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**COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES**

**DEPARTMENT OF BIOMEDICAL AND LABORATORY SCIENCES**

**BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS**

**MLS2105 BLOOD TRANSFUSION SCIENCE AND HAEMATOLOGY PRACTICAL**

**END OF FIRST SEMESTER FINAL EXAMINATIONS**

**NOVEMBER 2025**

**LECTURER: PORF. E. OBEAGU**

**DURATION: 3 HOURS**

## SECTION A

**Question 1**

a) Using the Westergren erythrocyte sedimentation rate (ESR) procedure given below, measure and record the ESR of the sample labelled 1A **(15 marks)**

b) List five (5) sources of error that must be guarded against when performing this test **(5 marks)**

c) Name five (5) disease states that can be associated with a high ESR **(5 marks)**

**Westergren erythrocyte sedimentation rate procedure**

I. Pipette 0.4 ml of sodium citrate anticoagulant into a container
II. Add 1.6 ml of EDTA anticoagulated blood and mix well before pouring into an ESR cup
III. Fill the Westergren pipette with the thoroughly mixed citrated blood and adjust to the
IV. zero mark
V. Place the pipette vertically onto the rack and leave to stand for sixty minutes

**Question 2**

a) Using the smear making and Romanowsky stain staining procedure given below make a thin smear of the provided sample G and submit **(10 marks)**
b) What is the principle of the staining procedure used **(5 marks)**
c) What are the different parts of the thin smear **(3 marks)**
d) Which is the best area to conduct a differential count **(2 marks)**
e) Viewing the smear, give general comments on red cells, platelets and white cells **(5 marks)**

**Procedure for slide making**

Thin smear
STEP ONE:
• Place clean glass slide on a flat surface
• Add one small drop of blood to one end
STEP TWO:
• Take another clean slide
• holding at an angle of about 45 deg
• touch the blood with one end of the slide so the blood runs along the edge of the slide by capillary action
• Push carefully along the length of the first slide to produce a thin smear of blood
STEP THREE:
• Make 2 smears, allow to air dry, and label clearly with your candidate number
STEP FOUR:
• Fix the thin film with methanol (100% or absolute) and let it dry completely before staining

**Procedure for thin film staining**

1. Fresh working Giemsa stain has been prepared for you
2. Place slides onto the staining rack and add the working Giemsa stain
3. Stain for 10minutes
4. Rinse slides with Giemsa buffer
5. Dry the slides upright in a rack.

**SECTION B**

**Question 3**

The following details in **Table 1** are for the two patients **Kelly** and **Keith**

**Table 1: Patient details for Kelly and Keith**

| Patient name | Age (years) | Sex | Clinical data |
|---|---|---|---|
| **Kelly** | 26 yrs | Female | Road traffic accident (RTA) victim |

| | | | |
|---|---|---|---|
| **Keith** | 7days | Male | Prematurely delivered symptomatic anaemia baby boy |

a) Perform ABO and Rhesus blood grouping for **Kelly** and **Keith** using the materials, reagents and Standard Operating Procedures provided (Procedure A). Record your results in Tables 3a & 3b **[20 marks].**

**b)** Why is it important to do reverse ABO blood grouping for **Kelly** and not for **Tapiwa**? Give reasons. **[5]**

**Procedure A: ABO Blood Grouping Procedure for each patient or donor**

| | |
|---|---|
| 1 | Label 3 tubes as follows:<br>• Tube 1- anti-A<br>• Tube 2- anti-B<br>• Tube 3- anti-AB |
| 2 | Add 2 drops of anti-A, anti-B and anti-AB to each of the labelled tubes in step **1** above, respectively as labelled (front group). |
| 3 | Add 1 drop of 2-5% (0.2ml/10ml -0.5ml/10ml) cell suspension of the donor or patient to each tube containing anti-A, anti-B and anti-AB. |
| 4 | Label 4 more tubes:<br>• Tube 4- A cells<br>• Tube 5- B cells<br>• Tube 6-O Cells<br>• Tube 7-ABOAcc |
| 5 | Add 2 drops of donor or patient serum or plasma to each tube labelled A cells, B cells, O cells and ABOAcc cells. |
| 6 | Add 1 drop of the respective blood grouping cells to tubes labelled A cells, B cells, O cells and (ABOAcc cells from the donor or patient, accordingly) |
| 7 | Mix contents of the tubes by gently tapping the base of each tube with your finger |
| 8 | Leave all the 7 tubes at approximately 25$^{o}$C for 5 minutes |
| 9 | Centrifuge at 3 000 revolutions per minute for 15 seconds |
| 10 | Take out the 7 tubes from the centrifuge and place them in the rack in same positions as before centrifuging |
| 11 | Read results macroscopically by tapping gently the base of each tube, looking for either agglutination or haemolysis. Grade as shown in **Table 2** |
| 12 | Record results in the ABO Blood Group Record Sheet **(Table 3)** as follows:<br>a. Positive (+) if there is agglutination or haemolysis<br>b. Negative (-) if there is no agglutination or haemolysis<br>c. Weak positive (+w)<br>***Refer to Table 4 for grading of agglutination reactions*** |

| | |
|---|---|
| 13 | Read microscopically for tubes where agglutination or haemolysis is NOT seen as follows:<br>a. Pipette 1 drop of sample from the negative tube and place the drop on a clean glass slide<br>b. Put cover slip<br>c. Read at x10 or x20 microscope objective lens |
| 14 | Interpret ABO Blood group results as shown on **Table 4** |

**Table 2: Grading Agglutination reactions**

| **Grade** | **Description** | | |
|---|---|---|---|
| | **erythrocyte aggregates** | **Erythrocytes** | **Supernatant** |
| Negative | None | free floating | |
| Mixed field | Few isolated | mostly free-floating | red |
| Weak | Tiny and barely visible macroscopically | many free | turbid and reddish |
| 1+ | few small just visible macroscopically | many free | turbid and reddish |
| 2+ | Medium size | some free | Clear |
| 3+ | Several large | some free | clear supernatant |
| 4+ | All combined into one solid | | clear |

**Table 3a: ABO Blood Group Record Sheet (for** Kelly**)** ***(10 marks)***

| Patient / Sample identification | Tube 1 Anti-A | Tube 2 Anti-B | Tube 3 Anti-AB | Tube 4 $A_1$ cells | Tube 5 B cells | Tube 6 O cells | Tube 7 ABOAcc Cells | ABO blood group |
|---|---|---|---|---|---|---|---|---|
| Kelly | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Table 3b: ABO Blood Group Record Sheet (for** Keith**)** *(10 Marks)*

| Patient / Sample identification | Tube 1 Anti-A | Tube 2 Anti-B | Tube 3 Anti-AB | Tube 4 $A_1$ cells | Tube 5 B cells | Tube 6 O cells | Tube 7 ABO Acc Cells | ABO blood group |
|---|---|---|---|---|---|---|---|---|
| Keith | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Table 4: Interpretation of ABO Blood grouping results**

| Tube 1 Anti-A | Tube 2 Anti-B | Tube 3 Anti-AB | Tube 4 $A_1$ cells | Tube 5 B cells | Tube 6 O cells | Tube 7 ABO Acc | ABO blood group |
|---|---|---|---|---|---|---|---|
| + | - | + | - | + | - | - | A |
| - | + | + | + | - | - | - | B |
| + | + | + | - | - | - | - | AB |
| - | - | - | + | + | - | - | O |

**Question 4**

a. Describe in detail how would you carry out transfusion reaction investigation **(15 Marks**)
b. State all the samples that will be required for the full process **(10 Marks**).