

## **COURSE TITLE**

### **Agriculture Science 2 (CP)**

#### **Description of Target Group**

Agriculture Science 2 is a one-year, laboratory science course designed as the second phase of the agriculture sequence. It is for the college-bound student with career interest in agriculture and will meet the University of California “a-f” requirements of Science as well as for the student who will enter the agriculture workplace following high school or further training at the community college level. Using agriculture as the learning vehicle, the course emphasizes the principles, central concepts, and inner-relationships among the following topics: the molecular and cellular aspects of life, the chemical and structural basis of life, energetic of life, growth and reproduction in plants and animals, evolution of modern plants and domestic livestock species, plant and animals genetics, taxonomy of modern agricultural plants and animals, animal behavior, ecological relationships among plants, animals, humans and environment, nutrition in animals, health and diseases in animals and the similarities between animals and humans. The course is centered around an extensive laboratory component in order to connect the big ideas of life science with agricultural applications, earth and physical science principals, and other curricular areas, including written and oral reporting skills.

Length of Course:	One Year
Units of Credit:	10
Prerequisites:	Ag Science 1 (CP) or Instructor’s Approval
Grade Level:	10-12
Special Course Designation:	College Pre “f” requirement
Course Code:	*
Homework:	3 hrs+/wk

#### **Standards of Expected Student Achievement**

Upon completion of this course, the student will be able to:

##### **1. Unit A. Introduction to Agricultural Biology**

- 1.1 Explain the importance of Agricultural Biology in our society. Provide evidence for and defend your explanation.
- 1.2 Compare various careers in the area of Agricultural Biology. Report on careers that are held by persons in underrepresented populations.

## **2. Unit B. Agricultural Research**

- 2.1 Explain the importance of research in agriculture.
- 2.2 Describe the process of scientific research methods in agriculture.
- 2.3 Develop a Supervised Agricultural Experience Project which involves the scientific method.
- 2.4 Formulate a term project focusing on one topic in Agricultural Biology and relate it to other scientific disciplines.
- 2.5 Develop a research project that can be entered in the FFA Agriscience competition.

## **3. Unit C. Agriculture and the Environment**

- 3.1. Identify the roles of plants and animals and their interactions in the web of life.
- 3.2. Describe the flow of energy through the biosphere.
- 3.3. Compare and contrast the oxygen and nitrogen cycles. Report on their importance in agriculture.
- 3.4. Define the term "ecosystem".
- 3.5. Appraise at least three current issues in agriculture which biology affects the environment.
- 3.6. Explain the impact of population on the environment and the effect of the environment on populations.
- 3.7. Report on both the good and bad effects of the agricultural revolution on the environment.
- 3.8. Evaluate the economic effects of pollution and erosion on production agriculture.
- 3.9. Develop and defend a plan to preserve limited resources related to agriculture.
- 3.10. Compare and contrast five forms of energy used in agriculture.
- 3.11. Design and conduct an experiment which shows the relationship between soil characteristics and plant growth.
- 3.12. Describe how agriculture practices can modify soil to improve soil moisture relationships.
- 3.13. Conduct an experiment, which involves water movement through soil.
- 3.14. Compare the internal systems of a single celled organism to those of multicellular organisms.
- 3.15. Describe the difference between plant cells and animal cells.
- 3.16. Identify blood, bone, fat, nerve, and muscle cells.
- 3.17. Identify and diagram male and female gametes in both plants and animals.
- 3.18. Compare and Contrast the process of Mitosis and Meiosis.
- 3.19. Describe how cells respond to certain stimuli.
- 3.20. Explain the concept of cellular adaptation.
- 3.21. Discuss the development of the biological concept of "Kingdom".
- 3.22. Discuss three reasons for the current use of the modern system of plant classification.
- 3.23. Apply taxonomy in three ways to the field of agriculture.

- 3.24. Prepare a phylogenetic tree for at least one domestic animal species.
- 3.25. Explain how the process of natural selection affects plants and animals. Include the impact of external conditions in the explanation.
- 3.26. Analyze the impact of increasing populations on the environment and its resources.

#### **4. Unit D. Plant physiology, reproduction, photosynthesis, and growth.**

- 4.1 Compare and Contrast the structures and functions of plants from different families.
- 4.2 Design and conduct an experiment which covers the entire life cycle of a plant.
- 4.3 Defend the role of green plants in the maintenance of life.
- 4.4 Compare and Contrast monocotyledons and dicotyledons with respect to leaf, stem, flower, structure, and agricultural significance.
- 4.5 Analyze the interrelationships among the different systems within the plant.
- 4.6 Discuss abiotic environmental factors that affect plant growth (wind, temperature, polar radiation, soil conditions, humidity, pollution, etc.).
- 4.7 Explain the difference between sexual and vegetative reproduction.
- 4.8 Demonstrate an application of both sexual and vegetative reproduction.
- 4.9 Discuss how sexual and asexual reproduction are used in agriculture.
- 4.10 Research and report on the significant uses of plants in nutrition and medicine.
- 4.11 Compare the life cycle of simple plants, such as algae or moss to a complex plant.
- 4.12 Grow at least one indoor and one outdoor landscaping plant or vegetable. Chart its growth pattern and report the results of observations.

#### **5. Unit E. ANIMAL PHYSIOLOGY AND BEHAVIOR**

- 5.1 Demonstrate an understanding of the structure and function of the digestive system by tracing the pathways of food through the various types of livestock digestive systems with emphasis on the function of organs in the digestive process.
- 5.2 Analyze the function of each mammalian body.
- 5.3 Compare the interrelationships of each system within the mammalian body.
- 5.4 Compare and contrast the estrus cycles of cattle, sheep, and swine and the menstrual cycle in humans. Chart the process of fertilization in each species.
- 5.5 Explain the importance of cellular respiration to living organisms. Develop a flow chart outlining the process of cellular respiration.
- 5.6 Develop a flow chart outlining the development of an embryo from conception through parturition.

- 5.7 Describe how animal behavioral patterns affect management and handling practices of domestic animals.
- 5.8 Dissect various organisms and identify the organs and systems of each.
- 5.9 Compare and contrast the organ systems of different livestock species.
- 5.10 Analyze the nutrient requirements of various domestic species.
- 5.11 Analyze the nutrient content of several feeds.
- 5.12 Develop a low-cost feed ration for one species of livestock form maintenance, growth, and lactation, using concentrates and roughage available locally.
- 5.13 Describe the symptoms of five common nutritional disorders caused by vitamin or mineral deficiencies or laxicity and explain the treatment and prevention of these diseases.
- 5.14 Feed an animal through an entire production cycle, recording the types of feed used, rate of gain, and the lean-to-fat ration. Report on observation and conclusions.
- 5.15 Develop a flow chart outlining the life cycle of one internal and one external parasite.
- 5.16 Describe the impact of parasites on livestock and on the agricultural industry.
- 5.17 Design a disease prevention and health care plan for a project animal.
- 5.18 Appraise the results of human medicine in relation to livestock medicine.

## **6. UNIT F. PLANT AND ANIMAL GENETICS**

- 6.1 Compare and contrast the phenotypic traits of related breeds and varieties of animals and plants.
- 6.2 Explain the function of each of the following: gene, allele, DNA and RNA.
- 6.3 Explain the role of enzymes in chromosome replication, and the implications of biotechnology involving these enzymes.
- 6.4 Discuss the contributions of Gregor Mendel to the field of genetics.
- 6.5 Conduct a simple experiment, which exhibits dominant and recessive properties.
- 6.6 Evaluate the effectiveness of selection and heritability in production of agriculture by comparing modern day crops and animals to their ancestors.
- 6.7 Develop an experiment, which develops a trait through selection and heritability.
- 6.8 Analyze the effects of biotechnology on modern agriculture.
- 6.9 Report on the importance of natural selection on the driving force of evolution and its importance in production agriculture.

## **7. SAMPLES OF LABORATORY EXAMPLES**

- 7.1 The scientific method
- 7.2 Analyzing ecosystems
- 7.3 Checking water for Coliform Bacteria

- 7.4 Genotypic and phenotypic ratios
- 7.5 Flower dissections and pollen growth germination
- 7.6 N-P-K tissue test on greenhouse/potted plants
- 7.7 Warm germination test
- 7.8 TS test
- 7.9 Cold germination test
- 7.10 Salinity and seed germination
- 7.11 Determining salt tolerance of plants
- 7.12 Factors affecting photosynthesis
- 7.13 Effects of leaf surface area, air movement and light on transportation rate
- 7.14 Effects of light quality on plant growth
- 7.15 Geotropism
- 7.16 Phototropism
- 7.17 The hydrologic cycle
- 7.18 Comparison of soil vs soilless plant culture
- 7.19 Effects of nutrient concentrations of hydroponic plant growth
- 7.20 Effects of herbicides on crop and plants
- 7.21 Herbicide bioassay
- 7.22 Effects of rooting hormones on root development
- 7.23 Effects of gibberallic acid on seed germination
- 7.24 Embryo culture of apples
- 7.25 Another culture
- 7.26 DNA extraction
- 7.27 Probability of trait inheritance
- 7.28 Classifying animals
- 7.29 Examining animal cells
- 7.30 Effects of feed ration on growth
- 7.31 Analyzing feed for nutrient content
- 7.32 Starch digestion by enzyme action
- 7.33 Effects of physical and chemical treatment of forage samples on digestibility
- 7.34 Effects of feed additives on animal growth
- 7.35 Livestock basic physical exam
- 7.36 Parasites of agriculture animals
- 7.37 Comparison of female reproductive organs
- 7.38 Culturing bacteria
- 7.39 Evaluating semen
- 7.40 Safety

## **8. CLASSIFYING AND NAMING LIVING THINGS**

- 8.1 Describe and classification system for living things
- 8.2 Explain taxonomy
- 8.3 Use a classification key to identify leaves
- 8.4 Describe how classification systems are useful in Agriscience and technology

## **9. APPLYING PRINCIPLES OF PLANT SCIENCE**

- 9.1 Define plant science and how plants differ from animals
- 9.2 Label the parts of a plant and explain their functions
- 9.3 Explain the life cycle of a plant
- 9.4 Observe the effect of light on plant growth
- 9.5 Observe the effect of gravity on plant growth

## **10. REPRODUCING PLANTS**

Explain the processes for the propagation of plants

- 10.1 Label the parts of a plant and explain their role
- 10.2 Determine viability of seeds by using germination and vigor tests
- 10.3 Explain the importance of imported seed

## **11. PRODUCING PLANTS**

- 11.1 Explain factors and processes in plant growth
- 11.2 Determine the rate of photosynthesis
- 11.3 Test for sugar production during photosynthesis
- 11.4 Define transpiration and its importance
- 11.5 Observe water loss by transpiration
- 11.6 Name the nutrients plants need and describe how plants get them
- 11.7 Explain the use of fertilizers

## **12. KEEPING PLANTS HEALTHY**

- 12.1 Explain five major kinds of pests
- 12.2 Explain three conditions for pests problems
- 12.3 Describe how pests are prevented
- 12.4 Describe how pests affect plants and cause losses
- 12.5 Explain integrated pest management
- 12.6 List safety practices to follow in pest control

## **13. APPLYING PRINCIPLES OF ANIMAL SCIENCE**

- 13.1 Name and describe the major animal groups
- 13.2 Describe the anatomy and physiology of animals
- 13.3 Describe the role of genetics, cells and genomes in molecular biotechnology
- 13.4 Describe the process of genetic engineering and the use of recombinant DNA
- 13.5 Identify areas of Agriscience being developed through genetic engineering

## **14. APPLYING EARTH SCIENCE IN AGRICULTURE**

- 14.1 Describe major features and resources of the earth
- 14.2 Explain changes that occur in the earth
- 14.3 Describe atmosphere and its importance in Agriscience
- 14.4 Explain the importance of climate in Agriscience
- 14.5 Identify and describe major factors in weather
- 14.6 Explain succession and its relationships to the Earth

## **15. APPLYING PRINCIPLES OF SOIL SCIENCE**

- 15.1 Describe the materials that make soil
- 15.2 Explain the different ways that soil can be described
- 15.3 Explain how soil is formed
- 15.4 Describe soil profile
- 15.5 Explain the kinds of soil water
- 15.6 Describe soil pH and its relation to plant growth
- 15.7 Explain the relation between soil and land
- 15.8 Describe important soil management practices

## **16. APPLYING PRINCIPLES OF CHEMISTRY**

- 16.2 Describe the major kinds of matter
- 16.3 Distinguish between elements, atoms and molecules
- 16.4 Describe how new compounds are formed
- 16.5 Explain the importance of carbon
- 16.6 Distinguish between solutions and suspensions
- 16.7 Explain acids, bases, and salts
- 16.8 Describe common chemical processes in Agriscience
- 16.9 Describe the importance of measurements in chemistry

## **17. APPLYING PRINCIPLES OF PHYSICS**

- 17.1 Define physics and explain important areas of physics
- 17.2 Explain work and power
- 17.3 Describe mechanical advantage
- 17.4 Explain the use of thermal energy in Agriscience
- 17.5 Explain the use of electrical energy in Agriscience
- 17.6 Describe the use of compression in Agriscience

## **18. COMMUNICATIONS**

- 18.1 List and describe the importance of public speaking skills
- 18.2 Demonstrate the ability to lead a discussion group
- 18.3 Describe the importance of being a good listener

- 18.4 Demonstrate public speaking skills by selecting, researching and orally delivering a five to ten minute presentation
- 18.5 Identify and demonstrate skills using telephones, letters, memos, and verbal conversation
- 18.6 Identify skills necessary to work on committees effectively and efficiently

## **19. RECORD KEEPING**

- 19.1 List reasons for record keeping
- 19.2 Explain functions of, maintain, and complete a calendar, business agreement, budget, and journal in a record book
- 19.3 Explain how business uses records

## **20. COMPUTERS**

- 20.1 Name five uses in agribusiness
- 20.2 Name and explain the functions of the major external parts of the computer
- 20.3 Demonstrate the use of a word processor
- 20.4 Gain access to information highway through computer network

## **IV. Student Assessment - Pre/Post Test**

- 1.1 To evaluate objective materials, pretests will be administered at the beginning of the course, and a post-test will be given at the end of the school year
- 1.2 To test application domain skills, an evaluation instrument will be maintained by the student
- 1.3 To evaluate specific performance indicators in the analysis, synthesis, and evaluation domains, essay questions will be administered and scored with a rubric.
- 1.4 Students will participate in FFA activities, such as the state Agriscience Fair and Agriscience Student of the Year program.

### **Instructional Materials**

Refer to: Secondary Adopted Texts and Approved Supplementary Books Used in the Santa Maria Joint Union High School District