PHYSICS 30

Mr. M Cherney

COURSE OUTLINE 2024-2025

Ch 09 Conservation of Momentum	8 Classes	8 School Days	Jan 28 – Feb 6
Ch 10 and 11 Electric Forces, Fields	9(10 OE) Classes	9(10) School Days	Feb 7 – Feb 27
Ch 12 Magnetic Forces and Fields	7 Classes	7 School Days	Feb 28 – Mar 10
Ch 13 Electromagnetic Radiation	11 Classes	11 School Days	Mar 11 – Apr 9
Ch 14 Quantum Nature of Light	8 Classes	8 School Days	Apr 10 – Apr 23
Ch 15 Atomic Physics	10 Classes	10 School Days	Apr 24 – May 7
Ch 16 and 17 Radioactivity	12(14 OE) Classes	12(14) School Days	May 8 – May 29
Course Review	7 Classes	10 School Days	May 30 – Jun 13
	75(78) Classes	75(78) School Days	

Final

Diploma Exam Jun 24, 2025

COURSE MARKING 2024-2025

Heading	Date	Weight	Points Earned (%)	Percent (%)
Course Work		70		
Tests		90		
Ch 09 Conservation of Momentum		15		
Ch 10 and 11 Electric Forces and Fields		15		
Ch 12 Magnetic Forces and Fields		15		
Ch 13 Electromagnetic Radiation		15		
Ch 14 Quantum Nature of Light		10		
Ch 15 Atomic Physics		15		
Ch 16 and 17 Radioactivity		15		
Homework, Quizzes, Labs		10		
Final Exam		30		
Final Grade				

Daily Homework for each assignment is due the day after it is assigned. It will be marked for completeness, 1 mark for each completed question out of the total assigned questions. Each question number of your work is to be highlighted once (**not** abc parts) with a marker. Each assignment is to have your Name, Date, and Assignment Label and to be clearly marked as correct or incorrect (and corrected).

Review Quizzes are given twice per chapter or when necessary as review. Each quiz will have about 5-10 questions.

Labs are due on the assigned dates. They are a set of questions and related problems designed to challenge and stimulate investigation and problem solving. Full complete written answers with graphs, diagrams, charts, explanations, and organized written work are expected.

Review Summary Sheets are given for each chapter and can be used as 'I Can' statements to self-assess learning or as review sheets for content covered in the chapter.

Tests may be rewritten on any chapter up to two times at any time during the semester before the beginning of the Course Review at the end of the semester. Your best score up to 79% will be taken on rewrites. Before any test is rewritten all previous tests from other chapters must be complete and at least some homework from the rewritten chapter must be handed in.

Extra Help or a quiet place to work is available during any lunch hour in my room throughout the year on a come and go as you need help basis.

PHYSICS DATA SHEET

Constants

Acceleration Due to Gravity Near Earth	$\lvert\vec{a}_g\rvert = 9.81\ \text{m/s}^2$
Gravitational Constant	$G = 6.67 \times 10^{-11}\ \text{N·m}^2/\text{kg}^2$
Radius of Earth	$r_e = 6.37 \times 10^6\ \text{m}$
Mass of Earth	$M_e = 5.97 \times 10^{24}\ \text{kg}$
Elementary Charge	$e = 1.60 \times 10^{-19}\ \text{C}$
Coulomb's Law Constant	$k = 8.99 \times 10^9\ \text{N·m}^2/\text{C}^2$
Electron Volt	$1\ \text{eV} = 1.60 \times 10^{-19}\ \text{J}$
Index of Refraction of Air	$n = 1.00$
Speed of Light in Vacuum	$c = 3.00 \times 10^8\ \text{m/s}$
Planck's Constant	$h = 6.63 \times 10^{-34}\ \text{J·s}$ $h = 4.14 \times 10^{-15}\ \text{eV·s}$
Atomic Mass Unit	$u = 1.66 \times 10^{-27}\ \text{kg}$

Physics Principles

0 Uniform motion ($\vec{F}_{net} = 0$)
1 Accelerated motion ($\vec{F}_{net} \neq 0$)
2 Uniform circular motion ($\vec{F}_{net}$ is radially inward)
3 Work-energy theorem
4 Conservation of momentum
5 Conservation of energy
6 Conservation of mass-energy
7 Conservation of charge
8 Conservation of nucleons
9 Wave-particle duality

Prefixes Used with SI Units

Prefix	Symbol	Exponential Value
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}
deka	da	10^{1}
hecto	h	10^{2}
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}

Particles

	Charge	Mass
Alpha Particle	$+2e$	$6.65 \times 10^{-27}\ \text{kg}$
Electron	$-1e$	$9.11 \times 10^{-31}\ \text{kg}$
Proton	$+1e$	$1.67 \times 10^{-27}\ \text{kg}$
Neutron	0	$1.67 \times 10^{-27}\ \text{kg}$

First-Generation Fermions

	Charge	Mass
Electron	$-1e$	~0.511 MeV/c^2
Positron	$+1e$	~0.511 MeV/c^2
Electron neutrino, ν	0	< 2.2 eV/c^2
Electron antineutrino, $\bar{\nu}$	0	< 2.2 eV/c^2
Up quark, u	$+\frac{2}{3}e$	~2.4 MeV/c^2
Anti-up antiquark, $\bar{u}$	$-\frac{2}{3}e$	~2.4 MeV/c^2
Down quark, d	$-\frac{1}{3}e$	~4.8 MeV/c^2
Anti-down antiquark, $\bar{d}$	$+\frac{1}{3}e$	~4.8 MeV/c^2

EQUATIONS

Kinematics

$$\vec{v}_{ave} = \frac{\Delta \vec{d}}{\Delta t} \qquad \vec{d} = \vec{v}_f t - \frac{1}{2}\vec{a}t^2$$

$$\vec{a}_{ave} = \frac{\Delta \vec{v}}{\Delta t} \qquad \vec{d} = \left(\frac{\vec{v}_f + \vec{v}_i}{2}\right) t$$

$$\vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2 \qquad v_f^2 = v_i^2 + 2ad$$

$$|\vec{v}_c| = \frac{2\pi r}{T} \qquad |\vec{a}_c| = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$$

Dynamics

$$\vec{a} = \frac{\vec{F}_{net}}{m} \qquad |\vec{F}_g| = \frac{Gm_1m_2}{r^2}$$

$$|\vec{F}_f| = \mu|\vec{F}_N| \qquad |\vec{g}| = \frac{Gm}{r^2}$$

$$F_s = -kx \qquad \vec{g} = \frac{\vec{F}_g}{m}$$

Momentum and Energy

$$\vec{p} = m\vec{v} \qquad E_k = \frac{1}{2}mv^2$$

$$F\Delta t = m\Delta v \qquad E_p = mgh$$

$$W = |\vec{F}||\vec{d}|\cos\theta \qquad E_p = \frac{1}{2}kx^2$$

$$W = \Delta E$$

$$P = \frac{W}{t}$$

Waves

$$T = 2\pi\sqrt{\frac{m}{k}} \qquad m = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

$$T = 2\pi\sqrt{\frac{l}{g}} \qquad \frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$T = \frac{1}{f} \qquad \frac{n_2}{n_1} = \frac{\sin\theta_1}{\sin\theta_2}$$

$$v = f\lambda \qquad \frac{n_2}{n_1} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

$$f = \left(\frac{v}{v \pm v_s}\right) f_s \qquad \lambda = \frac{d\sin\theta}{n}$$

$$\lambda = \frac{xd}{nl}$$

Electricity and Magnetism

$$|\vec{F}_e| = \frac{kq_1q_2}{r^2} \qquad \Delta V = \frac{\Delta E}{q}$$

$$|\vec{E}| = \frac{kq}{r^2} \qquad I = \frac{q}{t}$$

$$\vec{E} = \frac{\vec{F}_e}{q} \qquad |\vec{F}_m| = Il_\perp|\vec{B}|$$

$$|\vec{E}| = \frac{\Delta V}{\Delta d} \qquad |\vec{F}_m| = qv_\perp|\vec{B}|$$

Atomic Physics

$$W = hf_0 \qquad E = hf = \frac{hc}{\lambda}$$

$$E_{k_{max}} = q_e V_{stop} \qquad N = N_0\left(\frac{1}{2}\right)^n$$

Quantum Mechanics and Nuclear Physics

$$\Delta E = \Delta mc^2 \qquad E = pc$$

$$p = \frac{h}{\lambda} \qquad \Delta\lambda = \frac{h}{mc}(1 - \cos\theta)$$

Trigonometry and Geometry

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$c^2 = a^2 + b^2$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

Line

$$m = \frac{\Delta y}{\Delta x}$$

$$y = mx + b$$

Area

Rectangle $= lw$

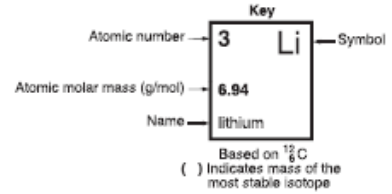
Triangle $= \frac{1}{2}ab$

Circle $= \pi r^2$

Circumference

Circle $= 2\pi r$

Periodic Table of the Elements



1 H 1.01 hydrogen																	2 He 4.00 helium
3 Li 6.94 lithium	4 Be 9.01 beryllium											5 B 10.81 boron	6 C 12.01 carbon	7 N 14.01 nitrogen	8 O 16.00 oxygen	9 F 19.00 fluorine	10 Ne 20.18 neon
11 Na 22.99 sodium	12 Mg 24.31 magnesium											13 Al 26.98 aluminium	14 Si 28.09 silicon	15 P 30.97 phosphorus	16 S 32.07 sulfur	17 Cl 35.45 chlorine	18 Ar 39.95 argon
19 K 39.10 potassium	20 Ca 40.08 calcium	21 Sc 44.96 scandium	22 Ti 47.87 titanium	23 V 50.94 vanadium	24 Cr 52.00 chromium	25 Mn 54.94 manganese	26 Fe 55.85 iron	27 Co 58.93 cobalt	28 Ni 58.69 nickel	29 Cu 63.55 copper	30 Zn 65.39 zinc	31 Ga 69.72 gallium	32 Ge 72.64 germanium	33 As 74.92 arsenic	34 Se 78.96 selenium	35 Br 79.90 bromine	36 Kr 83.80 krypton
37 Rb 85.47 rubidium	38 Sr 87.62 strontium	39 Y 88.91 yttrium	40 Zr 91.22 zirconium	41 Nb 92.91 niobium	42 Mo 95.94 molybdenum	43 Tc (98) technetium	44 Ru 101.07 ruthenium	45 Rh 102.91 rhodium	46 Pd 106.42 palladium	47 Ag 107.87 silver	48 Cd 112.41 cadmium	49 In 114.82 indium	50 Sn 118.71 tin	51 Sb 121.75 antimony	52 Te 127.60 tellurium	53 I 126.90 iodine	54 Xe 131.29 xenon
55 Cs 132.91 cesium	56 Ba 137.33 barium	57-71	72 Hf 178.49 hafnium	73 Ta 180.95 tantalum	74 W 183.84 tungsten	75 Re 186.21 rhenium	76 Os 190.23 osmium	77 Ir 192.22 iridium	78 Pt 195.08 platinum	79 Au 196.97 gold	80 Hg 200.59 mercury	81 Tl 204.38 thallium	82 Pb 207.21 lead	83 Bi 208.98 bismuth	84 Po (209) polonium	85 At (210) astatine	86 Rn (222) radon
87 Fr (223) francium	88 Ra (226) radium	89-103	104 Rf (261) rutherfordium	105 Db (262) dubnium	106 Sg (266) seaborgium	107 Bh (264) bohrium	108 Hs (277) hassium	109 Mt (268) meitnerium	110 Ds (271) darmstadtium	111 Rg (272) roentgenium	112 Cn (285) copernicium	113 Nh (286) nihonium	114 Fl (289) flerovium	115 Mc (289) moscovium	116 Lv (292) livermorium	117 Ts (294) tennessine	118 Og (294) oganesson

57 La 138.91 lanthanum	58 Ce 140.12 cerium	59 Pr 140.91 praseodymium	60 Nd 144.24 neodymium	61 Pm (145) promethium	62 Sm 150.36 samarium	63 Eu 151.96 europium	64 Gd 157.25 gadolinium	65 Tb 158.93 terbium	66 Dy 162.50 dysprosium	67 Ho 164.93 holmium	68 Er 167.26 erbium	69 Tm 168.93 thulium	70 Yb 173.04 ytterbium	71 Lu 174.97 lutetium
89 Ac (227) actinium	90 Th 232.04 thorium	91 Pa 231.04 protactinium	92 U 238.03 uranium	93 Np (237) neptunium	94 Pu (244) plutonium	95 Am (243) americium	96 Cm (247) curium	97 Bk (247) berkelium	98 Cf (251) californium	99 Es (252) einsteinium	100 Fm (257) fermium	101 Md (258) mendelevium	102 No (259) nobelium	103 Lr (262) lawrencium