

## Science J—Weekly Subject List

Week	Subject	History Reference
1	Aerodynamic shapes; engineering; Force = surface area * pressure * coefficient of drag; Newtons	Thales / <i>Aristotle Leads the Way</i> , pp. 36-43
2	Atomic structure; electron shells; static electricity; electron affinity; friction; electron transfer; hypotheses	Thales / <i>Aristotle</i> , p. 38
3	Mass; weight; $F=m*a$ ; gravity; $g=9.8m/s^2$ ; the effect of horizontal motion on a freefalling object	Aristotle, Newton / <i>Aristotle</i> , pp. 94-105
4	Hydraulics; mechanical advantage; Pressure = Force / Area	Hero of Alexandria / <i>Aristotle</i> , pp. 130-135
5	Basic machines; lever, pulley, wedge, wheel and axle, screw, inclined plane; Mechanical Advantage of Wheel and Axle = Radius of Wheel/Radius of Axle	Hero of Alexandria / <i>Aristotle</i> , pp. 130-135
6	Basic machines; First-class levers; mechanical advantage; Mass 1 * Distance 1 = Mass 2 * Distance 2	Archimedes / <i>Aristotle</i> , pp. 146-159
7	Compound Machines; inclined plan and screw; Archimedes' Screw;	Archimedes / <i>Aristotle</i> , pp. 146-159
8	Density = Mass / Volume; intrinsic value of coins; finding volume using water displacement; reading a meniscus	Archimedes / <i>Aristotle</i> , pp. 150-153
9	Compound Machines; wheel and axle; inclined plane; Work = Force * Distance	Filippo Brunelleschi / <i>Newton at the Center</i> , p. 7
10	Bridge efficiency; Da Vinci self-supporting bridge	Leonardo Da Vinci / <i>Newton</i> p. 33
11	Pendulums; periods and cycles; effect of weight and length of pendulum on the period; Period = $2 * \pi \sqrt{l/g}$	Galileo Galilei / <i>Newton</i> pp. 65-66
12	Telescopes; concave and convex lenses; radius of a lens; focus of a lens; angles of incidence and refraction	Galileo, Newton, Digges / <i>Newton</i> p. 108
13	Newton's Law of Universal Gravitation; $F = G * (m_1*m_2/r_2)$ ; $F=m*a$ ; $g = 9.8 m/s^2$ ; although objects drop at the same rate, objects with more mass can hit with more force	Isaac Newton / <i>Newton</i> pp. 144-153
14	Newton's Third Law: For every action there is an equal and opposite reaction;	Isaac Newton / <i>Newton</i> , pp. 172-177
15	Newton's Second Law: $F = m*a$ ; acceleration = $\Delta V/\Delta t$ ; momentum = mass * $\Delta V$ ; interaction between Newton's Second and Third Laws	Isaac Newton / <i>Newton</i> , p. 174
16	Newton's First Law, Law of Inertia; inertia vs. momentum	Isaac Newton / <i>Newton</i> , p. 173
17	Bernoulli's Principle; fluid dynamics; drag, lift, and gravity;	Daniel Bernoulli / <i>Newton</i> , pp. 220-229
18	Bernoulli's Law; the height of a column of fluid affects the pressure and therefore velocity of an escaping stream of fluid; conservation of energy; velocity = $\sqrt{(2*g*height)}$	Daniel Bernoulli / <i>Newton</i> , pp. 220-229
19	Electrolysis; electroplating; anodes; cathodes; ions; anions; cations; electric current	Humphry Davy / <i>Newton</i> , p. 331
20	Electromagnetism; electric and magnetic fields flow at 90° to each other; Lenz Effect; conductive materials	James Clerk Maxwell / <i>Newton</i> , p. 361
21	Sounds waves; wavelength and frequency; compressing air molecules; frequency; harmonics; $v=f*\lambda$ ; out-of-family results in a lab test	Pythagoras, Hertz / <i>Newton</i> pp. 366-368
22	Waves; $v=f*\lambda$ ; Hertz; speed of electromagnetic waves and light; electromagnetic spectrum	Albert Michelson / <i>Newton</i> p. 424
23	Magnets; poles; magnetic fields; free-body diagrams; vectors	William Gilbert / <i>Einstein Adds a New Dimension</i> , pp. 10-12
24	Light duality; light acts as a particle; photoelectric effect; photons; UV light; electromagnetic spectrum; electroscopes	Christiaan Huygens, Albert Einstein, Robert Millikan / <i>Einstein</i> , pp. 82-94

Week	Subject	History Reference
25	Light duality; light acts as a wave; double-slit experiment; wave interference patterns; parallel and concentric light waves	Thomas Young, Louis de Broglie / <i>Einstein</i> , p. 88
26	Bohr's atom; electron shells; photons; elemental absorption and emission spectrums; wavelengths of visible light	Niels Bohr / <i>Einstein</i> pp. 114-127
27	Thermodynamics; entropy; probability; statistics in quantum physics; Gaussian curves	Werner Heisenberg / <i>Einstein</i> pp. 150-157
28	1st Law of Thermodynamics: energy can be transformed but not destroyed; types of energy: chemical, gravitational, mechanical, nuclear, potential, kinetic, heat;	Julius Robert von Mayer / <i>Newton</i> pp. 394-399
29	2nd Law of Thermodynamics: entropy is always increasing, work must be added to return to a state of lower entropy; entropy; effects of temperature on particles	William Thomson, Ludwig Boltzmann / <i>Newton</i> pp. 400-411
30	Quantum electrodynamics; magnetism; creating magnets; electron spin; atomic energy levels	Robert Oppenheimer / <i>Einstein</i> , pp. 254-259
31	Speed of sound; $v=f*\lambda$ ; resonance of sound	Various / <i>Einstein</i> p. 273
32	Electric motors; homopolar motors; Lorentz Force; electric fields; magnetic fields; current; right-hand-rule	Hendrik Lorentz / <i>Einstein</i> , pp. 61, 160, 271, 283, 289
33	Doppler Effect; relative frequency; sound and light waves	Christian Doppler / <i>Einstein</i> , p. 331
34	Archimedean spiral; cartesian graphs; polar graphs; rotation angle ( $\theta$ ); the scientific method; $f_{\text{observer}} = f_{\text{source}} / (1 \pm (v/c))$	Archimedes / <i>Archimedes and the Door of Science</i> , Appendix
35	Angular momentum; right-hand-rule; vectors along x, y, and z axis; torque; $\tau = F*r$ ; gyroscopic precession in relation to gravity;	N/A
36	Review	N/A

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