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.

PHYSICS

CURRENT SUBJECT MATTER KNOWLEDGE REQUIREMENTS 2011-2016

PHYSICS, LEVELS 5-8, 8-12

(a) Mechanics (including fluid mechanics).
(b) Heat, heat transfer, and thermodynamics. (c) Kinetic theory of gases.
(d) Light and geometric optics. (e) Electricity and magnetism. (f) Waves (sound and light).
(g) The atom: its structure and the nucleus (including nuclear reactions). (h) Quantum theory of the atom.
(i) Quantum theory of light.
(j) Engineering and technical application of physics.
(k) Related aspects of biology, chemistry, earth science and mathematics, such as trigonometry, vector analysis, and calculus.
(l) History and philosophy of science.
(m) Methods of research in the sciences, including laboratory techniques and the use of computers.

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PHYSICS, LEVEL 8-12

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

(a) Understanding of Matter and its Interactions: The processes of fission, fusion and radioactive decay as energy is released and absorbed.

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

1. Showing mathematically the total momentum of a system is conserved when there is no net force on the system.

2. Prediction of the effects of gravitational and electrostatic forces between objects.
3. Use of evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

(c) Understanding of Energy

1. Identify energy transformations from one form to another and calculate the change of energy in the system.
2. That moving particles and energy stored in fields can be accounted for on the macroscopic scale.
3. Use of evidence that thermal energy will transfer between touching objects from high to low temperature to reach thermal equilibrium.
4. Use of illustration to show the forces and changes in energy between two magnetically or electrically charged objects changing position in a magnetic or electric field.

(d) Understanding of Waves and their Applications in Technologies for Information Transfer

1. Showing mathematically the relationships among the frequency, wavelength, and speed of waves.
2. The idea that electromagnetic radiation can be understood by either a wave model or a particle model.
3. How devices use waves to transmit and capture information and energy.