IB Physics SL Y2 - Fall 2014 Final Exam Study Guide

Exam Date:

Tuesday, December 16, 2014 (4B)
Thursday, December 18, 2014 (3B)

Format:

(i) Multiple Choice - 25 questions (5 per topic) - no calculator/formulas
(ii) Free Response - 1 required, Choose 3 of 4 questions
(iii) 75 minute exam (you will have the entire period to take exam)
(iv) In order to replace previous exam grades based on improved mastery, you must complete the free response questions that corresponds to that exam's topic (i.e. Exam 1: Complete electric force and field question).

Topics:

(i) Electric Force and Field
(ii) Electric Current and Circuits
(iii) Magnetic Force and Field
(iv) Gravitational Force and Field
(v) Atomic and Nuclear Physics

For each of the following IB Physics standards, provide the essential definitions, formulas, diagrams, and etc.

Your completed **Fall 2014 Study Guides** are due at the beginning of class on **Monday, December 8, 2014**.

Use the class website to access reference and supplementary materials regarding each topic.

Electric Force and Field (August 13 - August 28)
Electric Current and Circuits (September 3 - September 29)
Magnetic Force and Field (October 3 - October 22)
Gravitational Force and Field (Ocober 24 - October 30)
Atomic and Nuclear Physics (November 5 - November 21)

Gravitational Force and Field:

6.1.1 State Newton's universal law of gravitation.
6.1.2 Define gravitational field strength.
6.1.3 Determine the gravitational field due to one or more point masses.
6.1.4 Derive an expression for gravitational field strength at the surface of a planet, assuming that all its mass is concentrated at its centre.
6.1.5 Solve problems involving gravitational forces and fields.

Electric Force and Field:

6.2.1 State that there are two types of electric charge.
6.2.2 State and apply the law of conservation of charge.
6.2.3 Describe and explain the difference in the electrical properties of conductors and insulators.
6.2.4 State Coulomb's law.
6.2.5 Define electric field strength.
6.2.6 Determine the electric field strength due to one or more point charges.
6.2.7 Draw the electric field patterns for different charge configurations.
6.2.8 Solve problems involving electric charges, forces and fields.

Magnetic Force and Field:

6.3.1 State that moving charges give rise to magnetic fields.
6.3.2 Draw magnetic field patterns due to currents.
6.3.3 Determine the direction of the force on a current-carrying conductor in a magnetic field.
6.3.4 Determine the direction of the force on a charge moving in a magnetic field.
6.3.5 Define the magnitude and direction of a magnetic field.
6.3.6 Solve problems involving magnetic forces, fields and currents.

$F = G\frac{m_1 m_2}{r^2}$	$F = k\frac{q_1 q_2}{r^2}$
$g = \frac{F}{m}$	$E = \frac{F}{q}$

$$F = \frac{q_1 q_2}{4\pi\varepsilon_0 r^2}$$

$$F = qvB\sin\theta$$

$$F = BIL\sin\theta$$

Electric Potential Difference

5.1.1 Define electric potential difference.
5.1.2 Determine the change in potential energy when a charge moves between two points at different potentials.
5.1.3 Define the electronvolt.
5.1.4 Solve problems involving electric potential difference.

Electric Current and Resistance

5.1.5 Define electric current.
5.1.6 Define resistance.
5.1.7 Apply the equation for resistance in the form where ρ is the resistivity of the material of the resistor.
5.1.8 State Ohm's law
5.1.9 Compare ohmic and non-ohmic behaviour.
5.1.10 Derive and apply expressions for electrical power dissipation in resistors.
5.1.11 Solve problems involving potential difference, current and resistance.

Electric Circuits

5.2.1 Define electromotive force (emf).
5.2.2 Describe the concept of internal resistance.
5.2.3 Apply the equations for resistors in series and in parallel
5.2.4 Draw circuit diagrams.
5.2.5 Describe the use of ideal ammeters and ideal voltmeters.
5.2.6 Describe a potential divider
5.2.7 Explain the use of sensors in potential divider circuits.
5.2.8 Solve problems involving electric circuits.

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

$$I = \frac{\Delta q}{\Delta t}$$

$$R = \frac{V}{I}$$

$$R = \frac{\rho L}{A}$$

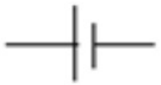
$$P = VI = I^2R = \frac{V^2}{R}$$

$$\varepsilon = I(R + r)$$

$$R = R_1 + R_2 + \cdots$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$$

cell



battery

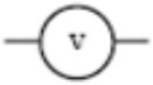
lamp

ac supply

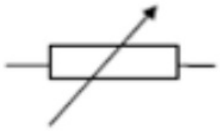
switch

ammeter

voltmeter

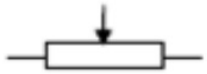


variable resistor

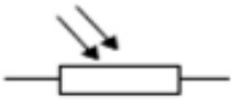


resistor

potentiometer



light-dependent resistor (LDR)

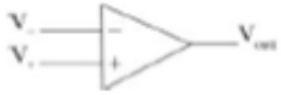


thermistor

transformer

heating element

operational amplifier (op-amp)



Atomic Structure

7.1.1 Describe a model of the atom that features a small nucleus surrounded by electrons.
7.1.2 Outline the evidence that supports a nuclear model of the atom.
7.1.3 Outline one limitation of the simple model of the nuclear atom.
7.1.4 Outline evidence for the existence of atomic energy levels.

Nuclear Structure

7.1.5 Explain the terms nuclide, isotope and nucleon.
7.1.6 Define nucleon number A, proton number Z & neutron number N.
7.1.7 Describe the interactions in a nucleus.

Radioactive Decay

7.2.1 Describe the phenomenon of natural radioactive decay.
7.2.2 Describe the properties of alpha (α) and beta (β) particles and gamma (γ) radiation.
7.2.3 Describe the ionizing properties of alpha (α) and beta (β) particles and gamma (γ) radiation
7.2.4 Outline the biological effects of ionizing radiation.
7.2.5 Explain why some nuclei are stable while others are unstable.

Half-Life

7.2.6 State that radioactive decay is a random and spontaneous process and that the rate of decay decreases exponentially with time.

7.2.7 Define the term radioactive half-life.

7.2.8 Determine the half-life of a nuclide from a decay curve.

7.2.9 Solve radioactive decay problems involving integral numbers of half-lives

Nuclear Reactions

7.3.1 Describe and give an example of an artificial (induced) transmutation.

7.3.2 Construct and complete nuclear equations.

7.3.3 Define the term unified atomic mass unit.

7.3.4 Apply the Einstein mass–energy equivalence relationship.

7.3.5 Define the concepts of mass defect, binding energy and binding energy per nucleon.

7.3.6 Draw and annotate a graph showing the variation with nucleon number of the binding energy per nucleon.

7.3.7 Solve problems involving mass defect and binding energy.

Fission and Fusion

7.3.8 Describe the processes of nuclear fission and nuclear fusion.

7.3.9 Apply the graph in 7.3.6 to account for the energy release in the processes of fission and fusion.

7.3.10 State that nuclear fusion is the main source of the Sun's energy.

7.3.11 Solve problems involving fission and fusion reactions.