بسمه تعالی 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 Information

Field	Details
Course Title	Cell Physiology
Instructor	Dr. Alireza Komaki
Course Coordinator	Dr. Alireza Komaki
Head of Department	Dr. Siamak Shahidi
Credit Hours	Theory: 0.80 units; Practical: —
Program & Level	Professional Doctorate
Teaching Location	School of Medicine

Session-by-Session Syllabus

Session	Topic(s)	Expected Learning Outcomes (Behavioral)	Learning Domain	Teaching Method(s)	Duration	Teaching Aids	Assessment Method(s)
1	Cell Organization, Function, and Internal Environment Regulation	1. Define cell physiology. 2. Describe intracellular and extracellular fluids, including ion concentrations. 3. Define homeostasis and explain organelle roles. 4. Explain positive and negative feedback mechanisms.	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions
2	Physical Structure of the Cell	1. Describe the structure of the cell membrane. 2. Explain the structure and function of intracellular organelles: ER, mitochondria, lysosomes, Golgi apparatus.	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions
3	Membrane Transport Mechanisms	1. Explain simple diffusion and examples. 2. Describe factors influencing diffusion. 3. Explain channel mechanisms. 4. Explain primary active transport and types. 5. Describe sodium–potassium pump structure	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions

		and function. 6. Explain secondary active transport and types. 7. Describe co-transport and counter-transport with examples.					
4	Cell Potentials	1. Describe resting membrane potential and ionic factors. 2. Calculate Nernst equilibrium potential. 3. Explain Goldman–Hodgkin equation and calculate resting potential under various conditions. 4. Explain phases of action potential and ionic roles. 5. Describe variations of action potential in different cells. 6. Explain propagation of action potentials. 7. Describe pacemaker potentials and influencing factors. 8. Explain threshold and subthreshold potentials.	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions
5	Neural Synapse	1. Describe neuron-to-neuron synapses. 2. Explain motor end plate structure. 3. Explain molecular	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions

		biology of neurotransmitter synthesis, release, and degradation. 4. Describe neurotransmitter receptors and drugs affecting them.					
6	Skeletal Muscle Organization	1. Describe skeletal muscle physical structure. 2. Describe molecular characteristics of actin, myosin, troponin, tropomyosin, titin. 3. Explain importance of triad structure. 4. Explain isometric contraction mechanism. 5. Explain isotonic contraction mechanism.	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions
7	Skeletal Muscle Contraction Mechanisms	1. Describe general mechanism of contraction. 2. Explain excitation–contraction coupling. 3. Describe action potential propagation to SR and Ca^{2+} release. 4. Explain role of Ca^{2+}–calmodulin in initiating contraction. 5. Explain role of myosin head phosphorylation in contraction initiation. 6.	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions

		Describe sliding filament mechanism. 7. Describe power stroke. 8. Explain relaxation mechanism. 9. Describe energy sources for contraction and usage sites. 10. Explain latch mechanism.					
8	Smooth Muscle Structure and Contraction	1. Describe smooth muscle physical structure. 2. Describe actin molecular structure and differences from skeletal muscle. 3. Describe smooth muscle myosin structure. 4. Explain dense bodies, caveolae, and filament arrangement. 5. Describe multi-unit smooth muscle structure, function, and distribution. 6. Describe single-unit smooth muscle structure and function. 7. Identify calcium sources for contraction. 8. Explain role of Ca^{2+}–calmodulin in contraction initiation. 9. Explain phosphorylation/ dephosphorylation of myosin light chain in	Cognitive	Lecture, film, PowerPoint images, Q&A	2 hrs	Video projector, computer	Multiple-choice & descriptive questions

		contraction control. 10. Explain stress–relaxation mechanism.					

Grading Scheme

Assessment Type	Assessment Tool	Points
Quiz	Classroom Q&A	2 points
Project/Presentation	—	—
Midterm Exam	—	—
Final Exam	Descriptive & multiple-choice questions	18 points
Other	—	—
Total	—	**20 points**

References

Main

- Guyton & Hall, *Textbook of Medical Physiology*, 2021 Edition (Latest Print)
- Ganong's *Review of Medical Physiology*, latest edition (2021)

Supplementary

- Berne & Levy, *Physiology*, latest edition (2021)