General Biology Syllabus
Oklahoma City Community College
Spring 2009

COURSE: General Biology
NUMBER: BIO 1114
INSTRUCTOR: _______________________________________
PHONE: 682-1611, EXT. _________________________
E-Mail ________________________________________@occc.edu
Home Page http://www.occc.edu
OFFICE LOCATION: _______________________________________
OFFICE HOURS: _______________________________________

Campbell, Reece, Taylor, Simon and Dickey


Edited by Anthony J. Stancampiano, Ph.D

COURSE DESCRIPTION:

General Biology is the study of life and all aspects of living organisms. Throughout the semester students will gain knowledge about the chemical basis of life, basic structural characteristics of cells, tissues, organs, organ systems and the study of living organisms. Student will be able to recognize, discuss and correctly apply fundamental biological principles influencing his or her personal relationship with other living things. Laboratory work is an integral and required part of the course to aid students in fully understanding fundamental biological concepts.

COURSE COMPETENCIES:

Using lecture and laboratory facilities, the student will:

1. Apply scientific application to basic chemical and structural aspects of the cell including studies of food production, energy making, replication, and reproduction.

2. Demonstrate basic genetic applications.

3. Recognize and be able to apply ecological and evolutionary principles including methods of classification.
RULES OF THE GAME:

College biology courses are some of the most challenging courses offered at Oklahoma City Community College. They require constant attention and hard work. The following instructions have been developed to help facilitate your success in General Biology.

1. Exams for each unit must be taken in class as directed by your instructor. There are **no retests**. A student who does not take a test on the day assigned will receive a zero for that test unless arrangements are made with their instructor. Makeup tests are only to be used for extenuating circumstances. Your instructor will establish a deadline for any makeup work.

2. Make-up laboratory work (**if approved by your instructor**) must be done within the time frame established by your instructor (usually one week). Contact your instructor as soon as you are aware of a requirement to miss lab. Failure to do so may result in your not being allowed to make up the work missed.

3. The Science Center (2D1 Main Building) is designed to accommodate the independent laboratory needs of students in this course. Students may work individually or in pairs to view lecture videotapes, perform laboratory exercises, review lab materials prior to exams, take lab tests, view enrichment audio-visual materials (filmstrips, slide-tapes, video tapes, computer assisted tutorials, etc.), and receive assistance from tutors scheduled to work with students in the course. Faculty or laboratory assistants supervise student activities during posted operating hours to introduce laboratories, answer questions, administer lab quizzes, and assure safety and the proper use of equipment and materials. Students wishing to use the Science Center must sign up for the planned activity at least **one day** in advance. Once requested activities are approved by the faculty or lab assistant, the availability of a work area and the required lab materials (other than videotape players) will be assured at the scheduled time. Students, who have not scheduled times in advance to use the Science Center, **may** be accommodated, **provided** there is no conflict with scheduled activities and the faculty person or lab assistant on duty gives approval. Students who schedule activities in advance have priority over those who "drop in" at unscheduled times. Students may not make appointments over the telephone.

Information about Science Center policies and procedures, operating hours and tutor schedules is available in the Science Center or from your instructor. Scheduled operating hours for the Science Center will be enforced. Students will not be allowed to begin activities which cannot reasonably be completed by scheduled closing times. Should activities not be completed, the student will be required to schedule another time for completion of the work. Before leaving the Science Center, students will turn in their completed lab sheets and laboratory attendance cards for review and initialing by the faculty person or assistant on duty.

4. Abuse of the Testing Center or Science Center may result in loss of the privilege to use these resources. Academic dishonesty in the Testing Center, Science Center, in class or in the lab may result in withdrawal from the course.

5. Photocopying laboratory exercises will be prohibited. All laboratory assignments turned in will be original copies purchased from the campus bookstore. All photocopied versions will not be accepted and the student will receive a **zero** for that exercise.
BIOLOGY COURSE GRADING CRITERIA:

GRADING POLICY:

A:  90-100%  average of all exams, and other graded assignments.
B:  80-89%   average of all exams, and other graded assignments.
C:  70-79%   average of all exams, and other graded assignments.
D:  60-69%   average of all exams, and other graded assignments.
F:  0-59% average of all exams, and other graded assignments.

For grades of AW, W or I refer to college bulletin for information and how they might affect financial aids.

GRADE DISTRIBUTION:

\[
\begin{align*}
6 \text{ Unit Exams} \times 100 \text{ pts} &= 600 \text{ pts}^* \\
13 \text{ Laboratory Exercises} \times 10 \text{ pts} &= 130 \text{ pts} \\
2 \text{ Laboratory Exams} \times 50 \text{ pts} &= 100 \text{ pts} \\
\text{Total} &= 830 \text{ pts}
\end{align*}
\]

* The final unit exam will contain a comprehensive section. Your instructor may choose to have a separate, comprehensive final exam that could alter the total amount of points possible.

NOTE: Missed labs will seriously affect your final grade. Each missed lab will drop your final grade one letter. If your average for the course is 90% and you do not complete one lab the maximum grade you can earn is a B. If you miss two labs the maximum grade you can earn is a C. If you miss three or more labs you will fail the course.

There will be two lab exams. A midterm lab exam will be administered in the middle of the semester and a final lab exam will be given near the end of the semester.

SPELLING POLICY:

You will be responsible for spelling correctly the following:

1. Words to be defined as stated in the objectives.
2. Terms to be used in identification as stated in objectives or supplemental materials.
3. Terms used in biological processes that is stated in the objectives or supplemental materials.
4. Scientific names.

Each term that is not spelled correctly will count off \( \frac{1}{4} \) of a percentage point from your test score.

For Example:

<table>
<thead>
<tr>
<th>Test score (before spelling errors)</th>
<th>= 96%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelling errors (4ea x .25% = 1.0)</td>
<td>-1%</td>
</tr>
<tr>
<td>Final test score</td>
<td>95%</td>
</tr>
</tbody>
</table>
ATTENDANCE REQUIREMENTS:

Oklahoma City Community College requires regular class attendance and punctuality of students. If a student is absent from class, it is the responsibility of the student to contact the instructor to discuss work missed, regardless of the cause of the absence. If a student does not appear at a pre-arranged time for make-up work, the instructor will determine whether or not the student will be permitted to make up work and will decide on the time and nature of the make up. Until the twelfth week of a sixteen-week semester, a student may withdraw from a class and receive the grade of W. The responsibility for withdrawal for non-attendance is yours. Your instructor cannot administratively withdraw you for non-attendance or because you are failing.

REINSTATEMENT:

A student who has been dropped or withdrawn from a course may be reinstated with the approval of the instructor and the Dean of Science and Mathematics. The student must contact the instructor involved within three calendar days of the official notice of drop.

ACCOMMODATIONS FOR STUDENTS WITH SPECIAL NEEDS:

Oklahoma City Community College complies with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Students with disabilities who seek academic accommodations must make their request by: Contacting the Office of Student Support Services located on the first floor of the main building near entry 12, or call 682-7520.

STUDENTS INTERESTED IN MEDICAL CAREERS.

“Some criminal convictions (misdemeanors or felonies) will prevent individuals from participating in medical careers. Often, background checks will be conducted prior to participation in clinical rotations and again prior to employment.”

NOTE

Changes in the class schedule, the sequence of activities, course policies or in course materials may be made at the discretion of the instructor in order to facilitate the instructional process. These changes are the professional responsibility of the faculty person assigned to teach each section of the class. When changes are deemed necessary, students will receive notification by the instructor.

In order facilitate good communication between students and faculty, OCCC has assigned all students and instructors with OCCC email accounts. It is the responsibility of the student to frequently check their OCCC email accounts. This will be the best way for instructors to communicate with the entire class if special notifications are necessary. If students do not check their email accounts regularly and miss important information given by the instructor, the student will be held accountable for the information.
GENERAL BIOLOGY

OBJECTIVES

Students will develop an understanding of the following concepts and be able to identify, discuss, describe, work simple problems or write short essays to demonstrate their comprehension.

UNIT 1

Chapters 1-5

OBJECTIVES

1. List and explain the characteristics of life.
   - Order, regulation, Growth and Development, Energy processing, Response to environment, Reproduction, Evolutionary adaptations
2. Explain the importance for biological organization from atoms to the biosphere.
3. Describe the major divisions of life, which includes a 3 Domain classification scheme.
4. Explain the cause for the unity and diversity of life.
5. Differentiate between discovery science and hypothesis-based science by outlining the steps of the hypothesis-based science.
6. Demonstrate how the scientific methods tests hypothesis by experiments and also by observations.
7. Name and describe the subatomic particles of an atom as well as be able to calculate the amount of subatomic particles by using the periodic table and finally be able to draw the structure of an atom.
8. Draw and explain the nature of an ionic bond, covalent bond and hydrogen bond.
9. Describe the chemical properties of water and understand the importance of water for life.
10. Define acid and base and explain how they relate to the pH scale and solutions.
11. Understand the basic principles for chemical reactions.
12. List the major organic molecules needed for life.
    - Carbohydrates, Lipids, Proteins, Nucleic acids
13. Name examples of the organic molecules defining the function of each including a discussion of the building blocks for those organic molecules.
14. Compare and contrast the plant and animal cell.
15. Contrast prokaryotic and eukaryotic cells.
16. Name the parts of the cell and give the function of each.
    - Plasma membrane, nucleus, ribosome, endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, mitochondria, chloroplasts
17. Discuss how the chloroplast and mitochondria evolved.
18. Describe the structure of the cell membrane naming the various types of proteins and giving their function.
19. Describe how molecules move across cell membranes for the following processes:
    - Simple Diffusion, Facilitated Diffusion, Osmosis, Active Transport, Cotransport, Exocytosis, Endocytosis
20. Define tonicity and describe the various solutions that cause a cell to gain and/or loss water.

In the course of the following above objectives please be familiar with the following terms.

<table>
<thead>
<tr>
<th>Emergent properties</th>
<th>system</th>
<th>producer</th>
<th>consumer</th>
<th>gene</th>
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<tr>
<td>Taxonomy</td>
<td>species</td>
<td>natural selection</td>
<td>control group</td>
<td>experimental group</td>
</tr>
<tr>
<td>compound</td>
<td>ion</td>
<td>solution</td>
<td>solvent</td>
<td>solute</td>
</tr>
<tr>
<td>isotopes</td>
<td>hydrophobic</td>
<td>hydrophilic</td>
<td>polar molecules</td>
<td>electronegativity</td>
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<tr>
<td>hydrocarbons</td>
<td>polymers</td>
<td>monomer</td>
<td>dehydration reaction</td>
<td>hydrolysis</td>
</tr>
<tr>
<td>endosymbiosis</td>
<td>selective permeability</td>
<td>concentration gradient</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT 2
Chapters 5-7

OBJECTIVES
1. Define energy and describe the types of energy.
2. State the first and second laws of thermodynamics.
3. Explain the relationship of energy, life and the second law of thermodynamics.
4. Explain the various biochemical reactions such as Metabolism (exergonic and endergonic reactions) and oxidation-reduction reactions.
5. Discuss the function of molecules that are involved in energy transformations.
   ATP, cofactors, coenzymes, cytochromes, and enzymes
6. Draw and explain the structure and function of ATP as well as explain the relationship of energy to ATP and ADP.
7. Describe the general process of cellular respiration including the discussion of:
   Glycolysis, Citric Acid Cycle, Oxidative phosphorylation
8. List the reactants and products that result from the stages of cellular respiration.
9. Explain the process that causes fermentation and describe lactic acid and alcohol fermentation.
10. Discuss the purpose of food molecules and the biosynthesis of macromolecules.
11. Explain how food molecules are made.
12. Explain the basic process of photosynthesis. Include the role of the following:
   Water, Oxygen, Electrons, ATP, NADP, Light reactions, Sunlight, Calvin cycle, Carbon dioxide and Glucose
13. Explain where and what type of cells will undergo photosynthesis.
14. Describe the characteristics of light and how it pertains to photosynthesis.
15. Give three reasons why photosynthesis is important to you.
16. Define photorespiration and list the different mechanisms that counter photorespiration.

In the course of the following the above objectives please be familiar with the following terms.

- entropy
- active site
- ATP synthases
- acetyl CoA
- autotrophs
- chlorophyll
- thylakoids
- photon
- global warming
- phosphorylation
- dehydrogenase
- substrate-level phosphorylation
- NADH
- facultative anaerobes
- mesophyll
- grana
- photosystem
- C₃ plants
- energy of activation
- electron transport chain
- intermediates
- FADH₂
- producers
- stomata
- electromagnetic spectrum
- reaction center complex
- CAM plants
- substrate
- chemiosmosis
- pyruvate
- obligate anaerobes
- photoautotroph
- stroma
- carbon fixation
- greenhouse effect
UNIT 3
Chapters 8-10

OBJECTIVES
1. Define sexual and asexual reproduction and relate it with cellular division.
2. Define chromosomes and discuss how they are duplicated during the cell cycle.
3. List the two major phases of the cell cycle discussing the function of each.
4. Describe in detail the stages of interphase and mitotic phase.
5. Discuss how cytokinesis differs in plant cells and animal cells.
6. Discuss how the cell cycle is controlled and what happens when control is lost.
7. Define meiosis and describe where and how it occurs in the human body.
8. Describe how you get genetic diversity from meiosis.
9. Define and discuss the various types of alterations of chromosome number and structure.
10. Outline the general methodology that Mendel used for his experiments in genetics.
11. Define and correctly use the following terms:
    - Genotype, Phenotype, Allele, Gene, Homozygous, Heterozygous, Dominant and Recessive
12. List and explain the two laws of mendelian genetics.
13. Solve one-trait and two-trait genetics problems utilizing the laws of probability.
15. Discuss technology available that provide insight into one's genetic legacy.
16. Define the following factors that violate mendelian genetics:
    - Complete dominance, incomplete dominance, codominant, pleiotropy, polygenic inheritance
17. Define the chromosome theory of inheritance and discuss how linked genes and crossing over affects genetic diversity
18. Given a pedigree you will determine if a represented is autosomal recessive, autosomal dominant or X-linked recessive. Also, give the genotypes and phenotypes of individuals in the pedigree.
19. Solve genetics problems with X-linked alleles.
20. Describe and draw the structure of a nucleotide.
21. Describe the Watson and Crick model of DNA.
22. Describe how DNA is replicated.
23. Describe the flow of genetic information from DNA to RNA to Protein by first focusing on DNA replication then eventually getting to transcription and finally translation.

In the course of the following the above objectives please be familiar with the following terms.

<table>
<thead>
<tr>
<th>Term</th>
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<tbody>
<tr>
<td>binary fission</td>
<td>chromatin</td>
<td>sister chromatids</td>
<td>centromere</td>
<td>mitotic spindle</td>
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<td>centrosome</td>
<td>somatic cell</td>
<td>homologous chromosome</td>
<td>locus</td>
<td>sex chromosome</td>
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<td>autosomes</td>
<td>diploid cell</td>
<td>gamete</td>
<td>haploid cell</td>
<td>fertilization</td>
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<tr>
<td>zygote</td>
<td>crossing over</td>
<td>genetic recombination</td>
<td>chiasma</td>
<td>karyotype</td>
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<tr>
<td>aneuploid</td>
<td>testcross</td>
<td>triplet code</td>
<td>codon</td>
<td>DNA polymerase</td>
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<td>DNA ligase</td>
<td>promoter</td>
<td>RNA polymerase</td>
<td>terminator</td>
<td>introns</td>
</tr>
<tr>
<td>exons</td>
<td>anticodon</td>
<td>RNA splicing</td>
<td>ribosome</td>
<td>start codon</td>
</tr>
<tr>
<td>P site</td>
<td>A site</td>
<td>stop codon</td>
<td>peptide bond</td>
<td>mRNA</td>
</tr>
<tr>
<td>rRNA</td>
<td>tRNA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT 4
Chapters 13-15

OBJECTIVES
1. Describe Charles Darwin’s voyage on the Beagle and who influenced him.
2. Discuss Darwin’s mechanism for evolution and compare it with artificial selection.
3. Describe the evidences for evolution including the discussion of:
   Fossils, biogeography, comparative anatomy, embryology, and molecular biology
4. Explain how biologists represent patterns of descent.
5. Explain how populations evolve.
6. Discuss the Hardy-Wienberg Equilibrium and what it’s used for.
7. List and describe the factors that will cause a microevolutionary event to occur.
8. Describe the types of natural selection and how it compares to sexual selection.
9. Explain the biological definition of a species including a comparison of other species definitions.
10. Describe how speciation occurs.
11. Discuss the importance of reproductive isolation and describe the different types of reproductive isolating mechanisms.
12. Describe the various mechanisms of speciation.
13. Define adaptive radiation and how it pertains to evolution.
14. Compare and contrast gradualism and punctuated equilibrium.
15. Describe the conditions of early earth that lead to the origin of life.
16. Describe the mechanisms of macroevolution including the role of:
   Mass extinctions, adaptive radiation, genes
17. Define phylogenies and systematics and discuss the various ways they are used to show evolutionary relationships amongst organisms.

In the course of the following the above objectives please be familiar with the following terms.

adaptation  evolution  extinction  homology  evolutionary tree
gene pool  microevolution  macroevolution  genetic drift  bottleneck effect
founder effect  gene flow  sexual dimorphism  taxonomy  polyploidy
hybrid zones  adaptive radiation  binomial  taxon  cladistics
clade  parsimony  protists  algae  protozoan
symbiosis  endosymbiosis
UNIT 5
Chapters 16-17, 31, 18-20

OBJECTIVES
1. Describe endosymbiosis and how it gave rise to all Eukaryotes.
2. Discuss the importance of Protists to the evolution of plants and animals.
3. Describe the adaptations that plants had to make to be successful on land.
4. Discuss how plant diversity reflects evolutionary history of the plant kingdom.
5. Differentiate between the major groups of plants.
   - Bryophytes, Seedless vascular plants, Seeded vascular plants.
6. Discuss alternation of generations.
7. Describe the two major groups of angiosperms.
8. Describe the three basic organs in plants as well as modifications to those organs.
9. Describe the tissue systems that make up the plant body.
10. Explain how plants grow.
11. Discuss the reproduction of flowering plants identifying the parts of a flower.
12. Define the general characteristics of an animal.
13. Discuss the probable ancestor of animals.
14. Define the basic features of an animal body plan and discuss how it is used to build phylogenetic trees.
15. Give the characteristics and examples for each of the following animal phyla:
   - Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, Annelida, Arthropoda, Echinodermata and Chordata
16. Discuss the reasons why the insects are so successful.
17. Discuss the derived characters that define the major classes of chordates.
18. Describe the characteristics and give examples of all vertebrates.
19. List and discuss the structural organization of animals.
20. List the types of tissues defining the function and examples of each.
21. List the organ systems and describe the function of each.

In the course of the following the above objectives please be familiar with the following terms.

<table>
<thead>
<tr>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>apical meristems</td>
<td>xylem</td>
<td>phloem</td>
<td>lignin</td>
<td>spore</td>
<td>Anatomy</td>
</tr>
<tr>
<td>seed</td>
<td>monocot</td>
<td>eudicot</td>
<td>Anatomy</td>
<td>physiology</td>
<td>physiology</td>
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<td>cnidocytes</td>
<td>cuticle</td>
<td>foot</td>
<td>visceral mass</td>
<td>mantle</td>
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<tr>
<td>radula</td>
<td>segmentation</td>
<td>exoskeleton</td>
<td>molting</td>
<td>mantle</td>
<td>metamorphosis</td>
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<tr>
<td>endoskeleton</td>
<td>vertebrae</td>
<td>operculum</td>
<td>swim bladder</td>
<td></td>
<td></td>
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<tr>
<td>lateral line system</td>
<td>amniotic egg</td>
<td>ectothermic</td>
<td>endothermic</td>
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UNIT 6
Chapters 34, 36-38

OBJECTIVES
1. Describe how ecologist study how organisms interact with their environment.
2. Define biosphere and discuss the physical and chemical properties that influence a biosphere.
3. Describe the processes that influence the distribution of terrestrial ecosystems.
4. Describe the key factors for the distribution of marine organisms.
5. Describe the various types of freshwater biomes and those factors that important to each.
6. List and describe the 8 major types of terrestrial biomes.
7. Define population ecology and discuss population structure and dynamics.
   Density, dispersion, survivorship
8. Discuss how populations grow and discuss what type of growth a population can have.
9. Contrast exponential and logistical growth curves.
10. Compare and contrast density-dependent and density-independent factors.
11. Compare and contrast r-selected and k-selected species.
12. Discuss human population growth and how human interference can upset the natural balance of an ecosystem.
13. Define community and discuss the various types of community interactions.
14. Describe trophic structure and how it is use to describe community dynamics.
15. Define species diversity and discuss the factors that affect species diversity.
16. Describe how energy flows through an ecosystem.
17. Define biogeochemical cycles and discuss why they are important to ecosystems.
18. Define biodiversity and discuss how it relates to genetics, species, and ecosystem diversity.
19. Discuss the threats to biodiversity.
20. Discuss the problems associated with the following environmental concerns.
   Ozone layer, global climate, greenhouse gases,
   21. Define conservation biology and restoration ecology including a discussion of the goals of each.

In the course of the following the above objectives please be familiar with the following terms.

<table>
<thead>
<tr>
<th>Biotic</th>
<th>Abiotic</th>
<th>Habitat</th>
<th>Landscapes</th>
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<td>Phytoplankton</td>
<td>Zooplankton</td>
<td>Estuary</td>
<td>Desertification</td>
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<td>Carrying capacity</td>
<td>Life history</td>
<td>Ecological footprint</td>
<td>Food chain</td>
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<td>Food web</td>
<td>Competitive exclusion</td>
<td>Resource partitioning</td>
<td>Ecological niche</td>
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<td>Coevolution</td>
<td>Keystone species</td>
<td>Disturbances</td>
<td>Invasive species</td>
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<td>Landscape Ecology</td>
<td>Sustainable development</td>
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</table>
### Required Reading for Each Unit

The following table represents the required reading for each unit. The chapters in your textbook are broken into "central concepts" (see page iv in textbook). The **Chapter Section** of the table breaks down the central concepts that are required for you to read. The **Pages** column represents the page numbers that is necessary for you to read. The number in parentheses indicates how many pages in the chapter you are responsible for. If you wish to do well in General Biology you should read all of the following before lecturing over the material.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Chapter Section</th>
<th>Pages (# pg/chapter)</th>
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<td>3.1-3.5, 3.7-3.9, 3.11, 3.13-3.14, 3.16</td>
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<td>5.1, 5.3-5.6, 5.8-5.9</td>
<td>74-79 (6)</td>
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<td>34.1, 34.3, 34.5-34.16</td>
<td>682, 684, 686-696 (13)</td>
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<td>36.1-36.7, 36.9-36.11</td>
<td>726-733, 734-737 (12)</td>
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<td>37.1-37.11, 37.14-37.16, 37.18-37.21</td>
<td>742-749, 752-757 (14)</td>
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<td>38.1-38.7, 38.9-38.10, 38.15</td>
<td>764-774, 779 (12)</td>
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