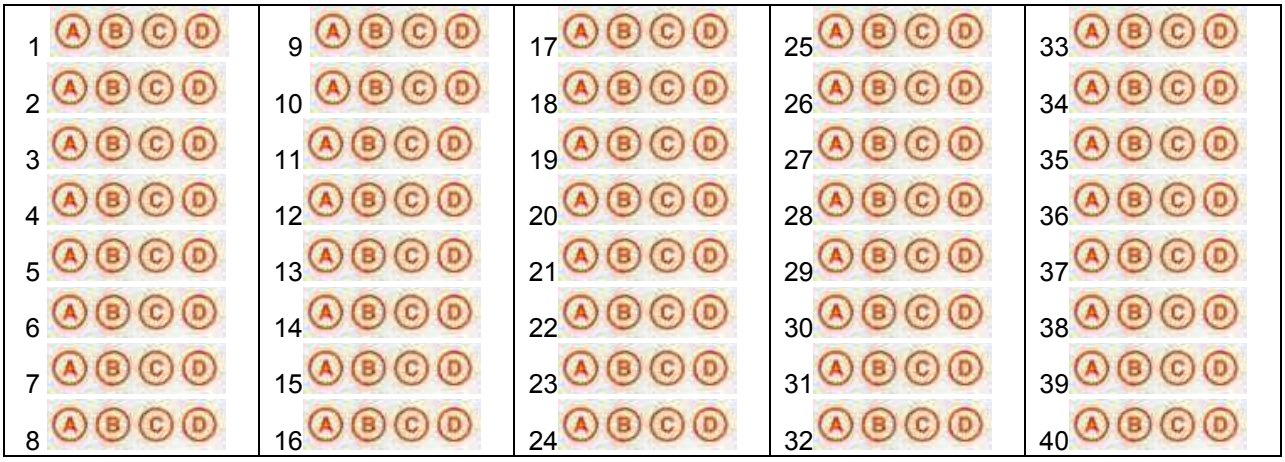
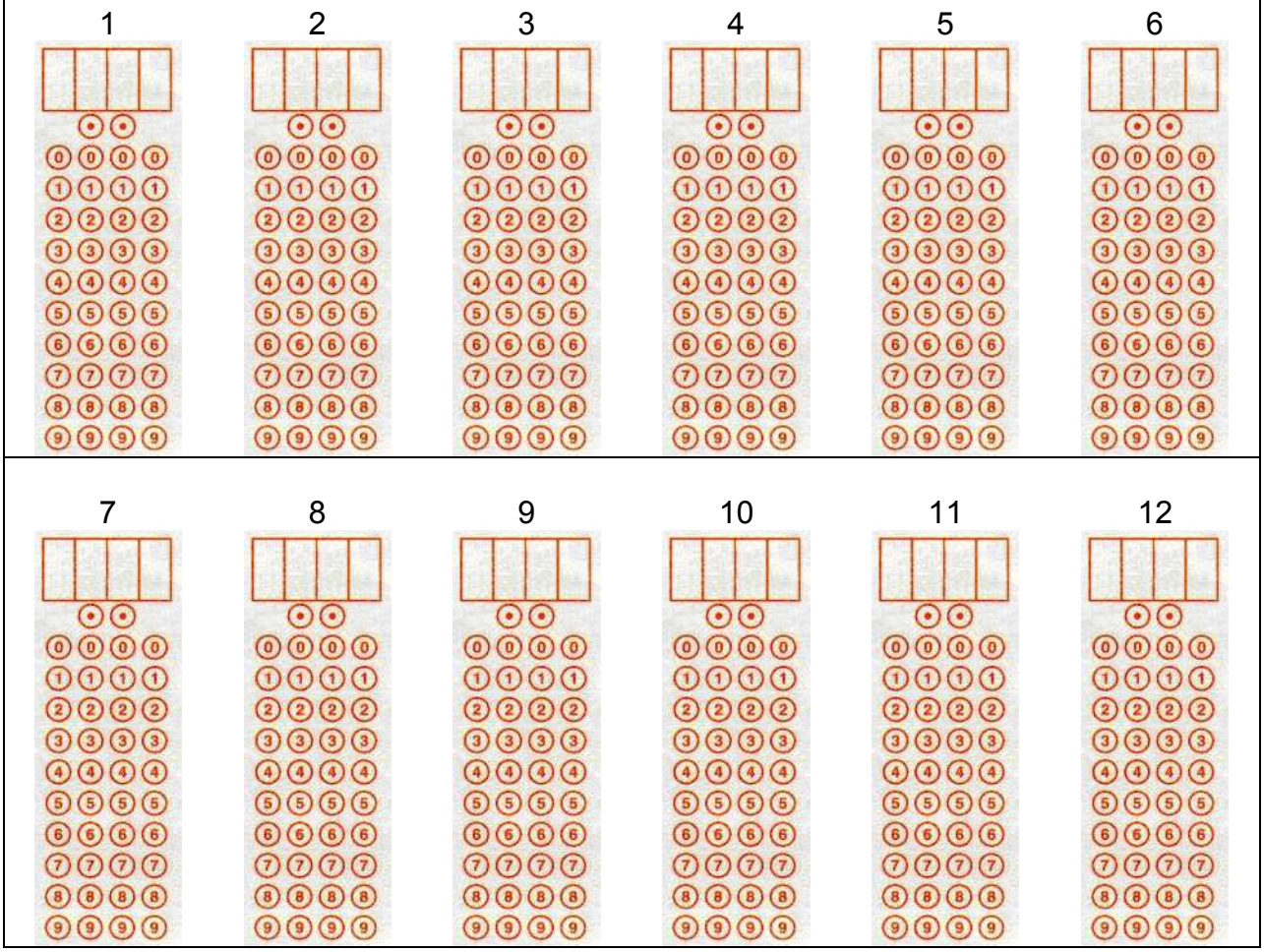
Physics 30 Mock Exam Bubble Sheet

Name: _____
Date: _____

Multiple Choice



Numerical Response



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	$+2e$	6.65×10^{-27} kg
Electron	$-1e$	9.11×10^{-31} kg
Proton	$+1e$	1.67×10^{-27} kg
Neutron	0	1.67×10^{-27} kg

First-Generation Fermions

	Charge	Mass
Electron	$-1e$	0.511 MeV/c^2
Positron	$+1e$	0.511 MeV/c^2
Electron neutrino, ν	0	< 50 eV/c^2
Electron antineutrino, $\bar{\nu}$	0	< 50 eV/c^2
Up quark, u	$+\frac{2}{3}e$	~5 MeV/c^2*
Anti-up antiquark, $\bar{u}$	$-\frac{2}{3}e$	~5 MeV/c^2*
Down quark, d	$-\frac{1}{3}e$	~10 MeV/c^2*
Anti-down antiquark, $\bar{d}$	$+\frac{1}{3}e$	~10 MeV/c^2*

*Current models seem to suggest a significantly lower mass of these quarks than those in this table.

EQUATIONS

Kinematics

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

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

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

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

Dynamics

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

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

$$\vec{F}_s = -k\vec{x} \qquad \vec{g} = \frac{\vec{F}_g}{m}$$

Momentum and Energy

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

$$\vec{F}\Delta t = m\Delta\vec{v} \qquad E_p = mgh$$

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

$$W = \Delta E$$

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

Waves

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

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

$$T = \frac{1}{f} \qquad \frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

$$v = f\lambda \qquad \lambda = \frac{d\sin\theta}{n}$$

$$f = \left(\frac{v}{v \pm v_s}\right) f_s \qquad \lambda = \frac{xd}{nl}$$

Electricity and Magnetism

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

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

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

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

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 = πr^2

Circumference

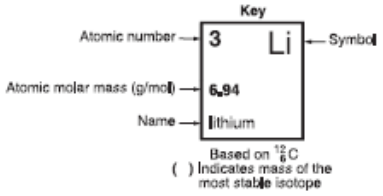
Circle = $2\pi r$

Graphing Calculator Window Format

x: $[x_{min}, x_{max}, x_{scl}]$

y: $[y_{min}, y_{max}, y_{scl}]$

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 Uub (285) ununbium	113 Uut (284) ununtrium	114 Uuq (289) ununquadium	115 Uup (288) ununpentium	116 Uuh (292) ununhexium	117 Uus (?) ununseptium	118 Uuo (294) ununoctium

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