

## Chapter 19

definition of a wave  
description of a wave  
wave motion  
transverse and longitudinal waves  
wave speed  
wave interference  
standing waves  
Doppler effect

## Chapter 20

origin of sound  
media that transmit sound  
compression and rarefaction  
reflection of sound  
refraction of sound  
forced vibrations  
natural frequency  
resonance  
interference

## Chapter 21

noise and music  
pitch  
sound intensity and loudness  
quality  
musical instruments  
Fourier analysis

## Chapter 22

electricity  
electric forces  
electric charges  
fundamental law of electricity  
conservation of charge  
Coulomb's law  
conductors and insulators  
charging by friction  
charging by induction  
charge polarization  
electric field  
electric potential

## Chapter 23

electric current  
voltage sources  
electrical resistance  
Ohm's law  
alternating current  
direct current  
speed and source of electrons in a circuit  
electric powers  
series circuits  
parallel circuits

## Chapter 24

magnetism  
magnetic poles  
fundamental law of magnetism  
magnetic fields  
magnetic domains  
magnetic forces  
Earth's magnetic field

## Chapter 25

electromagnetic induction  
magnetic flux  
electromotive force  
Faraday's law  
generators  
alternators  
motors  
field induction

## Chapter 26

electromagnetic waves  
electromagnetic spectrum (in order of increasing wavelength)  
wavelengths of violet and red light  
transparent  
opaque  
shadows  
seeing light – the eye

## Chapter 27

selective reflection  
selective transmission  
“color math” (mixing colored light)  
additive primary colors  
subtractive primary colors  
complementary colors  
Why...

- the sky is blue
- sunsets (and total lunar eclipses) are red
- clouds are white
- water is greenish blue

## Chapter 28

reflection  
Fermat’s principle of least time  
law of reflection  
plane mirrors  
convex mirrors  
specular reflection  
diffuse reflection  
refraction  
lenses  
lens defects  
dispersion and rainbows  
critical angle  
total internal reflection

## Chapter 29

Huygens’ principle  
diffraction  
Young’s double slit experiment  
thin film interference  
polarization

## Chapter 30

light emission  
excitation  
emission spectra

## Chapter 31

quantum  
quantum physics  
photon energy/Planck's constant  
photoelectric effect  
binding energy/work function  
wave-particle duality  
matter waves/electron diffraction  
uncertainty principle

## Chapter 32

Rutherford's gold foil experiment  
Bohr model of the atom  
quantized energy levels  
de Broglie wavelength  
correspondence principle

## Chapter 33

radioactivity  
different types of radioactive rays  
strong force  
transmutation  
half-life  
radioactive/carbon dating

## Chapter 34

nuclear fission  
chain reaction  
critical mass  
breeder reactor  
mass-energy equivalence  
mass per nucleon of different elements  
nuclear fusion  
thermonuclear fusion

## Chapter 35

reference frame  
relative motion  
Michelson-Morley experiment  
special relativity  
first and second postulate of special relativity

simultaneity  
spacetime  
time dilation  
length contraction  
addition of velocities  
relativistic momentum  
mass, energy, and  $E=mc^2$   
correspondence principle, revisited  
space travel\*

## Chapter 36

general relativity  
principle of equivalence  
gravitational lensing  
gravitational redshift  
advancement of perihelion of Mercury  
geodesic  
gravitational waves  
Einsteinian gravitation