PROGRAM OUTCOMES

(QUALITY SCHOOL INTERNATIONAL)

SCIENCE

(June 2017)

The Science program of Quality Schools International is related to the following Exit Outcomes:

I. Success Orientations -

- •Trustworthiness
- •Responsibility
- •Concern for Others
- •Kindness/Politeness
- •Group Interaction
- •Aesthetic Appreciation
- •Independent Endeavor

II. Competencies -

- •Verbal and Written Communications Skills
- •Numeracy and Mathematical Skills
- •Psychomotor Skills
- •Thinking and Problem Solving Skills
- •Decision Making and Judgment Skills

III. Knowledge -

- •English/Literature
- •Mathematics
- •Science
- •Personal Health and World Environmental Issues

There are two basic divisions of the science program of Quality Schools International, as follows:

I. **Elementary Science** - normally engaged beginning in the 5-year-old class and completed in the 13-year-old class. Elementary Science is divided into three areas: Life Science, Physical Science and Earth Science. Integrated courses of study of the three science areas are developed which are appropriate for each age level from the 5-year-old through the 11-year-old classes. The 5-year-old through the 11-year-old courses consist of five Essential units and one or two Selective Units. The 12- and 13-year-old classes may alternate by year between Earth Science and Life Science. The 12- and 13-year-old classes consist of 10 Essential units and one Selective Unit. Environmental issues are emphasized throughout the program.

II. **Secondary Science** – eleven courses form this division:

- **To qualify for the secondary graduation Academic Diploma, each student is normally required to attain mastery of at least thirty unit outcomes in the Science program including the essential outcomes of Physical Science and Biology. Mastery of at least twenty unit outcomes is required to qualify for the secondary graduation General Diploma.**

- **Physical Science** - normally engaged in the first or second year secondary. Mastery of the essential unit outcomes of elementary reading and language arts at the 13-year-old class level and of science at the 13-year-old class level must be demonstrated as prerequisites for entry. **This course is a graduation requirement for students pursuing the academic diploma**. The content is as follows:
    - Measurement, properties, and atomic theory
    - Kinetic theory
    - Phases of matter
    - Chemical processes
    - Carbon chemistry
    - Nuclear chemistry
    - Motion, force, and machines
    - Fluids, solids, and work
    - Heat, engines, and waves
    - Light and optics
    - Electricity and magnetism

- **Biology** - normally engaged in the first or second year secondary. Mastery of the essential unit outcomes of elementary reading and language arts at the 13-year-old class level, of elementary mathematics at the 13-year-old class level, and of elementary science at the 13-year-old class level must be demonstrated as prerequisites for entry. **This course is a graduation requirement for students pursuing the academic diploma**. The content can be summarized as follows:
    - Nature Of Life
    - Cell Biology And Processes
    - Genetics
    - Evolution
    - Classifying Organisms.
    - Ecology
    - Human and Animal Body Systems
    - Science Fair

- **Chemistry** - normally engaged in the third or fourth year secondary. Mastery of the essential unit outcomes of Writing I, Algebra and Physical Science must be demonstrated as prerequisites for entry. The content is as follows:
    - Properties of matter
    - Atomic theory and bonds
    - The Periodic Law
    - Chemical reactions

- The Mole
- Stoichiometry
- States of Matter
- Solution Chemistry
- Chemical Equilibrium
- Oxidation, Reduction and Electrochemistry

- **Physics** - normally engaged in the third or fourth year secondary. Mastery of the essential unit outcomes of Physical Science and Advanced Mathematics I must be demonstrated as prerequisites for entry. The content is as follows:
  - Linear motion
  - Momentum and Energy
  - Rotational Motion and Gravitation
  - Heat
  - Sound
  - Electricity and Magnetism
  - Light and Color
  - Light Emission and Quanta
  - Atomic and Nuclear Physics
  - Relativity

- **Discovery Science** - normally engaged in the first year secondary, this course combines life and physical science. Mastery of the essential unit outcomes of 13-year-old science, reading, and language arts must be demonstrated as prerequisites for entry. The content is taken from essential and selective topics including:
  - Scientific Method
  - Science Fair
  - Machines
  - Gardening
  - Entomology
  - Medical Science
  - Conservation
  - Ecology
  - Engineering
  - Forensic Science

- **Environmental Studies** - normally engaged in the third or fourth year secondary. Mastery of the essential unit outcomes of biology or physical science are not prerequisites for entry, but are highly recommended. Students having secondary standing may engage in this course with the consent of the instructor. The course may be offered when requested by a sufficient number of qualified students. The essential content is as follows:
  - Soil and Water
  - Air and Climate
  - Non-renewable Energy
  - Renewable Energy
  - Health and Waste

- **Microbiology** - normally engaged in the third or fourth year secondary. Mastery of the essential unit outcomes of biology or physical science are not prerequisites for entry, but are highly recommended. Students having secondary standing may engage in this course with the consent of the instructor. The course may be offered when requested by a sufficient number of qualified students. The content is as follows:
    - Microscopy
    - Pure Culture Technique
    - Microbial Classification
    - Identification of Bacteria
    - Microbial Control and Use

- **Advanced Biology (AP)** - normally engaged in the third or fourth year secondary. This course is designed for students interested in pursuing in-depth studies in biology and demands a high level of student interest and intellectual pursuit. Engagement requires that a student has demonstrated in previous studies a record of success in biology. Prerequisites include Biology, Algebra I and Literature II/Writing II. It is strongly recommended that Chemistry be completed prior to taking AP Biology but may be taken concurrently as a minimum requirement. Upon mastery of the appropriate unit outcomes, the student will have the opportunity to take the American 'Advanced Placement' examination in biology, which makes it possible to earn university credits. This course may be offered when requested by a sufficient number of qualified students. The content is as follows.
    - Process of evolution as a driver of diversity and unity of life
    - Biological systems use free energy and molecular building blocks to grow, reproduce and to maintain dynamic homeostasis
    - Biological systems store, retrieve, transmit and respond to information essential to life processes
    - Biological systems interact; these systems and their interactions possess complex properties

- **Advanced Chemistry (AP)** - normally engaged in the third or fourth year secondary. This course is designed for students interested in pursuing in-depth studies in chemistry and demands a high level of student interest and intellectual pursuit. Engagement requires that a student has demonstrated in previous studies a record of success in physical science and/or biology. Upon mastery of the appropriate unit outcomes, the student will have the opportunity to take the American 'Advanced Placement' examination in chemistry, which makes it possible to earn university credits. This course may be offered when requested by a sufficient number of qualified students. The content is as follows.
    - Chemical Reactions
    - Gases and Thermochemistry
    - Atomic Structure
    - Bonding
    - States of Matter
    - Kinetics
    - Equilibrium
    - Thermodynamics and Electrochemistry
    - Organic Chemistry

- **Advanced Physics (AP)** - normally engaged in the third or fourth year secondary. This course is designed for students interested in pursuing in-depth studies in physics and demands a high level of student interest and intellectual pursuit. Engagement requires that a student has demonstrated in previous studies a record of success in physical science and/or biology. Upon mastery of the appropriate unit outcomes, the student will have the opportunity to take the American 'Advanced Placement' examination in physics, which makes it possible to earn university credits. This course may be offered when requested by a sufficient number of qualified students. The content is as follows.
    - Kinematics and Vectors
    - Newton's Laws
    - Work, Energy, Power, Momentum
    - Fluid Mechanics, Waves and Sound
    - Thermal Physics
    - Electrostatics
    - Electromagnetism
    - Optics
    - Atomic Physics and Quantum Effects
    - Nuclear Physics

- **Advanced Environmental Studies (AP)** - normally engaged in the third or fourth year secondary. This course is designed for students interested in pursuing in-depth studies in environmental studies and demands a high level of student interest and intellectual pursuit. Engagement requires that a student has demonstrated in previous studies a record of success in physical science and/or biology. Upon mastery of the appropriate unit outcomes, the student will have the opportunity to take the American 'Advanced Placement' examination in environmental studies, which makes it possible to earn university credits. This course may be offered when requested by a sufficient number of qualified students. The content is as follows.
    - Introduction to Environmental Science
    - Ecology
    - Geology and Soil
    - Climate, Weather and Ocean Systems
    - Land and Water Resource Management
    - Food Resources
    - Energy Resource Management
    - Pollution
    - Conservation
    - Public Policy

  Each of the above secondary courses consists of ten essential unit outcomes (except for Microbiology, which has five) and each has selective unit outcomes in which students may engage for additional secondary credits. In certain cases a student may also engage in any of the essential or selective outcomes as an independent-study unit.

- **Computer Science Principles (AP)** introduces students to the foundational concepts of computer science and challenges them to explore how computing and technology can impact the world. With a unique focus on creative problem solving

and real-world applications, AP Computer Science Principles prepares students for college and career.

In AP Computer Science Principles students will develop computational thinking vital for success across all disciplines, such as using computational tools to analyze and study data and working with large sets of data to analyze, visualize, and draw conclusions from trends. This course is unique in its focus on fostering creativity. Students are encouraged to apply creative processes when developing computational artifacts and to think creatively whole using computer software and other technology to explore questions that interest them. They will also develop effective communication and collaboration skills, working individually and collaboratively to solve problems, and discussing and writing about the importance of these problems and the impacts to their community, society, and the world. The content is as follows:

- Creativity & Computational Thinking
- Introduction to Programming
- Digital Information
- The Internet
- Big Data
- AP Explore Performance Task
- AP Create Performance Task
- Blocks Programming Extended
- Text Programming Extended
- Web Development
- Innovative Technologies
- Artificial Intelligence

- **Computer Science A (AP)** is for the students who are planning to study in Computer Science majors or other technical fields such as engineering, electronic engineering or mechanical engineering.

  AP Computer Science A emphasizes programming methodology, procedural abstraction, and in-depth study of algorithms, data structures, and object oriented programming, as well as three structured labs components provided by College Board for minimum of 20 hours of hands-on lab experiences integrated throughout the course. Instruction also includes preparation for AP Computer Science A exam which is in May. The content is as follows:

  - Computer & Java Basics
  - Loops, Control Statements & Improving User Interface
  - Introduction to Defining Classes
  - Magpie Lab
  - Picture Lab
  - Arrays & 2D Arrays
  - Search & Sort Algorithms
  - Recursion
  - Elevens Lab
  - Computer Applications
  - Collections, Multithreading, & Non-Linear Data Structures