Department of Biology

College of Science

Salahaddin University

Subject: Hematology

Course Book – 4

1. **Lecturer's name: Asst. Prof. Dr. Edrees Mohammad Ameen**
2. **Lecturer's name: Practical Lecturer. Natheer Jameel Yaseen**

Academic Year: 2022/2023

Course Book

1.Course name	**Hematology (Theory & Practical)**
2. Lecturer in charge	**Edrees Mohammad Ameen**
3. Department/ College	**Biology department/ college of science**
4. Contact	**e-mail: edrees.ameen@su.edu.krd** **natheer.yaseen@su.edu.krd**
5. Time (in hours) per week	**Theory: 2** **Practical: 6**
6. Office hours	**17 hours per week**
7. Course code	**SBio 404**
8. Teacher's academic profile	I was awarded an M.Sc. in animal physiology in 1996 and pursuit in the biology department, college of science, Salahaddin university in 1996 as an assistant lecturer. Then, I started to work in the same department, as an assistant lecturer. Then I finished the Ph.D. at Babylon- university and then upgrading to lecturer in 2007 and assistant professor in 2011.

The teaching experience is both theoretical and practical including:

Undergraduate:

1- Animal physiology.
2- Hematology.
3- Ecophysiology.
4- Histology and embryology.
5- Cell biology.
6- General biology.
7- Invertebrate.
8- Biostatistics.
9- Endocrinology.

Postgraduate:

1- Reproductive physiology.
2- Endocrinology.
3- Advanced Hematology.

2013-2014 Supervising MSc Student.
2013-2016 Supervising Ph.D. Student.
2018-2020 Supervising MSc Student.
2020-2022 Supervising Ph.D. Student.

Administration:

In 2013 I become the supervisor of the library of the college of science.

List of Publications

1. Physiological responses to thyroxine (T4) and hydrocortisone (cortisol) in adult domestic pigeon Columba livia. (3rd Scientific Conference of Salahaddin Univ. Erbil (1997).
2. Effects of jaundice on some hematological and biochemical parameters in humans. IBN AL-HAITHAM J. FOR PURE & APPL. SCI, 19 (2), 2006.
3. A diagnostic study of some causes of male infertility in Kurdistan region of Iraq. 10th Scientific Conference of Babylon Univ. 16 (1), 2008.
4. Effect of stress on semen quality in a population of infertile human. Kufa Med.Journal. 12 (1), 2009.
5. Comparison between hypo-osmotic swelling and staining tests for determination of human sperm viability. Journal of Duhok

	University. 12 (1), 2009. 6. Effect of Iron Overload on Malondialdehyde Level in Beta-Thalassaemia patients. Zanco journal of pure and applied sciences of Salahaddin University. 21(5), 2009. 7. Relationships between ages, days of abstinence, and semen quality of infertile men. Journal of Duhok University. 13(1), 2010. 8. Effect of Ginseng Root on Some Reproductive Parameters in Normal and Cyclophosphamide Treated Male Albino Mice. Zanco journal of pure and applied sciences of Salahaddin University. 22 (4), 2010. 9. IN VITRO Human Sperm Activation Using Simple Layer and Centrifugation-Swim Up Single Layer Techniques. 6th conference of Diyala medical Science. 2010. 10. Effect of Smoking and Varicocele on Fertility and Semen Quality in Infertile Men. 1st conference of biological sciences of Kirkuk University. 2011. 11. Effect of Osmolality on Semen Quality and Using Endtz Method for Determination of Semen Leucocytes. 4th international conference of Salahaddin University. 2011. 12. Effect of viscosity and leucocytospemia on semen quality of infertile men. 4th conference of biological sciences of Duhok University. 2012. 13. Study the role of obesity and oxidative stress as factors of type 2 diabetes. World Journal of Pharmaceutical Research, Volume 4 issue 10: 90-98. 2015. 14. Study the role of Obesity and Pancreatic insufficiency as factors of type 2 diabetes. Online International Interdisciplinary Research Journal, Volume-V: 13-27. 2015. 15. Effect of Some Factors on Respiratory rate and Vital Capacity in human. 1st International Scientific Conference of Kirkuk University. 2015. 16. Effect of Polycystic Ovarian Syndrome and Obesity on Women Fertility in Erbil Governorate. 6th International Conference and Workshop on Basic and Applied Sciences, Salahaddin University, Erbil, 2017. 17. Impact of Diabetes and Obesity on Human Fertility and Semen Quality. 18. Arterial blood gases and some blood parameters in Tetralogy of Fallot patients. Zanco journal of pure and applied sciences of Salahaddin University. 33 (3), 2021. 19. Relationships of Osmolality and Oxidative Stress with Semen Quality and Their Effects on Male Fertility. Ibn Al-Haitham Journal for Pure and Applied science.2021. 20. REPRODUCTIVE, BIOCHEMICAL, AND HORMONAL TRAITS OF LOCAL QUAIL IN RESPONSE TO DIETARY SUPPLEMENTATION OF DRIED GARLIC POWDER. Iraqi Journal of Agricultural Sciences. 53(2):278-287. 2022.

21. REPRODUCTIVE, SERUM BIOCHEMICAL AND HORMONAL TRAITS OF LOCAL QUAIL IN RESPONSE TO DIETARY SUPPLEMENTATION OF GREEN TEA POWDER.Iraqi Journal of Agricultural Sciences. 53(1):57-66. 2022.
22.Correlation between Tumor Necrosis Factor–Alfa and Anti-tyrosine Phosphatase with Obesity and Diabetes Type 2. Iraqi Journal of Science. Vol. 63, No. 8, pp: 3322-3331.2022

Further academic training and Participation in Conferences

1. Teaching Mode Training held at Salahaddin University (College of Education, Salahaddin University) (1997).
2. 3rd Scientific Conference of Salahaddin Univ. Erbil (1997).
3. 10th Scientific Conference of Babylon Univ. (2008).
4. 6th conference of Diyala medical Science. (2010).
5. 1st conference of biological sciences of Kirkuk University. (2011).
6. 4th international conference of Salahaddin University. (2011).
7. 4th conference of biological sciences of Duhok University. (2012).
8. 1st International Scientific Conference of Kirkuk University. 2015.
9. 6th International Conference and Workshop on Basic and Applied Sciences, Salahaddin University, Erbil, 2017.

9. Keywords	Hematology, Blood, disorder, bone marrow

10. Course overview:

Hematology is a science that deals with blood and its components, structure, function, and disorders. The course will be 5 credit hours. Two credit hours will be designated for theory lectures and three credit hours for the laboratory. The course will contain an introductory part, in which basic concepts of hematology are introduced and major terms are defined; then, specialized topics will be tackled in a systematic approach to cover the major diseases of the blood and its components.

Hematology is a dynamic field that has always been on the frontier of clinical investigation within the scope of human disease, therefore the student can get secure employment through having more scientific knowledge about all blood disorders. The best way for investing their quality in making a private laboratory.

11. Course objective:

The course is specially planned for undergraduate students who intend to work in diagnostic laboratories. Upon the completion of the course, students would have benefited from the following objectives of the course:

1. Explain major concepts in hematology, including Haemopoiesis, bone marrow structure, blood

composition, and functions of blood components.
2. Elucidate the basis of blood diseases, including Anemias, hemoglobinopathies, bleeding disorders, and hematological malignancies
3. Clarify in detail the major concepts regarding blood transfusion and bone marrow transplantation.
4. Provide the latest information regarding the newest techniques utilized by hematologists to treat and diagnose hematological disorders, including hematological analyzer.

12. Student's obligation

- Students should attend all lectures and not miss any lecture time.
- Additionally, for each lecture, the student should prepare and follow up with sufficient studying time to cover the material presented in the class during that lecture.
- It is highly advised not to accumulate material until before the examination time. Cramming will weaken the student's ability to understand and retain valuable information.
- Students prefer to attend all the seminars on time which are held in our department especially the seminar about hematology.

13. Forms of teaching

Teaching with technology can deepen student learning by supporting instructional objectives.

- Data Show Projector
- Blackboard
- Video

14. Assessment scheme

Breakdown of overall assessment and examination

Grading System:

Exam No. 1 (Theory): 15%
Exam No.2 (Theory) : 15%
Mean Examination (Theory): 15 %
Practical Examination: 35%
Total =50 %
Final examination: 50 theory

15. Student learning outcome:

1. Interpret hematology test results and evaluate blood film morphology to analyze the differential diagnosis and suggest further tests to determine the actual diagnosis for a wide range of hematological disorders.
2. Understand and be able to communicate the normal physiology and pathophysiological conditions associated with the dysfunction of various organ systems.
3. Understand the etiology, pathophysiology, and laboratory diagnosis or a wide range of conditions including leukemia, proliferative disorders, various anemic conditions, hemolytic disorders, hemoglobin disorders, and hemostatic dysfunction.
4. Communicate scientific and hematological concepts, concisely, and logically.
5. Practise hematology within the laboratory environment safely and with due regard to occupational health and safety guidelines.

16. Course Reading List and References:

1- A–Z of Haematology by Barbara J. Bain and Rajeev Gupta, 2003 by Blackwell Publishing Ltd.

2- A beginners' guide to blood cells by Barbara J. Bain, 2nd Edition, 2004 by Blackwell Publishing Ltd.
3- Colour Atlas of Haematology Practical Microscopic and Clinical Diagnosis by Harald Theml, Heinz Diem, and Torsten Haferlach, 2nd revised edition, 2004, Thieme Stuttgart · New York.
4- Diagnostic Hematology by James A. Ker, 2009, Springer-Verlag London Limited.
5- Seely,R.R., Stephens, T.D. and Tate, P. (1998).Anatomy and physiology. Fourth edition, WCB McGraw – Hill.
6- Hematology, Basic Principles and Practice by Ronald Hoffman, Edward J. Benz, Sanford J. Shattil, Bruce Furie et al., Copyright © 2005, Elsevier Inc.
7- Haematolgy at a Galance. 2000. Atul B. Mehta and A. Victor Hoffbrand. BlackWell Science.
8- Hematology in Clinical Practice. 2005. Robert S. Hillman, Kenneth A. Ault and Henry M. Rinder. 4th Edition. McGraw-Hill.
9- Modern Hematology. 2007. Biology and clinical management. Reinhold Munker, Erhard Hiller, Jonathan Glass, and Ronald Paquette. Humana Press Inc.
10- PDQ Hematology. 2002. William F. Kern. BC Decker Inc
11- Williams Hematology. 2007. Marshall A. Lichtman. Ernest Beutler. Uri Seligsohn . Thomas J. Kipps and Kenneth Kaushansky. 7th edition. The McGraw-Hill Companies.

17. The Topics: Lecturer's name	
Week 1: Introduction, the role of blood, composition of blood. **Week 2:** Haematopoiesis, erythrocyte production, regulation of erythrocyte production, leucocytes production, platelet production. **Week 3:** Hemoglobin, structure and function, Transport of gases, oxygen and carbon dioxide, Carbon monoxide Poisoning. **Week 4:** Oxygen Delivery and Storage, myoglobin. Erythrocyte destruction, The Fate of Expired Erythrocytes and Hemoglobin, Iron Metabolism, The Pathway of Iron Absorption, Transport, and Storage. **Week 5:** Hemostasis—The Control of Bleeding, Vascular	

Spasm, Platelet Plug Formation, Coagulation, Initiation of Coagulation, Completion of Coagulation. **Week 6:** Blood Groups, Blood Typing, and Blood Transfusions, The discovery of blood groups, ABO blood grouping system, Rh factor blood grouping system, Cross-matching, Hemolytic disease of the newborn (HDN) or erythroblastosis fetalis, Blood Transfusions for Pets. **Week 07**: **Examination** **Week 08**: Blood bank **Week 09:** Some disorders of the blood **Week 10:** Polycythemia **Week 11:** Iron deficiency anemia **Week 12**: Thalassemia, Alpha- thalassemia, Beta-thalassemia **Week 13:** Hemolytic anemia **Week 14:** Sickle cell anemia **Week 15: Examination**	
18. Practical Topics (If there is any)	
The Topics:	**Date**
Week 1: Introduction to basic concepts in practical hematology lab. **Week 2:** Blood Specimen Collection, hematocrit, and blood groups **Week 3:** Determination of Haemoglobin concentration **Week 4:** Manual Red Blood Cell Counting using Hemocytometer **Week 5:** Manual Wight Blood Cell Counting **Week 6:** Manual Platelet count and Platelet Indices **Week 07**: First exam **Week 08**: Erythrocyte sedimentation rate and RBC indices	

Week 09: Preparation of the blood smear and differential Leukocyte count **Week 10**: Reticulocyte count **Week 11:** clotting Time and Bleeding Time estimation **Week 12:** Automated hematology analyzer **Week 13:** Second Exam	

19. Examinations: Theory
Examples of Semester Examinations

Q1: Define the following

Carboxyhemoglobin, Myoglobin, Hemolysis, Biliverdin, Iron overload, Chronic leukemia, beta-thalassemia, Polycythemia.

Q2: Complete the following sentences with suitable words:

1- The process of blood cell production, called ----------

2- Each erythrocyte contains about---------- Molecules of hemoglobin.

3-When hemoglobin is 100% saturated, every molecule of it carries ----------

4- Blood transfusion is the process of receiving ---------- into one's circulation intravenously.

5. ----------is the formation of a blood clot inside a blood vessel

Q3: Explain the following:

1- The causes of hypoxemia.

2- Vascular spasm.

3- Secondary polycythemia

4. Process of Erythropoiesis (Diagram)

Q4: Write the reasons of the following:

1- Warfarin (coumadin) prevents clot formation.

2-Platelets will not adhere to the endothelium of undamaged blood vessels.

Q5: Draw and labels the following:

1- Effects of Temp and pH on oxyhemoglobin dissociation.

2- The life and death of erythrocytes.

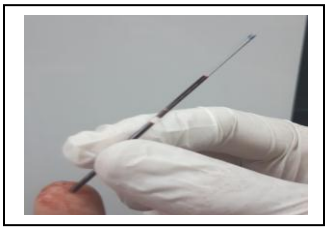
Examination (Practical)
Examples of Semester Examination

Practical Hematology exam

Thursday 11 November 2014

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



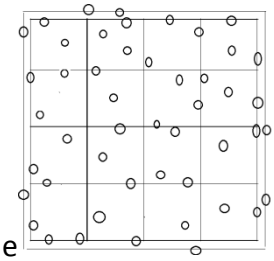
Q2

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 µl 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 the coulter counter? What is the importance of the solution in manual PLT counting?

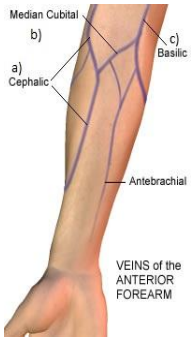
Q8

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 the 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

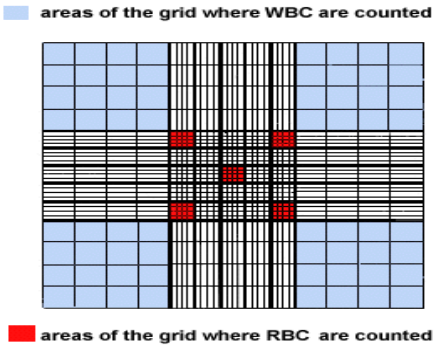
1. Which of the following vein is the first choice of vein puncture?
   A) Cephalic vein B) Median cubital vein C) Basilic vein

2- ……..is an anticoagulant which prevents 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 hemacytometer slide was 288 cell, calculate the number of RCB in 1 liter of blood?



20. Extra notes:

21. Peer review پێداچوونەوەی