

HEALTH & BIO SCIENCE CAREER CLUSTER DESIGN

BioMedical Pathway – CIP Code 14.0501

Approved Pathway:

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

INTRODUCTORY LEVEL

Biology	03051/53051	1 credit			
●Engineering Appl. (8-9)	21002/71002	1 credit	Computing Systems (8-9)	10002/60002	1 credit
●Engineering Tech (8-9)	21003/71003	1 credit	Computer Appl. (8-9)	10004/60004	1 credit

TECHNICAL LEVEL

●Prin. Of Biomedical Science	14251	1 credit	Pharmacology	14253	1 credit
●Medical Interventions	14105	1 credit	Food Science or	22203	1 credit
●Human Body Systems or	14102	1 credit	Ag. Food Science	18305	1 credit
●Anatomy & Physiology	03053	1 credit			
Robotics	21009	1 credit	AP Biology	03056	1 credit

APPLICATION LEVEL

●Biomedical Innovation	14255	1 credit	Project Management		
●BioEngineering or	21020	1 credit	and Resource Scheduling	21205	1 credit
●Biotechnical Engineering	21014	1 credit	Workplace Experience	21048	1 credit
Emerging Technologies in STEM	21053	1 credit	HealthCare Sciences - Other	14999	1 credit

- Course appropriate for Project Lead the Way Programs; competencies may be utilized by any/all schools.

KANSAS STATE CAREER CLUSTER COMPETENCY PROFILE

BIOMEDICAL PATHWAY (C.I.P. 14.1401)

STUDENT _____

Rating Scale:

- 3 - Proficient Achievement
- 2 - Limited Achievement
- 1 - Inadequate Achievement
- 0 - No Exposure

HEALTH & BIO SCIENCES CLUSTER

Graduation Date _____
I certify that the student has received training in the areas indicated.

Instructor Signature _____

Instructor Signature _____

Instructor Signature _____

Instructor Signature _____

COMMON CAREER TECHNICAL CORE – CAREER READY STANDARDS

1. Act as a responsible and contributing citizen and employee
2. Apply appropriate academic and technical skills
3. Attend to personal health and financial well-being
4. Communicate clearly, effectively and with reason
5. Consider the environmental, social and economic impacts of decisions
6. Demonstrate creativity and innovation
7. Employ valid and reliable research strategies
8. Utilize critical thinking to make sense of problems and persevere in solving them.
9. Model integrity, ethical leadership and effective management
10. Plan education and career path aligned to personal goals
11. Use technology to enhance productivity
12. Work productively in teams while

using cultural/global competence

COMMON CAREER TECHNICAL CORE – STEM CLUSTER STANDARDS

1. Apply engineering skills in a project that requires project management, process control and quality assurance.
2. Use technology to acquire, manipulate, analyze and report data.
3. Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
4. Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
5. Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
6. Demonstrate technical skills needed in a chosen STEM field.

INTRODUCTORY LEVEL COURSES

10004-Computer Applications

- 3 2 1 0
1. Personal Information Management
 - b. word usage, spelling, sentence structure, clarity, email
 - c. Demonstrate knowledge of email etiquette.
 - d. Send email messages.
 - e. Access email attachments.
 - f. Attach documents to messages.
 - g. Demonstrate knowledge of contamination protection strategies for email.
 - h. Save email messages / attachments.
 - 3 2 1 0 2. Research and Internet
 - a. Locate information using search engine(s) and Boolean logic.
 - b. Navigate web sites using software functions.
 - c. Select appropriate search procedures and approaches.
 - d. Select search engine(s) to use.
 - e. Access business and technical information using the Internet.
 - f. Access commercial, government, and education resources.
 - g. Evaluate Internet resources (e.g.,

- accuracy of information).
- h. Explore browser features.
- i. Test Internet connection.
- j. Unpack files using compression software.
- k. Bookmark web addresses (URLs).
- l. Navigate web sites using software functions (e.g., Forward, Back, Go To, Bookmarks).
- a. Create calendars/schedules.
- i. Document results.
- j. Create tasks (to-do) list.
- k. Identify PIM applications (MS Outlook, Lotus Notes, and others).
- l. Manage daily/weekly/monthly schedule using applications such as Notes, MS Outlook, etc.
- m. Create and send notes, informal memos, reminder using PIM applications.
- n. Create reminder for oneself.
- o. Access email messages received.
- p. Access email system using login and password functions.
- m. Create e-mail messages in accordance with established business standards (e.g., grammar, Access library catalogs on the Internet.
- n. Compile a collection of business sites (e.g., finance and investment).
- o. Add plug-ins and helpers to the web browser.
- p. Archive files.
- q. Explore the multimedia capabilities of the World Wide Web.
- r. Utilize online tools.
- s. Communicate via email using the Internet.
- t. Explore collaboration tools.
- u. Explore electronic commerce.

3 2 1 0

- v. Explore newsgroups.
- w. Compile a collection of business sites (e.g., finance and investment).
- 3. Word Processing and Presentations
- a. Create documents (e.g., letters, memos, reports) using existing forms and templates.
- b. Employ word processing utility tools (e.g., spell checker, grammar checker, thesaurus).
- c. Format text using basic formatting functions.
- d. Retrieve existing documents.
- e. Safeguard documents using name & save functions.
- f. Create new word processing forms, style sheets, and templates.
- g. Enhance publications using different fonts, styles, attributes, justification, etc.
- h. Enhance publications using paint/draw functions.
- i. Format new desktop publishing files.
- j. Output desktop publishing files.
- k. Place graphics in document.
- l. Prepare publications using desktop publishing software.
- m. Use advanced formatting features (e.g., headers/footers/dropped caps, and indexing).
- n. Create computer presentation and handouts in accordance with basic principles of graphics design and visual communication.
- o. Edit presentations.
- p. Insert graphic elements (e.g., graph, clip art, table) in a slide.
- q. Identify hardware items that support presentation software (e.g., scanners, digital cameras, printers, and projection systems).

3 2 1 0

- r. Print a single slide, an entire presentation, an outline, and notes.
- s. Run slide shows manually and automatically.
- 4. Spreadsheets
- a. Create spreadsheets.
- b. Edit spreadsheets.
- c. Print spreadsheets.
- d. Retrieve existing spreadsheets.
- e. Save spreadsheets.
- f. Create charts and graphs from spreadsheets.
- g. Group worksheets.
- h. Input/process data using spreadsheet functions.
- i. Perform calculations using simple formulas.
- 3 2 1 0 5. Data
- a. Enter data using a form.
- b. Locate/replace data using search and replace functions.
- c. Process data using database functions (e.g., structure, format, attributes, relationships, keys).
- d. Perform single- and multiple-table queries (e.g., create, run, save).
- e. Print forms, reports, and results or queries.
- f. Search a database table to locate records.
- g. Sort data using single and multiple field sorts.
- h. Verify accuracy of output.
- i. Maintain shared database of contact information.
- j. Manage daily/weekly/monthly schedule using applications.
- k. Participate in virtual group discussions and meetings.
- l. Apply basic commands of operating system software.

- m. Employ desktop operating skills.
- n. Apply appropriate file and disk management techniques.
- o. Recognize the need for regular backup procedures.
- p. Demonstrate knowledge of central processing unit (CPU) control and architecture.
- q. Identify CPU modes of operations.
- r. Define the role of memory management in an operating system.
- s. Demonstrate knowledge of network operating systems.
- t. Demonstrate knowledge of operating system architecture types.
- u. Demonstrate knowledge of the commands used to handle tasks in operating systems.
- v. Differentiate between microcomputer, minicomputer, and mainframe operating systems.
- w. Demonstrate knowledge of the basics of process management.
- x. Demonstrate knowledge of the system utilities used for file management.

3 2 1 0 6. Ethics and Security

- a. Demonstrate knowledge of potential internal and external threats to security.
- b. Assess exposure to security issues.
- c. Demonstrate knowledge of virus protection strategy.
- d. Ensure compliance with security rules, regulations, and codes.
- e. Explore ways to implement countermeasures.
- f. Implement security procedures in accordance with business ethics.
- g. Maximize threat reduction.

- i. Document security procedures.
- j. Understand how to follow a disaster plan.
- k. Identify sources of virus infections.
- l. Understand how to utilize backup and recovery procedures.
- m. Understand how to load virus detection and protection software.
- n. Maintain confidentiality.
- o. Understand how to provide for user authentication (e.g., assign passwords, access level).
- o. Understand how to remove viruses.
- p. Report viruses in compliance with company standards.
- q. Identify the features and benefits of quality planning.
- r. Identify the role of quality within the organization.

3 2 1 0 7. History / Quality Assurance

- a. Demonstrate knowledge of changes brought about by quality industry leaders in the world.
- b. Demonstrate knowledge of successful efforts by industry to improve quality and/or reduce costs.
- c. Demonstrate knowledge of the historical evolution of quality assurance/total quality management (e.g., Deming, ISO 9000).
- d. Demonstrate knowledge of the standards/requirements for the Baldrige award.
- e. Demonstrate knowledge of quality management terminology.

10002 Computing Systems

- 3 2 1 0 1. Apply knowledge of operating systems principles to ensure optimal functioning of system.
 - a. Interact with/respond to system messages using console device.
 - b. Apply basic commands of operating system software.
 - c. Apply appropriate file and disk management techniques.
 - d. Employ desktop operating skills.
 - e. Follow power-up and log-on procedures.
 - f. Run applications. jobs in accordance with processing procedures.
 - g. Follow log-off and power-down procedure(s).
 - h. Handle materials and equipment in a responsible manner.
- 3 2 1 0 2. Clearly document procedures for future use.
 - a. Document step-by-step installation and configuration procedures.
- 3 2 1 0 3. Communicate and recognize goal achievement.
 - a. Communicate goal achievement.
 - b. Provide recognition for goal achievement.
- 3 2 1 0 4. Configure systems to provide optimal system interfaces.
 - a. Apply concepts of privileged instructions and protected mode programming.
 - b. Configure peripheral device drivers (e.g., disk, display, printer, modem, keyboard, mouse, network).
 - c. Allocate disk space, non-sharable resources, and I/O devices.

- d. Interface peripheral devices/controllers in the computer system (e.g., software and hardware interrupts, exceptions, Direct Memory Addressing [DMA], bus structures).
 - e. Identify standards and issues related to I/O programming and design of I/O interfaces.
 - f. Define hardware-software interface issues for a computer system.
 - g. Apply advanced I/O concepts (e.g., disk caching, data compression, extended memory, magnetic disk/CD-ROM storage and formats).
- 3 2 1 0 5. Configure/modify system as needed.
- a. Build system software command structures using operating system macro facilities for computer systems.
 - b. Identify scheduling priority in programming.
 - c. Identify data requirements.
 - d. Review automated scheduling software.
 - e. Secure needed supplies and resources.
- 3 2 1 0 6. Determine audience and information needs
- a. Define research questions.
 - b. Identify target audience.
- 3 2 1 0 7. Document procedures and actions.
- a. Develop audit trails.
- 3 2 1 0 8. Ensure that hardware and software system components are compatible prior to performing installation.
- a. processor, memory, disk space, communications, printers, monitors).
 - b. Determine compatibility of hardware and Identify hardware requirements (e.g., software).
- 3 2 1 0 9. Ensure that software to be installed is licensed prior to performing installation.
- a. Verify conformance to licensing agreement.
- 3 2 1 0 10. Evaluate information systems problem-solving techniques and approaches.
- a. Evaluate systems engineering considerations.
 - b. Identify potential problems in system implementation.
 - c. Summarize application planning, development, and risk management for information system.
 - d. Demonstrate knowledge of critical thinking skills and techniques.
 - e. Demonstrate knowledge of decision-making skills and techniques.
 - f. Develop a plan using data-oriented techniques.
 - g. Determine whether prototyping system is feasible.
 - h. Determine software design process, from specification to implementation.
 - i. Appraise software process and product life-cycle models.
 - j. Assess software design methods and tools.
- 3 2 1 0 11. Evaluate information.
- a. Determine the accuracy and completeness of the information gathered.
- 3 2 1 0 12. Explain data communications procedures, equipment and media.
- a. Demonstrate knowledge of the uses of data communications media.
 - b. Demonstrate knowledge of the uses of data communications equipment.
 - c. Demonstrate knowledge of key communications procedures.
- 3 2 1 0 13. Explain measurement techniques for increased productivity due to information systems implementation.
- a. Measure increases in productivity realized by the implementation of information systems.
- 3 2 1 0 14. Explain new and emerging classes of software.
- a. Identify new and emerging classes of software.
- 3 2 1 0 15. Explain the benefits of hosting a web site on a local server vs. at an ISP (Internet Service Provider).
- a. Compare the advantages and disadvantages of running your own server vs. using a server provider.
- 3 2 1 0 16. Explain the differences between local and wide area networks.
- a. Distinguish between local area networks and wide area networks.
- 3 2 1 0 17. Explain the features and functions of web browsing software.
- a. Identify how different browsers affect the look of a web page.
 - b. Demonstrate knowledge of the characteristics and uses of plug-ins.
 - c. Demonstrate knowledge of the role of browsers in reading files on the World Wide Web (text-only, hypertext).
- 3 2 1 0 18. Explain the features and functions of web page design software.
- a. Compare/contrast the features and functions of software editors available for designing web pages.

- 3 2 1 0 19. Explain the key functions and applications of software.
- Demonstrate knowledge of the function and operation of compilers and interpreters.
 - Demonstrate knowledge of widely used software applications (e.g., word processing, database management, spreadsheet development).
 - Demonstrate knowledge of the key functions of systems software.
- 3 2 1 0 20. Explain the role of number systems in information systems.
- Identify the role the binary system in information systems.
 - Demonstrate knowledge of number systems and internal data representation.
- 3 2 1 0 21. Gather information.
- Identify potential sources of information.
 - Gather information from selected print and electronic sources.
 - Conduct interviews with selected human information sources.
 - Evaluate potential sources of information based on established criteria (e.g., affordability, relevance).
 - Target audience/user group as a key information source.
 - Determine priorities for the information that should be gathered.
 - Identify subject-matter experts.
- 3 2 1 0 22. Identify computer classifications and hardware.
- Identify types of computer storage devices.
 - Identify the hardware associated with telecommunications functions.
 - Identify major hardware components and their functions.
- 3 2 1 0 23. Identify new IT technologies and assess their potential importance and impact on the future.
- Identify new technologies relevant to information technology.
 - Assess the importance of new technologies to future developments & to future knowledge worker productivity.
 - Identify new & emerging drivers and inhibitors of information technology change.
- 3 2 1 0 24. Monitor and adjust goals.
- Obtain support for goals.
 - Provide support for goals.
 - Monitor goal achievement.
 - Adjust goals.
- 3 2 1 0 25. Operate computer-driven equipment and machines.
- Run applications/jobs in accordance with processing procedures.
 - Secure needed supplies and resources.
 - Interact with/respond to system messages using console device.
 - Follow log-off and power-down procedure(s).
 - Follow power-up and log-on procedures.
- 3 2 1 0 26. Perform customization as requested.
- Customize software to meet user preferences.
- 3 2 1 0 27. Perform installation accurately and completely, using available resources as needed.
- Select appropriate installation options (e.g., default, customized).
 - Configure software to appropriate operating system settings.
 - Configure macros, tools, and packages to accomplish simple organizational and personal tasks.
- 3 2 1 0 28. Resolve problems with installation if they occur.
- Access needed help using manufacturers' technical help lines or Internet sites.
 - Formulate new installation procedure if needed.
 - Troubleshoot unexpected results.
 - Set short- and long-term goals for assigned areas of responsibility/accountability.
- 3 2 1 0 29. Test and maintain products / services.
- Test products for reliability.
 - Initiate predictive maintenance procedures.
- 3 2 1 0 30. Troubleshoot computer-driven equipment and machines and access support as needed
- Test system using diagnostic tools/software.
 - Repair/replace malfunctioning hardware.
 - Reinstall software as needed.
 - Recover data and/or files.
 - Restore system to normal operating standards.
- 3 2 1 0 31. Understand and employ design and color principles.
- Assess the impact of various color harmonies on a two-dimensional picture plan.
 - Demonstrate knowledge of the two-dimensional picture plan.
- d. Differentiate between procedures for an upgrade and for a new installation.
- e. Differentiate between stand-alone and network installation procedures.
- f. Disable/uninstall software that may interfere with installation of new software.
- g. Install given application/system software on various platforms in accordance with manufacturer's procedures.
- h. Convert data files if required.
- i. Verify software installation and operation.

- c. Demonstrate knowledge of the nature of color and color harmonies.
 - d. Assess how color affects the principles of line, value, shape and form.
 - e. Demonstrate knowledge of the principles and elements of design and their relationship to each other.
- 3 2 1 0 32. Understand data communications trends and issues.
- a. Identify major current issues in data communications.
 - b. Identify data communication trends.
 - c. Demonstrate knowledge of data transmission codes and protocols.
- 3 2 1 0 33. Understand elements and types of information processing.
- a. Identify the elements of the information processing cycle (i.e., input, process, output, and storage).
 - b. Identify types of processing (e.g., batch, interactive, event-driven, object-oriented).
- 3 2 1 0 34. Understand functions and interactions of departments within a business.
- a. Identify the ways in which organizational functions are interdependent.
 - b. Define the role of strategic planning in business.
 - c. Identify types of communication channels (e.g., formal, informal).
 - d. Demonstrate knowledge of the components of a business plan.
- 3 2 1 0 35. Understand how bandwidth affects data transmission and on-screen image.
- a. Demonstrate knowledge of how bandwidths affect data transmission and on-screen image.

- 3 2 1 0 36. Understand how data is organized in software development.
- a. Demonstrate knowledge of how data is organized in software development.
- 3 2 1 0 37. Understand information organization principles.
- a. Demonstrate knowledge of group support technology for common knowledge requirements.
 - b. Demonstrate knowledge of methods for achieving productivity in knowledge work.
 - c. Demonstrate knowledge of the information analysis process.
 - d. Demonstrate knowledge of information technology solutions.
- 3 2 1 0 38. Understand product/service design.
- a. Consider customer satisfaction in determining product characteristics (e.g., usefulness, price, operation, life, reliability, safety, cost of operation).
 - b. Design product (e.g., using brainstorming, thumbnail sketches, rendering).
- 3 2 1 0 39. Understand the differences between a client and a server.
- a. Differentiate between a client and a server.
- 3 2 1 0 40. Understand the fundamentals of operating systems.
- a. Identify major operating system fundamentals and components.
- 3 2 1 0 41. Understand the range of languages used in software development.
- a. Demonstrate knowledge of the range of languages used in software development.

- 3 2 1 0 42. Understand types and functions of businesses.
- a. Define stakeholder relationships (e.g., customers, employees, shareholders, and suppliers).
 - b. Identify business reporting and information flow.
 - c. Identify types of business organizations and functions.
- 3 2 1 0 43. Use available reference tools as appropriate.
- a. Access needed information using appropriate reference materials.
 - b. Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts).
- 3 2 1 0 44. Use installation and operation manuals.
- a. Access needed information using appropriate reference materials.
- 3 2 1 0 45. Use reliability factors effectively to plan for and create products/services.
- a. Consider reliability factors (e.g., cost, human, productivity).
 - b. Achieve reliability through maintainability, good design, design simplification, and design redundancy.
 - c. Recognize the relationship of maintainability and reliability.
 - d. Align cost components with quality objectives.
 - e. Classify quality costs (e.g., preventive, evaluation, pre-delivery failures, post-delivery failures).

21002 Engineering Applications

Design and Modeling

- 3 2 1 0 1. Explain the relationship between science, technology, engineering and math.

- 3 2 1 0 2. Describe engineering and explain how engineers participate in or contribute to the invention and innovation of products.
- 3 2 1 0 3. Describe impacts that technology has had on society.
- 3 2 1 0 4. Distinguish between invention and innovation.
- 3 2 1 0 5. Assemble an engineering notebook and a portfolio.
- 3 2 1 0 6. Describe the design process and how it is used to aid in problem solving.
- 3 2 1 0 7. Use the design process to solve a technical problem.
- 3 2 1 0 8. Recognize design criteria and constraints.
- 3 2 1 0 9. Describe the purpose and importance of working in a team.
- 3 2 1 0 10. Explain a design brief and apply the concept when using the design process.
- 3 2 1 0 11. Describe the elements of design and apply this concept to the design process.
- 3 2 1 0 12. Use a decision matrix to select the best solution to a design problem.
- 3 2 1 0 13. Demonstrate the ability to measure accurately with different devices and scales.
- 3 2 1 0 14. Explain how to measure in different contexts.
- 3 2 1 0 15. Measure using both the English and Metric systems.
- 3 2 1 0 16. Summarize the reasoning for using sketching as a communication tool.
- 3 2 1 0 17. Use visualization, spatial reasoning, and geometric shapes to sketch two and three dimensional shapes.
- 3 2 1 0 18. Recognize and create thumbnail, perspective, isometric, and orthographic sketches.

- 3 2 1 0 19. Recognize and accurately interpret one and two-point perspective drawings.
- 3 2 1 0 20. Communicate ideas for a design using various sketching methods, notes, and drafting views.
- 3 2 1 0 21. Dimension an orthographic sketch following the guidelines of dimensioning.
- 3 2 1 0 22. Create a three-dimensional (3D) model of an object.
- 3 2 1 0 23. Apply geometric and dimension constraints to design CAD-modeled parts.
- 3 2 1 0 24. Assemble the product using the CAD modeling program.
- 3 2 1 0 25. Demonstrate the ability to produce various annotated working drawings of a 3D model.
- 3 2 1 0 26. Identify the difference between a prototype, a model and a mock-up and analyze what circumstances call for the use of each.
- 3 2 1 0 27. Explain why teams of people are used to solve problems.
- 3 2 1 0 28. Brainstorm and sketch possible solutions to an existing design problem.
- 3 2 1 0 29. Create a decision-making matrix.
- 3 2 1 0 30. Select an approach that meets or satisfies the constraints given in a design brief.

Automation and Robotics

- 3 2 1 0 31. Describe the purpose of automation and robotics and its effect on society.
- 3 2 1 0 32. Summarize ways that robots are used in today's world and the impact of their use on society.
- 3 2 1 0 33. Describe positive and negative effects of automation and robotics on humans in terms of safety and

- 3 2 1 0 34. Investigate a career related to automation and robotics and determine the requirements for entering the field.
- 3 2 1 0 35. Investigate and understand various mechanisms to determine their purpose and applications.
- 3 2 1 0 36. Be able to apply their knowledge of mechanisms to solve a unique problem.
- 3 2 1 0 37. Design, build, wire, and program both open and closed loop systems.
- 3 2 1 0 38. Troubleshoot a malfunctioning system using a methodical approach.
- 3 2 1 0 39. Experience fluid power by creating and troubleshooting a pneumatic device.
- 3 2 1 0 40. Design, build, wire and program a system operated by alternative energy.

Energy and the Environment (optional/extension)

- 3 2 1 0 41. Differentiate between potential and kinetic energy.
- 3 2 1 0 42. Explain the differences, advantages, and disadvantages between exhaustible, inexhaustible, renewable, and non-renewable energy sources.

Specific curriculum will differ from program to program. Additional topics of study can include:

- Efficiency vs. Conservation and measures to address each
- Water Conservation and Management
- Energy Budget and Fiscal Impact
- Geographic Barriers and Availability Considerations of Resources
- Power, Work, and Measure of

- Energy
- Trends of Consumption of Various Energy Sources
- Environmental Impact of Energy Usage and Disposal

21003 Engineering Technology

Flight and Space

- 3 2 1 0 1. Apply their knowledge of research techniques to investigate the history of an aerospace vehicle.
- 3 2 1 0 2. Experience the flight characteristics of kites, whirly gigs, model airplanes, hot air balloons, and model rockets.
- 3 2 1 0 3. Utilize language arts skills to write a script and create a storyboard for an infomercial promotion of an aerospace vehicle.
- 3 2 1 0 4. Distinguish between the forces of lift, drag, weight, and thrust that affect an object moving through a fluid. Understand the importance of each force.
- 3 2 1 0 5. Examine how center of gravity affects an aerospace vehicle in distributing weight.
- 3 2 1 0 6. Discover how Newton's laws apply to flight and space.
- 3 2 1 0 7. Discover Bernoulli's principle through exploration.
- 3 2 1 0 8. Recognize the tools and purpose of aeronautic design and testing.
- 3 2 1 0 9. Identify the characteristics of an airfoil and how they compare and contrast with the characteristics of wings.
- 3 2 1 0 10. Analyze the features and benefits of different types of wings.

- 3 2 1 0 11. Describe the major parts (fuselage, empennage, high lift devices, wings, undercarriage, propulsion, instruments, and controls) of aircraft and how they can affect the overall balance of an airplane during flight.
- 3 2 1 0 12. Research and design an airfoil and empennage for use in the prototyping of a Styrofoam glider.
- 3 2 1 0 13. Explore the history and development of rocketry, space flight, and living in space.
- 3 2 1 0 14. Discover the basic principles of flight and rocketry.
- 3 2 1 0 15. Investigate how changes in various design characteristics of a rocket will affect the rocket's performance.
- 3 2 1 0 16. Know that a rocket must overcome the forces of gravity and drag in order to get out of the atmosphere.
- 3 2 1 0 17. Understand that an orbit is the balance of gravity and an object's tendency to follow a straight path.
- 3 2 1 0 18. Use an immersive learning simulation to select optimal components for a lunar robot's engine, power source, tires, body type and sensor system to save stranded astronauts on the moon.
- 3 2 1 0 19. Understand the challenges that engineers face to provide safe travel and optimum living conditions in space.

Science of Technology

- 3 2 1 0 20. Describe the difference between a chemist and a chemical engineer.
- 3 2 1 0 21. Apply science and engineering skills to make ice cream.
- 3 2 1 0 22. Follow the design process to create an adhesive.
- 3 2 1 0 23. Work with a team to solve an oil spill engineering simulation problem.

- 3 2 1 0 24. Demonstrate an understanding of how small a nanometer is.
- 3 2 1 0 25. Explore how nano-products are used in society today.
- 3 2 1 0 26. Identify tools and processes used to see and manipulate matter at the nanoscale.
- 3 2 1 0 27. Discuss the impact that nanotechnology has on their lives today and will have in the future.
- 3 2 1 0 28. Correctly identify the six simple machines and explain their applications.
- 3 2 1 0 29. Distinguish between the three classes of levers.
- 3 2 1 0 30. Identify a machine as something that helps use energy more efficiently.
- 3 2 1 0 31. Determine mechanical advantage from assembled simple machines.
- 3 2 1 0 32. Be able to compare and contrast kinetic and potential energy.
- 3 2 1 0 33. Predict the relative kinetic energy based on the mass and speed of the object.
- 3 2 1 0 34. Recognize and follow safety rules for using lab tools and machines.
- 3 2 1 0 35. Build, test, and evaluate a model of a design problem.
- 3 2 1 0 36. Analyze a product through testing methods and make modifications to the product.

Magic of Electrons

- 3 2 1 0 37. Identify the roles of protons, neutrons, and electrons in an atom.
- 3 2 1 0 38. Identify an element based on the atomic number.
- 3 2 1 0 39. Identify metals, metalloids, and non-metals on the periodic table.
- 3 2 1 0 40. Judge whether a material is a conductor, insulator, or semiconductor based upon its number of valance electrons and

- its position on the periodic table.
- 3 2 1 0 41. Explain how the Law of Charges holds an atom together.
- 3 2 1 0 42. Explain how electrons transfer from one atom to another to create electron flow.
- 3 2 1 0 43. Define current, voltage, and resistance.
- 3 2 1 0 44. Measure voltage and current using a multimeter.
- 3 2 1 0 45. Understand the properties of a magnet.
- 3 2 1 0 46. Build an electromagnet to demonstrate its characteristics and functions.
- 3 2 1 0 47. Build a DC motor to identify the primary parts and demonstrate how it functions.
- 3 2 1 0 48. Build a generator to identify the primary parts and demonstrate how it functions.
- 3 2 1 0 49. Understand the role of an electromagnet in the function of a DC motor and generator.
- 3 2 1 0 50. Compare the characteristics of a basic motor and generator.
- 3 2 1 0 51. Build series, parallel, and combination electrical circuits.
- 3 2 1 0 52. Create circuit diagrams using standardized schematic symbols.
- 3 2 1 0 53. Build and test physical electrical circuits based upon circuit diagrams.
- 3 2 1 0 54. Integrate DC sources, lamps, switches, diodes, light emitting diodes, resistors, and capacitors into electrical circuits to achieve specific functions.
- 3 2 1 0 55. Distinguish between the functions and operations of fixed resistors, variable resistors, and photo resistors.

- 3 2 1 0 56. Determine the value of a fixed resistor based upon the color codes on those resistors.
- 3 2 1 0 57. Measure voltage, current, and resistance using a multimeter.
- 3 2 1 0 58. Mathematically calculate voltage, current, and resistance using Ohm's law.
- 3 2 1 0 59. Create a circuit that uses a transistor as a switch.
- 3 2 1 0 60. Interpret logic scenarios to determine outputs based upon possible conditions within those scenarios.
- 3 2 1 0 61. Distinguish between the functions of NOT, AND, OR, NAND, NOR, and XOR gates.
- 3 2 1 0 62. Create truth tables for logic scenarios and match those gates to truth tables.
- 3 2 1 0 63. Convert binary numbers to Base-10.
- 3 2 1 0 64. Convert ASCII characters to binary.
- 3 2 1 0 65. Create a digital wave form and graph it for a binary sequence.
- 3 2 1 0 66. Communicate using electronic circuit diagrams.
- 3 2 1 0 67. Use transistors as switches to create circuits that function as AND and OR gates.
- 3 2 1 0 68. Determine the logic, sensors, gates, outputs, and other components needed to emulate existing electronic devices that utilize logic.
- 3 2 1 0 69. Design, construct, and test device solutions for emulating common electronic devices that utilize logic.

03051 Biology

Structure and Function of Cells

- 3 2 1 0 1. Analyze the characteristics that are essential to life.
- 3 2 1 0 2. Apply the scientific method to

- answer an question/solve a problem.
- 3 2 1 0 3. Explains how cell functions involve specific chemical reactions.
- 3 2 1 0 4. Identify the structures, functions, and importance of organic and inorganic compounds in cells. 3 2 1 0 5. Describes how enzymes regulate the rate of chemical reactions.
- 3 2 1 0 6. Compares and contrasts prokaryotic and eukaryotic cells.
- 3 2 1 0 7. Discusses the function and structure of cell membranes.
- 3 2 1 0 8. Describes the process of photosynthesis.
- 3 2 1 0 9. Identifies the relationship between photosynthesis and cellular respiration
- Heredity and Evolution**
- 3 2 1 0 10. Evaluate the relationships between structure and function in nucleic acids.
- 3 2 1 0 11. Distinguish between the functions of DNA and RNA.
- 3 2 1 0 12. Compare and contrast mitosis and meiosis.
- 3 2 1 0 13. Identify Mendelian laws of inheritance, their relationship to chromosomes and related terminology.
- 3 2 1 0 14. Analyze applications of probability and statistical analysis in genetics.
- 3 2 1 0 15. Analyze various patterns of inheritance.
- 3 2 1 0 16. Identify the causes of genetic disorders.
- 3 2 1 0 17. Identify the effect of a mutation in a DNA sequence on the products of protein synthesis. 3 2 1 0 18. Explain how evolution is

3 2 1 0 19. Describe changes on early earth that challenged first life forms.

3 2 1 0 20. Cite evidence for evolution.

Ecology

3 2 1 0 21. Distinguish between individuals, populations, communities, ecosystems, biomes, and the biosphere.

3 2 1 0 22. Analyze the relationship between organisms and their trophic levels.

3 2 1 0 23. Identify processes, components, and roles of organisms in the hydrologic, carbon, nitrogen, and phosphorous cycles.

3 2 1 0 24. Analyze patterns of energy flow in an ecosystem.

3 2 1 0 25. Classify examples of species interactions and succession in biotic communities.

3 2 1 0 26. Evaluate the effects of human population size, resource use, and technology on environmental quality.

Organisms Behavior and Diversity

3 2 1 0 27. Explain how changes in the environment create selective pressures that challenge the survival of an organism.

3 2 1 0 28. Apply a taxonomic key to a set of objects.

3 2 1 0 29. Explains how animals have behavioral responses to internal changes and to external stimuli.

3 2 1 0 30. Evaluate the nervous system and it affect on behavior.

3 2 1 0 31. Identify homeostasis as the dynamic regulation and balance of an organism's internal environment.

3 2 1 0 32. Models the complexity of the division of labor into specific body systems.

TECHNICAL LEVEL COURSES

14251 Principles of Biomedical Sciences

3 2 1 0 1. Explain the functions of different human body systems, and list the major organs within each system.

3 2 1 0 2. Describe how multiple body systems are interconnected and how those interconnections are necessary for life.

3 2 1 0 3. Describe how an autopsy is performed and the types of information it provides to officials.

Heart

3 2 1 0 4. Explain what a pump is.

3 2 1 0 5. List two factors that affect the amount of work necessary to move a liquid from one flask to another.

3 2 1 0 6. Illustrate the human heart and label all the important structures.

3 2 1 0 7. Compare and contrast the characteristics of the different cardiac tissue types.

3 2 1 0 8. Explain how the design of the heart allows it to pump both oxygenated and un-oxygenated blood without mixing.

3 2 1 0 9. Summarize the use of technology as an important tool in the Biomedical Sciences.

3 2 1 0 10. Explain why heart rate, EKG, and blood pressure are important indicators of cardiovascular health.

3 2 1 0 11. Identify, sketch red and white blood cells viewed under a microscope.

3 2 1 0 12. Describe the functions of the major components of human blood.

3 2 1 0 13. Summarize the differences between cells, tissues, and organs.

Diabetes

3 2 1 0 14. Analyze food labels for nutritional content.

3 2 1 0 15. Build and analyze molecular models and diagrams of atoms, molecules and simple compounds.

3 2 1 0 16. Explain the process of calorimetry and how it is used to measure the amount of energy in a food.

3 2 1 0 17. Explain why water is an essential component of human bodies.

3 2 1 0 18. Describe how carbohydrates, proteins and lipids differ in function and structure.

3 2 1 0 19. Discuss the structure and functions of enzymes.

3 2 1 0 20. Explain the importance of enzymes on maintaining homeostasis in the human body.

3 2 1 0 21. Describe the function of co-enzymes and give examples of co-enzymes found in food.

3 2 1 0 22. Illustrate how insulin transfers glucose from blood into cells.

3 2 1 0 23. Explain the causes, symptoms, effects, and treatments of both Type I and Type II diabetes.

3 2 1 0 24. Summarize the dietary requirements and restrictions of people who have diabetes.

3 2 1 0 25. Describe the nutritional requirements of diabetic teens as

compared to their non-diabetic peers.

- 3 2 1 0 26. Plan a healthy one-day menu appropriate for a diabetic teen.

Sickle Cell

- 3 2 1 0 27 Describe the differences in the appearance of normal and sickle red
- 3 2 1 0 28 List the symptoms and complications of sickle cell disease.
- 3 2 1 0 29 Explain how sickle cell disease is transferred genetically.
- 3 2 1 0 30 Define chromosome.
- 3 2 1 0 31 Describe the structure of a chromosome.
- 3 2 1 0 32 Explain the relationship between
- 3 2 1 0 33. Outline the DNA code.
- 3 2 1 0 34. Explain how karyotypes are used to diagnose medical conditions.

Cholesterol

- 3 2 1 0 35. Explain the differences between saturated
- 3 2 1 0 36. Define stearic acid, oleic acid, linoleic
- 3 2 1 0 37. Describe how the polymerase chain action amplifies DNA.

Infectious Diseases

- 3 2 1 0 38. Explain what bacteria are.
- 3 2 1 0 39. Describes bacterial reproduction.
- 3 2 1 0 40. Summarizes antibiotic resistance, and explains why it is a major health problem today.
- 3 2 1 0 41. Describes the general structure of viruses.
- 3 2 1 0 42. Explain the structural and functional differences between bacterial cells and virus particles.

Medical Interventions

- 3 2 1 0 43. Describe the different types or categories of medical intervention.
- 3 2 1 0 44. Explain how biomedical engineers apply engineering principles to design and produce medical devices.

14105 Medical Interventions

Infections

- 3 2 1 0 1. List medical interventions to create a classroom display.
- 3 2 1 0 2. Illustrates connections between individuals in a disease outbreak.
- 3 2 1 0 3. Calculate serial dilutions and calculate resultant concentrations.
- 3 2 1 0 4. Describe the applications of bioinformatics in health and wellness.
- 3 2 1 0 5. Explain how bacteria can be identified using their DNA sequences.
- 3 2 1 0 6. Propose a plan to treat patients in an outbreak as well as prevent future spread.
- 3 2 1 0 7. Draw and label a diagram of a bacteria cell.
- 3 2 1 0 8. Explain the importance of taking antibiotics as described.
- 3 2 1 0 9. Infer the results of not taking antibiotics as prescribed.
- 3 2 1 0 10. Create a model of the structure of the ear.
- 3 2 1 0 11. Explain what causes hearing loss.
- 3 2 1 0 12. Recommend appropriate interventions for particular types of hearing loss.
- 3 2 1 0 13. Explain how sound waves are produced, travel and are interpreted by the ear.
- 3 2 1 0 14. Summarize how vaccines work.
- 3 2 1 0 15. Explain what recombinant DNA is and why it is important to vaccine creation.

Genes

- 3 2 1 0 16. Show how the process of PCR amplifies a specific gene.
- 3 2 1 0 17. Interpret gel electrophoresis results to determine genotype.

- 3 2 1 0 18. Predict how restriction enzymes will cut DNA based on single nucleotide polymorphisms (SNPs) at restriction sequences.
- 3 2 1 0 19. Compare amniocentesis and chorionic villus sampling.
- 3 2 1 0 20. Explain how gene therapy can treat a genetic disorder.
- 3 2 1 0 21. Debate the safety and overall effectiveness of gene therapy.
- 3 2 1 0 22. Describe medical interventions available to parents who wish to choose the gender of their next child.
- 3 2 1 0 23. Outline the process of reproductive cloning.

Cancer

- 3 2 1 0 24. Describe the differences in the appearance of normal cells and cancer cells.
- 3 2 1 0 25. Describe the different uses for X-rays, CT scans, and MRIs.
- 3 2 1 0 26. Describe the potential risk factors for different types of cancer as well as the ways to reduce the risks.
- 3 2 1 0 27. Outline the various cancer screenings they should have performed throughout their lives.
- 3 2 1 0 28. Consider the implications of genetic tests that detect hereditary breast cancer.
- 3 2 1 0 29. Describe the differences between chemotherapy and radiation.
- 3 2 1 0 30. Describe how specific chemotherapy drugs interact with and destroy cancer cells.
- 3 2 1 0 31. Explain how SNP (Single-nucleotide polymorphism) profiles may factor in to the decision to prescribe a specific medication.

3 2 1 0 32. Describe how cases of human abuse have led to strict regulations of human participation in clinical trials.

3 2 1 0 33. Describe an application of nanotechnology in medicine.

Organ Failure

3 2 1 0 34. Outline the evolution of the methods used to diagnose and treat diabetes from the 1800s to today.

3 2 1 0 35. Predict results of a bacterial transformation.

3 2 1 0 36. Outline the steps required to produce a protein in the laboratory.

3 2 1 0 37. Summarize the options available to patients with ESRD (End Stage Renal Disease).

3 2 1 0 38. Explain how dialysis machines work to remove wastes from the blood and adjust fluid and electrolyte imbalances.

3 2 1 0 39. Describe the procedures involved in a live donor laparoscopic nephrectomy.

3 2 1 0 40. Compare and contrast heart and kidney transplants.

3 2 1 0 41. Summarizes what factors need to be taken into account when deciding which patient should receive an organ donation.

3 2 1 0 42. Describe how xenotransplantation or tissue engineering work, as well as their potential risks, benefits, challenges, and ethical or moral concerns.

3 2 1 0 43. Evaluate current methods of disease prevention.

14102 Human Body Systems

3 2 1 0 1. Explain the functions of different human body systems, and lists the major organs within each system

3 2 1 0 2. Describe how multiple body systems are interconnected and how those interconnections and interactions are necessary for life

3 2 1 0 3. Describe the differences in the appearance of epithelial and connective tissue

3 2 1 0 4. Explain the basic structure and function of the skeletal system

3 2 1 0 5. Describe how bone markings, bone landmarks and bone measurements can provide information about gender, race, ethnicity and height of a missing person

3 2 1 0 6. Describe how the structure of DNA is linked to function in the body

3 2 1 0 7. Explain how restriction enzymes cut DNA

3 2 1 0 8. Define Biometrics

3 2 1 0 9. Identify how gel electrophoresis results can help solve a missing persons' case

3 2 1 0 10. Outline the structure and function of the central nervous system

3 2 1 0 11. Summarize the techniques scientists use to map brain function

3 2 1 0 12. Correctly predict how electrical signals are created and transmitted in the human body

3 2 1 0 13. Summarize the roles of ions in creating electrical impulses in the human body

3 2 1 0 14. Explain how neurotransmitters help propagate electrical impulses

3 2 1 0 15. Describe the way in which hormones interact with target cells

3 2 1 0 16. Differentiate between endocrine and exocrine glands as well as protein/peptide and steroid hormones

3 2 1 0 17. Illustrate how the structure of the eye focuses light on the retina

3 2 1 0 18. Describe how the eye and the brain work together to allow a person to see

3 2 1 0 19. Explain visual perception, including visual acuity, depth perception, peripheral vision, color vision, and the interpretation of optical illusions

3 2 1 0 20. Predict how long the body can function in the absence of water, food or oxygen

3 2 1 0 21. List and describe the human body systems that create, process and distribute food, water and oxygen

3 2 1 0 22. Deduce the factors, both environmental and personal that can impact the body's ability to survive with limited fuel

3 2 1 0 23. Describe the structure and function of the organs in the digestive system

3 2 1 0 24. Explain how energy is stored in ATP and how energy is released from ATP

3 2 1 0 25. Infer how the calories consumed in daily diet versus the calories expended in daily activities affects overall health

3 2 1 0 26. Describe the structure of the respiratory system, especially the lungs, and the basic mechanics of breathing

3 2 1 0 27. Illustrates how the structure of the lungs facilitates the exchange of oxygen and carbon dioxide between air and the body

3 2 1 0 28. Analyzes the process through which the respiratory and cardiovascular systems facilitates the transport of oxygen to all cells in the body

3 2 1 0 29. Describe the structure and function of the human urinary system

3 2 1 0 30. Describe how the structure of the kidney relates to its function in the body

- 3 2 1 0 31. Illustrate the composition of normal blood and normal urine
- 3 2 1 0 32. Explain how the body uses hormones to maintain a water balance
- 3 2 1 0 33. Describe how the types of joints found in the human body differ in both structure and function
- 3 2 1 0 34. Demonstrate the meaning of terms that describe the motion at joints, such as flexion and extension
- 3 2 1 0 35. Describe how the three types of muscle tissue differ in structure and function
- 3 2 1 0 36. Describe the requirements for muscle contraction
- 3 2 1 0 37. Illustrate the connection between nerves and muscles
- 3 2 1 0 38. Explain the relationship between the heart and the lungs and trace the path of major circulatory routes
- 3 2 1 0 39. Define pulse and blood pressure and name and locate several pulse points on the body
- 3 2 1 0 40. Identify the body's major arteries and veins and name the body region supplied by each
- 3 2 1 0 41. Describe the ways in which the human body can generate ATP as well as how long the energy will last in each case
- 3 2 1 0 42. Describe the structure and function of human skin
- 3 2 1 0 43. Explain how different degrees of burns damage layers of the skin
- 3 2 1 0 44. Describe how the human body senses and processes signals of pain
- 3 2 1 0 45. Compare the structure and function of compact and spongy bone

- 3 2 1 0 46. Describe the types of bone fractures
- 3 2 1 0 47. Outline what happens to bone structure as we age
 - 3 2 1 0 48. Describe the structure and function of the lymphatic and immune system
- 3 2 1 0 49. Describe the interaction between antigens and antibodies
- 3 2 1 0 50. Explain how the systems work together to maintain homeostasis in the body and to complete basic functions such as movement and communication

03053 Anatomy & Physiology

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

Human Structure & Function

- 3 2 1 0 1. Describe the basic structures and functions of cells, tissues, organs, and systems as they relate to homeostasis
- 3 2 1 0 2. Compare relationships among cells, tissue, organs, and systems
- 3 2 1 0 3. Explain body planes, directional terms, quadrants, and cavities
- 3 2 1 0 4. Analyze the interdependence of the body systems as they relate to wellness, disease, therapies, and care rehabilitation

Disease and Disorders

- 3 2 1 0 5. Compare selected diseases/disorders including respective classification(s), causes, diagnoses, therapies, and care/rehabilitation to include biotechnological applications
- 3 2 1 0 6. Analyze methods to control the spread of pathogenic microorganisms
- 3 2 1 0 7. Analyze body system changes in light of diseases, disorders, and wellness

Written Communication Skills

- 3 2 1 0 8. Report relevant information in order of occurrence

- 3 2 1 0 9. Distinguish between subjective and objective information and summaries
- 3 2 1 0 10. Recognize, organize, write and compile technical information, data and observations

Health Care Delivery System

- 3 2 1 0 11. Identify methods to assess vital signs
- #### Career Exploration
- 3 2 1 0 13. Identify a variety of careers that use anatomy and physiology knowledge and how it relates to health careers

Ethical Practice

- 3 2 1 0 14. Explain the importance of confidentiality in health care

Personal Safety

- 3 2 1 0 15. Use personal protective equipment as appropriate to the environment

Environmental Safety

- 3 2 1 0 16. Modify the environment to create safe working conditions. Evaluate and modify the environment to create and maintain safe working conditions
- 3 2 1 0 17. Prevent accidents by using proper safety techniques for the prevention of accidents

Health Science Related

- 3 2 1 0 18. Identify content, skills and technology related to the health science field
- 3 2 1 0 19. Apply mathematical computations related to common health industry procedures
- 3 2 1 0 20. Apply mathematical principles to conversion equations commonly used in health related fields
- 3 2 1 0 21. Apply mathematical principles involving temperature, weights, and measures commonly used in health related fields
- 3 2 1 0 22. Analyze diagrams, charts, graphs, and tables to interpret results commonly found in health related fields
- 3 2 1 0 23. Recognize, organize, write and compile technical information and summaries that relate to health science

21009 Robotics

- 3 2 1 0 1. Build or assemble robotic devices or systems.
- 3 2 1 0 2. Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes.
- 3 2 1 0 3. Troubleshoot robotic systems using knowledge of microprocessors, programmable controllers, electronics, circuit analysis, mechanics, sensor or feedback systems, hydraulics and pneumatics.
- 3 2 1 0 4. Train robots using artificial intelligence software to perform simple or complex tasks such as designing and carrying out a series of tests.
- 3 2 1 0 5. Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors.
- 3 2 1 0 6. Perform corrective maintenance on robotic systems or components.
- 3 2 1 0 7. Install, program, and repair programmable controllers, robot controllers, end-of-arm tools, or conveyors.
- 3 2 1 0 8. Read blueprints, schematics, diagrams, or technical orders to determine methods and sequences of assembly.
- 3 2 1 0 9. Analyze and record test results, and prepare written testing and documentation.
- 3 2 1 0 10. Explain complex mathematical information used in robotic operations.
- 3 2 1 0 11. Verify dimensions and clearances of parts to ensure conformance to specifications, using precision measuring instruments.
- 3 2 1 0 12. Debug robotics programs.
- 3 2 1 0 13. Read and utilize blueprints in the technical process.

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- 3 2 1 0 14. Read and utilize production layouts.
- 3 2 1 0 15. Read and utilize technical drawings as necessary in robotic assembly and usage.
- 3 2 1 0 16. Troubleshoot mechanical failures or unexpected problems.
- 3 2 1 0 17. Integrate robotics with peripherals or other equipment.
- 3 2 1 0 18. Demonstrate knowledge of how automated robotic systems increase production volume and precision in a variety of high-throughput operations.
- 3 2 1 0 19. Resolve engineering or science problems using robots.
- 3 2 1 0 20. Analyze test results in relation to design or rated specifications and test objectives, and modify or adjust equipment to meet specifications.
- 3 2 1 0 21. Record test procedures and results, numerical and graphical data, and recommendations for changes in product

14253 Pharmacology

- 3 2 1 0 1. Cite historical perspectives contributing to the development of pharmacology through the present
- 3 2 1 0 2. Utilize the nursing process and the five concepts of human functioning to assess appropriate/inappropriate responses to therapy.
- 3 2 1 0 3. Identify the roles of the professional nurse in relation to medication administration and education in both acute care and community health settings.
- 3 2 1 0 4. Explain the correct measures to ensure the prevention of medication errors. Evaluate example measures taken to determine if they ensure the prevention of medication errors.
- 3 2 1 0 5. Employ critical thinking skills to determine the effectiveness of medication administration on client care outcomes.

- 3 2 1 0 6. Predict potential drug-drug interactions and drug-food interactions based on physiological responses to pharmacological agents and apply critical thinking skills for appropriate intervention.
- 3 2 1 0 7. Recognize differences in physiology and pathophysiology that must be considered in assessing correct dosages administered to "at risk" populations such as the fetus, infant, child, pregnant woman, and the frail elderly.
- 3 2 1 0 8. Use the legal and ethical principles related to research and practice of medication administration in nursing to evaluate best practice in real-world scenarios.
- 3 2 1 0 9. Relate the differences in pharmaceutical use and its effects across the lifespan, when administering medications to culturally diverse populations for commonly occurring diseases.
- 3 2 1 0 10. Define the pharmacological terminology pertinent to specific categories and classifications of medications in relation to drug effects on commonly occurring diseases.
- 3 2 1 0 11. Identify major classifications of drug therapies/functions by prototypes as used in the treatment of commonly occurring health challenges.
- 3 2 1 0 12. Interpret effective communication in reports of the action, rationale for use, common and/or life-threatening side effects, nursing implications, and client teaching issues for each major classification of medications.
- 3 2 1 0 13. Describe basic principles of pharmacology including sources of drugs, divisions of pharmacology, differences between the chemical, generic and brand name of drugs.
- 3 2 1 0 14. State the functions of various regulatory agencies and legislative

- acts that regulate drug use.
- 3 2 1 0 15. Describe the function of each of the various publications that catalog drugs.
- 3 2 1 0 16. Describe the classical and practical parts of a prescription.
- 3 2 1 0 17. Identify the common Latin abbreviations used in prescription writing.
- 3 2 1 0 18. Describe the proper handling of prescriptions and drugs including a basic "safe" policy for storage of medications.
- 3 2 1 0 19. Describe the routes of administration of drugs including advantages and disadvantages of each.
- 3 2 1 0 20. Describe the effects of drugs.
- 3 2 1 0 21. Identify the function of both mild and strong analgesics, and describe their actions.
- 3 2 1 0 22. Identify the function of local anesthetics, types, and use of vasoconstrictors.
- 3 2 1 0 23. Identify sedative/hypnotics, and describe their actions.
- 3 2 1 0 24. Identify antianxiety drugs, and describe their actions.
- 3 2 1 0 25. Identify classifications of antibiotic drugs: penicillins, erythromycins, tetracyclines, cephalosporins, and sulfonamides.
- 3 2 1 0 26. Identify hypotensive drugs, anticoagulant drugs, drugs used for cardiovascular disease, diabetic drugs, hypothyroid drugs, corticosteroids; and describe their uses.
- 3 2 1 0 27. Identify and describe the uses of antihistamine drugs, bronchial dilators, anticonvulsants, antisialagogues, and local hemostatics.

22203 Food Science

- 3 2 1 0 1. Analyze career paths within the food science industry.
- Evaluate jobs and preparation requirements for food science careers within the food science industry.
 - Assess personal qualifications, interests, values, and educational food science preparation for employment in the industry and applications for the home.
- 3 2 1 0 2. Analyze the interrelationship of food, nutrition, and science.
- Define the study of the science of food and nutrition.
 - Analyze various guidelines for good nutrition that promote the health of individuals at home, work, and community.
 - Analyze and examine reliable sources of consumer food and nutrition information.
- 3 2 1 0 3. Examine methods for use of the science laboratory to conduct and report results of food science experiments
- Apply proper safety techniques for the laboratory.
 - Practice good personal hygiene procedures.
 - Identify the location and demonstrate the correct use of emergency equipment in the laboratory.
 - Identify basic laboratory equipment, rules for usage, and performance techniques.
 - Demonstrate how to make accurate and precise laboratory measurements.
 - Demonstrate the use of the scientific method when participating in food science and consumer experiences.
- 3 2 1 0 4. Evaluate the causes and prevention of food contamination and spoilage in industry and home.
- Identify sources and symptoms of food borne illness.
 - Use the Hazard Analysis Critical Control Point during all food handling processes to minimize the risk of food borne illness.
 - Use time, temperature, date markings, cross contamination, hand washing, and

personal hygiene as criteria for safe food preparation.

- Explore the agencies that regulate food quality, protect consumer rights, and handle consumer complaints.
- 3 2 1 0 5. Analyze methods used in food product development and marketing.
- Examine the sensory factors that make up the sensory characteristics for tasting food.
 - Demonstrate controlled sensory tasting and rating techniques.
 - Evaluate food label information.
 - Calculate food cost and examine price point in food product development and marketing.
- 3 2 1 0 6. Apply knowledge of metabolism and digestion to establish life-long habits of good nutrition.
- Analyze the relationship between calories, food, and energy.
 - Examine the digestive system and the role of enzymes in digestion and food preparation
- 3 2 1 0 7. Evaluate a variety of changes, including chemical and physical, that affect food product quality.
- Relate difference in chemical and physical changes to the state of matter.
 - Identify chemical symbols and use these symbols in writing chemical formulas and equations.
 - Compare the process of heat transfer in cooking and baking processes.
 - Demonstrate how the major leavening agents are used in foods and describe the actions observed.
 - Demonstrate emulsification in food technology.
 - Demonstrate the process of fermentation and explain the usage in food technology.
 - Demonstrate the process of pasteurization and explain the usage in food technology.
- 3 2 1 0 8. Apply science process skills when analyzing the structure and composition of food and their relationship to health and wellness.
- Explain the properties and functions of water.

- b. Analyze the structure and composition of carbohydrates and fiber.
 - c. Analyze properties and composition of lipids in relation to their functions in food preparation and the body.
 - d. Describe the chemical nature and molecular structure of protein and the functions of protein in food.
 - e. Examine the types, functions, sources, and deficiencies of vitamins, minerals, and phytonutrients.
 - f. Describe and analyze the impact of acids and bases in foods.
- 3 2 1 0 9. Analyze methods used and factors involved in the scientific process of food.
- a. Examine the use of additives in food processing and preservation.
 - b. Explain the process and conduct methods of food dehydration.
 - c. Examine the process of curing.
 - d. Identify and apply the science of freezing foods.
 - e. Explain how irradiation preserves foods.
 - f. Explore the impact of storing conditions on staling, rancidity, and molding.

18305 Ag. Food Science

Determining the Meaning and Importance of Food Science:

- 3 2 1 0 1. Explain the concept of food science (LA))
- 3 2 1 0 2. Explain the importance of food science (LA)
- 3 2 1 0 3. Identify the segments of the food Industry (CD) (LK HS 66, 126)
- 3 2 1 0 4. Identify careers related to food science (CD) (LK MS29, AHS 40)
- 3 2 1 0 5. Describe the education and skills needed for a career in food science (CD, LA)
- 3 2 1 0 6. Identify the two main occupations involved in food science and the food science industry (CD)

Examining the Food Service Industry:

- 3 2 1 0 7. Describe the food service industry.
- 3 2 1 0 8. Explain how food science and the food service industry are related.
- 3 2 1 0 9. Identify trends to the food service industry.

Explaining Human Digestion:

- 3 2 1 0 10. Explain the digestive process (S, LA)
- 3 2 1 0 11. Identify the parts of the digestive system (S) (LK HS 31)
- 3 2 1 0 12. Identify secretions and enzymes that aid in the digestive process (S) 3 2 1 0
13. Identify types of digestive system disorders (S)

Describing the Major Food Nutrients:

- 3 2 1 0 14. Explain the importance of nutrition (LA) (LK MS 30, HS 42)
- 3 2 1 0 15. Identify and describe the six major nutrients needed for good nutrition (S)

Determining the Impact of Diet on Health

- 3 2 1 0 16. Explain how calories relate to nutrition MS (S, LA)
- 3 2 1 0 17. Explain claims made on food labels related to diet and health (LA)
- 3 2 1 0 18. Describe the Recommended Dietary Allowance (RDA) (LA) Determining the Chemistry of Water in Foods
- 3 2 1 0 19. Identify effects of hydrogen bonding in water (S)
- 3 2 1 0 20. Demonstrate the chemical function of water as a dispersing medium (S, E)
- 3 2 1 0 21. Indicate differences between water activity and moisture of food (S) 3 2 1 0
22. Show characteristics of water that affect its use (S) B1-2

Examining the Chemistry of Lipids (Fats)

- 3 2 1 0 23. Identify the chemical composition of lipids (S)
- 3 2 1 0 24. Recognize the differences between saturated and unsaturated fats (S)
- 3 2 1 0 25. Examine the chemical changes that fats undergo S
- 3 2 1 0 26. Identify the functions of lipids in foods (S) Examining the Chemistry of Proteins
- 3 2 1 0 27. Identify chemical parts of proteins molecule (S)
- 3 2 1 0 28. Distinguish between conjugated proteins

- and nonconjugated proteins (S)
- 3 2 1 0 29. Recognize the different types of reactions of food proteins (S) 3 2 1 0
30. Identify the different properties of food proteins (S) B1-4

Describing the Chemistry of Carbohydrates

- 3 2 1 0 31. Identify carbohydrates and their chemical composition (S)
- 3 2 1 0 32. Identify simple carbohydrates (S)
- 3 2 1 0 33. Identify functional properties of monosaccharides (S)
- 3 2 1 0 34. Identify large complex carbohydrates (S)

Discussing the Chemistry of Flavor Enhancing Substances

- 3 2 1 0 35. Identify basic tastes (S)
- 3 2 1 0 36. Investigating Water in Food Physics
- 3 2 1 0 37. Identify the importance of hydrogen bonding in water molecular structure (S)

Investigating Water in Food Physics

- 3 2 1 0 38. Identify basic tastes (S)
- 3 2 1 0 39. Identify the importance of hydrogen bonding in water molecular structure (S).
- 3 2 1 0 40. Differentiate between adsorbed water and bound water (S)
- 3 2 1 0 41. Identify the relationship between bound water and water activity (S)
- 3 2 1 0 42. Identify the function of water in heat transfer in foods (S)

Examining Lipids (Fats) in Food Physics

- 3 2 1 0 43. Examine the structure of lipids (S) 3 2 1 0
- 3 2 1 0 44. Investigate controlled crystallization or tempering of lipids (S)
- 3 2 1 0 45. Recognize the effect of visible light upon the decomposition of fats (S)
- 3 2 1 0 46. Observe differences in melting points of fats that reflect strength of bonds (S)
- 3 2 1 0 47. Demonstrate liquid fat as a food conductor of heat (S)

Explaining Proteins in Food Physics

- 3 2 1 0 48. Identify the structure of proteins (S)
- 3 2 1 0 49. Recognize physical properties of proteins (S)

- 3 2 1 0 50. Investigate the development of synergism (S)
- 3 2 1 0 51. Explain the structure of collagen and factors affecting it (S, LA)
- 3 2 1 0 52. Identify factors that affect the functional properties of protein (S)

Explaining Carbohydrates in Foods Physics

- 3 2 1 0 53. Identify functional properties of carbohydrates (S)
- 3 2 1 0 54. Recognize the structural differences and similarities in carbohydrates (S)
- 3 2 1 0 55. Recognize that the structure of the carbohydrate molecule affects the reaction and properties of compound (S)
- 3 2 1 0 56. Recognize that molecular size and weight affect the affinity of water by a sugar molecule (S)
- 3 2 1 0 57. Identify the effect of heat upon the starch molecule without water and with water (S)

Classifying Chemical Food Additives

- 3 2 1 0 58. Define chemical food additive (S)
- 3 2 1 0 59. Explain the functions of food additives (S)
- 3 2 1 0 60. Identify the classifications for food additives (S)

Explaining Chemical Preservatives:

- 3 2 1 0 61. Describe the mechanisms of chemical food preservatives (S) (LK HS 61, HS 111, AHS 46)
- 3 2 1 0 62. Identify common types of chemical food preservatives (S)

Discussing Laws Related To Food Additives and Food Safety

- 3 2 1 0 63. Identify the agencies that oversee food additive and food safety regulations (SS)
- 3 2 1 0 64. Identify the primary laws/regulations related to food additives and food safety (SS)
- 3 2 1 0 65. Describe the process for approving a food additive (SS)
- 3 2 1 0 66. Describe recent controversies over food additives (LA, SS)

Explaining Microbes and Food Spoilage Caused by Microbial Growth:

- 3 2 1 0 67. Describe food microbiology (S, LA) (LK HS 42)
 - 3 2 1 0 68. Describe different types of microbes (S, LA) (LK HS 51)
 - 3 2 1 0 69. Describe how microbes cause food spoilage (S, LA) (LK HS 127)
- Describing the Prevention of Food Spoilage
- 3 2 1 0 70. Describe causes of food spoilage (S, LA)
 - 3 2 1 0 71. Describe methods of preventing food spoilage (S, LA)

Identifying Food-Borne Illnesses and Their Prevention

- 3 2 1 0 72. Describe the symptoms of food-borne illnesses (LA, S)
- 3 2 1 0 73. Describe the causes of food-borne illnesses (S, LA)
- 3 2 1 0 74. Describe prevention of food-borne illnesses (LA, S) Using Heat in Food Preservation
- 3 2 1 0 75. Describe methods of using heat to preserve food (S)
- 3 2 1 0 76. Describe the role of time and temperature in heat preservation (S)
- 3 2 1 0 77. Describe the process of canning (LA) Using Cold in Food Preservation
- 3 2 1 0 78. Describe methods of using cold to preserve food (S, LA)
- 3 2 1 0 79. Describe the important variables in refrigerated cold preservation (S, LA)

Using Drying, Chemical Additives and Irradiation in Food Preservation

- 3 2 1 0 80. Describe the use of dehydration as a food preservation method (S, LA)
- 3 2 1 0 81. Describe the use of irradiation as a food preservation method (S, LA)
- 3 2 1 0 82. Describe the use of chemical additives as a food preservation method (S, LA)

Using Fermentation

- 3 2 1 0 83. Describe the fermentation process (S, LA)
- 3 2 1 0 84. Describe the benefits of fermenting food (S, LA)
- 3 2 1 0 85. Identifying common foods that are preserved by fermentation. (S)

Explaining the Importance of Sanitation:

- 3 2 1 0 86. Describe the importance of sanitation. (LK HS 12)
- 3 2 1 0 87. Identify sources of contamination. (LK HS 14)
- 3 2 1 0 88. Differentiate between cleaning and sanitizing. Practicing Personal Hygiene in Food Processing
- 3 2 1 0 89. Describe the importance of personal hygiene in food processing. (CD, LA)
- 3 2 1 0 90. Describe methods of demonstrating good personal hygiene habits. (CD, LA)

Describing the Cleanliness of Processing Equipment

- 3 2 1 0 91. Describe the importance of the cleanliness of food processing equipment. (CD, LA)
- 3 2 1 0 92. Identify factors that affect the cleanliness of food processing equipment. (CD)

Maintaining a Clean Processing Plant:

- 3 2 1 0 93. Identify factors that affect cleanliness in a food processing plant (CD)
- 3 2 1 0 94. Describe the importance of cleanliness in a food processing plant (CD, LA)

Using Approved Practices in Handling and Processing Dairy Products

- 3 2 1 0 95. Explain milk handling from the cow to the processing plant (LA)
- 3 2 1 0 96. Describe the processing of fluid milk (LA)
- 3 2 1 0 97. Describe the processing of milk products and by-products (E, LA)

Identifying Dairy Products

- 3 2 1 0 98. Identify fluid milk products
- 3 2 1 0 99. Identify processed milk products
- 3 2 1 0 100. Distinguish milk products from non-dairy products (CD)

Describing Proper Handling of Red Meat

- 3 2 1 0 101. Describe proper handling of red meat prior to cooking (CD, LA)
- 3 2 1 0 102. Explain recommended red meat cooking procedures (LA)
- 3 2 1 0 103. Identify recommended storage of cooked meats

Identifying Cuts of Meat

- 3 2 1 0 104. Explain the difference between primal and retail cuts (CD, LA)
3 2 1 0 105. Explain the process of determining whether meat is beef, veal, pork or lamb (CD, LA)
3 2 1 0 106. Identify beef and veal cuts (CD)
3 2 1 0 107. Identify pork cuts (CD)
3 2 1 0 108. Identify lamb cuts (CD)

Quality and Yield Meat Grading

- 3 2 1 0 109. Explain how the quality grade influences the taste of meat (CD, M)
3 2 1 0 110. Explain the factors that influence yield grade of meat (CD, M)
3 2 1 0 111. Calculate Yield Grade (E, M)

Discussing the Processing of Meat:

- 3 2 1 0 112. Explain slaughtering/harvesting (CD, LA) (LK HS 96)
3 2 1 0 113. Describe cutting, grinding, and blending meat (E, CD)
3 2 1 0 114. Explain tenderizing processes (aging, cubing, chemical/electrical treatment, and marinating) (LA)
3 2 1 0 115. Describe preservation methods (dehydrating, curing, smoking, canning, freezing, freeze drying and irradiating) (LA)

Handling and Processing Poultry and Eggs:

- 3 2 1 0 116. Describe the steps in processing poultry (LA)
3 2 1 0 117. Describe the grading process for poultry and eggs (LA)
3 2 1 0 118. Identify the parts of egg
3 2 1 0 119. Describe the steps in egg processing (LA)

Handling and Processing Fish and Shellfish:

- 3 2 1 0 120. Identify types of fish and shellfish used for food
3 2 1 0 121. Define aquaculture (S)
3 2 1 0 122. Identify spoilage issues related to seafood
3 2 1 0 123. Identify methods of preserving fish
3 2 1 0 124. Describe the commercial processing of fish CD
3 2 1 0 125. List the general structure and composition of a grain seed S

- 3 2 1 0 126. Describe the grain milling process CD
3 2 1 0 127. List the types of flour and explain their uses
3 2 1 0 128. Describe the processing of breakfast cereals (LA)
3 2 1 0 129. Explain the concept of “value-added” agriculture in terms of cereal grains

Identifying Cereal Products

- 3 2 1 0 130. Identify the role of further processors
3 2 1 0 131. Identify common food products made from cereal grains
3 2 1 0 132. Identify industrial products made from cereal grains
3 2 1 0 133. Explain the importance of industrial products in increasing the demand for cereal grains (LA)
3 2 1 0 134. Identify the environmental benefits of using renewable resources for industrial products.(SS, LA)

Handling and Processing Fruits and Vegetables:

- 3 2 1 0 135. Identify general properties and characteristics of produce (fruits and vegetables)
3 2 1 0 136. Identify harvesting methods for produce
3 2 1 0 137. Describe proper handling and storing of produce (LA)
3 2 1 0 138. Identify enzyme activity detrimental to fruit and vegetable storage (S)
3 2 1 0 139. Identify alternative methods for preserving produce Producing Beverages
3 2 1 0 140. Identify the types of beverages produced in the food industry
3 2 1 0 141. Identify sweeteners used in beverages
3 2 1 0 142. Describe characteristics of soft drinks (LA)
3 2 1 0 143. Describe characteristics of non-carbonated and “healthy beverages”(LA)
3 2 1 0 144. Describe the process for making beer and wine (LA)

Producing Candies and Sweets

- 3 2 1 0 145. Explain how sugar is produced
3 2 1 0 146. Define and classify confectioneries

- 3 2 1 0 147. Explain the process of sugar reduction and why it is important S
3 2 1 0 148. Explain how chocolate is produced
3 2 1 0 149. Describe the confectionary manufacturing process CD Processing of Fats and Oils
3 2 1 0 150. Identify the sources of fats and oils used in food processing
3 2 1 0 151. List the different properties of fats and oils(S)
3 2 1 0 152. Describe the production and processing methods of fats and oils (LA)
3 2 1 0 153. List the essential fatty acids and explain why they are important (S)
3 2 1 0 154. Identify key health issues related to fats and oils

Using Safe Methods in Storing Foods in the Home:

- 3 2 1 0 155. Describe methods of safely storing foods in the home (LK HS 41)
3 2 1 0 156. Identify potential food storage problems in homes (LK AHS 32)

Following Safe Methods in Handling and Preparing Foods in the Home

- 3 2 1 0 157. Describe methods of safely handling and preparing foods in the home (LA)
3 2 1 0 158. Describe the importance of cooking meats to the proper temperatures (LA)
3 2 1 0 159. Observe a meal being prepared in the home and identify potential safety issues (E, LA)

Food Packaging and Labeling

- 3 2 1 0 160. Explain the importance of food packaging (LA)
3 2 1 0 161. Identify the characteristics of a food packaging material
3 2 1 0 162. Identify the different materials and forms of food packages
3 2 1 0 163. Explain the three different types of food packaging containers
3 2 1 0 164. Explain the importance of food labels
3 2 1 0 165. Identify foods affected by food labeling

- 3 2 1 0 166. Identify the parts of a food label
- 3 2 1 0 167. Explain the format of a nutrition panel
- 3 2 1 0 168. Define terms that may be found on a food label (LA)

Determining Risks Associated with Food

- 3 2 1 0 169. Explain the difference between true and perceived risks (L, LA)
- 3 2 1 0 170. Identify risks that can be caused by food
- 3 2 1 0 171. Identify ways that risk can be eliminated Explain Potential Carcinogenic Hazards Associated with Food

- 3 2 1 0 172. Define carcinogens (S, LA)
- 3 2 1 0 173. Identify carcinogenic hazards associated with foods (S)

Explaining Potential Pesticide Hazards Associated with Food

- 3 2 1 0 174. Identify the benefits of using pesticides
- 3 2 1 0 175. Explain how pesticide levels can be reduced (LA)

Identifying Government Agencies That Regulate Food:

- 3 2 1 0 176. Discuss the Food and Drug Administration (SS, LA, CD)
- 3 2 1 0 177. Discuss the Food Safety and Inspection Service (SS, LA, CD)
- 3 2 1 0 178. Discuss the Environmental Protection Agency (SS, LA, CD)
- 3 2 1 0 179. Discuss the United States Department of Agriculture (SS, LA, CD)

Complying With GMP and HACCP

- 3 2 1 0 180. Define and explain the importance of GMP (LA)
- 3 2 1 0 181. Define and explain the HACCP system in food safety (LA)

Explaining the Development Process of New Food Products:

- 3 2 1 0 182. Understand the importance of supermarket inventory management (CD)
- 3 2 1 0 183. Outline the product life cycle (CD)

- 3 2 1 0 184. Describe the research and development process (CD)
- 3 2 1 0 185. Explain the importance of packaging for new food products

Describing the Marketing of Foods

- 3 2 1 0 186. Define the utilities provided by the food marketing system (LA)
- 3 2 1 0 187. Describe the functions provided by the food marketing system (LA)
- 3 2 1 0 188. List and define the 4 Ps of marketing (CD)
- 3 2 1 0 189. Describe the type of markets for food products (SS, LA)
- 3 2 1 0 190. Explain the role of public food programs (SS, LA)

Assessing The Role of Governments in Food Economics

- 3 2 1 0 191. Explain concentration ration
- 3 2 1 0 192. Identify the government's role in ensuring competition in the food markets (SS, LA)
- 3 2 1 0 193. Define workable competition
- 3 2 1 0 194. Define the government's role in promoting food safety (LA, CD)
- 3 2 1 0 195. Explain the government's role in ensuring food security (SS, LA)

Associating Food Economics with Economic Development: LK MS59, HS102

- 3 2 1 0 196. List and define the most common challenges facing developing countries (LA, SS)
- 3 2 1 0 197. Explain why nations specialize and trade (SS, LA)
- 3 2 1 0 198. Explain the role of Public Law 480 in promoting economic development. (SS, LA)
- 3 2 1 0 199. Understand the role of trade agreements (SS, LA)

Using Genetic Engineering with Food

- 3 2 1 0 200. Explain the terms "genetic engineering," "GMO," and "transgenic." (S, LA)
- 3 2 1 0 201. Learn how GMOs are created in the laboratory (S)

- 3 2 1 0 202. Describe the uses of GMOs (S, LA)
- 3 2 1 0 203. Explain the regulation of GMOs Debating the Pros and Cons of Genetically Modified Foods

- 3 2 1 0 204. Acquire a basic understanding of how GMOs are formed (S)
- 3 2 1 0 205. Describe the positive aspects of GMOs in food (S, LA)
- 3 2 1 0 206. Describe the negative aspects of GMOs in foods (S, LA)
- 3 2 1 0 207. Debate issues for future leadership roles (LA, L)

Analyzing the Supply of Food For An Increasing World Population

- 3 2 1 0 208. Describe the roles of governments in the food supply LA, SS)
- 3 2 1 0 209. Describe the relationship between technology and food (LA)
- 3 2 1 0 210. Describe how food production affects economic development (SS, LA)

Exploring Future Food Products

- 3 2 1 0 211. Describe the role of biotechnology in food science (S, LA)
- 3 2 1 0 212. Describe future food products from improved crops (S, LA)
- 3 2 1 0 213. Describe the future of food producing animals (S, LA)

Addressing Environmental Concerns Related to Food Production and Processing

- 3 2 1 0 214. Describe the methods of disposing of food processing solid wastes (LA)
- 3 2 1 0 215. Discuss wastewater issues related to food processing (LA)
- 3 2 1 0 216. Describe the wastewater treatment process (LA, S)

03056 AP Biology

- 3 2 1 0 1. Describe how the unique chemical and physical properties of water make life on Earth possible.
- 3 2 1 0 2. Explain how some life processes directly rely on these unique chemical and physical properties.

- 3 2 1 0 3.Explain the role of carbon in the molecular diversity of life.
- 3 2 1 0 4.Illustrate how cells synthesize and break down macromolecules.
- 3 2 1 0 5.Relate how the laws of thermodynamics relate to the biochemical processes that provide energy to living systems.
- 3 2 1 0 6. Describe how enzymes regulate the rate of chemical reactions
- 3 2 1 0 7. Compare and contrasts prokaryotic and eukaryotic cells.
- 3 2 1 0 8. Diagram the various cell components.
- 3 2 1 0 9. Discuss the function and structure of cell membranes.
- 3 2 1 0 10. Outline the process of cellular respiration.
- 3 2 1 0 11. Describe the process of photosynthesis.
- 3 2 1 0 12. Identify the relationship between photosynthesis and cellular respiration.

Heredity and Evolution

- 3 2 1 0 13. Compare and contrast meiosis and gametogenesis.
- 3 2 1 0 14. Explain what features of meiosis are important in sexual reproduction.
- 3 2 1 0 15. Summarize how genetic information is organized in chromosomes.
- 3 2 1 0 16. Identify how Mendel’s work lay the foundation of modern genetics.
- 3 2 1 0 17. Compare and contrast RNA and DNA in terms of their structure and function.
- 3 2 1 0 18. Identify similarities and differences between prokaryotic and eukaryotic genes.
- 3 2 1 0 19. Explain how genetic information can be altered.
- 3 2 1 0 20. Explain the structure of viruses.
- 3 2 1 0 21.Outline the major steps in viral reproduction.

- 3 2 1 0 22.List some current recombinant technologies.
- 3 2 1 0 23.Discuss some legal and ethical problems that may arise from applications of nucleic acid technology.
- 3 2 1 0 24.Explain the current biological models for the origins of biological macromolecules.
- 3 2 1 0 25.Summarize the current evidentiary support for an evolutionary view of life.
- 3 2 1 0 26.Explain the role of natural selection in the process of evolution.
- 3 2 1 0 27.Relate how heredity and natural selection are involved in the process of evolution.

Organisms and Population

- 3 2 1 0 28.List the representative organisms from the Bacteria, Archaea, and Eukarya.
- 3 2 1 0 29.Explain the phylogenetic classification system (i.e., domains, kingdoms, and the major phyla and divisions of animals and plants.)
- 3 2 1 0 30.Discuss evidence that organisms are related to each other.
- 3 2 1 0 31.Relate how scientists study evolutionary relationships among organisms.
- 3 2 1 0 32.Describe the patterns of reproduction and development that are found in plants and animals and how they are regulated.
- 3 2 1 0 33.Evaluate how the organization of cells, tissues, and organs determine structure and function in plant and animal systems.
- 3 2 1 0 34. Tell how the organ systems of animals interact.
- 3 2 1 0 35. Infer how plants and animals might react to various environmental clues, and how hormones might mediate these responses.
- 3 2 1 0 36.Evaluate various models in describing the growth of a population.
- 3 2 1 0 37.Relate how population size is regulated by abiotic and biotic factors.

- 3 2 1 0 38.Summarize how energy flow through an ecosystem if related to trophic structure.
- 3 2 1 0 39.Explain how elements (carbon nitrogen, phosphorous, sulfur, and oxygen) cycle through the ecosystem.
- 3 2 1 0 40.Describe how biotic and abiotic factors affect community structure and ecosystem functions.

APPLICATION LEVEL COURSES

14255 Biomedical Innovation

- 3 2 1 0 1. List the health challenges of the 21st Century.
- 3 2 1 0 2. Describe the design of an effective oral presentation.
- 3 2 1 0 3. Demonstrate how to locate a research journal articles using the Internet.
- 3 2 1 0 4. Explain emergency room procedures used to triage and rank patients.
- 3 2 1 0 5. Analyze medical website content and assess overall credibility of the information.
- 3 2 1 0 6. Propose solutions to the health-related problems of the 21st century.
- 3 2 1 0 7. Demonstrate an understanding of the different research study designs by designing a study.
- 3 2 1 0 8. Critique science data presented in popular media and compare with science data presented in scientific journals.

- 3 2 1 0 9. Apply knowledge of statistical analysis methods to analyze the results of experimental studies.
- 3 2 1 0 10. Design and conduct an experimental study.
- 3 2 1 0 11. Reflect on various biomedical career fields involved in the topics covered in this class.
- 3 2 1 0 12. Use the design process to create a model, prototype, or schematic for a chosen solution.
- 3 2 1 0 13. Reflect on a medically-related problem that someone they know has experienced in order to identify a biomedical problem for which they would like to design a new or better product.
- 3 2 1 0 14. List multiple sources of water contamination.
- 3 2 1 0 15. Explain why water quality is a global issue.
- 3 2 1 0 16. Interpret the results of various chemical assays and identify specific contaminants.
- 3 2 1 0 17. Interpret maps indicating land use to determine possible sources of water contamination.
- 3 2 1 0 18. Analyze and evaluate a local water source.
- 3 2 1 0 19. Develop an action plan to prevent or treat water contamination.
- 3 2 1 0 20. Describe how to set up case control and cohort studies.
- 3 2 1 0 21. Interpret evidence such as laboratory data, imaging results, disease map, and molecular data to determine the source of a mystery illness.
- 3 2 1 0 33. Interpret patterns displayed on a world map of disease.

- 3 2 1 0 23. Apply what has been learned about epidemiology, human body systems, and laboratory testing to deduce the source of a mystery infection.
- 3 2 1 0 24. Investigate the medical conditions of a foreign country and discuss how culture, geographical location, and access to care affect health.
- 3 2 1 0 25. Describe the action of restriction enzymes.
- 3 2 1 0 26. Explain how to assemble recombinant DNA and clone a gene of interest using bacterial cells.
- 3 2 1 0 27. Predict the results of a ligation experiment.
- 3 2 1 0 28. Interpret plasmid maps to determine results of a specific digestion with restriction enzymes.
- 3 2 1 0 29. Solve recombinant DNA logic problems.
- 3 2 1 0 30. Describe observations of the internal and external anatomy of a specimen such as a fetal pig.
- 3 2 1 0 31. Evaluate a specimen such as fetal pig for any abnormalities that may have led to its death.

21020/21014 BioEngineering or Biotechnical Engineering

Biotechnical Engineering Procedures

- 3 2 1 0 1. Summarize the components of effective communication.
- 3 2 1 0 2. List the forms of documentation needed for effective communication.

- 3 2 1 0 3. Outline the steps necessary to keep one's self safe in a laboratory setting.
 - 3 2 1 0 4. Relates what could happen to experiment results if measurement is performed or recorded incorrectly.
 - 3 2 1 0 5. Distinguishes the difference between accuracy and precision
 - 3 2 1 0 6. Explains how both accuracy and precision play a vital role in the design process
- Biotechnical Engineering History and Industry**
- 3 2 1 0 7. Outline the evolution of biotechnical engineering.
 - 3 2 1 0 8. Illustrate the major biotechnical engineering milestones using a wide variety of internet resources.
 - 3 2 1 0 9. Assess the impact of each milestone based on their research.
 - 3 2 1 0 10. Identify the fundamental concepts common to all major industries in biotechnical engineering.
 - 3 2 1 0 11. Identify and explain how biotechnical engineered products impact society.
 - 3 2 1 0 12. Predict future developments in biotechnical engineering.
 - 3 2 1 0 13. Investigate the relationship between financial markets and scientific research

Values and Ethics

- 3 2 1 0 14. Distinguish between values and morals.
- 3 2 1 0 15. Identify some of the parameters that shape an individual's ethics.
- 3 2 1 0 16. Discuss bioethics.
- 3 2 1 0 17. Explain why it is important to consider the bioethical issues of technological advancements.

- 3 2 1 0 18. Outline the steps that might be used in determining the societal and environmental ramifications of biotechnology research.
- 3 2 1 0 19. Explain why it is important to keep an open mind to different perspectives in biotechnical research

Bioinformatics

- 3 2 1 0 20. Summarize the molecular techniques that are used by bioinformaticists.
- 3 2 1 0 21. Create a portfolio demonstrating the research and integration of forensics with engineering.
- 3 2 1 0 22. Illustrate the process necessary for creating a fuming chamber for lifting prints from evidence.
- 3 2 1 0 23. Analyze the technology utilized in the field of forensics.
- 3 2 1 0 24. Apply knowledge of genetic engineering to the design of a novel and beneficial application of the reporter gene, green fluorescent protein.
- 3 2 1 0 25. Describe how to isolate proteins.

Fermentation

- 3 2 1 0 26. Describe the applications of fermentation in food production and renewable energy.
- 3 2 1 0 27. Design a method or instrumentation to be used for measuring rates of fermentation.
- 3 2 1 0 28. Explain what variables affect CO₂ production in yeast in order to determine the ideal conditions for fermentation.

Biomedical Engineering

- 3 2 1 0 29. Demonstrate the application of engineering principles by improving upon existing hospital designs or surgical equipment designs.

- 3 2 1 0 30. Explain the concepts of product liability, product reliability, product reusability and product failure.

Orthopedics

- 3 2 1 0 31. Identify anatomical joint features and movements.
- 3 2 1 0 32. Design a joint model with the same degrees of freedom as the human counterpart.
- 3 2 1 0 33. Synthesize skeletal system concepts with the design process for engineering joints.

Cardiovascular Devices and Imaging

- 3 2 1 0 34. Summarize the most common forms of heart disease and disorders..
- 3 2 1 0 35. Explain procedures involving artificial heart surgery.
- 3 2 1 0 36. Estimate the cost of a proposed noninvasive implant.
- 3 2 1 0 37. Design a portable ECG monitor and study the electrical aspects associated with the heart.

21053 Emerging Technologies

Coursework should represent objectives reflective of the locally adopted process. Those listed below are example/foundational only.

- 3 2 1 0 1. Demonstrate the research skills necessary to identify and evaluate emerging technologies.
- 3 2 1 0 2. Seek and identify sources of information on new technology.
- 3 2 1 0 3. Identify solutions and problems that go beyond the expected and obvious.
- 3 2 1 0 4. Identify sciences and technology areas most impacted and with most potential to utilize the new technologies.

- 3 2 1 0 5. Be able to explain why it is important for STEM professionals to keep abreast of evolving technologies.

- 3 2 1 0 6. Be able to discuss the advantages, disadvantages, and prospects of current emerging technologies.

- 3 2 1 0 7. Discuss in depth a chosen emerging technology, based on independent research.

- 3 2 1 0 8. Explain the change process.

- 3 2 1 0 9. Develop a plan for anticipating change.

- 3 2 1 0 10. Address each of the following areas to varying degrees based on available information:

- a. anticipated employment,
- b. drivers and constraints,
- c. size and location of market,
- d. connection(s) to existing technologies,
- e. ability and ease of replication,
- f. physical and capital costs,
- g. industry and education partnerships to be leveraged,
- h. national best practices,
- i. illustrate qualifications, and recommendations, aims and approaches for the Technological innovation
- j. Innovation system modeling
- k. Technology monitoring, forecasting and assessment
- l. Trend analysis methods & scenarios
- m. Impact assessment
- n. Risk analysis
- o. Action (policy) analysis
- p. Technology road mapping

- q. Communication and implementation of innovation forecasts

21048 Workplace Experience

- 3 2 1 0 1. Employ effective listening skills when working with client.
- 3 2 1 0 2. Employ customer service principles when working with consumers.
- 3 2 1 0 3. Evaluate and follow-up on customer service provided.
- 3 2 1 0 4. Employ safety skills and equipment usage in appropriate ways.
- 3 2 1 0 5. Be aware of MSDS (Material Safety Data Sheets) and other safety resources and employ those resources as required for the workplace.

Additional competencies should reflect the particular work environment and the essential skills addressed reflective of previous coursework

21205 Project Management and Resource Scheduling

- 3 2 1 0 1. Recognize different resource types (Work, Material, Cost, Budget, Personnel/Skills, Generic, etc)
- 3 2 1 0 2. Understand the concept of scope and demonstrate in context of assessing the size of a project.
- 3 2 1 0 3. Develop plans for project management and resource scheduling.
- 3 2 1 0 4. Identify key personnel and responsibilities for project.
- 3 2 1 0 5. Develop SWOT analysis [Strengths, Weaknesses, Opportunities, and Threats] for project.

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- 3 2 1 0 6. Analyze workload of tasks and projects.
- 3 2 1 0 7. Determine required personnel groups and management hierarchy.
- 3 2 1 0 8. Determine resources necessary for project completion.
- 3 2 1 0 9. Determine essential tasks necessary for project completion.
- 3 2 1 0 10. Design potential timelines for assignments.
- 3 2 1 0 11. Explore appropriate technologies for project management and resource scheduling.
- 3 2 1 0 12. Create and present a project management and resource scheduling plan.
- 3 2 1 0 13. Create Gantt charts.
- 3 2 1 0 14. Evaluate and assign resources to tasks.
- 3 2 1 0 15. Implement project management skills to design and complete a collaborative project.
- 3 2 1 0 16. Learn various survey strategies to track project progress.
- 3 2 1 0 17. Develop strategies for monitoring interconnected assignments.
- 3 2 1 0 18. Survey strategies for critical path scheduling.
- 3 2 1 0 19. Create strategies to manage project budgets.
- 3 2 1 0 20. Build survey analysis for customer satisfaction

14999 Health Care Sciences - Other

Coursework should represent explicit objectives measured against specific target employment skills that are not available in other courses and should be enumerated in addition to those listed below. This course is opportunity to extend student learning.

- 3 2 1 0 1. Understand or extend knowledge of biomedical systems_{2,3}

- 3 2 1 0 2. Explore and research new and previously unknown information or information not available in courses offered.
- 3 2 1 0 3. Build a collective portfolio, model, or design utilizing the research completed.
- 3 2 1 0 4. Employ effective listening skills when working with client.
- 3 2 1 0 5. Employ customer service principles when working with consumers.
- 3 2 1 0 6. Evaluate and follow-up on customer service provided.

Additional competencies should reflect the particular work environment and the essential skills addressed reflective of previous coursework.