

In the Name of God



**Hamadan University of Medical Sciences and Health Services
Educational Deputy of the University
Center for Studies and Development of Medical Sciences Education**

Theory/Practical Lesson Plan Form

Dear Colleagues,

As the teaching-learning process is one that requires careful planning to achieve its objectives, the preparation of a lesson plan at the beginning of the educational process (as a map and guide for instructors and students) is essential. It serves as one of the main tools for the educational activities of instructors. Therefore, we kindly ask all instructors to pay utmost attention to completing the lesson plan.

Course and Instructor Details (Completing all items in this section is essential)

Course and instructor details (complete)

- Course title: Kidney Physiology and Body Fluids
- Instructor(s): Dr. Mohammad Zarei; Dr. Fatemeh Ramazani Ali Akbari
- Course coordinator: Dr. Mohammad Zarei
- Head of Department: Dr. Siamak Shahidi
- Credit hours: Theory: 2.0 units
- Program & student level: MSc (Master's)
- Term: First semester, Academic Year 1402–1403
- Teaching location: School of Medicine classrooms
- Language of instruction: English

Session schedule (16 sessions) — Persian dates preserved

Session	Date (Solar Hijri)	Topic (Title)	Behavioral objectives	Learning domain	Teaching methods	Duration	Teaching aids	Assessment method
1	04/07/1402	Body fluid compartments	1. Define intracellular and extracellular fluids. 2. Describe components of intra- and extracellular fluids. 3. Explain methods to measure fluid volumes in compartments.	Cognitive — Knowledge; Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
2	18/07/1402	Osmolarity of body fluids	1. Define osmolarity. 2. List factors affecting osmolarity. 3. Define hypotonic, hypertonic, and isotonic solutions.	Cognitive — Knowledge	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
3	25/07/1402	Functional anatomy and urine formation in the kidneys	1. List renal functions in the body. 2. Describe functional anatomy of the kidney. 3. Explain physiology of urine formation.	Cognitive — Knowledge; Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
4	02/08/1402	Glomerular filtration	1. Explain glomerular filtration. 2. State factors determining GFR. 3. Describe regulation of GFR.	Cognitive — Comprehension; Cognitive — Knowledge	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A

5	09/08/ 1402	Glomerular filtration (II)	1. Explain hormonal factors regulating GFR. 2. Explain neural factors regulating GFR. 3. Describe opposing and promoting pressures for filtration.	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
6	16/08/ 1402	Tubular reabsorption	1. Describe tubular reabsorption pathways and mechanisms. 2. Explain reabsorption in different nephron segments. 3. Describe regulation of tubular reabsorption.	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A and quiz
7	23/08/ 1402	Tubular secretion	1. Describe tubular secretion pathways and mechanisms. 2. Explain secretion in different nephron segments. 3. Describe regulation of tubular secretion.	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
8	30/08/ 1402	Urine concentration and dilution	1. Explain formation of dilute urine. 2. Explain formation of concentrated urine. 3. Describe regulation of extracellular	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A

			fluid osmolarity.					
9	04/07/1402	Potassium homeostasis	1. Describe plasma potassium regulation. 2. Explain hypokalemia. 3. Explain hyperkalemia.	Cognitive — Knowledge; Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
10	18/07/1402	Renal potassium excretion	1. Explain cellular mechanisms of K ⁺ secretion. 2. Describe regulation of K ⁺ secretion. 3. Identify factors interfering with renal K ⁺ excretion.	Cognitive — Knowledge	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
11	25/07/1402	Calcium and inorganic phosphate homeostasis	1. Describe body calcium balance. 2. Explain calcium handling along the nephron. 3. Describe regulation of urinary calcium excretion. 4. Describe body phosphate. 5. Explain phosphate handling along the nephron. 6. Describe regulation of urinary phosphate excretion.	Cognitive — Knowledge; Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
12	02/08/1402	Overview of acid-base balance	1. Explain buffer systems. 2. Describe the respiratory system role in acid-base balance. 3. Describe the	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A

			renal system role in acid-base balance.					
13	09/08/1402	Renal role in acid-base regulation — Part I	1. Describe bicarbonate reabsorption and secretion processes along the nephron. 2. Explain mechanisms of bicarbonate reabsorption in the nephron. 3. Explain mechanisms for generation of new bicarbonate in the nephron.	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
14	16/08/1402	Renal role in acid-base regulation — Part II	1. Explain H ⁺ secretion and its coupling to bicarbonate reabsorption. 2. Describe secretion mechanisms for nonvolatile acid H ⁺ in the nephron. 3. Explain net acid excretion by the kidneys.	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A and quiz
15	23/08/1402	Renal role in acid-base regulation — Part III	1. Explain regulation of H ⁺ secretion in the nephron and factors affecting it.	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A
16	30/08/1402	Acid-base disorders	1. List types of acid-base disorders. 2. Explain compensatory responses: intracellular/extracellular buffers,	Cognitive — Comprehension	Lecture	90 minutes	Slides, markers, whiteboard	Oral Q&A

			respiratory compensation, and renal compensation. 3. Analyze acid-base disturbances.					
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Student assessment table (grading scheme)

Assessment type	Date / When	Assessment tool	Weight (% of final grade)
Oral Q&A / Quiz	Selected sessions	Oral questions and short-answer / completion questions	10%
Project presentation	—	—	—
Midterm exam	—	—	—
Final exam	According to academic calendar	Short-answer and multiple-choice questions	90%
Other	—	—	—
Total	—	—	100%

References

1. Guyton and Hall — Textbook of Medical Physiology, 2021 edition
2. Ganong — Review of Medical Physiology, latest edition (2021)
3. Berne & Levy Physiology, latest edition (2021)