QUALIFICATION: BACHELOR of BIOMEDICAL SCIENCES

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<td>COURSE: APPLIED LABORATORY PRINCIPLES</td>
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SECOND OPPORTUNITY EXAMINATION PAPER

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MODERATOR: MR MARTIN GONZO

THIS EXAMINATION PAPER CONSISTS OF 8 PAGES
(INCLUDING THIS FRONT PAGE)

INSTRUCTIONS

1. Answer all questions.

2. When writing take the following into account: The style should inform than impress, it should be formal, in third person, paragraphs set out according to ideas or issues and the paragraphs flowing in a logical order. Information provided should be brief and accurate.

3. Please, ensure that your writing is legible, neat and presentable.
SECTION A [30]

QUESTION 1 [15]

1.0 Decide which of the following statements are TRUE or FALSE.
Write only TRUE or FALSE next to the number.

1.1 A pipette containing liquid may be left lying horizontally on a bench. [1]

1.2 0.5 ml serum is mixed with 9.5 ml diluent. The resulting dilution is 1 to 10. [1]

1.3 The quality control samples are treated differently from patient samples, and special care should be taken when running quality control samples. [1]

1.4 If a control value is out of range, it must be assumed that the patient values are also in error. [1]

1.5 Cerebrospinal fluid (CSF) needs to be tested STAT (urgently) because the elements disintegrate easily and the conditions for which they are drawn, tend to be life threatening. [1]

1.6 Antiseptics are usually referred to as germicide agents that that can be used on human body. [1]

1.7 Normality (N) is the number of equivalents of solute per liter of solution. [1]

1.8 If you have a total quality management system in place, there should not be a concern for continuous improvement. [1]

1.9 Vapor pressure is the temperature at which the liquid solvent is in equilibrium with the water vapor. [1]

1.10 The quality system must be an integrated part of daily work. [1]

1.11 Ionic strength is the concentration or activity of ions in a solution or buffer. [1]

1.12 Accuracy in quality control means the closeness of the estimated value to the true mean. [1]

1.13 Accuracy is measured by the Internal quality controls. [1]

1.14 Large dilutions of serum can be made with only small amounts of serum being used. [1]

1.15 Buffers are used to minimize changes in pH. [1]

QUESTION 2 [15]
2.0 Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Fill in the appropriate letter next to the number.

Answer ALL the questions.

2.1 Which of the following actions would be most likely the action of the additives to the grey top Vacutainer?

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

2.2 Decide in which of the following cases blood specimens would be acceptable for laboratory testing.

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

2.3 Certain appearances of blood will have an interference with laboratory tests. Which of the following will interfere with light-based tests?

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

2.4 Decide on the best focusing adjustment to be used when you start looking at a slide through the microscope:

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

2.5 Which characteristic is INACCURATE with respect to the anticoagulant EDTA?

a) It is the most often used anticoagulant in haematology
b) Removes calcium from fresh whole blood by the process of chelation
c) Is used for most routine coagulation studies
d) Is conveniently placed in purple (lavender) stopped Vacutainers

2.6 If you cannot get the object in focus on oil, the following should be done:
   a) Make sure the fine adjustment knob is not turned all the way in one direction
   b) Make sure the slide is not upside down
   c) Make sure there is enough oil
   d) All of the above

2.7 The quality of reagent type water may be tested by the following methods, EXCEPT:
   a) Tested for resistance – poor conduction of electricity
   b) Observed with the eye for impurities
   c) pH tested – should be pH = 7
   d) Colony counts – culture on selective and non-selective media

2.8 All the following are true regarding the transportation of specimens to the laboratory EXCEPT:
   a) The delay of transporting will influence certain test results
   b) Specimens need to be transported in a special container
   c) All the different specimen types are transported in one container
   d) The shortest possible route should be taken when specimens are transported from a clinic to a laboratory

2.9 The greater the magnifying power of the objective, the smaller the working distance. Choose the expected working distance for the x 100 objective.
   a) The working distance is 5 - 6 mm
   b) The working distance is 0,5 - 1,5 mm
   c) The working distance is 0,5 - 0,20 mm
   d) The working distance is 0,5 – 0,40 mm

2.10 The acronym STI stands for the following:
   a) Systic tube infection
   b) Sexually transmitted infection
   c) Serum transferring index
   d) Systemic toxic infection
2.11 Which of the following tests would be delivered to the chemistry section?
   a) Erythro sedimentation rate
   b) Gram stain
   c) Bilirubin
   d) Type and screen

2.12 Which of the following tests would be delivered to the haematology section?
   a) Glucose
   b) Gram stain
   c) Platelets
   d) CD4 count

2.13 Which of the following duties is NOT performed by the Laboratory Administrative Director?
   a) Maintains overall budget
   b) Makes sure laws and regulations are maintained
   c) Interacts with hospital administration
   d) Ultimately responsible for all lab testing and reporting

2.14 Which of the following is NOT part of the support system on a microscope?
   a) The stage
   b) Specimen holder
   c) The limb
   d) The revolving nosepiece

2.15 The following is true for a horizontal head type of centrifuge:
   a) Used for rapid centrifugation of small particles
   b) Particles being pushed to the bottom are evenly distributed
   c) Spins slow to allow a single layer of cells to be placed on a glass slide
   d) Used when sample must be kept cold at all times

SECTION B  [33]

QUESTION 3  [9]

3.1 List two [2] analytes that can be affected by the patient’s diet.

3.2 When light strikes a surface it is reflected, refracted or diffracted.
Explain briefly what is meant by reflected and refracted. [2]

3.3 How does plasma differ from serum? [1]

3.4 Name two types of glass flasks used in the laboratory. [2]

3.5 What is the difference in accuracy between these two types of flasks? [2]

QUESTION 4 [10]

4.1 The types of centrifuges found in a laboratory vary tremendously by size and function.
   a) Describe the horizontal head type of centrifuge. [2]
   b) Describe the fixed angle-head type of centrifuge. [2]

4.2 Support the following technical terms used in a laboratory with an explanation of each:
   a) MSDS
   b) Histopathology
   c) Sterilisation
   d) Accuracy
   e) Distilled water

QUESTION 5 [14]

5.1 Any chemical or biological solution has basic properties of which the concentration is one. Mention five [5] more properties of any solution.

5.2 Explain what does Point-of-Care Testing means. [5]

5.3 Describe some of the pre-analytical factors that may have an impact on the reliability of laboratory results. [4]

SECTION C [37]

QUESTION 6 [16]

6.1 Evaluate and discuss the data points on the Levy Jennings graph below. [2]
6.2 When evaluating controls plotted on a Levy Jennings graph, the following terms are used:

Describe the following terms:

a) Negative bias  
   b) Positive trend  
   c) QC multi-rules  
   d) Precision

6.3 The total Quality Management System consists of many elements. List 4 of these elements.

6.4 What are the differences between a random error and a systematic error?

6.5 Differentiate between Internal quality control and External quality assurance.

6.6 The acceptable range for haemoglobin values on a control sample is 12.0 with + 0.4 or – 0.4. A haemoglobin determination is performed five times in succession on the same control sample.

The results obtained were:

12.0
12.3
12.0
12.2
12.1

These results are:

a) Both accurate and precise
b) Precise but not accurate
c) Accurate but not precise
d) Neither accurate nor precise

QUESTION 7
7.0 Spectrophotometry is one of the most useful methods of quantitative analysis in chemistry. Answer the following questions regarding spectrophotometry.

7.1 Briefly describe what is meant by spectrophotometry. [2]

7.2 Explain what you understand under Beer’s Law. [2]

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

- Unknown (patient) absorbance: 0.604
- Standard absorbance: 0.340
- Standard concentration: 5.2 mmol/L

7.4 Specify four reasons that can cause Deviations from Beer’s Law [4]

7.5 Describe how a standard curve is obtained for use in spectrophotometry. [4]

7.6 Decide which of the following statements are TRUE or FALSE. Write TRUE or FALSE next to the number.

- a) Absorbance is the light being thrown off by particles in solution [1]
- b) Transmittance is the light being absorbed by particles in solution [1]
- c) One of the most common applications of spectrophotometry is to determine the concentration of an analyte in a solution. [1]
- d) In spectrophotometry, absorbance of light is directly proportional to the concentration of the substance. [1]
- e) The light being absorbed by particles in solution is called transmittance. [1]

TOTAL MARKS 100