DRAFT CHANGES TO

SUBJECT MATTER KNOWLEDGE REQUIREMENTS

FOR EDUCATOR LICENSURE

PUBLIC COMMENT: WWW.SURVEYGIZMO.COM/S3/3620828/DRAFT-PUBLIC-COMMENT-SMK-UPDATES

Subject matter knowledge requirements (SMKs) outline the minimum level of content and pedagogical skills Massachusetts educators are expected to hold. SMKs establish the content assessed in Massachusetts Tests for Educator Licensure (MTEL) and guide content-area coursework for educator preparation programs. SMKs are aligned to Massachusetts curriculum frameworks.

Massachusetts regulation 603 CMR 7.06 requires a public comment period of at least thirty days prior to any changes to the guidelines where SMKs are published. More information on the 2017 proposed changes is available at www.doe.mass.edu/edprep.

BIOLOGY

CURRENT SUBJECT MATTER KNOWLEDGE REQUIREMENTS 2011-2016

BIOLOGY , LEVELS: 5-8; 8-12

(a) Biology of organisms, especially that of humans, including characteristics and classifications of organisms.
(b) Cells and cell theory.
(c) Ecology and evolutionary biology. (d) Matter and energy in ecosystems.
(e) Genetics, including chromosome structure and function and inheritance. (f) Molecular biology.
(g) Related aspects of chemistry, physics, earth science, and mathematics, such as statistics. (h) Engineering and technical applications of biology.
(i) History and philosophy of science.
(j) Methods of research in the sciences, including laboratory techniques and the use of computers.

DRAFT CHANGES TO SUBJECT MATTER KNOWLEDGE REQUIREMENTS 2017

BIOLOGY, LEVELS 8-12

The following topics will be addressed on a subject matter knowledge test:

(a). Understanding of Molecules to Organisms: Structures and Processes:

1. Use of a model/representation to explain the process for building proteins within a cell including the roles of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) in communication and creation of proteins that regulate cell functions.
2. The principle structures and functions of animal body systems including the digestive, respiratory, circulatory, excretory, and nervous systems.

3. Use of evidence that the human body uses both positive and negative feedback mechanisms to maintain homeostasis; understand the transport of molecules across a cellular membrane and the function of specialized structures within a cell.

4. Use of evidence to explain the life cycle of a cell in multicellular organisms, the significance of cell reproduction as the ability to grow, repair, and replace cells. The cycle should include cell growth, DNA replication, the division of the nucleus and division of the cytoplasm.

5. Use of a model to explain how plants and other photosynthesizing organisms convert light energy into chemical energy.

6. Carbon, hydrogen, oxygen, nitrogen, sulfur, and phosphorus atoms may chemically combine to form large molecules which are necessary for life.

7. Use of a model to illustrate the ability of live organisms to convert food into energy.

(b) Understanding of Ecosystems: Interactions, Energy, and Dynamics:

1. Use of data to support explanations of how living and nonliving factors affect an area's ability to support life.

2. Living and non-living factors effect different kinds of plants and animals of a population and or a species within a particular environment.

3. Use of a mathematical model to predict and explain the constant flow of energy in an ecosystem affects the number of individuals living in an environment.

4. Cycling of the carbon molecule throughout the land, ocean, and atmosphere with the constant input of energy from sunlight, energy created by cells, decomposition of organisms, and combustion.

5. Use of data to construct an argument with evidence that an area which includes living and non-living components, will tend to resist change and remain more consistent with numbers and types of organisms.

6. There are direct and indirect effects of human activities on the numbers and types of organisms living in an area.

7. Human impact on a living organism's health and the condition of the non-living components.

(c) Understanding of Heredity: Inheritance and Variation of Traits:

1. Use of a model to show how DNA passes genetic information from parents to offspring during sexual reproduction.

2. Use of evidence to explain genetic variations in an organism may come from new combinations of genes during egg and sperm development, mutations during the process of copying cellular DNA, or mutations caused by an organism's environment.

3. Application of scientific reasoning to illustrate how genetic and environmental factors (living and non-living) can influence the traits of individuals within a population.

(d) Understanding of Biological Evolution: Unity and Diversity:

1. The fossil record, genetic information, anatomical, and developmental homologies provide evidence for common ancestry among organisms to support biological evolution.

2. Darwin's theory that evolution within a population occurs through a process where organisms with favorable traits are more likely to reproduce and pass on their traits.

3. The differences between viruses and bacteria and the ability of viruses and bacteria to adapt and reproduce in diverse types of environments.

4. Evaluation of models that show how changes in an environment may result in the modification of similar organisms living in the same location.