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.

CHEMISTRY

CURRENT SUBJECT MATTER KNOWLEDGE REQUIREMENTS 2011-2016

CHEMISTRY, LEVELS: 5-8; 8-12

(a) Inorganic chemistry.
(b) Organic chemistry.
(c) Analytical chemistry.
(d) Physical chemistry.
(e) Biochemistry.
(f) Related aspects of biology, physics, earth science, and mathematics, such as statistics and calculus.
(g) Engineering and technical applications of chemistry.
(h) History and philosophy of science.
(i) Methods of research in the sciences, including laboratory techniques and the use of computers.

DRAFT CHANGES TO SUBJECT MATTER KNOWLEDGE REQUIREMENTS 2017

CHEMISTRY, 8-12

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

(a) Understanding of Matter and Its Interactions:
    1. Use of the Periodic table to predict properties of ionization energy, atomic size, configuration of outer shell electrons and reactivity.
    2. Use of models to predict the products of a chemical reaction, when basic ionic and molecular compounds are produced, and the relative strength of ionic and covalent bonds using observable data and the concept of electronegativity.
    3. Observable properties of substances relate to their structure in terms of how molecules are arranged, the

motion of molecules and the attractive forces between them.

4. How energy is transferred during endothermic and exothermic chemical reactions by bonds being broken and formed into new substances.
5. Variables impact how fast a chemical reaction occurs and the motion and collision of the particles impact that rate.
6. The products of an equilibrium reaction and the motion and collision of particles impacts the forward and reverse rates of a reaction until equilibrium is reached.
7. Use of balanced chemical equations and stoichiometry to calculate a specific amount of product for a reaction and how atoms and mass are conserved during a reaction.
8. The relative strengths of acids or bases based on the potential of hydrogen (pH) of a solution.
9. The oxidation-reduction (Redox) theory of how electrons are transferred within a reaction, the products of a reaction using Redox. Use the oxidation numbers to show how the electrons move through devices that produce electricity or prevent corrosion.
10. The components of a mixture can be separated and physical and chemical properties can be identified.

(b) Understanding of Motion and Stability: Forces and Interactions:

1. The structure of polymers, ionic compounds, acids and bases, and metals impact on the functional uses of different materials.
2. Solubility and conductivity data determines how much an ionic substance dissolves.
3. The strength and relative amount of attractive forces in solids, liquids and gases based on the motion and collisions of these particles, and how changes in pressure, volume and temperature impact gases.

(c) Understanding of Energy:

1. Use of data and communication to illustrate that the overall energy in a chemical reaction is conserved despite transfer of enthalpy and entropy that occurs.