Medicine and Biosciences
(MED)

Algebra II

COURSE DESCRIPTION: Algebra II covers advanced work on the development of the real and complex number systems including linear equations and inequalities and their graphs, systems of equations and inequalities, matrices and determinants, the basic operations of polynomial functions, quadratic equations and their graphs, systems of quadratic equations, radicals, integral and rational exponents, logarithms and progressions. This course is an intense study of these topics as well as special relationships and their graphs.

Algebra II
Common Core State Standards

Objective	OK C³ Standards
Polynomial, Rational, and Radical Relationships	
Perform arithmetic operations with complex numbers.	N.CN.1, N.CN.2
Use complex numbers in polynomial identities and equations.	N.CN.7, N.CN.8(+), N.CN.9(+)
Interpret the structure of expressions.	A.SSE.1, A.SSE.2
Write expressions in equivalent forms to solve problems.	A.SSE.4
Perform arithmetic operations on polynomials.	
Understand the relationship between zeros and factors of polynomials.	A.APR.2, A.APR.3
Trigonometric Funtions	
Extend the domain of trigonometric functions using the unit circle.	F.TF.1, F.TF.2
Model periodic phenomena with trigonometric functions.	F.TF.5
Prove and apply trigonometric identities.	F.TF.8
Modeling with Functions	
Create equations that describe numbers or relationships.	A.CED.1, A.CED.2, A.CED.3, A.CED.4
Interpret functions that arise in applications in terms of a context.	F.IF.4, F.IF.5, F.IF.6
Inferences and Conclusions from Data	
Summarize, represent, and interpret data on a single count or measurement variable.	S.ID.4
Understand and evaluate random processes underlying statistical experiments.	S.IC.1, S.IC.2
Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	S.IC.3, S.IC.4, S.IC.5, S.IC.6
Use probability to evaluate outcomes of decisions.	S.MD.6(+), S.MD.7(+)

Medicine and Biosciences (MED)

Advanced Placement Calculus AB

COURSE DESCRIPTION: This is a college preparatory course that offers rigor in a specialized field of study. It will enable the student to be successful on the Advanced Placement AB Calculus exam and/or in college calculus. Topics covered will be: limits, differentiation, and basic integration techniques. An emphasis will be placed on real world applications as well as development of problem-solving skills.

Pre-Calculus Objectives

Objective	OK C³ Standards
The Complex Number System	
Perform arithmetic operations with complex numbers.	N.NC.3
Represent complex numbers and their operations on the complex plane.	N.NC.4, N.NC.5, N.NC.6
Vector and Matrix Quantities	
Represent and model with vector quantities.	N.VM.1, N.VM.2, N.VM.3
Perform operations on vectors.	N.VM.4a, b, c; N.VM.5a, b
Perform operations on matrices and use matrices in applications.	N.VM.6, N.VM.7, N.VM.8, N.VM.9, N.VM.10, N.VM.11, N.VM.12
Reasoning with Equations and Inequalities	
Solve systems of equations	A.REI.8, A.REI.9
Interpreting Functions	
Analyze functions using different representations	F.IF.7, F.IF.7d
Building Functions	
Build a function that models a relationship between two quantities	F.BF.1, F.BF.1c
Build new functions from existing functions	F.BF.4b,c,d; F.BF.5
Trigonometric Functions	
Extend the domain of trigonometric functions using the unit circle.	F.TF.3, F.TF.4
Model periodic phenomena with trigonometric functions	F.TF.6, F.TF.7, F.TF.9

Expressing Geometric Properties with Equations	
Translate between the geometric description and the equation for a conic section.	G.GPE.3
Geometric Measurement and Dimension	
Explain volume formulas and use them to solve problems.	G.GMD.2
Using Probability to Make Decisions	
Calculate expected values and use them to solve problems	S.MD.1, S.MD.2, S.MD.3, S.MD.4
Use probability to evaluate outcomes of decisions	S.MD.5a, b
Standards for Mathematical Practice	
Make sense of problems and persevere in solving them.	
Reason abstractly and quantitatively.	
Construct viable arguments and critique the reasoning of others.	
Model with mathematics.	
Use appropriate tools strategically.	
Attend to precision.	
Look for and make use of structure.	
Look for and express regularity in repeated reasoning.	

Calculus

Objective	NCTM Standard	Oklahoma C³ Standards
I. Preparation for Calculus		
A. Sketch the graph of an equation	Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
B. Find the intercepts of a graph	Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
C. Test a graph for symmetry with respect to an axis and the origin	Number & Operations Algebra Measurement Geometry Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 3.3, 3.4, 5.1, 5.2
D. Find the points of intersection of two graphs	Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
E. Interpret mathematical models for real-life data	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
F. Find the slope of a line passing through two points	Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
G. Write the equations of a line with a given point and slope	Number & Operations Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
H. Interpret slope as a ratio or as a rate in a real-life application	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
I. Sketch the graph of a linear equation in	Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2

slope-intercept form		
J. Write equations of lines that are parallel or perpendicular to a given line	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
K. Use function notation to represent and evaluate a function	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
L. Find the domain and range of a function	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
M. Sketch the graph of a function	Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
N. Identify different types of transformations of functions	Number & Operations Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
O. Classify functions and recognize combinations of functions	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
P. Fit a linear model to a real-life data set	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
Q. Fit a quadratic model to a real-life data set	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
R. Fit a trigonometric model to a real-life data set	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
II. Limits and Their Properties		
A. Understand what calculus is and how it	Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 4.4, 5.1, 5.2

compares to pre-calculus	Algebra	
B. Understand that the tangent line problem is basic to calculus	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 4.4, 5.1, 5.2
C. Understand that the area problem is also basic to calculus	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 4.4, 5.1, 5.2
D. Estimate a limit using a numerical or graphical approach	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
E. Learn different ways that a limit can fail to exist	Number & Operations Data Analysis & Probability Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
F. Study and use a formal definition of a limit	Number & Operations Data Analysis & Probability Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
G. Evaluate a limit using properties of limits	Number & Operations Data Analysis & Probability Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
H. Develop and use a strategy	Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
I. Evaluate a limit using dividing out and rationalizing techniques	Number & Operations Data Analysis & Probability Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
J. Evaluate a limit using the Squeeze Theorem	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
K. Determine continuity at a point and continuity on an open interval	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
L. Determine one-sided limits and continuity on a closed	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2

interval	Measurement	
M. Use properties of continuity	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
N. Understand and use the Intermediate Value Theorem	Number & Operations Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
O. Determine infinite limits from the left and from the right	Number & Operations Data Analysis & Probability Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
P. Find and sketch the vertical asymptotes of the graph of a function	Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
III. Differentiation		
A. Find the slope of the tangent line to a curve at a point	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
B. Use the limit definition to find the derivative of a function	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
C. Understand the relationship between differentiability and continuity	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
D. Find the derivative of a function using the Constant Rule	Number & Operations Algebra Measure Data Analysis & Probability ment	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
E. Find the derivative of a function using the Power Rule	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
F. Find the derivative of a function using the Constant Multiple Rule	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
G. Find the derivative of a function using the	Number & Operations Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2

Sum and Difference Rules	Measurement Data Analysis & Probability	
H. Find the derivative of the sine function and of the cosine function	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
I. Use derivatives to find rates of change	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
J. Find the derivative of a function using the Product Rule	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
K. Find the derivative of a function using the Quotient Rule	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
L. Find the derivative of a trigonometric function	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
M. Find a higher-order derivative of a function	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
N. Find the derivative of a composite function using the Chain Rule	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
O. Find the derivative of a function using the General Power Rule	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
P. Simplify the derivative of a function using algebra	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
Q. Find the derivative of a trigonometric function using the Chain Rule	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2

R. Distinguish between functions written in implicit and explicit forms	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
S. Use implicit differentiation to find the derivative of a function	Number & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
T. Find a related rate	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
U. Use related rates to solve real-life problems	Number & Operations Algebra Measurement Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
IV. Applications of Differentiation		
A. Understand the definition of extrema of a function on an interval	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
B. Understand the definition of relative extrema of a function on an open interval	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
C. Find extrema on a closed interval	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 5.1, 5.2
D. Understand and use Rolle's Theorem	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
E. Understand and use the Mean Value Theorem	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
F. Determine intervals on which a function is increasing or decreasing	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
G. Apply the First Derivative Test to find relative extrema of a function	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3

H. Determine intervals on which a function is concave upward or downward	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
I. Find any points of inflection of the graph of a function	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3 1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
J. Apply the Second Derivative Test to find relative extrema of a function	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.3, 4.1, 4.3, 5.1, 5.2, 5.3
K. Determine (finite) limits at infinity	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
L. Determine the horizontal asymptotes of the graph of a function	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
M. Determine infinite limits at infinity	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
N. Analyze and sketch the graph of a function	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
O. Solve applied minimum and maximum problems	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
P. Approximate a zero of a function using Newton's Method	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
Q. Understand the concept of a tangent line approximation	Data Analysis & Probability Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
R. Compare the value of the differential, dy, with the actual change in y, delta y	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
S. Estimate a propagated error using a differential	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2

T. Find the differential of a function using differentiation formulas	Data Analysis & Probability Algebra Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
V. Integration		
A. Write the general solution of a differential equation	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
B. Use indefinite integral notation for antiderivatives	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
C. Use basic integration rules to find antiderivatives	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
D. Find a particular solution of a differential equation	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
E. Use sigma notation to write and evaluate a sum	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
F. Understand the concept of area	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
G. Approximate the areas of a plane region	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
H. Find the area of a plane region using limits	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
I. Understand the definition of a Riemann sum	Numbers & Operations Measurement Algebra	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2
J. Evaluate a definite integral using limits	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
K. Evaluate a definite integral using properties of definite integrals	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
L. Evaluate a definite integral using the	Numbers & Operations Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3

Fundamental Theorem of Calculus	Algebra Data Analysis & Probability	
M. Understand and use the Mean Value Theorem for Integrals	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
N. Find the average value of a function over a closed interval	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
O. Use pattern recognition to evaluate an indefinite integral	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
P. Use a change of variables to evaluate an indefinite integral	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
Q. Use the General Power Rule for Integration to evaluate an indefinite integral	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
R. Use a change of variables to evaluate a definite integral	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
S. Evaluate a definite integral involving an even or odd function	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
T. Approximate a definite integral using the Trapezoidal Rule	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
U. Approximate a	Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3,

definite integral using Simpson's Rule	Measurement Algebra Data Analysis & Probability	3.3, 4.2, 5.1, 5.2, 5.3
V. Analyze the approximate error I the Trapezoidal Rule and Simpson's Rule	Numbers & Operations Measurement Algebra Data Analysis & Probability	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
VI. Logarithmic, Exponential, and Other Transcendental Functions		
A. Develop and use properties of the natural logarithmic function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
B. Understand the definition of the number e	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
C. Find derivatives of functions involving the natural logarithmic function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
D. Use the Log Rule for Integration to integrate a rational function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
E. Integrate trigonometric functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
F. Verify that one function is the inverse function of another function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
G. Determine whether a function has a inverse function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
H. Find the derivative of an inverse function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
I. Develop properties of the natural exponential function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
J. Differentiate	Numbers & Operations	1.1, 1.2, 2.1, 2.2, 2.3,

natural exponential functions	Algebra Measurement	3.3, 4.2, 5.1, 5.2, 5.3
K. Integrate natural exponential functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
L. Define exponential functions that have bases other than e	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
M. Differentiate and integrate exponential functions that have bases other than e	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
N. Use exponential functions to model compound interest and exponential growth	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
O. Use separation of variables to solve a simple differential equation	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
P. Use exponential functions to model growth and decay in applied problems	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
Q. Use initial conditions to find particular solutions of differential equations	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
R. Recognize and solve differential equations that can be solved by separation of variables	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
S. Recognize and solve homogeneous differential equations	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
T. Use a differential equation to model and solve an applied problem	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
U. Develop properties of the six inverse trigonometric functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
V. Differentiate an	Numbers & Operations	1.1, 1.2, 2.1, 2.2, 5.1,

inverse trigonometric function	Algebra Measurement	5.2
W. Review the basic differentiation formulas for elementary functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
X. Integrate functions whose antiderivatives involve inverse trigonometric functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
Y. Use the method of completing the square to integrate a function	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
Z. Review the basic integration formulas involving elementary functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
AA. Develop properties of hyperbolic functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
BB. Differentiate and integrate hyperbolic functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
CC. Develop properties of inverse hyperbolic functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
DD. Differentiate and integrate functions involving inverse hyperbolic functions	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
VII. Applications of Integration		
A. Find the area of a region between two curves using integration	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
B. Find the area of a region between intersecting curves using integration	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
C. Describe integration as a accumulation process	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3
D. Find the volume of	Numbers & Operations	1.1, 1.2, 2.1, 2.2, 5.1,

a solid of revolution using the disk method	Algebra Measurement	5.2
E. Find the volume of a solid of revolution using the washer method	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
F. Find the volume of a solid with known cross sections	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
G. Find the volume of a solid of revolution using the shell method	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 5.1, 5.2
H. Compare the uses of the disk method and the shell method	Numbers & Operations Algebra Measurement	1.1, 1.2, 2.1, 2.2, 2.3, 3.3, 4.2, 5.1, 5.2, 5.3

Medicine and Biosciences (MED)

Advanced Placement Chemistry

COURSE DESCRIPTION: This class prepares students for intermediate and advanced college courses by making demands upon them equivalent to those full-year introductory college courses. Students will learn to assess scientific materials, their relevance to given interpretive problems, their reliability and their importance, and weigh the evidence and interpretations presented in scientific scholarship

AP Chemistry

Objective	National Science Education Standards 9-12 Content Standards	Oklahoma C³ Standards
Atomic theory and atomic structure		
• Investigate evidence for the atomic theory	B, G	**Content** 1.1, 1.2, 1.3, 1.4
• Discuss atomic masses; determination by chemical and physical means	B	**Content** 1.1, 1.2, 1.3, 1.4
• Discuss atomic number and mass number; isotopes	B	Content 1.1, 1.2, 1.3, 1.4
• Discuss electron energy levels: atomic spectra, quantum numbers, atomic orbitals	B	**Content** 1.1, 1.2, 1.3, 1.4
• Interpret periodic relationships including, for example, atomic radii, ionization energies, electron affinities, oxidation states	A, B	**Content** 1.1, 1.2, 1.3, 1.4, 1.5
Chemical Bonding		
• Investigate and discuss binding forces • types: ionic, covalent, metallic, hydrogen bonding, van der Waals (including London dispersion forces) • relationships to states, structure, and properties of matter • polarity of bonds, electronegativities	A, B	**Content** 1.2, 1.4, 2.1, 2.2, 2.3, 2.4
• Build molecular models • lewis structures • valence bond: hybridization of orbitals, resonance, sigma and	A, B	**Content** 1.2, 1.4, 2.1, 2.2, 2.3, 2.4

pi bonds • VSEPR		
• Discuss and model geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure	A, B	Content 1.2, 1.4, 2.1, 2.2, 2.3, 2.4
• Discuss and build geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure • Understand nuclear chemistry: nuclear equations, half-lives, and radioactivity; chemical applications	A, B	Content 1.2, 1.4, 2.1, 2.2, 2.3, 2.4
Gases		

• Interpret the laws of ideal gases
  • Equation of state for an ideal gas
  • Partial pressures
	B	Content
		1.4, 1.5, 2.1, 2.2, 2.3, 2.4

• Kinetic-molecular theory
  • Interpretation of ideal gas laws on the basis of this theory
  • Avogadro's hypothesis and the mole concept
  • Dependence of kinetic energy of molecules on temperature
  • Deviations from ideal gas laws
	B	Content
		1.4, 1.5, 2.1, 2.2, 2.3, 2.4

Liquids and solids		
• Understand liquids and solids form the kinetic-molecular viewpoint	B	Content 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
• Create phase diagrams of one-component systems	A, B	Content 1.2, 1.3, 1.4, 1.5
• Interpret changes of state, including critical points and triple points	B	Content 1.2, 1.3, 1.4, 1.5
• Discuss structure of solids; lattice energies	B	Content 1.4, 1.5, 2.1, 2.2, 2.3, 2.4

Solutions		
• Create types of solutions and understand factors affecting solubility	A, B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
• Discuss methods of expressing concentration (The use of normalities is not tested.)	B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
• Model Raoult's law and colligative properties (nonvolatile solutes); osmosis	A, B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
• Discuss non-ideal behavior (qualitative aspects)	B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
Reactions		
• Model acid-base reactions; concepts of Arrhenius, Brönsted- Lowry, and Lewis; coordination complexes; amphoterism	A, B	Content 1.5, 2.1, 2.2, 2.3
• Create precipitation reactions	A, B	Content 1.5, 2.1, 2.2, 2.3
• Create oxidation-reduction reactions • An Oxidation number • The role of the electron in oxidation-reduction • Electrochemistry: electrolytic and galvanic cells; Faraday's Laws; standard half-cell potentials; Nernst equation; prediction of the direction redox reactions	A, B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3
Stoichiometry		
• Understand and model ionic and molecular species present in chemical systems: net ionic equations	B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3, 2.4
• Balance equations including those for redox reactions	B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3, 2.4
• Apply mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting reactants	B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3, 2.4

Equilibrium		
• Apply concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants	B	Content 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
• Interpret quantitative treatment	A, B	Content 2.3, 2.4

• Apply equilibrium constants for gaseous reactions: Kp, Kc
   • Equilibrium constants for reactions in solution Constants for acids and bases; pK; pH
   • Solubility product constants and their application to precipitation and the dissolution of slightly soluble compounds
   • Common ion effect; buffers; hydrolysis
	A, B	Content 2.3, 2.4

Kinetics		
• Understand concept of rate of reaction	B	Content 2.2
• Apply differential rate laws to determine order of reaction and rate constant from experimental data	A, B	Content 2.2, 2.3
• Discuss effect of temperature change on rates	B	Content 1.4, 2.2
• Discuss energy of activation; the role of catalysts	B	Content 1.2, 1.3, 2.1, 2.2
• Discuss the relationship between the rate-determining step and a mechanism	B	Content 2.2
Thermodynamics		
• Apply functions • Apply first law: change in enthalpy; heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry • Apply second law: entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy	A, B	Content 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.4

and entropy changes • Compare and contrast relationship of change in free energy to equilibrium constants and electrode potentials		
Labs/Activities: These labs follow Collegeboard ® recommendations.		
Determination of the Formula of a Compound Students will: • Determine the water of hydration in a copper chloride hydrate sample. • Conduct a reaction between a solution of copper chloride and solid aluminum. • Use the results of the reaction to determine the mass and moles of Cu and Cl in the reaction. • Calculate the empirical formula of the copper chloride compound. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 **Process** 1.1, 1.2, 1.3, 3.3, 4.1, 4.2, 4.7, 5.1, 5.2, 6.1, 6.2, 6.3, 6.4
Separation by Chromatography Students will: • Conduct a liquid chromatographic separation. • Conduct a step gradient chromatographic separation. • Complete the necessary measurements and calculations to evaluate the components of a mixture that have been separated by liquid chromatography. • Write a detailed lab report citing all steps in the scientific method	A, B, E	**Content** 1.5 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.3, 4.1, 4.2, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4

Determination of the Rate of a Reaction and Its Order Students will: • Conduct the catalyzed decomposition of hydrogen peroxide under various conditions. • Calculate the rate constant for the reaction. • Determine the rate law for the reaction. • Calculate the activation energy for the reaction. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.4, 2.1, 2.2, 2.3, 2.4 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Determination of Enthalpy Change Associated With a Reaction Students will: • Use Hess's Law to determine the enthalpy change of the reaction between aqueous ammonia and aqueous hydrochloric acid. • Compare your calculated enthalpy change with the experimental results. • Write a detailed lab report citing all steps in the scientific method	A, B, D	**Content** 1.4, 2.1, 2.2, 2.3, 2.4 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Synthesis of a Coordination Compound and Its Chemical Analysis Students will: • Synthesize a sample of potassium aluminum sulfate dodecahydrate (alum). • Observe and record the process of synthesizing a compound. • Calculate the percent yield of your synthesis. • Determine the melting temperature of a sample of alum.	A, B, E	**Content** 1.4, 2.1, 2.2, 2.3, 2.4 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4

• Determine the water of hydration of a sample of alum. • Determine the percent sulfate of a sample of alum. • Verify the chemical formula of a sample of alum. • Write a detailed lab report citing all steps in the scientific method		
Analytical Gravimetric Determination Students will: • Measure the conductivity of the reaction between sulfuric acid and barium hydroxide. • Use conductivity values as a means of determining the equivalence point of the reaction. • Measure the mass of a product of the reaction as a means of determining the equivalence point of the reaction gravimetrically. • Calculate the molar concentration of a barium hydroxide solution. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.4, 2.1, 2.2, 2.3, 2.4 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4
Determination of the Percentage of Water in a Hydrate Students will: • Carefully heat a measured sample of a hygroscopic ionic compound. • Determine the water of hydration of the compound. • Complete the chemical formula of the compound. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.4, 2.1, 2.2, 2.4 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4

Determination of the Equilibrium Constant for a Chemical Reaction Students will: • Prepare and test standard solutions of $FeSCN^{2+}$ in equilibrium. • Test solutions of SCN^- of unknown molar concentration. • Determine the molar concentrations of the ions present in an equilibrium system. • Determine the value of the equilibrium constant, K_{eq}. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 2.1, 2.2, 2.4 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4
Standardization of a Solution Using a Primary Standard Students will: • Prepare an aqueous solution of sodium hydroxide to a target molar concentration. • Determine the concentration of your NaOH solution by titrating it with a solution of potassium hydrogen phthalate, abbreviated KHP, of precise molar concentration. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 2.1, 2.4 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4
Determination of Electrochemical Series Students will: • Prepare a Cu-Pb voltaic cell and measure its potential. • Test two voltaic cells that use unknown metal electrodes to identify the metals. • Prepare copper and lead concentration cells, observe, and measure their respective cell	A, B, E	**Content** 1.3, 1.4, 1.5, 2.1, 2.2, 2.3 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4

potentials. • Use the Nernst equation to calculate the K_{sp} of PbI_2. • Write a detailed lab report citing all steps in the scientific method		
Synthesis, Purification, and Analysis of an Organic Compound Students will: • Synthesize a sample of acetylsalicylic acid (aspirin). • Calculate the percent yield of your synthesis. • Measure the melting temperature of your aspirin sample. • Conduct a colorimetric analysis of your aspirin sample. • Write a detailed lab report citing all steps in the scientific method	A, B, F	**Content** 1.3, 1.4, 1.5, 2.1, 2.2, 2.3 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Determination of Mass and Mole Relationship in a Chemical Reaction Students will: • Measure the enthalpy change of a series of reactions. • Determine the stoichiometry of an oxidation-reduction reaction in which the reactants are known but the products are unknown • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.3, 1.4, 1.5, 2.1, 2.2, 2.3 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Determination of Molar Mass by Vapor Density Students will: • Measure the gas production of a chemical reaction by a pressure change. • Determine the molar volume of the	A, B	**Content** 1.3, 1.4, 1.5, 2.3 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3,

gas produced in the reaction. • Calculate the molar volume of a gas at STP. • Write a detailed lab report citing all steps in the scientific method		6.1, 6.2, 6.3, 6.4
Determination of Molar Mass by Freezing-Point Depression Students will: • Determine the freezing temperature of the pure solvent, lauric acid. • Determine the freezing temperature of a mixture of lauric acid and benzoic acid. • Calculate the freezing point depression of the mixture. • Calculate the molecular weight of benzoic acid. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.3, 1.4, 1.5, 2.3 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Determination of the Molar Volume of a Gas Students will: • Measure the gas production of a chemical reaction by a pressure change. • Determine the molar volume of the gas produced in the reaction. • Calculate the molar volume of a gas at STP. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 1.3, 1.4, 1.5, 2.3 **Process** 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4

Determination of Appropriate Indicators for Various Acid-Base Titrations, pH Determination Students will: • Conduct strong acid-strong base titrations using solutions of hydrochloric acid and sodium hydroxide, and three different indicator solutions. • Select the proper indicator to use with a titration involving a weak acid or a weak base, based on your observations and measurements. • Write a detailed lab report citing all steps in the scientific method	A, B, E	Content 2.1 Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Determination of Concentration by Acid-Base Titration, Weak Acid & Weak Base Students will: • Accurately conduct acid-base titrations. • Determine the equivalence point of a strong acid - strong base titration. • Determine the equivalence point of a weak acid - strong base titration. • Calculate the molar concentrations of two acid solutions. • Write a detailed lab report citing all steps in the scientific method	A, B, E	Content 2.1, 2.3, 2.4 Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4
Preparation and Properties of Buffer Solutions Students will: • Evaluate a standard buffer solution. • Prepare and test an acid buffer solution. • Determine the buffer capacity of the standard buffer and the prepared buffer. • Write a detailed lab report citing all	A, B	Content 2.1 Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4

steps in the scientific method		
Determination of Concentration by Oxidation-Reduction Titration Students will: • Conduct the potentiometric titration of the reaction between ferrous ammonium sulfate hexahydrate and ammonium cerium (IV) nitrate. • Measure the potential change of the reaction. • Determine the molar concentration of iron (II) ions in a sample of ferrous ammonium sulfate hexahydrate • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** **2.1** **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4
Separation and Qualitative Analysis of Cations and Anions Students will: • Prepare and analyze a solution that contains ten selected cations. • Analyze an unknown solution that contains a selection of cations. • Prepare and analyze a solution that contains six selected anions. • Analyze an unknown solution that contains a selection of anions. • Write a detailed lab report citing all steps in the scientific method	A, B	**Content** 2.1, 2.2, 2.3, 2.4 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
Colorimetric or Spectrophotometric Analysis Students will: • Prepare and test the absorbance of five standard copper (II) sulfate	A, B, E	**Content** 2.2, 2.2, 2.3 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5,

solutions.		4.6, 4.7, 6.1, 6.2, 6.3, 6.4
• Calculate a standard curve from the test results of the standard solutions.		
• Test the absorbance of a copper (II) sulfate solution of unknown molar concentration.		
• Calculate the molar concentration of the unknown $CuSO_4$ solution.		
• Write a detailed lab report citing all steps in the scientific method		
Measurements Using Electrochemical Cells and Electroplating Students will:	A, B, E	**Content** 2.1, 2.2, 2.3 **Process** 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4
• Prepare and operate an electrochemical cell to plate copper onto a brass surface.		
• Measure the amount of copper that was deposited in the electroplating process.		
• Calculate the amount of energy used to complete the electroplating process.		
• Write a detailed lab report citing all steps in the scientific method		

Medicine and Biosciences (MED)

Anatomy & Physiology

COURSE DESCRIPTION: This course is designed as a high school, lab science course where the structural complexity of the human body and its intricate functional mechanisms will be investigated. Students will conduct scientific investigations and fieldwork using scientific knowledge and methodology that will enable them to make educated conclusions based on higher-level critical thinking and problem-solving skills. An emphasis is placed on real-world applications and active learning exercises as well as laboratory experiences.

Anatomy and Physiology

Objectives	National Science Education Standards 9-12 Content Standards	Oklahoma C³ Standards
Organization of the Body		
• Define and explain how anatomy and physiology are related.	C, G	
• Name and explain the relationship between levels of structural organization that make up the human body.	A, C	
• Identify and state the major functions of the organ systems of the body.	A, C	
• Properly use the terms that describe relative positions, body sections, and body regions.	A, C	
• Describe the functions of the human body and explain how these functions aid in the maintenance of life.	A, B, C, F, G	
• Develop an understanding of homeostasis and its role in normal body function.	A, B, C, F, G	
Labs/Activities Organization of the Body		
• Observe, measure, and describe the anatomical body directions, regions, and planes.	A, B, C	1.1, 1.2, 1.3, 2.2, 4.2, 4.5, 4.8, 5.1

body directions, regions, and planes.		
• Interpret a biological model	A, C	5.1, 6.4
• Analyze and formulate treatments and outcomes from real-world case studies	A, B, C, F, G	4.1, 4.7, 5.1, 6.1, 6.4
Suggested Labs and Activities		
Zoologik System of Human Anatomy in Clay: Lesson A-Directional Terminology	A, B, C	4.2, 4.5, 4.8, 5.1,
Revealed software	A, C	5.1, 6.4
MAVCC-Anatomy and Physiology Module Set I-Module 1: Assignment 1	A, B, C, F, G	4.1, 4.7, 5.1, 6.1, 6.4
Chemical Basis for Life		
• Explain how the study of living materials requires understanding of chemistry.	A, B, C	
• Describe the relationships among matter, atoms, and molecules.	B, C	
• Identify three major types of chemical reactions that occur in the body	B, C	
• Differentiate between a salt, an acid, and a base	B, C	
• Describe factors that affect chemical reaction rates	B, C	
• Compare the processes of osmosis, diffusion, filtration and give examples of their uses in the body	A, B, C	
• Explain the concept of pH, and its effect on body functions	B, C	
• Explain the importance of water and salts to body homeostasis	B, C	
• Distinguish between organic and inorganic compounds	B, C	
• Compare the structures and functions of carbohydrates,	B, C	

lipids, proteins, and nucleic acids		
• Distinguish between different types of proteins	B, C	
• Describe how and where enzymes work in the body	B, C	
• Compare and contrast the structure and functions of DNA and RNA	A, B, C	
• Explain the role of ATP in cell metabolism	B, C	
Lab/Activities **Chemical Basis for Life**		
• Investigations with enzymes that illustrate criteria for their proper function	A, B, C, E	1.2,1.3,3.1,3.2,4.2,4.4,4.5, 4.6,4.7,4.8,6.1,6.2,6.3,6.4
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
• Build a model of DNA	A, B, C	5.1, 5.3
• Inquiry activities that investigate pH range	A, B, C, E	6.1, 6.2, 6.3, 6.4
Suggested **Labs & Activities**		
Anatomy & Physiology Coloring Workbook-Chapter 2	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
MAVCC-Anatomy and Physiology Module Set I-Module 2: Assignment 1	A, B, C, F, G	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
Cells and Tissues		
• Identify on a cell model or diagram the cell organelles and be able to explain their functions	C	
• Describe the structure of the plasma membrane, and explain how the various transport processes account for the directional movements of specific substances across the	A, B, C	

plasma membrane		
• Describe different cell types and explain the functionality of the differences	C	
• Describe the cell cycle, including the phases of mitosis and explain how the timing of cell division is regulated.	C	
• Have an understanding of stem cells and how they are used in modern medical procedures and research	C, E, F, G	
• Name the four primary classes of human tissues and explain how they differ structurally and functionally	C	
• Know the anatomical location of the different tissue types	C	
• Describe ways the body repairs damaged tissue	C	
• Identify the various forms of cancer and describe how it affects the body	C, E, F, G	
Labs/Activities-Cells and Tissues		
• Osmosis and diffusion investigations	A, B, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Microscope labs with either prepared or student-made cell and tissue slides	A, C, E	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.4
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Multimedia that enables students to visualize what occurs in the body microscopically	C, E, F, G	5.1, 5.3

Suggested Labs & Activities		
Anatomy & Physiology Coloring Workbook-Chapter 3	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
MAVCC-Anatomy and Physiology Module Set 1-Module 4: Assignment 1	A, B, C, F, G	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Viewing and study guide of *Osmosis Jones*	C, E, F, G	5.1, 5.3
Integumentary System		
• Have an understanding of the functions of the skin and be able to relate them to its structure	B, C	
• Recognize and identify the major skin structures when provided a diagram or model	C	
• Identify and know the purpose of the accessory structures of the skin	C, F	
• Describe the normal and pathological colors that the skin can have and explain their causes	C, F, G	
• Identify and differentiate between the three types of skin cancer	C, F, G	
• Describe the three classes of burns and the priorities in burn treatment	C, F	
• Understand the role of the Integumentary System in maintaining homeostasis	B, C	
Labs/Activities - Integumentary System		
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Multimedia that enables students to visualize what	C, E, F, G	5.1, 5.3

occurs physiologically		
• Microscope lab that enables the student to observe either prepared or fresh skin cells	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
Suggested Labs & Activities		
Anatomy & Physiology Coloring Workbook-Chapter 4-Skin and Body Membranes	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
MAVCC-Anatomy and Physiology Module Set II-Module 1: Assignment 1 & 2	A, B, C, F, G	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Skeletal System		
• Identify the subdivisions of the skeleton as axial or appendicular	C	
• State several functions of the skeletal system	C	
• Demonstrate knowledge, with the use of models or pictures, the major bones, their surface features, and basic functions	C, E, F	
• Describe the developmental aspects of the skeleton from formation in the fetus throughout the lifetime of the bones	C, F, G	
• Distinguish between and give the function of the four major classes of joints	C	
• Be able to identify and understand the function of tendons and ligaments	C	
• Understand the causes and current medical treatments of skeletal disorders and abnormalities	C, E, F, G	
Labs/Activities-Skeletal System		
• Classification of joints according to their shape	C	2.1, 2.2

and function		
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
• Multimedia that enables students to visualize what occurs physiologically	C, E, F, G	5.1, 5.3
Suggested Labs & Activities		
Zoologik System of Human Anatomy in Clay: Lesson B-Them Bones!	B, C	2.1, 5.1 5.3
Anatomy & Physiology Coloring Workbook-Chapter 5-The Skeletal System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3,4.4, 4.5, 4.8
Anatomy & Physiology Revealed software-Volume 1	A, C	5.1, 6.4
MAVCC-Anatomy and Physiology Module Set II-Module 2: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
Muscular System		
• Distinguish between the three types of muscles, and tell where they are located in the body	A, C	
• Describe the structure of a skeletal muscle with respect to location and names of its connective tissue coverings and attachments	A, C	
• Describe the microscopic structure and functional role of the skeletal muscle fiber	A, C	
• Explain how muscle fibers are stimulated to contract and what occurs during a muscle twitch with regard to each component's function	A, B, C	
• Explain how skeletal muscle	C	

fibers are innervated and how they contract		
• Explain how skeletal muscle meets its energy demands during rest and exercise	A, B, C	
• Explain oxygen debt and muscle fatigue and discuss situations that would cause them	A, B, C	
• Describe the effects of aerobic and resistance exercise on skeletal muscles and other body organs	A, B, C	
• List and define the criteria used in naming muscles and be able to provide an example to illustrate the use of each criterion	C	
• Name and identify, on a diagram or model, each of the muscles. State the origin and insertion for each, and describe the action of each.	C	
Labs/Activities-Muscular System		
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Labs that demonstrate muscle fatigue	A, C, F	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.4
• Labs that model the mechanical advantage of certain muscle groups	A, B, C, F	1.1, 1.2, 1.3 3.1, 3.2, 3.3, 3.4, 3.5
• Microscope lab that enables the student to observe either prepared or fresh muscle tissue	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Multimedia that enables students to visualize the action of muscles from	C, E, F, G	5.1, 5.3

within the body		
Suggested Labs & Activities		
Zoologik System of Human Anatomy in Clay: Lessons C-F-Muscle Concepts-Muscle Building	A, C, E	1.3, 5.1, 5.3
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 11, Activities 1,2, & 7	A, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
Anatomy & Physiology Coloring Workbook-Chapter 6-The Muscular System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Anatomy & Physiology Revealed software-Volume 1	A, C	5.1, 6.4
MAVCC-Anatomy and Physiology Module Set II-Module 3: Asignment 1 & 2	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Nervous System		
• List the general functions of the nervous system	C	
• Explain the structural and functional divisions of the nervous system	C	
• List the types of supporting cells and cite their functions	C	
• Describe the important anatomical regions of a neuron and relate each to a physiological role	A, C	
• Classify sensory receptors according to body location, structure, and stimulus detected	A, C	
• Describe the events that lead up to, happen during, and result after a nerve impulse and its conduction from one neuron to another	A, C, F	

• Identify and indicate the functions of the major regions of the cerebral hemispheres, diencephalons, brain stem, and cerebellum on a human brain model or diagram	C	
• Identify the three meningeal layers, and state their functions	C	
• Understand the formation and function of cerebrospinal fluid and the blood-brain barrier	C	
• Describe spinal cord structure and list its functions	C	
• List the components of the peripheral nervous system	C	
• Distinguish between sensory, motor, and mixed nerves	C	
• Name the 12 pairs of cranial nerves and describe the body region and structures innervated by each	C	
• Name the four major nerve plexuses, give the major nerves of each, and describe their distribution	A, C	
• Distinguish between autonomic and somatic reflexes	C	
• Compare and contrast the general functions of the parasympathetic and sympathetic divisions	A C	
• Understand from an anatomical and physiological perspective, the functions of sight, hearing & balance, taste, and smell	A, C, F	
• Describe the developmental	A, C	

aspects of the nervous system, from embryo to old age		
Labs/Activities-Nervous System		
• Modeling of the human nervous system, either made by the student or prepared	A, C	3.5, 5.1, 5.3
• Observation/dissection of preserved animal central nervous systems and/or special sense organs	A, C, F	3.5, 4.1, 4.2, 6.2
• Labs demonstrating human reflex	A, C, E, F	3.5, 6.1, 6.2, 6.3, 6.4
• Multimedia that enables students to visualize what occurs physiologically with the nervous system	C, E, F, G	5.1, 5.3
• Microscopically observing different parts of the special sense organs	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Suggested Labs & Activities		
Zoologik System of Human Anatomy in Clay: Lesson G-Nervous System	A, C	3.5, 5.1, 5.3
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 16-Human Reflex Physiology & Exercise 17- Activities 1-15	A, C, E, F	3.5, 6.1, 6.2, 6.3, 6.4
Anatomy & Physiology Revealed software-Volume 2	A, C	5.1, 5.3
Anatomy & Physiology Coloring Workbook-Chapter 7-The Nervous System & Chapter 8-Special	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8

Senses		
MAVCC-Anatomy and Physiology Module Set II-Module 4: Assignment 1, Module 6: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Endocrine System		
• Indicate important differences between hormonal and neural controls of body functioning	A, C	
• List the major endocrine organs, and describe their locations in the body and the hormones they secrete	C	
• Describe what a hormone is and how it functions	C	
• Understand the negative feedback mechanism and describe its role in regulating blood levels of the various hormones	A, B, C	
• Describe major pathological consequences of hypersecretion and hyposecretion of the hormones	A, B, C	
• Identify the endocrine role of the kidneys, the stomach and intestine, the heart, and the placenta	C	
• Describe the effect of aging on the endocrine system and body homeostasis	A, C, F, G	
Labs/Activities-Endocrine System		
• Multimedia that enables students to visualize what occurs physiologically with the endocrine system	C, E, F, G	5.1, 5.3

• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Microscopically observing different types of cells in different endocrine glands	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
Suggested Labs & Activities		
Anatomy & Physiology Coloring Workbook-Chapter 9-The Endocrine System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Anatomy & Physiology Revealed software-Volume 4	A, C	5.1, 5.3
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 18-Activities 1-5	A, C, E, F	3.5, 6.1, 6.2, 6.3, 6.4
MAVCC-Anatomy and Physiology Module Set II-Module 5: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Blood		
• Describe the composition and physical characteristics of whole blood and explain why it is classified as a connective tissue	B, C	
• List the functions of blood	C	
• Discuss the composition and functions of plasma	C	
• Describe the blood-clotting process	B, C	

• Describe the ABO and Rh blood groups and explain the basis of transfusion reactions	B, C, E	
• Explain the importance of blood testing as a diagnostic tool	C, E	
• Name some blood disorders that become more common with age	C, F, G	
Labs/Activities-Blood		
• Examining the formed elements of blood microscopically	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Mathematical computation activity in which the ratio of components in human blood is found	A, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Hematologic Tests- Hematocrit, hemoglobin determination, coagulation time, blood typing	A, B, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Multimedia that enables the student to visualize what is occurring physiologically	C, E, F, G	5.1, 5.3
Suggested Labs & Activities		
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 19-Activities 1-6	A, B, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
Anatomy & Physiology Coloring Workbook-Chapter 10-Blood	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
MAVCC-Anatomy and Physiology Module Set II-Module 7: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Cardiovascular System		
• Describe the location of the heart in the body, and	C	

identify its major anatomical areas on a model or diagram		
• Name the coverings of the heart	C	
• Describe the structure and functions of the four heart chambers. Name each chamber and provide the name and general route of its associated great vessels	C	
• Identify the elements of the intrinsic conductions system of the heart, and describe the pathway of impulses through this system	B, C	
• Explain what information can be gained from an electrocardiogram	A, C	
• Compare and contrast the structure and function of arteries, veins, and capillaries	A, C	
• Define vasoconstriction and vasodilation	C	
• Identify the body's major arteries and veins, and name the body region supplied by each	C	
• Discuss the unique features of special circulations of the body: arterial to the brain, hepatic portal, pulmonary, and fetal	A, C	
• List and explain the factors that influence blood pressure and describe how blood pressure is regulated	A, B, C	
• Describe the structure and function of a capillary bed	A, C	
• Describe the fetal circulatory system	C, F	
Labs/Activities-		

Cardiovascular		
• Draw a diagram of a normal electrocardiogram tracing: name the individual waves and intervals, and indicate what each represents. Name some abnormalities that can be detected on an ECG tracing	A, C	4.7, 5.1, 5.2, 5.3
• Examining blood vessel and cardiac muscle slides microscopically	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Modeling of the human circulatory system	A, C	5.1, 5.2, 5.3
• Investigations of pulse, heart sounds, and blood pressures	A, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Observation/dissection of preserved animal heart	A, C, F	3.5, 4.1, 4.2, 6.2
• Multimedia that enables the student to visualize what is occurring physiologically	A, C, E, F, G	5.1, 5.3
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Suggested Labs & Activities		
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 20-Activities 1-3, Exercise 21-Activities 1-7, Exercise 22-Activities 1-6	A, C, E, F	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
Anatomy & Physiology Coloring Workbook-Chapter 11-The Cardiovascular System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Anatomy & Physiology Revealed software-Volume 3	A, C	5.1, 5.2, 5.3
Zoologik System of Human Anatomy in Clay: Lesson H-Cardiovascular System: The Beat Goes On...	A, C	5.1, 5.2, 5.3

MAVCC-Anatomy and Physiology Module Set II-Module 8: Assignment 1, Module 9: Assignment	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Lymphatic System and Immune Systems		
• Name the two major types of structures composing the lymphatic system and explain how the lymphatic system is functionally related to the cardiovascular and immune systems	A, C, F	
• Describe the composition of lymph and explain its formation and transport	C	
• Describe the general location, histological structure, and functions of lymph nodes	A, C	
• Name and describe the other lymphoid organs of the body. Compare and contrast them with lymph nodes structurally and functionally	A, C	
• Describe the surface membrane barriers and their protective functions	B, C	
• Explain the importance of phagocytosis and natural killer cells in nonspecific body defense	A, C	
• Relate the events of the inflammatory process.	A, C	
• Name several antimicrobial substances produced by the body that act in nonspecific body defense	A, C, F	
• Explain how fever helps protect the body against invading pathogens	A, C, F	

• Explain what an antigen and hapten is and name that act as complete antigens	C	
• Compare and contrast the origin, maturation process, and general function of B and T lymphocytes. Describe the role of macrophages and other phagocytes in immunity	A, C, F	
• Describe immunodeficiencies, allergies, and autoimmune diseases	C, F, G	.
Labs/Activities-Lymphatic & Immune		
• Multimedia that enabling the student to visualize the physiology of the lymphatic system	A, C, E, F, G	5.1, 5.3
• Creating a model of the human lymphatic system	A, C	5.1, 5.2, 5.3
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Suggested Labs & Activities		
Anatomy & Physiology Revealed software-Volume 3	A, C	5.1, 5.2, 5.3
Zoologik System of Human Anatomy in Clay: Lesson I-Lymph System	A, C	5.1, 5.2, 5.3
Anatomy & Physiology Coloring Workbook-Chapter 12-The Lymphatic System and Body Defenses	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
MAVCC-Anatomy and Physiology Module Set I-Module 3, Assignment 1 *& Module Set II-* Module 10: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3

Respiratory System		
• Identify the organs forming the respiratory passage-way in descending order until the alveoli are reached	C	
• Describe several protective mechanisms of the respiratory system	A, C	
• Describe the makeup of the respiratory membrane and relate its structure to its function	A, C	
• Describe the structure and function of the lungs and the pleural coverings	C	
• Explain the relative roles of the respiratory muscles and lung elasticity in effecting volume changes that cause air to flow into and out of the lungs	A, B, C	
• Explain the functional importance of the partial vacuum that exists in the intrapleural space	B, C	
• Describe several physical factors that influence pulmonary ventilation	C	
• Explain and compare the various lung volumes and capacities. Indicate types of information that can be gained from pulmonary function tests	A, B, C	
• Describe how oxygen and carbon dioxide are transported in the blood	C	
• Describe the neural controls of respiration	C	
• Name several physical factors that influence respiratory rate	A, C	
• Describe the symptoms and	C, F, G	

probable causes of Chronic Obstructive Pulmonary Disease and lung cancer		
• Describe normal changes that occur in respiratory system functioning from infancy to old age	C, F	
Labs/Activities-Respiratory System		
• Measure volumes and capacities of lungs with either a commercial or homemade spirometer	A, B, C, E	1.1, 1.2, 1.3, 2.1, 3.5, 6.1, 6.2, 6.3, 6.4
• Measuring respiratory rate	A, C, E	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.4
• Examining prepared slides of trachea and lung tissue microscopically	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Multimedia enabling the student to visualize the physiology of the respiratory system	A, C, E, F, G	5.1, 5.3
Suggested Labs & Activities		
Anatomy & Physiology Revealed software-Volume 3	A, C, E, F, G	5.1, 5.3
Anatomy & Physiology Coloring Workbook-Chapter 13-The Respiratory System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Spirometer Lab	A, B, C, E	1.1, 1.2, 1.3, 2.1, 3.5, 6.1, 6.2, 6.3, 6.4
MAVCC-Anatomy and Physiology Module Set II-Module 11: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3

Digestive System and Metabolism		
• Describe the overall function of the digestive system and differentiate between organs of the alimentary canal and accessory digestive organs	A, C	
• List and briefly describe the major processes occurring during digestive system activity	C	
• Explain how villi aid digestive processes in the small intestine	B, C	
• Describe the anatomy and basic function of each organ and accessory organ of the alimentary canal	C	
• Name the deciduous and permanent teeth and describe the basic anatomy of a tooth	C	
• Describe the composition and functions of saliva and explain how salivation is regulated	C	
• Describe the mechanism of chewing and swallowing	C	
• Explain how gastric secretion and motility in the stomach are regulated	C	
• Describe the function of local hormones in the digestive process	C	
• State the roles and tell how bile and pancreatic juice are regulated in the small intestine	B, C	
• List the major functions of the large intestine and describe the regulation of defecation	C	
• List the major enzymes or	B, C	

enzyme groups produced by the digestive organs or accessory glands and name the foodstuffs on which they act and the end products of protein, fat, carbohydrate, and nucleic acid digestion		
• List the six major nutrient categories and note important dietary sources and the main cellular uses of each	B, C	
• Define metabolism and explain the difference between catabolism and anabolism	C	
• Analyze and explain the chemical reactions that provide energy for the body. Identify the means, including the structure and function of the digestive system by which energy is processed and stored within the body	A, B, C	
• Explain the importance of energy balance in the body and indicate consequences of energy imbalance	B, C	
• Define basal metabolic rate and total metabolic rate and name several factors that influence each	B, C	
• Describe how body temperature is regulated and indicate the common mechanisms regulating heat production/retention and heat loss from the body	B, C	
• Analyze the effects of energy deficiencies in malabsorption disorders and name important congenital disorders of the digestive system and	A, B, C, F	

significant inborn errors of metabolism		
Labs/Activities-Digestive & Metabolism		
• Multimedia enabling the student to visualize the physiology of the digestive system and metabolic processes	A, C, E, F, G	5.1, 5.3
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real-world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
• Observations/dissections of preserved digestive system specimens	A, C, F	3.5, 4.1, 4.2, 6.2
• Examining parts of the digestive system microscopically using prepared slides	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Experimentation in which the process and products are found when protein, carbohydrates, and lipids are broken down	A, B, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Observation and classification of movements and sounds of digestion	A, C	1.1, 2.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8
• Mathematically calculate basal metabolic rate	A, C, E	3.3, 5.1, 5.3
Suggested Labs & Activities		
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 25-Activities 1-12	A, C, E, F, G	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 5.1, 5.3
Anatomy & Physiology Revealed software-Volume 4	A, C, E, F, G	5.1, 5.3
Anatomy & Physiology Coloring Workbook-Chapter 14-The Digestive System and Body Metabolism	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8

MAVCC-Anatomy and Physiology Module Set II-Module 12: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Urinary System		
• Describe the anatomy of the kidney and its coverings	C	
• Trace the blood supply through the kidney	C	
• Identify the parts of the nephron responsible for filtration, reabsorption, and secretion and describe the mechanisms underlying each of these functional processes	A, B, C	
• Describe the normal physical and chemical properties of urine	B, C	
• List several abnormal urine components and name the condition when each is present in detectable amounts	A, B, C, E	
• Describe the general structure and function of the ureters, bladder, and urethra	C	
• Compare the course, length, and functions of the male urethra with those of the female	C	
• Define micturition and describe the micturition reflex	C	
• List the factors that determine body water content and describe the effect of each factor	B, C, E	
• Compare and contrast the relative speed of buffers, the respiratory system, and the kidneys in maintaining the acid-base balance of the blood	B, C	

• Describe some congenital problems and explain the effect of aging of the urinary system	C, E, F	
Labs/Activities-Urinary System		
• Observation/dissection of preserved specimen	A, C, F	3.5, 4.1, 4.2, 6.2
• Multimedia enabling the student to visualize the physiology of the digestive system and metabolic processes	A, C, E, F, G	5.1, 5.3
• Examining the nephron microscopically via prepared slides	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5
• Creating a model of the human urinary tract with an understanding of the function of all its components	A, C	5.1, 5.3
• Conduct urinalysis testing on known and unknown samples of urine	A, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Conduct dialysis testing	A, B, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Perform glucose analysis on urine	A, B, C	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3
Suggested Labs & Activities		
Anatomy & Physiology Revealed software-Volume 4	A, C, E, F, G	5.1, 5.3
Anatomy & Physiology Coloring Workbook-Chapter 15-The Urinary System	A, B, C	1.1, 1.3, 2.1, 2.2, 4.1, 4.2, 4.3, 4.4, 4.5, 4.8
Essentials of Human Anatomy & Physiology Laboratory Manual: Exercise 26-Activities 1-	A, B, C, E	1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5

3		
Zoologik System of Human Anatomy in Clay: Lesson J-Urinary System	A, C, E	5.1, 5.3
MAVCC-Anatomy and Physiology Module Set II-Module 13: Assignment 1	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
Reproductive System		
• Describe the common function of the male and female reproductive systems	C	
• Using a model or diagram, identify the organs and accessory organs of the male and female reproductive systems and discuss the general function of each	C	
• Know the process of meiosis to the extent of comparing and contrasting it to mitosis	B, C	
• Outline the process of spermatogenesis	C	
• Discuss hormonal regulation of testicular function and the physiological effects of testosterone on male reproductive anatomy	B, C	
• Trace the pathway of sperm cells from their site of formation to the body exterior	C	
• Describe the phases of the ovarian cycle and relate them to events of oogenesis	C	
• Describe how hormones control the activities of female reproductive organs and the development of female secondary sex characteristics	B, C	
• Discuss the structure and function of the mammary	C	

glands		
• Describe the process of fertilization and the changes of the female body during pregnancy	C	
• Understand the major functions of the placenta	C	
• Explain how labor is initiated and describe the three stages of labor	C	
• Describe the stages of human embryology and gestation including investigation of gestational and congenital disorders	C, E, F	
• Discuss several agents that can interfere with normal fetal development	C, E, F	
• Distinguish among the modes of inheritance and describe the events that lead to genetic variability of gametes	C, E	
• List and explain several techniques used to determine or predict genetic diseases	C, E	
Labs/Activities-Reproductive System		
• Case study exercises in which students formulate explanations and design controlled experimental procedure to resolve real- world dilemmas	A, B, C, F, G	4.1, 4.2, 4.5, 4.6,4.7, 5.1, 5.2, 5.3
• Multimedia enabling the student to visualize the physiology of the digestive system and metabolic processes	A, C, E, F, G	5.1, 5.3
• Microscopic examination of prepared slides of sperm cells and ovarian tissue	A, C, E	1.1, 1.2, 1.3, 3.1, 3.4, 3.5

Medicine and Biosciences (MED)

Pre-Calculus

COURSE DESCRIPTION: My goal is to prepare students for a High school level Calculus class. To achieve this goal, students will need to demonstrate an understanding of the concepts of functions, vectors, matrix transformations, sequences and series, and triangle trigonometry and use them in solving problems.

Pre-Calculus Objectives

Objective	OK C³ Standards
The Complex Number System	
Perform arithmetic operations with complex numbers	N.NC.3
Represent complex numbers and their operations on the complex plane.	N.NC.4, N.NC.5, N.NC.6
Vector and Matrix Quantities	
Represent and model with vector quantities.	N.VM.1, N.VM.2, N.VM.3
Perform operations on vectors.	N.VM.4a, b, c; N.VM.5a, b
Perform operations on matrices and use matrices in applications.	N.VM.6, N.VM.7, N.VM.8, N.VM.9, N.VM.10, N.VM.11, N.VM.12
Reasoning with Equations and Inequalities	
Solve systems of equations	A.REI.8, A.REI.9
Interpreting Functions	
Analyze functions using different representations	F.IF.7, F.IF.7d
Building Functions	
Build a function that models a relationship between two quantities	F.BF.1, F.BF.1c
Build new functions from existing functions	F.BF.4b,c,d; F.BF.5
Trigonometric Functions	
Extend the domain of trigonometric functions using the unit circle.	F.TF.3, F.TF.4
Model periodic phenomena with trigonometric functions	F.TF.6, F.TF.7, F.TF.9

Pre-Calculus Objectives

Expressing Geometric Properties with Equations	
Translate between the geometric description and the equation for a conic section.	G.GPE.3
Geometric Measurement and Dimension	
Explain volume formulas and use them to solve problems.	G.GMD.2
Using Probability to Make Decisions	
Calculate expected values and use them to solve problems	S.MD.1, S.MD.2, S.MD.3, S.MD.4
Use probability to evaluate outcomes of decisions	S.MD.5a, b
Standards for Mathematical Practice	
Make sense of problems and persevere in solving them.	
Reason abstractly and quantitatively.	
Construct viable arguments and critique the reasoning of others.	
Model with mathematics.	
Use appropriate tools strategically.	
Attend to precision.	
Look for and make use of structure.	
Look for and express regularity in repeated reasoning.	

Application for Focused Field of Career Study
Oklahoma State Board of Education

Plan of Study
and
Course Descriptions

Tri County Technology Center
6101 SE Nowata Road
Bartlesville, OK 74006

MEDICINE AND BIOSCIENCES PROGRAM PLAN OF STUDY AND COURSE DESCRIPTION

PROGRAM PLAN OF STUDY

HS YEAR	MEDICINE COURSE	MATHEMATICS	SCIENCE
Sophomore	Principles of the Biomedical Sciences; Human Body Systems	Pre-AP Geometry; or Pre-AP Algebra II	Pre AP Chemistry; Pre AP Anatomy and Physiology
Junior	Medical Interventions	Pre-AP Algebra II; or Pre-AP-Trig/Pre-Calculus	AP Chemistry; Pre-AP or AP Physics
Senior	Biomedical Innovations	AP Calculus AB	Microbiology

MEDICINE AND BIOSCIENCES COURSE DESCRIPTIONS

The Medicine and Biosciences courses have been developed, in conjunction with higher education and industry, by Project Lead The Way (PLTW), a non-profit organization. Additional information about PLTW and the Medicine and Biosciences curriculum is available at www.pltw.org.

FOUNDATION COURSES

- **Principles of the Biomedical Sciences (PBS)**
  - Students investigate various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They determine the factors that led to the death of a fictional person, and investigate lifestyle choices and medical treatments that might have prolonged the person's life. The activities and projects introduce students to human physiology, medicine, and research processes. This course provides an overview of all the courses in the Biomedical Sciences program and lays the scientific foundation for subsequent courses. This course is designed for 9th or 10th grade students.
- **Human Body Systems (HBS)**
  - Students examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis. Students design experiments, investigate the structures and functions of the human body, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration. Exploring science in action, students build organs and tissues on a skeletal manikin, work through interesting real world cases and often play the roles of biomedical professionals to solve medical mysteries. This course is designed for 10th, 11th or 12th grade students.

- **Medical Interventions (MI)**
  - Students investigate a variety of interventions involved in the prevention, diagnosis and treatment of disease as they follow the life of a fictitious family. The course is a "How-To" manual for maintaining overall health and homeostasis in the body. Students explore how to prevent and fight infection; screen and evaluate the code in human DNA; prevent, diagnose and treat cancer; and prevail when the organs of the body begin to fail. Through these scenarios, students are exposed to a range of interventions related to immunology, surgery, genetics, pharmacology, medical devices, and diagnostics. This course is designed for 11th or 12th grade students.

Capstone Course

- **Biomedical Innovation (BI)**
  - Students design innovative solutions for the health challenges of the 21st century. They work through progressively challenging open-ended problems, addressing topics such as clinical medicine, physiology, biomedical engineering, and public health. They have the opportunity to work on an independent project with a mentor or advisor from a university, hospital, research institution, or the biomedical industry. Throughout the course, students are expected to present their work to an audience of STEM professionals. This course is designed for 12th grade students.

ACADEMIC COURSE DESCRIPTIONS

Algebra II - This course is intended to provide the mathematical background needed for Algebra 2. The text integrates graphing technology into the course without losing the underlying mathematics, which is the crucial issue. Students have ample opportunities, through discovery-based activities, to explore algebraic concepts, and then reach closure and assure their understanding by reviewing examples and formalizing theorems. Mathematics is presented in an informal manner that stresses meaningful motivation, careful explanations, and numerous examples, with an ongoing focus on real-world problem solving.

AP Biology – This course is intended to be the equivalent to two semesters of college introductory biology taken by students majoring in a biological science. AP Biology differs from regular high school biology through use of a college-level text, a greater range and depth of topics covered, a faster pace of instruction, more sophisticated lab work done by students, and more time and effort required of students in order to succeed in the course. The main goals of this course are to help students develop a conceptual framework for modern biology and an appreciation of science as a process.

AP Calculus - A college preparatory course that offers extreme rigor in a specialized field of study. It will enable the student to be successful on the Advanced Placement AB Calculus exam and/or in college calculus. The course will include the study of limits, differentiation, and basic integration techniques. An emphasis will be placed on real world applications as they relate to the various medical fields as well as development of problem-solving skills.

AP Physics - A college level course that uses advanced algebra and trigonometry as the primary tools for problem solving. The course covers topics in mechanics, energy, waves, thermodynamics, electricity, magnetism, optics, quantum theory, and nuclear physics. Students will be prepared to take the AP Physics B exam at the end of the school year.

Geometry - This course is intended to provide the mathematical background needed for geometry. The text integrates graphing technology into the course without losing the underlying mathematics, which is the crucial issue. Students have ample opportunities, through discovery-based activities, to explore geometric concepts, and then reach closure and assure their understanding by reviewing examples and formalizing theorems. Mathematics is presented in an informal manner that stresses meaningful motivation, careful explanations, and numerous examples, with an ongoing focus on real-world problem solving.

Trigonometry/Pre-Calculus - This course is intended to provide the mathematical background needed for calculus. The text integrates graphing technology into the course without losing the underlying mathematics, which is the crucial issue. Mathematics is presented in an informal manner that stresses meaningful motivation, careful explanations, and numerous examples, with an ongoing focus on real-world problem solving.

APPLICATION AND ENROLLMENT INFORMATION

About the Medicine and Biosciences Program
The Medicine and Biosciences Program offers high school students a broad overview of medicine and bioresearch related fields and processes along with rigorous math and science classes.

School Day Structure
Students attend one-half of the school day (either morning or afternoon) at their high school and the other one-half of the day at Tri County Technology Center. Transportation is provided between Tri County and the student's high school.

Extracurricular Activities
In addition to activities at the home high school, Medicine and Biosciences Program students are active in HOSA (Health Occupations Students of America). This national organization provides opportunities for students to participate in leadership activities, competitions, and additional learning activities. Participation is encouraged, but is not required.

Student Qualifications
• Candidates are at, or above, grade level in reading and mathematics and demonstrate a high interest and/or aptitude in math, science, and technology fields.

• Candidates must secure a recommendation from a science, mathematics, or technology teacher.

• Candidates must have passed eighth grade state tests in reading and mathematics and have a minimum of 3.0 overall GPA.

• Candidates must be at least of sophomore status before starting in the Medicine and Biosciences Program.

Enrollment Procedures
1. Candidates complete an application for enrollment and submit the application by the specified deadline.

2. Eligibility is verified and pertinent school records including transcripts and any standardized test scores are attached to the application.

3. Applications are reviewed and scored.

4. Recommended candidates and their parents are contacted for a personal interview at Tri County Technology Center.

5. Applicants are informed if they are selected for enrollment.

6. Selected candidates begin courses in the Medicine and Biosciences Program.

*career*tech

Project Lead The Way (PLTW) Biomedical Sciences Academy
2 year Program (Juniors & Seniors)

Block Scheduling: 2-85 minute classes per semester
4 classes/year or A/B Block

Course	Hours
First Year	
PLTW Principles of Biomedical Science (8706)	120
Advanced Mathematics: Geometry (4520), Algebra II (4412), Trigonometry/Pre-Calculus (4750/4611), Pre-AP Calculus (4612)	120
Advanced Laboratory Science: Pre-AP Chemistry (5051), Pre-AP Physics (5211), AP Chemistry (5055), AP Physics B (5215), AP Biology (5035), AP Environmental (5121), Anatomy/Physiology (5333/5220)	120
PLTW Human Body Systems (8707)	120
Second Year	
PLTW Medical Interventions (8708)	120
Advanced Mathematics: Trigonometry/Pre-Calculus (4750/4611), Pre-AP Calculus (4612), AP Calculus AB (4615), AP Calculus BC (4616), AP Statistics (4760)	120
Advanced Science: Pre-AP Chemistry (5051), Pre-AP Physics (5211), AP Chemistry (5055), AP Physics B (5215), AP Biology (5035), AP Environmental (5121), Anatomy/Physiology (5333/5220)	120
PLTW Biomedical Innovations (8719)	120
Total—8 Courses	**960**

Anatomy/Physiology (5333/5220)	
PLTW Medical Interventions (8708) or Advanced Science: Pre-AP Chemistry (5051), Pre-AP Physics (5211), AP Chemistry (5055), AP Physics B (5215), AP Biology (5035), AP Environmental (5121), Anatomy/Physiology (5333/5220)	120
Third Year	
PLTW Medical Interventions (8708) or Advanced Science: Pre-AP Chemistry (5051), Pre-AP Physics (5211), AP Chemistry (5055), AP Physics B (5215), AP Biology (5035), AP Environmental (5121), Anatomy/Physiology (5333/5220)	120
Advanced Mathematics: Pre-AP Calculus (4612), AP Calculus AB (4615), AP Calculus BC (4616), AP Statistics (4760)	120
Advanced Science: Pre-AP Chemistry (5051), Pre-AP Physics (5211), AP Chemistry (5055), AP Physics B (5215), AP Biology (5035), AP Environmental (5121), Anatomy/Physiology (5333/5220) Microbiology (only in final year-no OHLAP credit) (5336)	120
PLTW Biomedical Innovations (8719)	120
Total—12 Courses	**1440**

SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS PATHWAY: SCIENCE AND MATHEMATICS This plan of study can serve as a guide, along with other career planning materials, as learners work to achieve their career goals. Courses listed within this plan are options for recommended coursework. This plan should also be customized with the educational institution's specific course titles and meet college ready/work ready requirements. Educational levels to be considered (check all that apply): ___ On-the-job training ___ Apprenticeship ___ Military Training

___ Associate Degree ___ Bachelor Degree ___ Professional Degree ___ Certificate/License

Science, Technology, Engineering and Mathematics – Science and Mathematics Pathway

NOTE: Interest Inventory Administered and Interpreted Tentative Plan of Study intended for all learners.

Grade Level	English/ Language Arts	Math	Science	Social Studies/ Sciences	Career and Technology Education (CTE) Majors *Tentative majors here to be in addition to course information	Other Elective and Required Courses
			HIGH SCHOOL / TECHNOLOGY CENTER			
S E C O N D A R Y 9 → 10 → 11 → 12	English/LA I English/LA II English/LA III English/LA IV	Algebra I Geometry Algebra II Trigonometry or other upper level math courses: Pre-Calculus Calculus Statistics	Biology I Chemistry Physics (Upper division lab sciences)	Oklahoma History American History U.S. Government Economics Geography World History	*Biotech Medical *Biotech Ag *Biotech Pharmaceutical *Biotech Environmental *Biomedical Science and Engineering *Biomedical Science and Medicine *Medical Safety & Analysis Lab Science Technician *Laboratory Science Technician "Laboratory Science Assistant *Environmental Safety & Analysis Laboratory Science Technician *Industrial Safety & Analysis Laboratory Science Technician NOTE: Cooperative Alliance courses may be listed here	Computer Technology or Foreign Language Fine Arts or Speech Financial Literacy Additional courses to support career goal Intro to Horticulture Intro to Plant and Soil Science Intro to Environmental Science and Natural Resources Microbiology Geodics Zoology Additional math and science, including AP classes
			COLLEGE/ UNIVERSITY			
P O S T - S E C O N D A R Y 13	-English Comp I -English Comp II	-College Algebra or Trigonometry -Calculus I & II	-Chemistry -Physics	-Psychology -Global Issues	-Science and Mathematics in the Real World -Advanced Applications of Science and Mathematics	**TECHNOLOGY CENTER** NOTE: Attainment of a CTE major at a technology center may be completed as a high school student or an adult. Career Major courses may count for college credit.
14	-Speech/Oral Communications -Professional and Technical Writing	-Intro to Differential Equations -Calculus III -Statistics	-Organic chemistry -Microbiology	-American History - Sociology -Ethics and Legal Issues	-Using Science and Mathematics to Solve Problems -Technical Aspects of Science and Mathematics	
15	Continue courses in your area of specialization					NOTE: Use the postsecondary institution's degree plan to help customize the learner's plan with regard to degree, licenses, certification, etc.
16	Complete Science and Mathematics Major (4-year degree program)					

Opportunities for experience/training for high school or postsecondary learner:
___ Career and Technology Education student organization ___ Internship/work study ___ Mentorship
___ Part-time employment ___ Volunteer work in charitable/community organizations ___ Job shadowing
___ Work based/work site learning

(Learner Signature) _____ (Parent/Guardian Signature) _____ (School Official Signature) _____
Dates: Freshman review _____ Sophomore review _____ Junior Review _____ Senior Review _____ Grade 13 review _____ Grade 14 review _____
Sample plan adapted from States Career Clusters Initiative Pathway Plans of Study.

Academic/Career Advisement Provided

SAMPLE OCCUPATIONS
- Analytical Chemist
- Anthropologist
- Applied Mathematician
- Archeologist
- Astronomer
- Astrophysicist
- Atmospheric Scientist
- Biologist
- Botanist
- Chemist
- Ecologist
- Economist
- Environmental Scientist
- Geneticist
- Geologist
- Geophysicist
- Marine Scientist
- Math Teacher
- Mathematician
- Meteorologist
- Microbiologist
- Nuclear Chemist/Technician
- Physicist
- Programmer
- Quality-Control Scientist
- Research Technician
- Science Teacher
- Scientist
- Statistician
- Zoologist

Application for Focused Field of Career Study
Oklahoma State Board of Education

**Documentation that Mathematics and Science Teachers
are Certified in the Subject They Teach**

Tri County Technology Center
6101 SE Nowata Road
Bartlesville, OK 74006

Karen Dillard
4900 Killdee Road • Talala, OK 74080
918-638-0580

QUALIFICATIONS:

- Bachelor of Science, Mechanical Engineering, 1981
- Certified Teacher, State of Oklahoma – Algebra, Analysis (Trigonometry), Calculus, General Mathematics, Geometry, Math Middle School, Anatomy/Physiology, Biology, Botany, Chemistry, Earth Science, General Science, Physical Science, Physics, and Zoology
- Engineering experience (approximately five years), managerial experience (approximately two years), excellent organizational, analytical and planning skills (designed and implemented Summer Algebra Camp for grades 7-12 providing skills individualized instruction based on academic need
- Skilled in verbal and written communication including public speaking, persuasion and team coordination. Extensive experience in mentoring, including academic tutoring, study and planning skills. Highly motivated self-starter, quick learner, dependable, and flexible.

TEACHING EXPERIENCE:

Tri County Technology Center (TechWorks Academy)   August 2008 to current
Math and Science Teacher

Subjects taught:
- Algebra I & II
- Geometry
- Physical Science
- Biology I & II
- Chemistry

Facilitator for:
- Various Real-life Math and Science related projects
- Dissection involved in Physiology and Anatomy
- Support for High School and College level Math

Oologah-Talala Public Schools   August 1999 to August 2008
Math and Science Teacher

Subjects taught:
- Seventh and Eight grade Science
- Science Explorations (self-developed hands-on curriculum intended to increase student interest in science and awareness of science-related careers.)
- Career Explorations (a hands-on class where students explore different careers and job skills, colleges, universities, and trade schools)
- Seventh and Eight grade Mathematics
- Algebra I and Pre-Algebra
- High School Ecology
- Honors Zoology

Johnson-O-Malley Tutor
    Subjects taught: All area of Math and Science, Study Skills and Reading

Substitute Teacher – Middle School through High School
    Tutored all subject areas from 1997 – 1999 for Quarterback Club (employed by Booster
    Club to provide help for High School football players needing academic assistance)

Summer Algebra Camp – 1997-2001 (self-designed program to remediate students in Targeted
    areas of individual need)

Sylvan Learning Center (Owasso)   2005 - 2008
Tutor
    Subjects taught: Math, Reading, Algebra, Geometry, ACT prep, study skills, homework
    support

Rogers State University (Bartlesville campus)   Summer 1989
Adjunct Faculty
    Subjects taught: Intermediate College Algebra

ENGINEERING EXPERIENCE:
Oil Dynamics Incorporated (Tulsa)   1984 - 1986
    Submersible Pump Company. Responsibilities included design and implementation of test
    and assembly fixturing, package design for worldwide shipping, as well as evaluation of
    pump components with recommendations for improvement.

Lee C. Moore Corporation   1981 - 1984
    First Company to design and manufacture cantilever mast type drilling rig. Responsible for
    drilling rig design (on shore cantilever mast and offshore derrick), taught Drilling
    Technology School for LCM (Odessa, TX).

ORGANIZATIONS:
PTA President   1994 - 1996
    Provided funding for classroom, teacher and student needs (over $10,000 raised)
Girl Scout Leader (Magic Empire Council)   1996 - 1999
Private Tutoring   1994 to present
    All math, science, reading, study skills, through college level
Honors – Who's Who Among American Teachers   1994 - 1996
National Education Association, Oklahoma Education Association   1999 - 2008
Pastor's Staff – Fellowship Community Church   2003 - current

EDUCATION:
Geneva College (Beaver Falls, PA)   1981
    Bachelor of Science, Mechanical Engineering (Minor Math)
Parkway West Area Vocational Technical School   1975 - 1976
Center Area High School (Center Township, PA)   Graduated 1977
    National Honor Society; Graduated top 10% of class
Continued Education
    Accounting and Geology, University of Tulsa; Educating the Exceptional Child and Methods
    of Teaching, NSU at Tulsa/Rogers State University

Oklahoma State

Department of Education

Teaching Certificate

The State Board of Education certifies and authorizes

KAREN L. DILLARD

to serve in the accredited schools of Oklahoma as indicated below:

Description	Level	Valid From	Valid To
ALGEBRA	7-12	07/01/2007	06/30/2012
ANALYSIS	7-12	07/01/2007	06/30/2012
CALCULUS	7-12	07/01/2007	06/30/2012
GENERAL MATHEMATICS	7-12	07/01/2007	06/30/2012
GEOMETRY	7-12	07/01/2007	06/30/2012
MATH MIDDLE SCHOOL	6-7-8	07/01/2007	06/30/2012
ANATOMY/PHYSIOLOGY	7-12	07/01/2007	06/30/2012
BIOLOGY	7-12	07/01/2007	06/30/2012
BOTANY	7-12	07/01/2007	06/30/2012
CHEMISTRY	7-12	07/01/2007	06/30/2012
EARTH SCIENCE	7-12	07/01/2007	06/30/2012
GENERAL SCIENCE	7-12	07/01/2007	06/30/2012
PHYSICAL SCIENCE	7-12	07/01/2007	06/30/2012
PHYSICS	7-12	07/01/2007	06/30/2012
ZOOLOGY	7-12	07/01/2007	06/30/2012
********************* NO ENTRIES BELOW THIS LINE *********************			

Teacher #: 199176 L

Date: 04/16/2007

Degree: BACHELORS 05/11/1981

Class of Certification: STANDARD

State Superintendent of Public Instruction

Jason Godfrey

414 Steadway Ave. Dewey, OK. 74029 918-332-0995 jasong0820@gmail.com

Objective

Advanced Math, Science, and Engineering Instructor

Experience

Pre-Engineering Academy Instructor
August 2008-Present Tri County Technology Center, Bartlesville, OK
- Currently teach Digital Electronics, Principles of Engineering
- Currently teach AP Calculus AB
- Currently teach Physics

Mathematics & Engineering Instructor
August 1999-May 2007 Grandview High School, Grandview, MO
- Taught all levels of mathematics and engineering
- School's Teacher of the Year 2002
- Wrote multiple common assessments for Mathematics Department
- Member of Instructional Committee that developed and implemented teacher inservicing
- Coached several different sports

Education

Kansas State University, Manhattan, KS
August 1994 – August 1999
- Bachelor of Science, Secondary Education Mathematics

Affiliations

Project Lead the Way Digital Electronics Master Teacher 2008-present
Core Training Institute Instructor in 2009 and 2010
Nationally Board Certified Teacher – 2010
ACT Prep Course Instructor – 2010-2012
Sat on McDougall Littell's Kansas City Textbook Review Committee
Forty-two hours of postgraduate credit

References

References are available on request.

Oklahoma State Department of Education Teaching Certificate

The State Board of Education certifies and authorizes JASON W. GODFREY to serve in the accredited schools of Oklahoma as indicated below.

Teacher #: 237255

Degree: Bachelor's Degree

Area Description	Level	Valid	Expire
5550 ADVANCED MATHEMATICS	6-12	3/1/2010	6/30/2015
5555 MATH FOR HIGH SCHOOL CREDIT	5-8	3/1/2010	6/30/2015
6015 PHYSICS	6-12	3/1/2010	6/30/2015

••••••••••NO ENTRIES BELOW THIS LINE••••••••••

Class: Standard

Print Date: 3/11/2010

Area Description	Level	Valid	Expire
2910 PHYSICAL EDUCATION/HEALTH/SAFETY	PK-12	3/1/2010	6/30/2015
5549 INTERMEDIATE MATHEMATICS	6-12	3/1/2010	6/30/2015

••••••••••NO ENTRIES BELOW THIS LINE••••••••••

State Superintendent of Public Instruction

Kendall W. Baker
2508 SE Williamsburg St.
Bartlesville, OK 74006
(918) 333-6569

Certifications:

Superintendent	Secondary Principal
Algebra	Analysis
Calculus	Computer Science/Applications
General Mathematics	Geometry
Statistics	Trigonometry
Math Middle School	

Experience:

7/09 – Present

Tri-County Technology Center, Bartlesville, Oklahoma
PLTW Math Instructor/Aerospace Instructor/POE Instructor
Responsibilities
- Develop curriculum and syllabi
- Direct students toward program completion
- Manage program budget
- Manage FIRST Robotics program
- Prepare students for college entrance in engineering

7/00 – 7/09

Tri-County Technology Center, Bartlesville, Oklahoma
Math Instructor
Responsibilities
- Set standards for positive student behavior
- Develop curriculum and syllabi
- Direct students toward program completion
- Manage program budget
- Develop strategies for online testing/survey
- Mentor new instructors
- Teach Math Analysis and trade specific math

7/97 – 7/99

Tri-County Technology Center, Bartlesville, Oklahoma
STAR Program Instructor
Responsibilities
- Instructed students in the areas of Math and Science
- Coordinated field trips and events
- Created STAR program graduation
- Facilitated Advisory Board meetings

8/95 – 6/97	**Tri-County Technology Center, Bartlesville, Oklahoma**
	JOBS Program – Project Challenge Instructor
	Responsibilities

- Designed secretarial program certificate
- Taught students computer skills
- Assessed performance on GED exam

Education:

August 2003	Oklahoma State University, Tulsa Oklahoma
	Masters of Curriculum and Instruction

May 1995	Northeastern State University, Tahlequah, Oklahoma
	Bachelor of Science, Mathematics

Associations:

Tri County Technology Center Education Association
Oklahoma Association for Career and Technical Education – STEM
Oklahoma Association Alternative Education Association
National Association of Parliamentarians
Nazarene Educators Worldwide

Committees:

Health and Fitness Committee
Bartlesville First Church of the Nazarene Board Member
Bartlesville First Church of the Nazarene Finance Committee Chair

Additional Certificates:

North Central Association Team Chair and Team Member Trained
TABE Test Administrator
Ability-To-Benefit Test Administrator
PLTW Aerospace pre-engineering
PLTW POE pre-engineering
AP Math Certified

Activities:

Youth Sponsor
Angel Food Ministries
Proctor Tests for Rogers State University
FIRST Robotics Mentor
Proctor ACT Test
Tutor

Oklahoma State Department of Education Teaching Certificate

The State Board of Education certifies and authorizes KENDALL W. BAKER to serve in the accredited schools of Oklahoma as indicated below.

State Superintendent of Public Instruction

Teacher #: 197760

Degree: Master's Degree

Class: Standard

Print Date: 6/30/2009

Area Description	Level	Valid	Expire
5501 ALGEBRA	7-12	5/1/2009	6/30/2014
5505 CALCULUS	7-12	5/1/2009	6/30/2014
5509 GENERAL MATHEMATICS	7-12	5/1/2009	6/30/2014
5515 STATISTICS	7-12	5/1/2009	6/30/2014
5517 TRIGONOMETRY	7-12	5/1/2009	6/30/2014
5575 MATH	0-8	5/1/2009	6/30/2014

············NO ENTRIES BELOW THIS LINE············

Area Description	Level	Valid	Expire
6301 SUPERINTENDENT	PK-12	5/1/2009	6/30/2014
6303 SECONDARY PRINCIPAL	6-12	5/1/2009	6/30/2014
5503 ANALYSIS	7-12	5/1/2009	6/30/2014
5507 COMPUTER SCIENCE/APPLICATIONS	7-12	5/1/2009	6/30/2014
5511 GEOMETRY	7-12	5/1/2009	6/30/2014

············NO ENTRIES BELOW THIS LINE············

Sammie 'Renee' Tanner

ADDRESS
3560 US Highway 60
Bartlesville, OK
74006

PHONE
918.440.1274

EMAIL
rtanner@tctc.org

Profile

- Honest and dependable
- People-oriented
- Highly organized
- Dedicated

Experience

PRE-ENGINEERING & SCIENCE INSTRUCTOR,   2010-PRESENT

TRI COUNTY TECHNOLOGY CENTER-BARTLESVILLE, OK
Provide instruction in compliance with PLTW & OSDE curriculum

HIGH SCHOOL SCIENCE INSTRUCTOR,   1999-2010

PAWHUSKA PUBLIC SCHOOLS-PAWHUSKA, OK
Provide instruction in compliance with OSDE curriculum

SECONDARY SCIENCE INSTRUCTOR,   1992-1999

BARTLESVILLE MID-HIGH SCHOOL-
Provide instruction in compliance with OSDE curriculum

SECONDARY SCIENCE INSTRUCTOR,   1990-1992

LAWTON HIGH SCHOOL
Provide curriculum in compliance with OSDE curriculum

SECONDARY SCIENCE INSTRUCTOR,   1987-1998

OKMULGEE JR HIGH-OKMULGEE, OK
Provide instruction in compliance with OSDE curriculum

Education

NORTHEASTERN STATE UNIVERSITY,   1987
Bachelor's Degree-Secondary Science Education

CONNORS STATE COLLEGE,   1985
Associate's Degree

Certifications

CERTIFIED OSDE STANDARD CERTIFICATE #159485

PLTW CERTIFICATION-BIOTECHNICAL ENGINEERING

PLTW CERTIFICATION-INTRODUCTION TO ENGINEERING DESIGN

Oklahoma State Department of Education Teaching Certificate

The State Board of Education certifies and authorizes

SAMMIE ROSE TANNER

to serve in the accredited schools of Oklahoma as indicated below.

Code	Description	#	I	M D Y	M D Y	Code	Description	#	I	M D Y	M D Y
6001	ANATOMY/PHYSIOLOGY	1	1	1960301080630 13	6003	6003	BIOLOGY	1	1	1960301080630 13	
6011	GENERAL SCIENCE			19603010806630 13	6013	6013	PHYSICAL SCIENCE			1960301080630 13	
6017	ZOOLOGY			19603010806630 13	6075	6075	SCIENCE MID SCHOOL			3950301080630 13	

*************** NO ENTRIES BELOW THIS LINE ***************************

Teacher #:   159485 L
Degree: BACHELORS
             05/13/1987
Class: STANDARD
Print Date: 03/25/2008