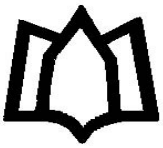
In the Name of God



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 Title:** Genetics
- **Instructors:** Dr. Fatemeh Bahreini, Dr. Fahimeh Piryaei
- **Course Coordinator:** Dr. Fatemeh Bahreini
- **Department Head:** Dr. Rezvan Najafi
- **Type and Credit Hours Breakdown:**
  - ☑ Theoretical: 2 credits
  - ☐ Practical: ... credits
- **Student Major and Level:** General Medicine

- **Academic Semester:**
  - ☑ First Semester
  - ☐ Second Semester
- **Location of Instruction:** Medical School

1	History, Clinical Importance of Medical Genetics, and Its Future, Basics of Genetics	1. Students can depict allele distribution during gametogenesis based on Mendel's laws. 2. Students can explain recent advances in genetics and the impact of genetic diseases on society. 3. Students recognize hereditary material and can describe the general process of gene expression.	1. Cognitive - Analysis 2. Cognitive - Understanding 3. Cognitive - Knowledge	Lecture, Q&A	2 hours	Projector, computer, board, PowerPoint files, video clips	Q&A or quiz and final exam
2	Cell Structure, Genome, Gene Function, and Regulation	1. Students should describe genome organization. 2. Explain gene expression regulation.	1. Cognitive - Understanding 2. Cognitive - Understanding	Lecture, Q&A	2 hours	Projector, computer, board, PowerPoint files, video clips	Q&A or quiz and final exam
3	Mutations, Mechanisms of Their Occurrence, Importance, and Applications	1. Students can differentiate between mutation and polymorphism. 2. Identify mutation types by comparing gene sequences. 3. Explain	1. Cognitive - Understanding 2. Cognitive - Analysis 3. Cognitive - Understanding	Lecture, Q&A	2 hours	Projector, computer, board, PowerPoint files, video clips	Q&A or quiz and final exam

		mechanisms of mutations.					
4	Mechanisms of Numerical and Structural Chromosomal Disorders	1. Differentiate numerical from structural chromosomal disorders. 2. Explain the difference between mosaicism and chimera. 3. Describe mechanisms of major chromosomal disorders.	1. Cognitive - Analysis 2. Cognitive - Understanding 3. Cognitive - Understanding	Lecture, Q&A	2 hours	Projector, computer, board, PowerPoint files, video clips	Q&A or quiz and final exam
5	Clinical Cytogenetics, Chromosomal Examination Methods	1. Choose appropriate techniques based on the type of disorder. 2. Explain cytomolecular techniques and their applications. 3. Understand that the chosen technique is the best method for diagnosis.	1. Cognitive - Application 2. Cognitive - Understanding 3. Attitude	Lecture, Q&A	2 hours	Projector, computer, board, PowerPoint files, video clips	Q&A or quiz and final exam
6	Principles of Counseling, Drawing, and Interpreting Pedigrees in Single-Gene Diseases	1. Draw a pedigree based on family disease history. 2. Identify inheritance patterns from pedigree structure. 3. Explain the importance and application of coefficients of relationship and inbreeding.	1. Cognitive - Analysis 2. Cognitive - Application 3. Cognitive - Application	Lecture, Q&A, Role play	2 hours	Projector, computer, board, PowerPoint files, video clips	Q&A or quiz and final exam
7	Mendelian Inheritance Patterns (Single-Gene) in Humans	Identify Mendelian inheritance patterns based on pedigree structure.	Cognitive - Application	Lecture, Q&A	2 hours	Projector, computer, board, PowerPoint files,	Q&A or quiz and final

						video clips	exa m
8	Examples of Single-Gene Diseases and Androgenic Inheritance	1. Explain single-gene diseases. 2. Define androgenic inheritance.	1. Cognitive - Understanding 2. Cognitive - Knowledge	Lectur e, Q&A	2 hou rs	Projector, computer, board, PowerPoi nt files, video clips	Q& A or quiz and final exa m
9	Multifactorial Inheritance	1. Familiarize with multifactorial inheritance. 2. Understand empirical risk and patterns different from Mendelian inheritance.	1. Cognitive - Knowledge 2. Cognitive - Knowledge	Lectur e, Q&A	2 hou rs	Projector, computer, board, PowerPoi nt files, video clips	Q& A or quiz and final exa m
1 0	Chromosomal Disorders (Autosomal and Sex-Linked)	1. Explain autosomal chromosomal disorders (e.g., Down, Patau, Edwards syndromes). 2. Explain sex-linked chromosomal disorders (e.g., Klinefelter, Turner syndromes). 3. Describe diseases caused by structural chromosomal disorders. 4. Compare mosaicism, chimera, and true hermaphroditis m.	1. Cognitive - Understanding 2. Cognitive - Understanding 3. Cognitive - Understanding 4. Cognitive - Analysis	Lectur e, Q&A	2 hou rs	Whiteboa rd, markers, PowerPoi nt	Q& A, final exa m
1 1	Congenital Disorders (Birth Defects) and Teratogens	1. Define congenital disorders. 2. Classify isolated and multiple anomalies. 3. Define malformations,	1. Cognitive - Knowledge 2. Cognitive - Synthesis 3. Cognitive - Knowledge	Lectur e, Q&A	2 hou rs	Whiteboa rd, markers, PowerPoi nt	Q& A, final exa m

		disruptions, deformations, dysplasias, and clinical examples. 4. Define sequences, associations, syndromes, and clinical examples. 5. List teratogenic factors. 6. Name types of teratogens. 7. Provide examples of teratogens and congenital anomalies.	4. Cognitive - Knowledge 5. Cognitive - Knowledge 6. Cognitive - Knowledge 7. Cognitive - Knowledge				
12	Epigenetics	1. Define epigenetics. 2. Explain the role of epigenetics in development and tissue differentiation. 3. Discuss the role of epigenetics in multifactorial diseases. 4. Classify epigenetic markers. 5. Interpret methylation status during human development. 6. Explain genomic imprinting. 7. Provide examples of epigenetically influenced diseases (e.g., Angelman syndrome, Prader-Willi syndrome, Russell-Silver syndrome). 8. Explain X chromosome	1. Cognitive - Knowledge 2. Cognitive - Understanding 3. Cognitive - Knowledge 4. Cognitive - Synthesis 5. Cognitive - Evaluation 6. Cognitive - Understanding 7. Cognitive - Understanding 8. Cognitive - Understanding	Lecture, Q&A	2 hours	Whiteboard, markers, PowerPoint	Q&A, final exam

		inactivation in females.					
13	Pharmacogenetics	1. Define pharmacogenetics, pharmacogenomics, and pharmacokinetics. 2. Compare how the human genome affects drug effects. 3. Describe drug metabolism stages. 4. Interpret different population responses to drugs. 5. Provide clinical examples of genotype differences affecting drug metabolism and response. 6. Discuss increasing drug efficacy based on genetic status. 7. Define personalized medicine.	1. Cognitive - Knowledge 2. Cognitive - Evaluation 3. Cognitive - Understanding 4. Cognitive - Evaluation 5. Cognitive - Understanding 6. Cognitive - Knowledge 7. Cognitive - Knowledge	Lecture, Q&A	2 hours	Whiteboard, markers, PowerPoint	Q&A, final exam
14	Cancer Genetics	1. Describe the cell cycle and factors involved in its regulation. 2. Define cancer. 3. List characteristics of cancer cells. 4. Classify types of cancer. 5. Explain the genetic and environmental contributions to cancer. 6. Categorize genes involved in cancer. 7. Explain signaling	1. Cognitive - Knowledge 2. Cognitive - Knowledge 3. Cognitive - Knowledge 4. Cognitive - Synthesis 5. Cognitive - Understanding 6. Cognitive - Synthesis 7. Cognitive -	Lecture, Q&A	2 hours	Whiteboard, markers, PowerPoint	Q&A, final exam

		pathways in oncogenes. 8. Describe mechanisms activating proto-oncogenes. 9. Explain tumor suppressor genes. 10. Discuss familial cancer and the importance of genetic counseling. 11. Name effective drugs for specific cancers with known mutations.	Understanding 8. Cognitive - Understanding 9. Cognitive - Understanding 10. Cognitive - Knowledge 11. Cognitive - Knowledge				
15	Prenatal Screening	1. Compare screening tests and diagnostic tests. 2. Describe the history of screening tests. 3. Explain levels of screening programs. 4. Name characteristics of screening programs. 5. Classify genetic diseases and congenital disorders detectable by prenatal screening tests. 6. Identify criteria for mothers to undergo diagnostic tests.	1. Cognitive - Evaluation 2. Cognitive - Understanding 3. Cognitive - Understanding 4. Cognitive - Knowledge 5. Cognitive - Synthesis 6. Cognitive - Knowledge	Lecture, Q&A, group discussion	2 hours	Whiteboard, markers, PowerPoint	Q&A, final exam
16	Pre- and Postnatal Diagnosis	1. Correctly select prenatal genetic diagnostic tests. 2. Explain problems arising during prenatal diagnosis and solutions. 3. Classify	1. Cognitive - Application 2. Cognitive - Understanding 3. Cognitive - Synthesis	Lecture, Q&A, group discussion	2 hours	Whiteboard, markers, PowerPoint	Q&A, final exam

		disorders identifiable through prenatal diagnosis. 4. Properly suggest pre-implantation genetic diagnosis (PGD). 5. Properly suggest non-invasive prenatal testing (NIPT). 6. Recommend molecular techniques at the appropriate time.	4. Cognitive - Application 5. Cognitive - Application 6. Cognitive - Application				
17	Treatment of Genetic Diseases	1. Explain genetic engineering, gene therapy, and genome editing. 2. Describe the process and stages of genetic engineering. 3. Name tools needed for genetic engineering. 4. Explain applications of genetic engineering in industry, nature, and medicine. 5. Classify viral and non-viral vectors. 6. Discuss the use of novel drugs based on gene mutations.	1. Cognitive - Understanding 2. Cognitive - Knowledge 3. Cognitive - Knowledge 4. Cognitive - Understanding 5. Cognitive - Synthesis 6. Cognitive - Understanding	Lecture, Q&A	2 hours	Whiteboard, markers, PowerPoint	Q&A, final exam

Grading Scheme

Evaluation Type	Evaluation Tool	Percentage of Total
Quiz	Descriptive Exam	30%
Project Presentation		
Midterm Exam		
Final Exam	Multiple Choice Exam	70%
Other Items	Role Play	
Total		20

Reference

-Emery's Elements of Medical Genetics-…last Edition, Peter Turnpenny Sian Ellard

-Thompson & Thompson Genetics in medicine last Edition, Robert Nussbaum, Roderick McInnes, Huntington Willard
-Medical Genetics last Edition, Lynn Jorde John Carey Michael Bamshad
Scientific papers
-Gene cloning and DNA analysis, last edition, T. A. Brown

-Human Genetics: From Molecules to Medicine, P Schaaf

-Molecular Human Genetics, 5th edition, Strachan