ARIZONA CTE CAREER PREPARATION STANDARDS & MEASUREMENT CRITERIA

These core technical knowledge and skill standards were used to adapt, adopt, and develop test items for pilot testing in Fall 2009.

08/2012

**BIOSCIENCE**, 41.0100.00

 STANDARD 1.0 ─ MAINTAIN A SAFE WORK ENVIRONMENT

1.1 Employ knowledge of personal protective equipment (PPE)

1.2 Practice emergency protocols

1.3 Apply knowledge of material safety data sheets (MSDS)

1.4 Practice sanitation procedures

1.5 Perform routine maintenance of equipment

1.6 Maintain documentation of equipment log

1.7 Identify specific biological/biohazardous/chemical materials

1.8 Understand and respond to safety signs and symbols

1.9 Distinguish the characteristics of biosafety levels

1.10 Perform cleanup of biological/biohazardous/chemical spills

1.11 Monitor, use, store, and dispose of materials in compliance with regulations

STANDARD 2.0 ─ DEMONSTRATE UNDERSTANDING AND RELEVANCE OF STANDARD LABORATORY OPERATING PROCEDURES

2.1 Identify compliances of federal, state, local, and industry regulatory agencies

2.2 Use industry terminology (i.e., cGMP, GLP, SOP, CIP, SIP)

2.3 Perform tasks according to protocols of standard operating procedures

2.4 Operate lab equipment according to SOP

2.5 Calibrate lab equipment according to SOP

2.6 Set up and maintain a legal scientific lab notebook

STANDARD 3.0 ─ DEMONSTRATE CRITICAL THINKING AND SCIENTIFIC PROBLEM-SOLVING SKILLS IN SCIENTIFIC INQUIRY

3.1 Demonstrate appropriate observational skills

3.2 Identify tractable questions

3.3 Develop testable hypotheses and alternative hypotheses

3.4 Frame testable questions showing evidence of observation and connections to prior knowledge

3.5 Test hypotheses utilizing appropriate experimental design (distinguish between controls and variables)

3.6 Collect, record, and analyze appropriate data

3.7 Support conclusions based on evidence

3.8 Communicate results of scientific investigations in oral, written, and graphic form

STANDARD 4.0 ─ DEMONSTRATE RESEARCH AND INVESTIGATIVE SKILLS

4.1 Access and retrieve relevant scientific literature related to research topic

4.2 Develop a vocabulary of relevant scientific terminology

4.3 Utilize electronic databases to identify areas of peer-reviewed scientific research

4.4 Review the content of peer-reviewed articles

4.5 Produce a literature review

4.6 Evaluate prior research to drive further inquiry and experimental/research design

STANDARD 5.0 ─ DEMONSTRATE ETHICAL AND LEGAL CONDUCT IN JOB-RELATED ACTIVITIES

5.1 Maintain legal and ethical guidelines to safeguard confidentiality

5.2 Maintain job responsibilities within the laws and regulations of federal, state, and industry protocols and procedures

5.3 Compare and contrast behaviors and practices that could result in malpractice, liability, or negligence

5.4 Examine the pros and cons of bioethical issues

5.5 Use risk management protocols such as incident reporting

5.6 Maintain code of ethics and organization’s ethical protocols

5.7 Comply with legal, regulatory, and accreditation standards or codes

5.8 Adhere to standards for harassment, labor, and employment laws

STANDARD 6.0 ─ ADHERE TO QUALITY ASSURANCE PROCEDURES

6.1 Investigate customer complains

6.2 Take corrective action according to SOP or as directed

6.3 Document actions and outcomes

6.4 Perform trend analyses

STANDARD 7.0 ─ ADHERE TO QUALITY CONTROL PROCEDURES

7.1 Perform quality test

7.2 Document results of quality testing

7.3 Verity test standards

7.4 Maintain QC records

7.5 Archive samples and documents

7.6 Release final product

7.7 Perform trend analyses

STANDARD 8.0 ─ UNDERSTAND THE ROLE OF LIVING ORGANISMS IN BIOSCIENCE RESEARCH

8.1 Identify model organisms for research

8.2 Research the types of testing used in bioscience research

8.3 Understand the role of the proper care of living organisms

8.4 Maintain organisms for optimal growth

STANDARD 9.0 ─ DEMONSTRATE BASIC LAB SKILLS IN THE USE OF EQUIPMENT AND

INSTRUMENTATION

9.1 Use software/hardware for scientific analyses and documentation

9.2 Use scientific calculator to perform calculations

9.3 Identify, select, and use laboratory glassware

9.4 Identify, select, and use laboratory balances

9.5 Identify, select, set and use micropipettes

9.6 Identify select, calibrate, and use spectrophotometers

9.7 Identify, balance, and operate centrifuges

9.8 Describe and operate autoclave

9.9 Describe and operate fume/laminar flow hoods

9.10 Prepare microscopic specimens and interpret results

9.11 Use hot plate/stirrers

9.12 Identify, select, and operate incubators

9.13 Identify, select, and operate water baths

9.14 Use a pH meter

9.15 Perform electrophoresis

9.16 Operate a PCR thermal cycler

9.17 Perform basic separation techniques

9.18 Operate chromatography equipment

9.19 Maintain control inventory for materials and supplies

STANDARD 10.0 ─ DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF CELL BIOLOGY TECHNIQUES

10.1 Isolate and characterize cell lines

10.2 Propagate plant and animal tissue

10.3 Use cryogenic techniques

10.4 Use microscopes

10.5 Perform cytological tests, i.e. sectioning and staining

10.6 Perform bioassays

STANDARD 11.0 ─ DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF MICROBIOLOGY SKILLS

11.1 Maintain workshop and equipment hygiene

11.2 Prepare, sterilize, and dispense media, buffers, solutions, etc.

11.3 Identify and quantify microorganisms and cells

11.4 Isolate, maintain and store pure cultures

11.5 Maintain and analyze fermentation materials

11.6 Harvest cells

11.7 Transform hosts

11.8 Perform bioassays

11.9 Decontaminate and dispose of equipment, glassware, and biologicals

STANDARD 12.0 ─ DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF PROTEIN TECHNIQUES

12.1 Detect specific proteins

12.2 Precipitate/solubilize proteins

12.3 Separate proteins, isolate or characterize proteins

12.4 Concentrate proteins

12.5 Perform protein assays

12.6 Describe the immunological technique

12.7 Identify genetic engineering and molecule biology techniques

STANDARD 13.0 ─ DEMONSTRATE KNOWLEDGE OF MATERIAL PREPARATION AND STORAGE

13.1 Identify type of media

13.2 Identify uses of media

13.3 Prepare media

13.4 Store media

13.5 Identify solutions

13.6 Identify uses of solutions

13.7 Prepare solutions

13.8 Store solutions

STANDARD 14.0 ─ DEMONSTRATE USE OF BIOINFORMATIC RESOURCES

14.1 Identify databases for sequence analysis (NCBI)

14.2 Utilize electronic databases/websites (NCBI)

14.3 Identify unknown sequences

14.4 Recognize relationships between sequences

STANDARD 15.0 ─ DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF NUCLEIC ACID TECHNIQUES

15.1 Detect specific nucleic acid sequences

15.2 Isolate nucleic acids

15.3 Perform restriction digests

15.4 Perform gel electrophoresis

15.5 Label nucleic acids

15.6 Perform nucleic acid sequencing procedures

15.7 Perform PCR procedures

15.8 Use sequence database

15.9 Perform basic genetic cloning techniques

STANDARD 16.0 ─ DEMONSTRATE UNDERSTANDING AND KNOWLEDGE OF SCIENTIFIC MEASUREMENTS

16.1 Perform calculations and solve problems using arithmetic and algebra math skills

16.2 Perform basic mathematical calculations using scientific and engineering notations

16.3 Convert from the metric system to the English system

16.4 Perform measurements using temperature scales

16.5 Explain the acid base

16.6 Construct, interpret graphs, and apply graphs

16.7 Perform statistical analysis

STANDARD 17.0 ─ ENGAGE IN OCCUPATIONAL-SPECIFIC WORK-BASED LEARNING EXPERIENCE IN CHOSEN CAREER FIELD (E.G., BIOMEDICAL, BIOENVIRONMENTAL, BIO-INNOVATIONS)

17.1 Develop a personalized professional portfolio that substantiates growth in chosen career field

17.2 Design and conduct original research in chosen career field

17.3 Participate in job shadowing, internship, mentor-mentee, entrepreneurial enterprise, or employment experience in chosen career field