

**APPROVED PATHWAY:**

- Includes minimum of three secondary-level credits.
- Includes a work-based element.
- Consists of a sequence:
  - Introductory-level.
  - Technical-level.
  - Application-level courses.
- Supporting documentation includes Articulation Agreement(s), Certification, Program Improvement Plan and a Program of Study.
- Technical-level and Application-level courses receive .5 state-weighted funding in an approved CTE pathway.



## HEALTH AND BIO SCIENCES CAREER CLUSTER DESIGN

**Biochemistry Pathway**

CIP CODE 14.1401

**INTRODUCTORY LEVEL**

Title	Code	Credit
Environmental Science	03003	1 credit
Computing Systems (8-9)	10002/60002	1 credit

Title	Code	Credit
Computer Applications (8-9)	10004/60004	1 credit
Chemistry	03101	1 credit

**TECHNICAL LEVEL**

Title	Code	Credit
*Anatomy and Physiology	03053	1 credit
Biotechnology in Agriculture	18308	1 credit
AP Environmental Science	03207	1 credit

Title	Code	Credit
Applied Biochemistry	03203	1 credit
Pharmacology	14253	1 credit
Plant and Soil Science	18058	1 credit

**APPLICATION LEVEL**Must choose **ONE** of the boxed courses.

Title	Code	Credit
Emerging Technologies	21053	1 credit
*Bioengineering	21020	1 credit
*Biotechnical Engineering	21014	1 credit
Natural Resources Management	18504	1 credit

Title	Code	Credit
BioChem Workplace Experience	21048	1 credit
Applications in Biotechnology in Ag	18320	1 credit
Environmental Resources and Wildlife Science	37506	1 credit

- \* Required for pathway approval.

## ***Kansas BioChemistry Pathway***

<b>Course:</b>	Environmental Science	<b>Course #:</b>	41207	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Introductory Level course

### **COURSE DESCRIPTION:**

<p><b>Rating Scale:</b> 3. Skilled-Works Independently 2. Limited Skills-Requires Assistance 1. Skill Undeveloped 0. No exposure, instruction or training</p>	<p>Student: _____ Graduation Date: _____ <b>I certify that the student has received training in the areas indicated.</b> Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

***\*See Energy Pathway for competencies (17.2071)***

## Kansas BioChemistry Pathway

<b>Course:</b>	Computing Systems	<b>Course #:</b>	10002	<b>Credit:</b>	1
<b>CIP Codes:</b>					

### COURSE DESCRIPTION:

The Computing Systems course offers a broad exploration of the use of computers in a variety of fields. This course has a considerable range of content, but typically includes the introduction of robotics and control systems, computer-assisted design, computer-aided manufacturing systems, and computer technologies as the relate to industry applications.

<p><b>Rating Scale:</b>          3. Skilled-Works Independently          2. Limited Skills-Requires Assistance          1. Skill Undeveloped          0. No exposure, instruction or training</p>	<p>Student: _____</p> <p>Graduation Date: _____</p> <p>I certify that the student has received training in the areas indicated.</p> <p>Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

**\*See Programming and Software Development Pathway (1.0201) for course competencies.**

## Kansas BioChemistry Pathway

<b>Course:</b>	Computer Applications	<b>Course #:</b>	10002	<b>Credit:</b>	1
<b>CIP Codes:</b>					

**COURSE DESCRIPTION:**

In Computer Applications, students acquire knowledge of and experience in the proper and efficient use of previously written software applications. This course explore a wide range of applications, including (but not limited to) word-processing, spreadsheets, graphics, and database programs, and they may cover the use of electronic mail and desktop publishing.

<p><b>Rating Scale:</b>  3. Skilled-Works Independently  2. Limited Skills-Requires Assistance  1. Skill Undeveloped  0. No exposure, instruction or training</p>	<p>Student: _____  Graduation Date: _____  <b>I certify that the student has received training in the areas indicated.</b>  Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

**\*See Competencies in Programming and Software Development Pathway (1.0201) for course competencies.**

## Kansas Health Science Cluster

BioChemistry Pathway – Introductory Level

Course: Chemistry

Course #: 03101

Credit: 1.0

### COURSE DESCRIPTION:

*Chemistry courses involve studying the composition, properties, and reactions of substances. These courses typically explore such concepts as the behaviors of solids, liquids, and gases; acid/base and oxidation/reduction reactions; and atomic structure. Chemical formulas and equations and nuclear reactions are also studied. Special attention should be given to health careers, related technical skills, and technology associated with these professions.*

### Rating Scale:

- 3. Skilled-Works Independently
- 2. Limited Skills-Requires Assistance
- 1. Skill Undeveloped
- 0. No exposure, instruction or training

**Directions: The following competencies are required for full approval of a course in a Health Science Pathway. These skills are directly tied to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.**

Student: \_\_\_\_\_

Graduation Date: \_\_\_\_\_

**I certify that the student has received training in the areas indicated.**

Benchmark 1: State Standards		3	2	1	0
1.1	Meet all state academic standards for chemistry				

Benchmark 2: Health Science Related		3	2	1	0
2.1	Identify content, skills and technology related to the health science field				
2.2	Apply mathematical computations related to common health industry procedures				
2.3	Apply mathematical principles to conversion equations commonly used in health-related fields				
2.4	Apply mathematical principles involving temperature, weights, and measures commonly used in health-related fields				
2.5	Analyze diagrams, charts, graphs and tables to interpret results commonly found in health-related fields				
2.6	Recognize, organize, write and compile technical information and summaries that relate to health science				

Benchmark 3: <b>Chemistry Performance Expectations</b>		3	2	1	0
3.1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.				
3.2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.				

3.3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.				
3.4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.				
3.5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.				
3.6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*				
3.7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.				
3.8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.				
3.9	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.				
3.10	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.				
3.11	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).				
3.12	Evaluate the validity and reliability of claims in published materials.				

## ***Kansas Health & BioScience Cluster***

BioChemistry Pathway – Technical Level

**Course:** Anatomy and Physiology      **Course #:** 03053      **Credit:** 1.0

### **COURSE DESCRIPTION:**

*Usually taken after a comprehensive initial study of biology, Anatomy and Physiology presents the human body and biological systems in more detail. In order to understand the structure of the human body and its functions, students learn anatomical terminology, study cells and tissues, explore functional systems (skeletal, muscular, circulatory, respiratory, digestive, reproductive, nervous, and so on), and may dissect mammals. Special attention should be given to health careers, related technical skills, and technology associated with these professions.*

#### **Rating Scale:**

- 3. Skilled-Works Independently
- 2. Limited Skills-Requires Assistance
- 1. Skill Undeveloped
- 0. No exposure, instruction or training

**Directions:** The following competencies are required for full approval of a course in a Health Science Pathway. These skills are directly tied to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.

Student: _____
Graduation Date: _____
<b>I certify that the student has received training in the areas indicated.</b>

#### **Academics Standards:**

- Standard 1:** Explore and describe the body plan organization and homeostasis
- Standard 2:** Explain basic principles of body chemistry
- Standard 3:** Describe basic concepts of structures and functions of cells
- Standard 4:** Describe basic concepts of structures and functions of histology and the integumentary system
- Standard 5:** Describe the structures and functions of the skeletal system
- Standard 6:** Describe the structures and functions of the muscular system and its components
- Standard 7:** Describe the structures and functions of the nervous system and special senses
- Standard 8:** Describe the structures and functions associated with the endocrine system
- Standard 9:** Describe the components and functions associated with blood
- Standard 10:** Describe the structures and functions of the lymphatic system
- Standard 11:** Describe the structures and functions of the cardiovascular system
- Standard 12:** Describe the structures and functions associated with the respiratory system
- Standard 13:** Perform basic life support skills
- Standard 14:** Describe the structures and functions associated with the urinary system
- Standard 15:** Describe the structures and functions associated with the reproductive system

*After meeting all state standards for A&P, the following competencies should be covered.*

<b>Benchmark 1: Human Structure and Function</b>	3   2   1   0
1.1    Describe the basic structures and functions of cells, tissues, organs, and systems as they relate to homeostasis	
1.2    Compare relationships among cells, tissue, organs, and systems	
1.3    Explain body planes, directional terms, quadrants, and cavities	
1.4    Analyze the interdependence of the body systems as they relate to wellness, disease, disorders, therapies, and care rehabilitation	
<b>Benchmark 2.: Disease and Disorders</b>	3   2   1   0
2.1    Compare selected diseases/disorders including respective classification(s), causes, diagnoses, therapies, and care/rehabilitation to include biotechnological applications	

- 2.2 Analyze methods to control the spread of pathogenic microorganisms
- 2.3 Analyze body system changes in light of diseases, disorders, and wellness

Benchmark 3: **Health Care Delivery System** 3 2 1 0

- 3.1 Identify methods to assess vital signs

Benchmark 4: **Career Exploration** 3 2 1 0

- 4.1 Identify a variety of careers that use anatomy and physiology knowledge and how it relates to health careers

Benchmark 5: **Ethical Practice** 3 2 1 0

- 5.1 Explain the importance of confidentiality in health care

Benchmark 6: **Safety Practices** 3 2 1 0

- 6.1 Use personal protective equipment as appropriate to the environment
- 6.2 Modify the environment to create safe working conditions. Evaluate and modify the environment to create and maintain safe working conditions
- 6.3 Prevent accidents by using proper safety techniques for the prevention of accidents

Benchmark 7: **Health Science Related** 3 2 1 0

- 7.1 Identify content, skills and technology related to the health science field
- 7.2 Apply mathematical computations related to common health industry procedures

- 7.3 Apply mathematical principles to conversion equations commonly used in health-related fields
- 7.4 Apply mathematical principles involving temperature, weights, and measures commonly used in health-related fields
- 7.5 Analyze diagrams, charts, graphs and tables to interpret results commonly found in health-related fields
- 7.6 Recognize, organize, write and compile technical information and summaries that relate to health science

## Kansas BioChemistry Pathway

<b>Course:</b>	Biotechnology in Agriculture	<b>Course #:</b>	18308	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Technical Level course

### COURSE DESCRIPTION:

<b>Rating Scale:</b> 3. Skilled-Works Independently 2. Limited Skills-Requires Assistance 1. Skill Undeveloped 0. No exposure, instruction or training	<b>Student:</b> _____ <b>Graduation Date:</b> _____ <b>I certify that the student has received training in the areas indicated.</b> <b>Instructor Signature:</b> _____
<b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.	

**\*See Competencies in Biotechnology in Agriculture Pathway (26.1201) for course competencies.**

## *Kansas Health Science Cluster*

BioChemistry Pathway – Technical Level

Course:            Course #: 03203            Credit: 1.0  
Applied  
Biochemistry

COURSE DESCRIPTION: Includes the reactions, strategy, and regulation of the major metabolic pathways in humans and of selected pathways in plants, and the storage, repair, and transmission of genetic information.

### Rating Scale:

- 3. Skilled-Works Independently
- 2. Limited Skills-Requires Assistance
- 1. Skill Undeveloped
- 0. No exposure, instruction or training

**Directions: The following competencies are required for full approval of a course in a Health Science Pathway. These skills are directly tied to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.**

Student: \_\_\_\_\_

Graduation Date: \_\_\_\_\_

**I certify that the student has received training in the areas indicated.**

Benchmark 1: <b>Understand biochemical terms and concepts for living processes, such as cell development, respiration and digestion, and living energy changes such as growth, aging, and death.</b>		3	2	1	0
1.1	Study physical principles of living cells and organisms and their electrical and mechanical energy, applying methods and knowledge of mathematics, physics, chemistry, and biology.				
1.2	<b>Study the chemistry of living processes, such as cell development, respiration and digestion, and living energy changes such as growth, aging, and death.</b>				
1.3	Isolate, analyze, and/or synthesize vitamins, hormones, allergens, minerals, and enzymes, and determine their effects on cell functions.				
1.4	Examine the molecular and chemical aspects of immune system functioning.				
1.5	Research how characteristics of organisms are carried through successive generations.				
1.6	Research the chemical effects of substances such as drugs, serums, hormones, and food on tissues and vital processes.				
1.7	Investigate the nature, composition, and expression of genes, and research how genetic engineering can impact these processes				
1.8	Design or conduct studies to determine optimal conditions for cell growth, protein production, or protein and virus expression and recovery.				
1.8	<b>Read current scientific and trade literature to stay abreast of scientific, industrial, or technological advances.</b>				

Benchmark 2: <b>Understanding and interpreting data and research</b>		3	2	1	0
2.1	Analyze clinical or survey data using statistical approaches such as longitudinal				

	analysis, mixed effect modeling, logistic regression analyses, and model building techniques.				
2.2	Analyze archival data such as birth, death, and disease records.				
2.3	Draw conclusions and make predictions based on data summaries or statistical analyses.				
2.4	Maintain laboratory notebooks that record research methods, procedures, and results.				
2.5	Communicate research results through presentations or project reports				

## Kansas BioChemistry Pathway

<b>Course:</b>	AP Environmental Science	<b>Course #:</b>	03207	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Technical Level Course

### COURSE DESCRIPTION:

<b>Rating Scale:</b> 3. Skilled-Works Independently 2. Limited Skills-Requires Assistance 1. Skill Undeveloped 0. No exposure, instruction or training	<b>Student:</b> _____ <b>Graduation Date:</b> _____ <b>I certify that the student has received training in the areas indicated.</b> <b>Instructor Signature:</b> _____
<b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.	

**\*See Energy Pathway (17.2071) for course competencies.**

# Kansas Health & BioScience Cluster

## BioChemistry Pathway – Technical Level

Course: Pharmacology

Course #: 14253

Credit: 1.0

### COURSE DESCRIPTION:

*Pharmacology courses involve a study of how humans can be changed by chemical substances, especially by the actions of drugs and other substances used to treat disease. Basic concepts of physiology, pathology, biochemistry, and bacteriology are typically brought into play as students examine the effects of drugs and their mechanisms of action.*

**Rating Scale:**

- 3. Skilled-Works Independently, Proficient Achievement
- 2. Limited Skills-Requires Assistance
- 1. Skill Undeveloped, Inadequate Achievement
- 0. No exposure, instruction or training

**Directions:** The following competencies are required for full approval of a course in a Health Science Pathway. These skills are directly tied to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.

Student: \_\_\_\_\_

Graduation Date: \_\_\_\_\_

**I certify that the student has received training in the areas indicated.**

Benchmark 1 Demonstrate Knowledge of Pharmacology Basics		3	2	1	0
1.1	Review of basic body systems and normal body processes				
1.2	Define and discuss the major areas of pharmacology not limited to: pharmacodynamics, pharmacokinetics, pharmacotherapeutics, pharmacy, posology, toxicology				

1.3	Explain factors affecting the action of drugs including dosage forms, drug absorption, distribution, metabolism, excretion, and blood drug levels				
1.4	Explain common conditions, use and side effects of prescriptions or over the counter (OTC) medications used to treat these conditions not limited to: hypertension, hypothyroidism, diabetes, weight loss, cardiovascular disease, chronic obstructive pulmonary diseases, arthritis, anxiety, and insomnia				
1.5	Define and use as common language; pharmaceutical and medical terminology not limited to: indication, side effect, adverse effect, toxic effect, action, contraindication, allergic reaction, therapeutic effect, and cumulative effect				
1.6	Define and distinguish the difference between drug abuse, drug dependence and drug tolerance				
1.7	Identify and define common classifications of drugs including classifications for prescriptions, controlled substances, and over the counter (OTC) drugs not limited to: anesthetics, sedatives, (hypnotic drugs and alcohol), antipsychotic, antiemetic, antianxiety, antidepressants, psychomotor stimulants, and lithium, antiepileptics, antiparkinson, narcotic analgesics, non-narcotic analgesics, anti-inflammatory, antiarrhythmics, diuretics, antihypertensive, anticoagulants and coagulants, antianemics, antiallergics and antihistamines, bronchodilators, antiulcer, hormones, steroids, antibacterials, and miscellaneous anti-infectives, antifungals and antivirals				
1.8	Identify 200 common drugs and match them to indications				
1.9	Define and differentiate drug nomenclature to include chemical, generic and brand (trade) names of medications				
1.10	Identify common drug interactions not limited to: drug-drug, food-drug, prescription drug-OTC, and prescription drugs-herbal preparations				
1.11	Identify contraindications to use of drugs not limited to: drug-disease, drug-laboratory, food-drug				
1.12	Identify conditions affected by drugs not limited to: pregnancy, breastfeeding and allergies				
1.13	Discuss common alternative therapies not limited to: herbal preparations, dietary supplements, homeopathy, and lifestyle changes				
1.14	Identify common OTC medications not limited to: antacids, laxatives, cold remedies, allergy remedies and pain relievers				

1.15	Explain symptoms of adverse drug reactions not limited to: rash, hives, light headedness, nausea, and vomiting				
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<b>Benchmark 2 – Identify Medical and Legal Considerations Related to the Practice of Pharmacy</b>		3	2	1	0
2.1	Identify the purpose of the FDA and the duties they perform				
2.2	Identify the process that drugs must go through to be developed and approved for use				
2.3	Identify methods used to store, handle, and dispose of hazardous substances and wastes according to federal standards				
2.4	Explain hazardous substances exposure, prevention and treatment not limited to: eyewash, spill kit and safety data sheets (SDS)				
2.5	Explain controlled substance regulations according to the drug enforcement agency (DEA) not limited to: receiving, ordering, returning, loss/theft, and destruction				
2.6	Discuss the regulations that affect the production and distribution of a variety of types of drugs				
2.7	Identify the responsibilities and liabilities of a pharmacist preparing and filling prescriptions				
2.8	Identify the responsibilities and liabilities of a doctor prescribing drugs				
2.9	Define and discuss the illegal use of legal drugs				
2.10	Explain the FDA mandatory versus voluntary recall classification				
2.11	Discuss the roles and responsibilities of pharmacy careers not limited to: pharmacists, pharmacy technicians or other pharmacy employees according to the Board of Pharmacy (BOP)				
2.12	Describe record keeping requirements related to pharmacy not limited to: length of time prescriptions are maintained, repackaging products, recalled products and supplies, and invoicing				
2.13	Identify professional standards relating to data integrity, security and confidentiality not limited to HIPPA, archiving records, and OBRA				

<b>Benchmark 3.1 Demonstrate Measurement and Calculating Techniques</b>		3	2	1	0
3.1	Demonstrate the use of Arabic and Roman numerals, weights and measures, and the metric system				

3.2	Recognize and use the metric units of length, weight volume and temperature in mathematical problems				
3.3	Demonstrate the ability to perform pharmacology math-related problems not limited to calculations, data analysis and graphing				

<b>Benchmark 4.1 Safety</b>		3	2	1	0
4.1	Identify methods to reduce errors in prescription or medication orders not limited to: correct patient, look-alike sound-alike medications, leading and trailing zeros and error prone abbreviations				
4.2	Identify requirements for the package insert and medication guidelines				
4.3	Identify and define the published list of high-alert/risk medications				
4.4	Identify what belongs on a drug product label, including auxiliary labels not limited to: poison, shake well, store away from direct sunlight, external use only and take on empty stomach				
4.5	Demonstrate the understanding of the importance and how to perform data searches for accurate pharmacology information				
4.6	Identify issues that require pharmacist intervention not limited to: drug utilization review, adverse drug events, substitutions, misuse and missed dosages				

## Kansas BioChemistry Pathway

<b>Course:</b>	Plant & Soil Science	<b>Course #:</b>	18058	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Technical Level course

### COURSE DESCRIPTION:

<p><b>Rating Scale:</b></p> <p>3. Skilled-Works Independently 2. Limited Skills-Requires Assistance 1. Skill Undeveloped 0. No exposure, instruction or training</p>	<p>Student: _____</p> <p>Graduation Date: _____</p> <p>I certify that the student has received training in the areas indicated.</p> <p>Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

***\*See Plant & Soil Science in Plant Systems Pathway for competencies (01.1101)***

## *Kansas Health & BioScience Cluster*

BioChemistry Pathway – Application Level

**Course:** BioEngineering/Biotechnical Engineering      **Course #:** 21020/21014      **Credit:** 1.0

### **COURSE DESCRIPTION:**

Students will have the opportunity to develop projects that are responsive to real-world problems, using solutions that depend on biological technologies by learning the techniques, strategies and vocabulary related to the engineering of synthetic biological systems. This subject will provide an engaging introduction for would-be biological engineers.

#### **Rating Scale:**

- 3. Skilled-Works Independently
- 2. Limited Skills-Requires Assistance
- 1. Skill Undeveloped
- 0. No exposure, instruction or training

**Directions: The following competencies are required for full approval of a course in a Health Science Pathway. These skills are directly tied to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.**

Student: \_\_\_\_\_

Graduation Date: \_\_\_\_\_

**I certify that the student has received training in the areas indicated.**

Benchmark 1: Understands Biotechnology Engineering procedures		3	2	1	0
1.1	Summarize the components of effective communication.				
1.2	List the forms of documentation needed for effective communication.				
1.3	Outline the steps necessary to keep one's self safe in a laboratory setting.				
1.4	Relates what could happen to experiment results if measurement is performed or recorded incorrectly.				
1.5	Describe the difference between accuracy and precision and the role each plays in the design process.				
1.6	Explains how both accuracy and precision play a vital role in the design process				

Benchmark 2: Investigate the history of BioTechnical Engineering		3	2	1	0
2.1	Outline the evolution of biotechnical engineering.				
2.2	Illustrate and assess the major biotechnical engineering milestones using a wide variety of internet resources.				
2.3	Identify the fundamental concepts common to all major industries in biotechnical engineering.				
2.4	Identify and explain how biotechnical engineered products impact society.				
2.5	Predict future developments in biotechnical engineering.				
2.6	Investigate the relationship between financial markets and scientific research				

Benchmark 3: Values & Ethics in BioEngineering		3	2	1	0
3.1	Distinguish between values and morals.				
3.2	Identify some of the parameters that shape an individual's ethics.				
3.3	Discuss and explain why it is important to consider the bioethical issues of technological advancements.				
3.4	Outline the steps that might be used in determining the societal and environmental ramifications of biotechnology research.				
3.5	Explain why it is important to keep an open mind to different perspectives in biotechnical research				

Benchmark 4: Understanding principles of Bioinformatics		3	2	1	0
4.1	Summarize the molecular techniques that are used by bioinformaticists				
4.2	Create a portfolio demonstrating the research and integration of forensics with engineering.				
4.3	Analyze the technology utilized in the field of forensics.				
4.4	Apply knowledge of genetic engineering to the design of a novel and beneficial application of the reporter gene, green fluorescent protein				
4.5	Describe how to isolate protein				
4.6	Demonstrate the application of engineering principles by improving upon existing hospital designs or surgical procedures				
4.7	Explain the concepts of product liability, product reliability, product reusability and product failure.				

Benchmark 5: Applying principles of Fermentation		3	2	1	0
5.1	Describe the applications of fermentation in food production and renewable energy.				
5.2	Design a method of instrumentation to be used for measuring rates of fermentation				
5.3	Explain what variables affect CO <sub>2</sub> production in yeast in order to determine the ideal conditions for fermentation				

Benchmark 5: Understanding Biomedical Engineering		3	2	1	0
5.1	Demonstrate the application of engineering principles by improving upon existing hospital designs or surgical equipment designs				
5.2	Explain the concepts of product liability, product reliability, product reusability and product failure.				
5.3	Identify anatomical joint features and movements.				

5.4	Design a joint model with the same degrees of freedom as the human counterpart.				
5.5	Synthesize skeletal system concepts with the design process for engineering joints.				
5.6	Summarize the most common forms of heart disease and disorders..				
5.7	Explain procedures involving artificial heart surgery.				
5.8	Estimate the cost of a proposed noninvasive implant.				
5.9	Design a portable ECG monitor and study the electrical aspects associated with the heart.				
<b>Benchmark 6: Understanding Cardiovascular Devices and Imaging</b>		<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
6.1	Summarize the most common forms of heart disease and disorders.				
6.2	Explain procedures involving artificial heart surgery.				
6.3	Estimate the cost of a proposed noninvasive implant.				
6.4	Design a portable ECG monitor and study the electrical aspects associated with the heart.				

<b>Benchmark 7: Understanding Orthopedics in Bioengineering</b>		<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
7.1	<b>. Identify anatomical joint features and movements.</b>				
7.2	<b>Design a joint model with the same degrees of freedom as the human counterpart.</b>				
7.3	<b>Synthesize skeletal system concepts with the design process for engineering joints.</b>				

## Kansas BioChemistry Pathway

<b>Course:</b>	Emerging Technologies	<b>Course #:</b>	21053	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Application Level course

### COURSE DESCRIPTION:

<p><b>Rating Scale:</b>          3. Skilled-Works Independently          2. Limited Skills-Requires Assistance          1. Skill Undeveloped          0. No exposure, instruction or training</p>	<p>Student: _____</p> <p>Graduation Date: _____</p> <p><b>I certify that the student has received training in the areas indicated.</b></p> <p>Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

***\*See Engineering & Applied Mathematics Pathway for competencies (14.0101)***

## Kansas BioChemistry Pathway

<b>Course:</b>	Natural Resource Management	<b>Course #:</b>	18504	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Technical Level course

### COURSE DESCRIPTION:

<p><b>Rating Scale:</b>          3. Skilled-Works Independently          2. Limited Skills-Requires Assistance          1. Skill Undeveloped          0. No exposure, instruction or training</p>	<p>Student: _____</p> <p>Graduation Date: _____</p> <p><b>I certify that the student has received training in the areas indicated.</b></p> <p>Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

***\*See Natural Resources & Environmental Systems Pathway for competencies (03.0101)***

## Kansas BioChemistry Pathway

<b>Course:</b>	Biochemistry Workplace Experience	<b>Course #:</b>	14998	<b>Credit:</b>	.1
<b>CIP Codes:</b>					

Application Level Course

### COURSE DESCRIPTION:

*Biomedical Workplace Experience provides students with Professional Learning Experiences (PLE) to gain extensive knowledge of professionals in private/public industry, community organizations, and biomedical settings, as well as job opportunities, wage, and duties. Students will gain extensive knowledge in selected areas of biomedical technology, specific occupations, skills sets, educational requirements, credentials/licensure, and daily routines by participating in Job Shadows or Internships. Instruction is focused on specific skill sets related to biomedical occupations, research on emerging trends, exploration of daily routines, understanding code of ethics, standards and regulations, safety, and legal requirements. Collaboration with local professionals, organizations and businesses is highly encouraged to offer PLE with documentation of the student experience.*

<p><b>Rating Scale:</b>          3. Skilled-Works Independently          2. Limited Skills-Requires Assistance          1. Skill Undeveloped          0. No exposure, instruction or training</p>	<p>Student: _____</p> <p>Graduation Date: _____</p> <p><b>I certify that the student has received training in the areas indicated.</b></p> <p>Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

Benchmark 1	3	2	1	0
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<b>Analyze strategies to balance roles and responsibilities in the health sciences (individual and career)</b>					
1.1	Compare and contrast occupations that fit individual interests and personal life goals (i.e. interest survey results).				
1.2	Research, and evaluate information to set SMART career goals				
1.3	Apply fundamental knowledge of cost benefits related to personal career goal achievement.				
1.4	Summarize local and global policies, issues, and trends in the health sciences.				
1.5	Research new technologies to meet future health or medical needs				
1.6	Predict potential impact of career path decisions on balancing work and family responsibilities.				
1.7	Identify community and human resources for meeting individual career needs (i.e. personal knowledge, non-profit agencies, educational institutions,).				

<b>Benchmark 2 Enhance job application and retention</b>		<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
2.1	Analyze career choices to determine the knowledge, skills, and personality traits associated with health science careers.				
2.2	Practice public speaking skills to build personal confidence and enhance employability.				
2.3	Demonstrate job seeking skills.				
2.4	Analyze strategies for job retention, addressing job performance weaknesses and how to leave a job appropriately.				
2.5	Assess health, wellness, and work safety considerations of the health science worker.				
2.6	Analyze the impact of an individual's career decision on personal goals, relationships, financial benefit, and the impact on the national and global community .as in picking one health care field over another).				
2.7	Demonstrate teamwork and leadership skills in school and community settings (e.g. HOSA experience).				
2.8	Demonstrate respect for others regardless of age, gender, socio-economic or culture.				

## Kansas BioChemistry Pathway

<b>Course:</b>	Applications in Agricultural Biotechnology	<b>Course #:</b>	18320	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Application Level course

### COURSE DESCRIPTION:

<p><b>Rating Scale:</b>          3. Skilled-Works Independently          2. Limited Skills-Requires Assistance          1. Skill Undeveloped          0. No exposure, instruction or training</p>	<p>Student: _____          Graduation Date: _____  <b>I certify that the student has received training in the areas indicated.</b>          Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

**\*See Competencies in Biotechnology in Agriculture Pathway (26.1201) for course competencies.**

## Kansas BioChemistry Pathway

<b>Course:</b>	Environmental Resources & Wildlife Science	<b>Course #:</b>	37506	<b>Credit:</b>	1
<b>CIP Codes:</b>					

Application Level course

### COURSE DESCRIPTION:

<p><b>Rating Scale:</b>          3. Skilled-Works Independently          2. Limited Skills-Requires Assistance          1. Skill Undeveloped          0. No exposure, instruction or training</p>	<p>Student: _____</p> <p>Graduation Date: _____</p> <p><b>I certify that the student has received training in the areas indicated.</b></p> <p>Instructor Signature: _____</p>
<p><b>Directions:</b> The following competencies are required for full approval of a course in a Health Science Cluster. These skills are <b>directly tied</b> to the career ready practices and therefore important to all Health Science careers. Check the appropriate number to indicate the level of competency reached for learner evaluation.</p>	

***\*See Natural Resources & Environmental Systems Pathway for competencies (03.0101)***