Physics Semester A 2009 Exam

Test Description

Length: 2 hours
Items: 50 SR, 3 BCRs, 1 Problem

Unit	Approximate Number of Selected Response Items	Approximate Number of Constructed Response Items
Physics Skills and Processes	8	1
Kinematics	16	1
Force	11	1
Momentum	7	
Energy	8	
Totals	**50**	**3**

Some Vocabulary for the Examination

The vocabulary includes words that students may encounter when reading the examination items.

acceleration
air resistance
collision
component
constant
dependant variable
direction
displacement
distance
duration
elastic collision
elliptical
energy
force
free fall
friction/ frictionless
gravitational field strength
gravitational potential energy
horizontally
hypothesis
impulse
independent variable
initial
investigation
inelastic collision
joules
kilogram
kinetic
kinetic energy
law of conservation of momentum
magnitude
mass
momenta
momentum
net force
net impulse
newtons
normal force
pendulum
potential energy
projectile
power
radius
resistance
scientific notation
static
stationary
vectors
velocity
vertically
volume
weight
work
Y-intercept

Student Review

Upon successful completion of the first semester the student should be able to:

Physics Skills and Processes

- interpret graphs and diagrams.
- identify trends revealed by data.
- analyze data to form conclusions.
- defend the need for verifiable data.
- read and interpret a technical passage.
- identify the hypothesis of an experiment.
- identify meaningful, answerable, scientific questions.
- identify appropriate methods for conducting an investigation.
- use ratio and proportion in appropriate situations to solve problems.
- distinguish between a dependent variable and an independent variable.
- describe similarities and differences when explaining concepts and/or principles.

Physics Concepts

- given the forces acting on an object and the mass of the object, determine the magnitude of the net force.
- given the forces acting on an object and the mass of the object, determine the acceleration.
- given a vector diagram of an object's velocity, determine the magnitude of its components.
- interpret a position versus time graph to determine the velocity and initial position of an object.
- given velocity versus time graphs, determine changes in direction, distance traveled, displacement, initial velocity, and acceleration.
- identify the path that an object would take when dropped from a moving object.
- describe how the magnitudes of components of velocities change during projectile motion.
- describe the magnitude of force on objects in elastic and inelastic collisions.
- given mass and speed, determine kinetic energy.
- given mass and the force of gravity, determine weight.
- given mass, distance, and the force of gravity, determine the net force on an object in free fall.
- determine the kinetic energy of an object in free fall.
- determine the speed and distance traveled of an object in free fall at a given time.
- given a description of the movements of objects, identify vector diagrams that describe the final velocities of the objects.
- calculate relative velocity.
- given initial height and distance traveled, determine the time of flight and speed of a projectile.
- determine the acceleration of an object in one dimension.
- given a diagram showing forces on a moving object, determine the size of a frictional force.
- distinguish between mass and weight.
- use Newton's third law of motion to solve problems.
- quantitatively describe how gravitation force on an object changes with distance.
- given distance, time, and amount of work, determine the magnitude of force and average power.
- identify the relationship among force, time, and momentum.
- describe the forces acting on an object in a circular orbit.
- given a diagram, describe force responsible for acceleration.
- given force, mass, distance, and time, determine work.
- describe the forces that act on a conical pendulum.

- identify appropriate units for quantities.
- describe the effect of a force on an object in space.
- describe the relationship between mass and velocity in elastic collisions.
- identify factors that limit the acceleration of an object in free fall.
- use vectors to represent forces of different magnitudes.
- given speed and time, determine average acceleration.
- compare velocity and acceleration of an object thrown vertically.
- compare the location of a plane and an object dropped from a plane.
- determine the magnitudes of velocity and acceleration for objects in free fall.
- given the mass, direction, and speed of an object in a collision, determine the magnitude of the net impulse.
- given a force versus time graph, determine impulse.
- determine the relationship among mass, kinetic energy, and work.
- describe relationships among force, work, and gravitational potential energy.
- describe how momentum changes in an inelastic collision.
- state the law of conservation of momentum.
- state the law of conservation of energy.
- state Newton's 2^{nd} Law.
- solve a problem using Newton's 2^{nd} Law.
- describe how Newton's 2^{nd} and 3^{rd} Laws relate to impulse.
- describe the relationship among speed, acceleration, force, and mass.
- describe the magnitudes of velocity and acceleration of a rocket.
- solve problems using the law of conservation of energy.
- solve problems using the law of conservation of momentum.

Useful Website:
This document (Physics Field Test Semester A Student Review Sheet) can be found on the MCPS science website at http://www.mcps.k12.md.us/curriculum/science/assess/finals.htm.

Student Review

Physics Semester A Formula Sheet

Motion

$$speed = \frac{\text{distance}}{\text{time}}$$

$$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

$$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$$

$$v_f = v_i + at$$

$$\Delta x = v_i t + \tfrac{1}{2} a t^2$$

$$a = \frac{v^2}{r}$$

Work, Power, and Energy

$$W = F_{||}\, d$$

(where $F_{||}$ is the part of F parallel to d)

$$PE_G = mgh$$

$$KE = \tfrac{1}{2} mv^2$$

$$\Delta KE = -\Delta PE$$

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

$$W = \Delta KE$$

Momentum

$$p = mv$$

$$F\Delta t = mv_f - mv_i$$

$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$$

Forces

$$\Sigma F = ma$$

$$W = mg$$

Constants

$$g = 9.8\ m/s^2$$

Mathematical Equations

$$\sin\theta = \frac{opp}{hyp}$$

$$\cos\theta = \frac{adj}{hyp}$$

$$\tan\theta = \frac{opp}{adj}$$

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