INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Scientific calculator

THIS QUESTION PAPER CONSISTS OF 6 PAGES (Including this front page)
SECTION A (40 MARKS)

QUESTION 1

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Write the appropriate letter next to the number of the statement/phrase.

1.1 The major benefit(s) of laboratory automation is (are) the following:

(a) Reduction in medical errors
(b) Improved safety for laboratory staff
(c) Faster turnaround time
(d) All of the above

1.2 The additives to the grey top Vacutainer have the following action:

(a) Activate clotting of the blood
(b) Prevent glycolysis
(c) Prevent haemolysis
(d) Separate the cells from the fluid

1.3 Blood specimens are acceptable for laboratory testing, when:

(a) There is no patient name or identification on the tube
(b) The label on the request form and the label on the collection container do not match
(c) The phlebotomist has written the patient’s name on the collection tube
(d) The wrong collection tube has been used eg anticoagulant additive instead of tube for serum

1.4 The following appearance of processed blood interferes with all light-based tests:

(a) Haemolysis
(b) Icteric samples due to increased bilirubin
(c) Lipaemia after a fatty meal
(d) All of the above

1.5 At wavelength 435 – 480 nm, the colour absorbed is blue. This means that the colour observed with the eye is the following:

(a) yellow
(b) blue
(c) purple
(d) none of the above
1.6 Reverse osmosis refers to the following treatment of water:

(a) Using either anion / cation exchange resin
(b) Impurities remain in boiling apparatus
(c) Water pumped across a semi-permeable membrane
(d) Submicron filters remove substances larger than the pores of the filter, eg bacteria

1.7 Which focusing adjustment do you first use when you start looking at a slide through the microscope:

(a) Small focusing knob
(b) Big focusing knob (coarse adjustment)
(c) Fine focus
(d) 100X objective

1.8 To convert 5.0 gram NaCl to milligram, the following method is followed:

(a) Move the decimal three places to the right
(b) Move the decimal three places to the left
(c) Multiply by 10
(d) Divide by 1000

1.9 The acronym STI stands for the following:

(a) Serum transferring index
(b) Sexually transmitted infection
(c) Systic tube infection
(d) Systemic toxic infection

1.10 A sudden change in the performance of a control of 1 or 2 standard deviations, is called:

(a) A bias
(b) A shift
(c) A trend
(d) Imprecision

QUESTION 2

Assess the following statements and decide whether they are true or false. Write only the number of the question and TRUE for a true statement or FALSE for a false statement next to the number of the question.

2.1 Future developments in the clinical laboratory include more molecular diagnostics.
2.2 The most common reason for fatal transfusion reactions, is improper identification of the patient. (1)

2.3 Most of the errors in the lab happen in the analytical area of operation. (1)

2.4 After collection, a urine sample may be left at room temperature if it is not going to be tested within two hours. (1)

2.5 The light being absorbed by particles in solution is called transmittance. (1)

2.6 One should never use ordinary paper or cotton wool to clean the lenses of a microscope. (1)

2.7 A pipette containing liquid may be left lying horizontally on a bench. (1)

2.8 0.5 ml serum is mixed with 9.5 ml diluent. The resulting dilution is 1 to 10. (1)

2.9 The quality system must be an integrated part of daily work. (1)

2.10 If a control value is out of range, it must be assumed that the patient values are also in error. (1)

QUESTION 3 [20]

Define / briefly describe the following terms

3.1 Flow cytometry (2)

3.2 Haemolysis (2)

3.3 Microscope (2)

3.4 Spectrophotometry (2)

3.5 Bactericide (2)

3.6 The two parts of any dilution (2)

3.7 A standard used in spectrophotometry (2)

3.8 Reference range for a test (2)

3.9 Internal control (2)

3.10 Quality in the laboratory (2)
SECTION B (60 MARKS)

QUESTION 4

4.1 Differentiate between the duties of the Pathologist and the Medical Technologist in the clinical laboratory.

4.2 Trace the route that a blood sample will follow from the smallest clinical laboratory to the lab where specialized testing takes place. Name the different levels of laboratories correctly.

(6)

QUESTION 5

Match each item in the first column with the correct items in the second and third columns.

(Example of answer: 1C serum)

<table>
<thead>
<tr>
<th>Vacutainer stopper colour</th>
<th>Additive</th>
<th>Fluid after centrifugation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Light blue</td>
<td>A EDTA</td>
<td>Serum</td>
</tr>
<tr>
<td>2 Purple</td>
<td>B Sodium Citrate</td>
<td>Plasma</td>
</tr>
<tr>
<td>3 Grey</td>
<td>C Gel, clot activator</td>
<td></td>
</tr>
<tr>
<td>4 Yellow</td>
<td>D None, or with clot activator</td>
<td></td>
</tr>
<tr>
<td>5 Red</td>
<td>E Na fluoride, K oxalate</td>
<td></td>
</tr>
</tbody>
</table>

QUESTION 6

6.1 Match the objectives with the correct common working distances when using the microscope.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Distance in mm between slide and objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Oil-immersion objective</td>
<td>A 4</td>
</tr>
<tr>
<td>2 High power objective</td>
<td>B 1.8</td>
</tr>
<tr>
<td>3 Low power objective</td>
<td>C 16</td>
</tr>
</tbody>
</table>
6.2 Indicate whether the following centrifuges are BALANCED or UNBALANCED: (3)

A  B  C

QUESTION 7 [10]

7.1 Describe how a standard curve is obtained for use in spectrophotometry. (8)

7.2 Explain the use of a standard curve. (2)

QUESTION 8 [5]

Use Beer’s law to calculate the glucose concentration in a patient sample (unknown):

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown (patient) absorbance</td>
<td>0.508</td>
</tr>
<tr>
<td>Standard absorbance</td>
<td>0.320</td>
</tr>
<tr>
<td>Standard concentration</td>
<td>5.6 mmol/L</td>
</tr>
</tbody>
</table>

QUESTION 9 [5]

9.1 Describe a situation in the clinical laboratory when a dilution needs to be made. (1)

9.2 0.2 ml of serum is mixed with 1 ml saline and 1 ml reagent. What is the dilution? What is the dilution factor? (2)

9.3 A patient serum tested outside the linear range of an instrument. The serum is diluted 1 to 4 and re-run. The re-analyzed result is 2 mmol/L. What is the final patient result that needs to be reported to the doctor? (2)

QUESTION 10 [14]

10.1 Define a Levey-Jennings chart (2)

10.2 Explain how a Levey-Jennings chart is obtained (2)

10.3 Define the Westgard multi-rule system (2)

10.4 Define four areas of error that may occur on a Levey-Jennings chart (4)

10.5 Give one possible cause of each of the areas of error in 10.4 (4)