 001 | 4/1/2013 | Updated owners<br>Section 4: revise hemoglobin levels of slight and moderate hemolysis<br>Section 6: updated documents<br>Section 9: add App A, update App B | R. SanLuis | L. Loffredo |
| 002 | 7/21/2015 | Section 5: refer to related documents in step 7<br>Section 6: updated SOP list, moved HIL Index from section 9 and updated | L. Barrett | R. SanLuis |
| | | | | |

## 9. APPENDICES

A: Hemolysis, Icteria and Lipemia (HIL) Interference Chart

Form revised 3/31/00

## APPENDIX A




Form revised 3/31/00

| TestCode | Hemolysis Hold | Icteria Hold | Lipemia Hold | Hemolysis Comment | Icteria Comment | Lipemia Comment | Add Comment | Replace Result | Internal Comment Instruction |
|---|---|---|---|---|---|---|---|---|---|
| ALC | | | | | | 8 | LIP | | |
| ALC | | | | | 8 | | IIR | | |
| ALC | | | | 8 | | | HIR | | |
| ALP | | | | | 8 | | IIR | | |
| ALP | | | | | | 8 | LIP | | |
| ALP | | | | 8 | | | HIR | | |
| ALT | 7 | | | 7 | | | HIR | | |
| ALT | 8 | | | 8 | | | HIR | | |
| ALT | | | | | | 8 | LIP | | |
| ALT | | | | | | 7 | LIP | | |
| ALT | | | | | | 5 | LIP | | |
| ALT | | | | | | 6 | LIP | | |
| AMON | 7 | | | 7 | | | HIR | | |
| AMON | 8 | | | 8 | | | HIR | | |
| AMON | | 7 | | | 7 | | IIR | | |
| AMON | | 8 | | | 8 | | IIR | | |
| AMON | | | 7 | | | 7 | * | LLK | LLK - Notify RN |
| AMON | | | 8 | | | 8 | * | LLK | LLK - Notify RN |
| AST | | | | 3 | | | HIR | | |
| AST | | | | | 7 | | IIR | | |
| AST | | | | 4 | | | HIR | | |
| AST | | | | 6 | | | HIR | | |
| AST | | | | 5 | | | HIR | | |
| AST | | | | | 8 | | IIR | | |
| AST | | | | | | 6 | LIP | | |
| AST | | | | | | 8 | LIP | | |
| AST | | | | | | 7 | LIP | | |
| AST | | | | | 9 | | IIR | | |
| AST | | | | | | 4 | LIP | | |
| AST | | | | | | 5 | LIP | | |
| AST | | | | | 5 | | IIR | | |
| AST | | | | | 6 | | IIR | | |
| AST | | | | | 4 | | IIR | | |
| AST | | | | 7 | | | HIR | | |
| AST | | | | 8 | | | HIR | | |
| CA | | | | | 8 | | IIR | | |
| CA | | | | | | 7 | LIP | | |
| CA | | | | | | 8 | LIP | | |
| CA | | | | | | 6 | LIP | | |
| CA | | | | | | 5 | LIP | | |
| CA | | | | 8 | | | HIR | | |
| CHOL | | | | 8 | | | HIR | | |
| CHOL | | | | | 6 | | IIR | | |
| CHOL | | | | | 7 | | IIR | | |
| CHOL | | | | | 8 | | IIR | | |
| CHOL | | | | | 3 | | IIR | | |
| CHOL | | | | | 4 | | IIR | | |
| CHOL | | | | | 5 | | IIR | | |
| CHOL | | | | | | 8 | LIP | | |
| CKI | 5 | | | 5 | | | HIR | | |
| CKI | 6 | | | 6 | | | HIR | | |
| CKI | 7 | | | 7 | | | HIR | | |
| CKI | 8 | | | 8 | | | HIR | | |
| CKI | | | | 4 | | | HIR | | |
| CRBM | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| CRBM | | | | 8 | | | HIR | | |
| CRBM | | | | | 8 | | IIR | | |
| CREA | | | | | 7 | | IIR | | |
| CREA | | | | | 5 | | IIR | | |
| CREA | | | | | 6 | | IIR | | |
| CREA | | | | | 8 | | IIR | | |
| CREA | | | | | | 8 | LIP | | |

| TestCode | Hemolysis Hold | Icteria Hold | Lipemia Hold | Hemolysis Comment | Icteria Comment | Lipemia Comment | Add Comment | Replace Result | Internal Comment Instruction |
|---|---|---|---|---|---|---|---|---|---|
| CREA | | | | 7 | | | HIR | | |
| CREA | | | | 8 | | | HIR | | |
| DBIL | 8 | | | 8 | | | HIR | | |
| DBIL | | | | | | 8 | LIP | | |
| DBIL | | | | | 8 | | IIR | | |
| DBILN | 8 | | | 8 | | | HIR | | |
| DBILN | | | 8 | | | 8 | LIP | | |
| DBILN | | | | | 8 | | IIR | | |
| ECO2 | | | | 8 | | | HIR | | |
| ECO2 | | | | | 8 | | IIR | | |
| ECO2 | | | | | | 8 | LIP | | |
| FE | 4 | | | 4 | | | HIR | | |
| FE | 5 | | | 5 | | | * | HLK | Recollect |
| FE | 6 | | | 6 | | | * | HLK | Recollect |
| FE | 7 | | | 7 | | | * | HLK | Recollect |
| FE | 8 | | | 8 | | | * | HLK | Recollect |
| FE | | | 4 | | | 4 | LIP | | |
| FE | | | 5 | | | 5 | LIP | | |
| FE | | | 6 | | | 6 | LIP | | |
| FE | | | 7 | | | 7 | LIP | | |
| FE | | | 8 | | | 8 | LIP | | |
| FE | | | | 3 | | | HMS | | |
| FERR | 7 | | | 7 | | | * | HLK | Recollect |
| FERR | 8 | | | 8 | | | * | HLK | Recollect |
| FERR | | 6 | | | 6 | | IIR | | |
| FERR | | 7 | | | 7 | | IIR | | |
| FERR | | 8 | | | 7 | | IIR | | |
| FERR | | | 8 | | | 8 | LIP | | |
| FOLA | 4 | | | 4 | | | HIR | | |
| FOLA | 5 | | | 5 | | | * | HLK | Recollect |
| FOLA | 6 | | | 6 | | | * | HLK | Recollect |
| FOLA | 7 | | | 7 | | | * | HLK | Recollect |
| FOLA | 8 | | | 8 | | | * | HLK | Recollect |
| FOLA | | 8 | | | 8 | | IIR | | |
| FOLA | | | 8 | | | 8 | LIP | | |
| FOLA | | | | 3 | | | HMS | | |
| GENP | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| GENP | | | | | 8 | | IIR | | |
| GENP | | | | 8 | | | HIR | | |
| GENT | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| GENT | | | | 8 | | | HIR | | |
| GENT | | | | | 8 | | IIR | | |
| GLUC | 8 | | | 8 | | | HIR | | |
| GLUC | | | | | | 6 | LIP | | |
| GLUC | | | | | | 5 | LIP | | |
| GLUC | | | | | | 8 | LIP | | |
| GLUC | | | | | | 7 | LIP | | |
| GLUC | | | | | 6 | | IIR | | |
| GLUC | | | | | | 4 | LIP | | |
| GLUC | | | | | 8 | | IIR | | |
| GLUC | | | | | 7 | | IIR | | |
| IBCT | 4 | | | 4 | | | HIR | | |
| IBCT | 5 | | | 5 | | | * | HLK | Recollect |
| IBCT | 6 | | | 6 | | | * | HLK | Recollect |
| IBCT | 7 | | | 7 | | | * | HLK | Recollect |
| IBCT | 8 | | | 8 | | | * | HLK | Recollect |
| IBCT | | | | | | 8 | LIP | | |
| IBCT | | | | | | 7 | LIP | | |
| IBCT | | | | | | 6 | LIP | | |
| IRON | 4 | | | 4 | | | HIR | | |
| IRON | 5 | | | 5 | | | * | HLK | Recollect |
| IRON | 6 | | | 6 | | | * | HLK | Recollect |

| TestCode | Hemolysis Hold | Icteria Hold | Lipemia Hold | Hemolysis Comment | Icteria Comment | Lipemia Comment | Add Comment | Replace Result | Internal Comment Instruction |
|---|---|---|---|---|---|---|---|---|---|
| IRON | 7 | | | 7 | | | * | HLK | Recollect |
| IRON | 8 | | | 8 | | | * | HLK | Recollect |
| IRON | | | | | | 5 | LIP | | |
| IRON | | | | | | 6 | LIP | | |
| IRON | | | | | | 4 | LIP | | |
| IRON | | | | | | 7 | LIP | | |
| IRON | | | | | | 8 | LIP | | |
| IRON | | | | 3 | | | HMS | | |
| K | 5 | | | | | | * | HLK | Hemolyzed |
| K | 6 | | | | | | * | HLK | Hemolyzed |
| K | 7 | | | | | | * | HLK | Hemolyzed |
| K | 8 | | | | | | * | HLK | Hemolyzed |
| K | | | | 3 | | | HMS | | |
| K | | | | 4 | | | HIR | | |
| LA | | | | | 7 | | IIR | | |
| LA | | | | | 8 | | IIR | | |
| LA | | | | | | 8 | LIP | | |
| LA | | | | | | 7 | LIP | | |
| LA | | | | 8 | | | HIR | | |
| LDHPT | 4 | | | | | | * | HLK | |
| LDHPT | 5 | | | | | | * | HLK | |
| LDHPT | 6 | | | | | | * | HLK | |
| LDHPT | 7 | | | | | | * | HLK | |
| LDHPT | 8 | | | | | | * | HLK | |
| LDHPT | | | | | | 6 | LIP | | Lipemic Specimen |
| LDHPT | | | | | | 7 | LIP | | Lipemic Specimen |
| LDHPT | | | | | | 8 | LIP | | Lipemic Specimen |
| LDHPT | | | | | 8 | | IIR | | |
| LDHPT | | | | 3 | | | HMS | | |
| LDI | 4 | | | | | | * | HLK | |
| LDI | 5 | | | | | | * | HLK | |
| LDI | 6 | | | | | | * | HLK | |
| LDI | 7 | | | | | | * | HLK | |
| LDI | 8 | | | | | | * | HLK | |
| LDI | | | | | | 8 | LIP | | Lipemic specimen |
| LDI | | | | | | 6 | LIP | | Lipemic specimen |
| LDI | | | | 3 | | | HMS | | |
| LDI | | | | | | 7 | LIP | | Lipemic specimen |
| LDI | | | | | 8 | | IIR | | |
| LIPL | 8 | | | 8 | | | HIR | | |
| LIPL | | | | | 8 | | IIR | | |
| LIPL | | | | | | 8 | LIP | | |
| MG | 5 | | | 5 | | | HIR | | |
| MG | 6 | | | 6 | | | HIR | | |
| MG | 7 | | | 7 | | | HIR | | |
| MG | 8 | | | 8 | | | HIR | | |
| MG | | | | | | 8 | LIP | | |
| MG | | | | 4 | | | HIR | | |
| MG | | | | | 8 | | IIR | | |
| PAL | 8 | | | 8 | | | HIR | | |
| PAL | | 8 | | | 8 | | IIR | | |
| PAL | | | 8 | | | 8 | LIP | | |
| PFLDH | 4 | | | | | | * | HLK | |
| PFLDH | 5 | | | | | | * | HLK | |
| PFLDH | 6 | | | | | | * | HLK | |
| PFLDH | 7 | | | | | | * | HLK | |
| PFLDH | 8 | | | | | | * | HLK | |
| PFLDH | | | | | | 6 | LIP | | Lipemic Specimen |
| PFLDH | | | | | | 7 | LIP | | Lipemic Specimen |
| PFLDH | | | | | | 8 | LIP | | Lipemic Specimen |
| PFLDH | | | | | 8 | 8 | LIP | | Lipemic Specimen |
| PFLDH | | | | | 8 | | IIR | | |

| TestCode | Hemolysis Hold | Icteria Hold | Lipemia Hold | Hemolysis Comment | Icteria Comment | Lipemia Comment | Add Comment | Replace Result | Internal Comment Instruction |
|---|---|---|---|---|---|---|---|---|---|
| PFLDH | | | | 3 | | | HMS | | |
| PHOS | 7 | | | 7 | | | HIR | | |
| PHOS | 8 | | | 8 | | | HIR | | |
| PHOS | | | | | | 7 | LIP | | |
| PHOS | | | | | | 8 | LIP | | |
| PHOS | | | | | 8 | | IIR | | |
| PHOS | | | | | 7 | | IIR | | |
| PLTP | 8 | | | 8 | | | HIR | | |
| PLTP | | | | | 6 | | IIR | | |
| PLTP | | | | | 7 | | IIR | | |
| PLTP | | | | | 8 | | IIR | | |
| PSA | 8 | | | 8 | | | HIR | | |
| PSA | | 8 | | | 8 | | IIR | | |
| PSA | | | 8 | | | 8 | LIP | | |
| TBIL | 8 | | | 8 | | | HIR | | Hemolyzed |
| TBIL | | | | | 8 | | IIR | | |
| TBIL | | | | | | 8 | LIP | | |
| TBILN | 8 | | | 8 | | | HIR | | Hemolyzed |
| TBILN | | | | | | 8 | LIP | | |
| TBILN | | | | | 8 | | IIR | | |
| THEO | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| TIBC | 4 | | | 4 | | | * | HLK | |
| TIBC | 5 | | | 5 | | | * | HLK | |
| TIBC | 6 | | | 6 | | | * | HLK | |
| TIBC | 7 | | | 7 | | | * | HLK | |
| TIBC | 8 | | | 8 | | | * | HLK | |
| TIBC | | | 8 | | | 8 | LIP | | |
| TIBC | | | | | | 7 | LIP | | |
| TIBC | | | | | | 6 | LIP | | |
| TOBP | | | | | | 8 | LIP | | Ultra-Centrifuge if Required |
| TOBR | | | | | | 8 | LIP | | Ultra-Centrifuge if Required |
| TOBT | | | | | | 8 | LIP | | Ultra-Centrifuge if Required |
| TP | 8 | | | 8 | | | HIR | | |
| TP | | | | | 6 | | IIR | | |
| TP | | | | | 7 | | IIR | | |
| TP | | | | | 8 | | IIR | | |
| TP | | | | | | 8 | LIP | | |
| TPPL | 8 | | | 8 | | | HIR | | |
| TPPL | | | | | 6 | | IIR | | |
| TPPL | | | | | 7 | | IIR | | |
| TPPL | | | | | 8 | | IIR | | |
| URCA | 8 | | | 8 | | | HIR | | |
| URCA | | | | | | 8 | LIP | | |
| URCA | | | | | 8 | | IIR | | |
| VANC | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| VANC | | | | | 8 | | IIR | | |
| VANC | | | | 8 | | | HIR | | |
| VANP | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| VANP | | | | | 8 | | IIR | | |
| VANP | | | | 8 | | | HIR | | |
| VANT | | | 8 | | | 8 | LIP | | Ultra-Centrifuge if Required |
| VANT | | | | | 8 | | IIR | | |
| VANT | | | | 8 | | | HIR | | |
| VITB12 | 6 | | | 6 | | | HIR | | |
| VITB12 | 7 | | | 7 | | | HIR | | |
| VITB12 | 8 | | | 8 | | | HIR | | |
| VITB12 | | 8 | | | 8 | | IIR | | |
| VITB12 | | | 8 | | | 8 | LIP | | |

Hold = Hold for Manual Test Review in Data Innovation (Instrument Manager).