



Department of -----Biology

College of ----- Science

University of ----- Salahaddin

Subject: ----- Haematology II.

Course Book ----- (3rd Year/ Second semester)

**Lecturer's name----- [Assist. Prof. Sarbaz I. Mohammed, PhD
(Theory) + Darya M. Azeez**

Academic Year: ----- 2023/2024

Course Book

1. Course name	Haematology II
2. Lecturer in charge	Dr. Sarbaz I. Mohammad
3. Department/ College	Biology /Science
4. Contact	e-mail: sarbaz.mohammed@su.edu.krd. Tel: (+9647504545386)
5. Time (in hours) per week	Theory: 2hr/week Practical: 6hr/week
6. Office hours	To be Return to the schedule on the office door
7. Course code	
8. Teacher's academic profile	<p>1- Assistan prof. Dr. Sarbaz I. Mohammad</p> <ul style="list-style-type: none"> • I graduate from Salahaddin University in 1987(Ranked 4th in department). In 1997 I finished my MSc degree and start as Assistant Lecturer Teaching Practical animal physiology, Practical hematology, Practical parasitology, practical cell biology and Practical Invertebrate Biology. • For 8 years I worked as a Member of the Examination Committee for College of Science. <p>In 2007 I get my PhD degree in hematology and from that time, as a Lecturer, I am in charge in teaching comparative theory for 4th class students, Supervising MSc and diploma student, Teaching Advanced hematology and endocrinology for Graduate student.</p> <p>I am head of Kurdistan natural history museum from 2008</p>
9. Keywords	Haematology
<p>10. Course overview:</p> <p>In this section the lecturer shall write an overview about the subject he/she is giving. The course overview must cover:</p> <ul style="list-style-type: none"> ▪ The importance of studying the subject ▪ Understanding of the fundamental concepts of the course ▪ Principles and theories of the course ▪ A sound knowledge of the major areas of the subject ▪ Sufficient knowledge and understanding to secure employment <p>This should not be less than 200 words</p>	
<p>11. Course objective:</p> <ul style="list-style-type: none"> • The goal of the clinical hematology is to facilitate mastery of the principles and practice of hematology needed by medical laboratory technician and medical 	

laboratory science students to achieve board certification or licensure upon graduation. Clinical hematology has been classroom and laboratory (field tested) medical laboratory technician and medical laboratory technology

12. Student's obligation

Classroom polices:

1- Attendance: You are strongly encouraged to attend class on a regular basis, as participation is important to your understanding of the material. This is your opportunity to ask questions. **You are responsible for obtaining any information you miss due to absence**

2- Lateness: Lateness to class is disruptive

3-Talking: During class please refrain from side conversations. These can be disruptive to your fellow students and your professor

13. Forms of teaching

Course Book, white board and PowerPoint

14. Assessment scheme

Breakdown of overall assessment and examination

Component	Date	Percent
Examination		20 %
Attendance		5 %
Quiz		5%
seminars		30%
Total		60%

15. Student learning outcome:

After completion of this course, you will be able to:

- Define common terms used in clinical hematology & blood banking.
- Identify all the possible methods for preparation of blood analysis
- Different structure blood
- Identify basic classification of anemia
- Steps of blood banking

16. Course Reading List and References:	
<ol style="list-style-type: none"> 1. Turgeon M. L. (2018). Clinical Hematology Theory and Procedures. 6th edition. Philadelphia: Wolters Kluwer 2. Provan D., Trevor B., Inderjeet D., Johannes de vos. (2015) Oxford Handbook of Clinical Haematology. 4th edition. USA by Oxford University press. 3. Denise Harmening (2012). Modern Blood Banking & Transfusion Practices. 6th edition. F. A. Davis Company Philadelphia, PA. 	
17. The Topics:	Lecturer's name
1- Course book hematology II	Week 1
2- Anaemia	Week 2
3- Iron-Deficiency Anemia	Week 3
4- Haemolytic anemia (Thalassemia)	Week 4
5- Haemolytic anemia (Sickle cell anemia)	Week 5
6- Glucose-6-phosphate dehydrogenase deficiency anemia	Week 6
7- Megaloblastic anemia	Week 7
8- Hemolytic Anemia (Membrane Defects)	Week 8
9- Polycythemia	Week 9
10- Introduction to Acute Leukaemia (Lymphoblastic ALL & myeloblastic Leukemia AML)	Week 10
11- Introduction to chronic Leukaemia (Lymphoblastic CLL & myeloblastic Leukemia CML)	Week 11
12- Bleeding disorders	Week 12
13- Hemolytic Anemia: Immune Anemias	Week 13
14- Blood banking	Week 14
15- Examination 1	
18. Practical Topics (If there is any)	
In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture	Lecturer's name ex: (3-4 hrs) ex: 14/9/2022
19. Examinations:	
Q1/ Choose correct answer	(30 marks)

- 1- The blood is fluid of life about ----- of human body weight
(**a-** 7-8% **b-** 6-7% **c-** 8-9% **d-** 6-9%)
- 2- Plasma is liquid portion of the blood, mainly consists of -----

(**a-** Organic , inorganic substances and H₂O **b-** Lipid, protein and H₂O₂ **c-** protein, sugar and blood cell **d-** Organic , inorganic substances and protein)
- 3- HSCs are capable of cell division to give rise to more stem cells is called-----(**a-** Differentiation **b-** Self-renewal **c-** Pluripotent **d-** stem cells)
- 4- Stromal cells are the major source of growth factors except for -----
(**a-** erythropoietin **b-** thrombopoietin **c-** Interleukin-3 **d-** cytokines)
- 5- Collectively, the progenitors, precursors, and adult red cells make up an organ termed the ----- (**a-** erythron **b-** spleen **c-** blood cells **d-** all of them)
- 6- Although the erythropoietin response is primarily a function of the severity of ----- (**a-** hypoxia, **b-** erythroid marrow mass **c-** inflammatory cytokines **d-** all of them)
- 7- Which red cells is not a biconcave disc? (**a.** Anisocyte **b.** Microcyte **c.** Hypochromic red cells **d.** Spherocyte)
- 8- Red blood cells which are larger than 8.1 microns are called-----
(**a.** Anisocytes **b.** Macrocytes **c.** Microcytes **d.** Normocytes)
- 9- An iron protein complex which combines with oxygen and carbon dioxide is----- (**a.** Deoxyhemoglobin **b.** Hemoglobin **c.** Hemosiderin **d.** Oxyhemoglobin)
- 10- The Bohr Effect is a physiological phenomenon, stating that hemoglobin's oxygen binding affinity is inversely related both to ---
----- & ----- (**a-** Alkalinity & CO₂ **b-** Acidity & O₂ **c-** acidity & CO₂ **d-** Alkalinity & O₂)
- 11- Most antibodies are ----- globulins (**a-** α **b-** β **c-** γ **d-** δ)
- 12- Water act as----- for blood cells (**a-** Enzyme **b-** polar solvent **c-** polar solute **d-** cofactor)
- 13- In allergic conditions, we commonly find an increase of-----
(**a.** Basophil **b.** Eosinophils **c.** Neutrophils **d.** Lymphocytes)
- 14-In which stage of erythrocytic maturation does Hgb formation begin?

(a. Orthochromic normoblast b. Pronormoblast c. Basophilic normoblast
d. Polychromatic normoblast)

15-life span of pronormoblast is ----- day (a- 1.3 b- 1.5 c-
2 d- 0.8)

Q2/ True or False

(20 marks)

- 1- The lower level of haemoglobin during pregnancy is due to by reduction of plasma volume
- 2- Poikilocytosis significant variation in size of red cells
- 3- Extravascular destruction of red cells by macrophages
- 4- Howell-Jolly bodies are small, spherically shaped DNA remnants
- 5- Heinz bodies are composed of denatured proteins, primarily hemoglobin
- 6- Hemoglobin H is composed of γ_4 tetramers
- 7- Natural killer cells are a type of granulocyte group
- 8- In Orthochromic normoblast, the nucleus appears as a dense blue-black sphere, is known as a pyknotic nucleus
- 9- Changes in the oxygen delivery to tissue are sensed by peritubular interstitial, fibroblast-like cells in the liver.
- 10- The rate of new RBC production varies according to the rate of RBC destruction and Tissue oxygen requirements.

Q3/

- 1- Explain morphological classification of anemia (15 marks)
- 2- Explain Biosynthesis of heme (20 marks)
- 3- Mention various hematopoietic organs during antenatal life (15marks)

20. Extra notes:

Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks.

21. Peer review

پیداچوونہوہی ھاوہل

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم كۆرسىبووكە دەبىت لەلايەن ھاوئىكى ئەكادىمىيە سەير بىكرىت و ناوەرۆكى بابتەكانى كۆرسەكە پەسەند بىكات و جەند ووشەيك بنووسىت لەسەر شىاوى ناوەرۆكى كۆرسەكە و واژووى لەسەر بىكات.
ھاوئى ئەو كەسەپە كە زانىارى ھەبىت لەسەر كۆرسەكە و دەبىت پلەى زانستى لە ماموستا كەمتر نەبىت.

Theory Lecturer's

Assist. Prof. Dr. Sarbaz I. Mohammed

Haematology/Biology department

College of Science



Department of Biology

College of Science

University of Salahaddin

Subject: Hematology

Course Book – 3/ 1st semester

Lecturer's name: Darya M. Azeez

Supervisor: Dr. Sarbaz M. Ibrahim

Academic Year: 2023/2024

Course Book

1. Course name	Practical Haematology
2. Lecturer in charge	Darya M. Azeez
3. Department/ College	Biology department/ college of science
4. Contact	E-mail: Darya.Azeez@su.edu.krd .
5. Time (in hours) per week	Theory: 0 Practical: 6
6. Office hours	18 hours per week
7. Course code	
8. Teacher's academic profile	B.Sc. of Biology/ Salahaddin University /Biology Department 2012 M.Sc. of Haematology/ 2016 Lecturer/Salahaddin University since 2016
9. Keywords	Hematology, blood, disorder, platelet.
10. Course overview:	Studding of this module is intended to: In this course students will study fundamental concepts of hematology and the analysis of laboratory results and their clinical implications.

Understand the process of haemopoiesis and explain the function of the various blood constituents. Explain how certain disease processes may lead to a change in the numbers and morphology of blood cells.

Understanding the principles and efficiently performing, a range of routine laboratory tests including; full blood examination (including automated analysis and manual techniques for hemoglobin estimation, hematocrit, leucocyte counts, platelet and reticulocyte counts), and erythrocyte sedimentation rate (ESR).

Prepare, examine and report on stained peripheral blood smears (normal and abnormal) to include differential white cell count (DWCC) and assessment of morphology of blood cells. Understand the significance of the morphological changes in a peripheral blood smear and indicate further investigations useful in establishing a diagnosis of blood diseases.

Perform and understand the basis of certain laboratory tests used in the diagnosis and treatment of anemia, leukemia, and other blood disorders.

Understand normal and abnormal hemostasis, including the blood coagulation and fibrinolytic systems and the role of platelets. Perform relevant laboratory tests used in the diagnosis of patients with hemorrhagic disorders

Explain the inheritance, characteristics and nature of clinically important blood group antigens and antibodies. Understand the principles of, and perform various blood banking techniques including ABO, Rh grouping and compatibility testing.

11.Course objective

The course is especially planned for undergraduate students who intend to work in diagnostic laboratories. The goals of this module include:

1. Demonstrate proper procedures for the collection, safe handling, and analysis of biological specimens
2. Describe the principles of some of the most frequently used laboratory tests and their diagnostic significance.
3. Conduct a biomedical laboratory procedure and process, interpret and document the data obtained.
4. Apply appropriate problem-solving steps for determining instrument/methodology problems, utilizing instrument manuals, laboratory procedure manuals, and information contained in package inserts
5. Evaluate laboratory test results to determine disease diagnosis.
6. Characterizing of different blood diseases (Anemia and Leukemia) bases on observation of blood cells under the microscope.

12. Student's obligation <ul style="list-style-type: none">• Students should attend all lectures and not miss any lecture time.• Electronic devices: All cell phones are to be turned off at the beginning of class and put away.• It is highly advised not to accumulate material until before the examination time. Cramming will definitely weaken the student's ability to understand and retain valuable information.
13. Forms of teaching <ul style="list-style-type: none">• Data Show Projector• Blackboard• Video• The hard copy of the lectures will be given to the students
14. Assessment scheme <p>Breakdown of overall practical assessment and examination</p> Grading System: <ul style="list-style-type: none">• Semester exams: 20 %• Weekly quizzes: 5%• Activities and attendance 5%• Assignment 5%• Overall practical haematology marks 35 %
15. Student learning outcome: <p>At the end of the course students should be able to</p> <ul style="list-style-type: none">• Demonstrate a working knowledge of the theories and techniques utilized in standard laboratory procedures performed in Hematology• Differentiate various hematological procedures and the use of basic equipment required to working in Clinical Hematology Laboratory• Evaluate test results with normal and abnormal physiologic circumstances• Identify the various components of blood, their functions, and roles in various disease state
16. Course Reading List and References: <ol style="list-style-type: none">1- Colour Atlas of Haematology Practical Microscopic and Clinical Diagnosis by Harald Thelml, Heinz Diem, and Torsten Haferlach, 2nd revised edition, 2004, Thieme Stuttgart · New York.2- Diagnostic Hematology by James A. Ker, 2009, Springer-Verlag London Limited.3- Hematology, Basic Principles and Practice by Ronald Hoffman, Edward J. Benz, Sanford J. Shattil, Bruce Furie et al., Copyright © 2005, Elsevier Inc.4- Dacie and Lewis Practical Haematology. 2017. BARBARA J. BAIN, IMELDA BATES.5- Basic Medical Laboratory Techniques. 2007. Barbara H. Estridge, Anna P. Reynolds, Norma J. Walters. 5th edition

6- Hematology: Clinical Principles and Applications. 2007. Bernadette F. Rodak, George A. Fritsma, Kathryn Doig. 3ed edition. Elsevier Health Sciences

17. The Topics:	Date
Week 1: Introduction to basic concepts in practical haematology lab.	4/9/ 2023
Week 2: Blood Specimen Collection.	11/9/2023
Week 3: Haematocrit test	18/9/2023
Week 4: Determination of Haemoglobin (Hb) concentration	25/9/2023
Week 5: Manual Red Blood Cell Counting.	2/10/2023
Week 6: Erythrocyte sedimentation rate	9/10/2023
Week 7: First exam	16/10/2023
Week 8: Total white blood cell counting	23/10/2023
Week 9: Preparation of the blood smear and differential Leukocyte count	30/10/2023
Week 10: amimia and RBC indices	6/11/2023
Week 11: Foreword and reverse blood grouping	13/11/2023
Week 12: Crossmatch	20/11/2022
Week 13: Reticulocyte count	27/11/2022
Week 14: Second exam	4/12/2023

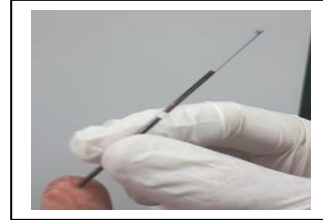
18. Examinations:

Examples of Semester Examination

Practical Hematology exam

Q1/ Write briefly the aim of using the followings in hematological tests

1. Trisodium citrate in ESR
2. Turk's solution
3. Pottassium ferricyanide in Hb determination



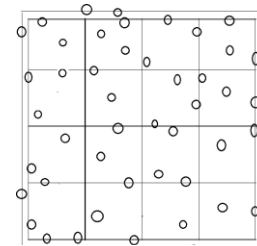
Q2/

A/ Write the name of this tube and mention the errors during this sample collection for estimation Htc

B/What are the suspected layers which are formed after centrifugation of this tube.

Q3 /

Count WBCs in this large square and calculate the number of WBC in 1 μ l of blood (if you know the sample is 10 times diluted) and explain the result?



Q4/ Explain why

- 1- The RBC pipette in some cases is used for WBC count instead of WBC pipette?
- 2- The error encountered in Hb estimation by SAHLI method may be up to 15 %? Mention two of sources error

Q5/

1. What are the differences between plasma and serum and how you can get both of them practically?
2. During blood sugar estimation blood collected in Oxalate or EDTA tubes mixed with sodium fluoride. Why?

Q6/

- 1- Why you are performing ESR? Write the principle of the test?
- 2- What are the stages of ESR?

Q7/

How many platelet parameters are measured by coulter counter? What is the importance of the solution in manual PLT counting?

Q8

A/ Identify this test and briefly write the principle of it

B/ It's not true to divide PCV value by 3 for obtaining hemoglobin concentration in patients? Why

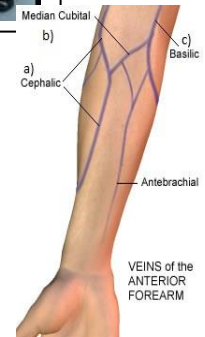


Q9 A/ True or false

1. Polycythemia Vera is overproduction of RBC which is resulted from hypoxia?
2. Hayme's solution is used for diluting the blood during RBC counting

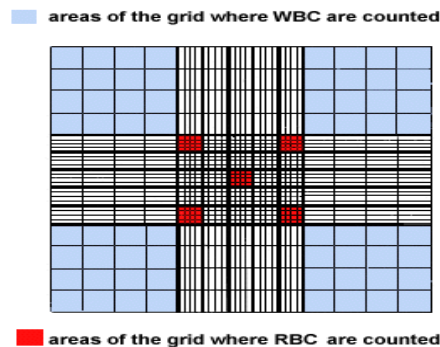
Q9 A/ Chose the correct answer

1. Which of the following vein is the first choice of vein puncture?
A) Cephalic vein B) Median cubital vein C) Basilic vein
- 2-is an anticoagulant which prevent blood clotting by inhibiting thrombin activity
a) Heparin, b) Sodium citrate, c) Salt-EDTA



Q10/

If the number of RBCs in 3 medium squares of hemomacutometer slide was 288 cell, calculate the number of RCB in 1 liter of blood?



Lecturer

Darya M. Azeez