Biotechnology – 1 Term, Distance Learning or in the Lab Option Course Plan

Suggested Lesson Planning Guide

50 min class periods, 5X/week of lectures/discussions/demonstrations/labs/projects meetings X 16-18 weeks

Week	Lesson Focus	Topic, Activity, Format, Focus	Key Objectives/Activities/Notes
1	Introduction	What the course look like (this semester (distance vs in the lab)	
	Scientific Notebook	Lab 1a Setting up the Scientific Notebook (as a group)	- Start (contract, rules, safety, etc.) and maintain a legal scientific notebook - Students need composition NB, gluestick, black pen, ruler, goggles, scissors and handouts from instructor (printed up 77% size).
	What is Biotech?	Assign e-books and access codes Biotech Live Activity 1.1	- Define Biotech, examples. Work individually, then share with the group. - Work individually, submit (email) to the instructor - Glue sheet(s) in NB
	Getting to Know Your Textbook	Textbook and lab manual survey Getting to know your Textbook and lab manual Activity (www.BiotechEd.com)	- Work individually, submit (email) to the instructor - Glue sheet(s) in NB
	Biotech is Important in so many Ways	1.1 Defining Biotechnology and Figure 1.13 Domains of Biotech (use for Tues'disc.)	- Activity (Using Fig 1.13): '**Biotech Products used by you and your "family**"' - Group reading and discusssion using text figures for discussion, Q/A sheet.
	Biotech Product Study	1.2 Biotechnology Products Table 1.1 Biotech Product Study 1.3 Selecting Potential Products	- Assign a different product to each student. Students find interesting things about it (use, structure, etc.), make a "Factsheet", share
2	Biotechnology Products/Cheese Production/Scientific Methodology	1.4 Scientific Methodology – experimental plan, lab writeup **at home Lab Kit bag** " How has	- Lab Prepping/Background, different curdling agents, controlled experiment, collecting numerical data, etc.

	Day 1 BBED Kit BTNM-1c Cheese Production Day 2 Cheese-making = Prepare samples Day 3 Cheese-making = Data Collection Day 4 Cheese-making = Data Analysis Day 5 Cheese-making = Data Analysis	biotechnology affected the cheese industry?" bag of lab supplies, protocol Conduct a controlled experiment Collect timing data Collect volume data Data Table Construction Report timing and volume data in data tables Graphical analysis of timing and volume data Graph Construction Reporting Analyzed Data is a clear concise way with supporting numerical data	- Demonstrate measuring techniques - Set up experiment with 4 tubes per student - Measure time to curdle - Share timing data - Filter curds from whey, collect volume data - Set up data tables - Analyzing data using graphs - Error analysis - WORD® REE/PE/PA conclusions	
3	Bioethical Dilemmas Biotech Basics Skill #1 Micropipetting BBED Kit BBED-3B Biotech Careers	1.6 Bioethics Ch 1 Animal Use Bioethics (individual) Ch 1 Animal Use Bioethics (group) Day 1Micropipetting Volume measurement (metrics) **at home Micropipet Lab Kit bag** Day 2 Micropipetting Volume measurement (metrics) **at home Micropipet Lab Kit bag** 1.5 Biotech Careers, and use Career Focus Employees from each Chapter (except Ch 12)	- Ch 1 Animal Use Bioethical Dilema, personal positions/policy - Ch 1 Animal Use Bioethical Dilema, group positions/policy - Trainng on use of micropipets - Demonstrate skill using micropipets, safely, accurately - Group reading and discusssion using text figures for discussion. Q/A sheet. - Find Job Listings for similar careers	

	Researching Biotech Businesses	Biotech Live Activity 1.2 (Syngenta or other "local company)	- Using Member Directory of Bio.org for TX (or other state) Companies
4-5	Organisms, Cells, Molecules	2.1 Levels of Organization: Organisms, Cells, Molecules (emphasis on Fig 2.5, and molecules of cells)	- Review of Levels of Biological Organization (atoms, molecules, macromolecules, cells with organelles) - Group reading and discusssion using text figures for discussion. Q/A sheet. - Biotech Online 'Picking the Right Tool for the Job" - Biotech Live Activity 4.2 *E. coli* Model Organism..
	Cells and Cellular Organization	2.2 Cellular Organization and Processes	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Online 'Cell Picture Show"
	Macromolecules	2.3 Macromolecules of Cells	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Live Activity 2.2 Macromolecules in Food - Biotech Online 'Computer-Generated Models"
	Biotech Basics Skill #2 DNA Isolation BBED Kit BTNM-4B	**at home DNA Spooling Lab Kit bag**	- DNA isolation, identification, and quantification
	GE Biotech Products and the Applications of Genetic Engineering	2.4 The New Biotechnology Ch 2 Bioethics: Stop! You cannot use THOSE cells	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Online 'Biotech Products Make a Difference" - Ch 2 Bioethics: Stop! You cannot use THOSE cells.
6-7	Biotech Company Stock Project = "semester" long" project	Biotech Live Activity 1.3	- Stock Project set up (check weekly from here forward)

	Introduction to DNA	4.1 DNA Structure and Function 4.2 Sources of DNA	- Group reading and discusssion using text figures for discussion. Q/A sheet - DNA Model (Biotech Live Activity 4.1)
	Using/Manipulating DNA	4.3 Isolating and Manipulating DNA	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Online 'Know Your Genome" - Biotech Online 'Using Viruses to do Good"
	Biotech Basics Skill Studying DNA	Biotech Basics Skill #3 Electrophoresis BBED Kit BBED-4J Gel Box Science	- The Chemistry, Physics and Biology of Gel Electrophoresis - Importance of buffers - Load, run, stain and analyze molecules/DNA on a gel
		Chapter 4 Bioethics	- Biotech Online 'Recombinant Pharmaceuticals…" - Gene Therapy Bioethics Activity
8	DNA in the News	Biotech Live Activity 1.5 (a current event article about DNA)	- Keeping up to date are Biotech applications in the real world - Group Share
	DNA Analysis by Electrophoresis	Electrophoresis BBED Kit BBED-4M Crime Scene DNA Analysis/Forensics	- Load, run, stain and analyze molecules/DNA from crime scene samples on a gel
	Computer Modeling of DNA Molecules		- Biotech Live Activity 4.4 NCBI and Bioinformatics - Biotech Live Activity 4.5 3-D DNA compter Modeling using Cn3d or Molecule World
	Biotech Careers		- **Virtual Field Trip to Biotech Facility and/or Molecular Biologist/DNA Scientist Guest Speaker**
9	Protein Structure and Function	5.1 Structure of Proteins with focus on 1°, 2°, 3°, 4° structure	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Online 'What Sound Does Protein Make?"

	Enzyme Function	5.1 Function of Proteins with focus on 9 groups of proteins Lab 5b – Effects of Enzymes on Apple Juicing (take home version)	- Biotech Online 'Gluten-free? No Bread for You" - Biotech Live Activity 5.1 Gathering Info on a Protein, Group Share Observations of Commercial Importance of Enzyme (protein) on Production - Biotech Online 'Antibody-Producing Companies"
10	Protein Synthesis 3-D/Computer Modeling of Protein Molecules (Part 1) Stock Project update	5.2 The Production of Proteins 3-D Molecular Modeling	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Live Activity 5.2 Determining the Structure of Insulin (paper) - Biotech Live Activity 5.3 Computer Modeling of Insulin - Stock Project 4-week analysis update/changes
11	Enzymes Enzyme Activity BS4NM Kit BTNM-6c	5.3 Enzymes: Protein Catalysts At home lab _Assaying for Alpha Amylase Activity 3-D/Computer Modeling of Protein Molecules (Part 2)	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Online 'Enzymes: Catalysts for Better Health" - Compare the activity of bacterial and human alpha amylase - Biotech Live Activity 6.2 Computer Modeling of Amylase (using Cn3d or Molecule World)
12	Protein Studies Applications	5.5 Applications of Protein Analysis Chapter 5 Bioethics	- Group reading and discusssion using text figures for discussion. Q/A sheet - Biotech Live Activity 5.4: Prions: Enough to Drive You Mad - Bioethics: Who Owns your Protein Patents? - Group Share - **Guest Speaker: Protein Chemist?**
13	Assays using Spectrophotometry Protein	Sec 7.1 Spectrophotometer Use and Applications 7.2 Using the Spec to Measure	- Group reading and discusssion using text figures for discussion. Q/A sheet - Spectrophotometer lab demo/data

	Concentration BS4NM Kit BTNM-7c Proteins in the News	Protein Concentration Biotech Live Activity 1.5 (a current event article about Covid-19 vaccine, proteins, antibody testing, etc.)	collection/analysis - Take home lab kit = 7d Amylase Concentration Assay - Instructor spec of results - Keeping up to date are Biotech applications in the real world, group share
14	Bioinformatics in Medicine (Week 1) Stock Project update	Use Career Focus Employees from Ch 12 12.5 Recent Advances In Medical Biotechnology 8-week Stock Project Reports	- Use Career Focus Employees from Ch 12 to introduce Genetic Counselors - Sec 12.5 Genetic Testing Section - Group reading and discusssion using text figures for discussion. Q/A sheet (pedigree charts, markers, etc) - Biotech Online 'Diagnosis this Genetic Disorder" - 8-week Stock Project Check and PPT presentations/Reports (to the class) ☺
15	Bioinformatics in Medicine (Week 2)	 Ch 12 Bioethics	- Biotech Live Activity 12.4: What's the Risk in a Pedigree? - Biotech Live Activity 12.5: Who Passes the BRCA1 Test?" - Biotech Live Activity 12.2: A Lot of Work for Medical Biotechnologists - Ch 12 Bioethics: How DO you Decide Who Lives and Who Dies?
16		Product Pipeline Study (week 1)	- Biotech Live Activity 6.5: Product Pipeline Study" preparation
17		Product Pipeline Study (week 2)	- Biotech Live Activity 6.5: Product Pipeline Study" presentations