

Baptist Lui Ming Choi Secondary school  
F.6 1<sup>st</sup> Examination Revision  
Guidelines for essay-type questions

***This gives you a set of brief guidelines on revising AL physics, focusing on essay-type questions only. You can treat them as the minimum requirement in answering essay-type questions. The teachers tried to breakdown all the contents in topics in an attempt to let you revise in a more analytical way. Yet, it is not enough, indeed. You should be able to integrate them on your own for the second phase of learning. HKAL past exam question may help a lot, then.***

***ENJOY YOUR LEARNING!!***

### **Fundamental Mechanics (including moment)**

<i>Page</i>	<i>Contents / Questions</i>
p.5 sometimes)	sketch s-t, v-t, and a-t graph of a given motion described in wordings (explanation required
p.10	state Newton's laws of motion, explain the concepts of inertia, mass, force, etc.
p.13	explain motions with Newton's laws of motion, e.g. 3 <sup>rd</sup> law in the question
p.17	define work in terms of transfer of energy
p.18	explain relationship between work and different forms of energy with examples
p.18	deduce the linear kinetic energy of an object
p.22	describe the magnitude of friction with a friction-applied force graph
p.25	describe and explain the motion of a falling object under the influence of air resistance (from projectile motion)
p.26	deduce the elastic potential energy of a spring (from s.h.m.)
p.26 (from s.h.m.)	deduce the equivalent spring constant of springs connected in series / parallel
p.29, 30	define moment of a force and couple
p.36	describe an experiment / method to determine the C.G. of an object

### **Linear Momentum**

<i>Page</i>	<i>Contents / Questions</i>
p. 1	define linear momentum, impulse
p. 3	explain how safety measures such as a seat belt, air bag and car bumper can reduce the degree of jury
p.4	deduce principle of conservation of momentum from Newton's 2 <sup>nd</sup> and 3 <sup>rd</sup> laws.
p.6	deduce the velocities of two objects after elastic head-on collision with one of the object at rest initially.
p.7	prove that the right-angled fork collision can be resulted from an elastic oblique collision between two identical objects with one object at rest initially.
p.9	differentiate inertial mass and gravitational mass
p.10	describe an experiment to determine inertial mass / gravitational mass

### **Projectile Motion**

<i>Page</i>	<i>Contents / Questions</i>
p.2	describe an experiment to illustrate the independence of horizontal and vertical motion of a projectile motion e.g. Monkey and Hunter experiment to illustrate the projectile motion ( <b>AI</b> )
p.3	deduce trajectory function, maximum height, time of flight, range of flight of a projectile motion.
p.6	describe the effect of air resistance to the projectile motion.

*Experiment (G01 Projectile Motion)*

## Circular Motion

<i>Page</i>	<i>Contents / Questions</i>
p.4	explain why a net force is required for a uniform circular motion
p.5	deduce the magnitude and direction of the centripetal acceleration of an object moving in a uniform circular motion / centripetal force
p.6	describe an experiment to verify $F = mr^2 \omega$

### *Experiment (G02 Centripetal force)*

p.7-16	give some examples to illustrate the concept of centripetal force
p.9	explain why a cyclist must lean in order to turn round a corner
p.10	describe and explain how a rotor operates
p.13	describe and explain the motion in a looping-the-loop for different initial speed at the bottom.
p.15	describe and explain the working principle of a centrifuge
p.16	explain how artificial gravity can be achieved
p.16	explain why an astronaut feel weightlessness when he is moving round the Earth in a space ship.

## s.h.m.

<i>Page</i>	<i>Contents / Questions</i>
p.1	define s.h.m. in wording and in mathematics
p.8 – 11	deduce if an oscillation is an exact s.h.m. and determine the period of motion
p.8	describe an experiment to determine the mass of an object with a mass-spring system
p.12-13	deduce if an oscillation is an approximated s.h.m. and determine the period of motion

### *Experiment (G03 s.h.m.)* describe an experiment to verify a simple pendulum is a s.h.m.

p.12	describe an experiment to determine the acceleration due to gravity a pendulum system
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### *Experiment (G04 Determining acceleration due to gravity by means of a simple pendulum)*

p.13	differentiate the motions of a s.h.m. and a rebounding ball
p.15	draw a rotating vector model to illustrate the phase relationship between $x$ , $v$ and $a$ of a s.h.m.
p.17-19	deduce and draw the variation of K.E. and P.E. of a mass-spring system / pendulum

## Damped and Forced Oscillation

<i>Page</i>	<i>Contents / Questions</i>
p.2-4	describe and illustrate the three kinds of damping with examples
p.4	explain the meaning of transient state and steady state in a forced oscillation
p.5	describe an experiment to illustrate the forced oscillation with Barton's pendulums

### *Experiment (G05 Barton's Pendulums)*

p.6	describe the variation of amplitude and phase difference in forced oscillation
p.6	explain what is meant by resonance and state the condition for it.

End

To Be continued .....2<sup>nd</sup> Term

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### **g-field**

<i>Page</i>	<i>Contents / Questions</i>
p.2	describe the three Keplers' law of planetary motion
p.3	state Newton's law / theory of gravitation
p.4	derive Kepler's 3 <sup>rd</sup> law from Newton's law of of gravitation, vice versa
p.5	explain why we cannot feel the gravitational force acting on us by the object surrounding us.
p.6	define g-field strength and derive $g = GM / R^2$
p.11	define the gravitational potential energy
p.11	deduce the gravitational P.E. of two-mass system to be $-GMm / r$
p.12	deduce the gravitational P.E. of an object on the Earth's surface is approximately equal to $m g h$ .
p.13	deduce the escape speed on the surface of a planet
p.15	what is parking orbit
p.15	what is meant by synchronous satellite
p.16	deduce the energy of a satellite moving in an orbital motion and hence the launching velocity

### **E-field**

<i>Page</i>	<i>Contents / Questions</i>
p.2	state Coulomb's law
p.4	describe and explain the motion of the shuttle ball in the shuttling ball experiment
p.5	describe an experiment to illustrate the electric field pattern due to (1) two charged parallel straight wire, (2) two point charges, etc.
p.11	<i>Experiment Demo #C2 Electric field pattern (Supplementary worksheet 2)</i> describe an experiment to investigate the electric field strength between the two charged parallel plates, and to verify the relation $E = V / d$ .
p.8	<i>Experiment Demo #C1 Investigating the electric field between parallel plates using a charged foil strip (Supplementary worksheet 1)</i> define electric potential energy and deduce the electric potential due to a point charge
p.10	describe an experiment to plot equip-potential lines between two electrodes. <i>Experiment Demo #C3 Plotting equip-potential lines (Supplementary worksheet 3)</i>
p.10	derive $V = Q/4\pi\epsilon r$ and $E=-dV/dr$
p.12	describe the effect of neutral neighbouring bodies to the potential due to a charged sphere
p.13	describe the structure and working principle of a flame probe
p.14	describe an experiment to investigate the electric potential due to a charged sphere with flame probe <i>Experiment Demo #C4 (Supplementary worksheet 4)</i>
p.14	describe an experiment to investigate the p.d. between two charged plates with flame probe <i>Experiment Demo #C4 (Supplementary worksheet 4)</i>

## Capacitor

Page	Contents / Questions
p.2	define the capacitance of a capacitor
p.2	deduce the formula of capacitance for an isolated conducting sphere
p.3	deduce the formula of capacitance for an parallel-plate capacitor
p.4-5	describe an experiment with electrometer to investigate how the capacitance of a parallel-plate capacitor relates to the overlapping area and the separation of the plates.
	<i>Experiment R 6.1</i>
p.7	derive capacitance for capacitors connected in series and parallel
p.9	describe the capacitor actions of charging and discharging.
	<i>Experiment (G06 Capacitor actions)</i>
p.10	describe an experiment to determine the capacitance of a capacitor by charging it at a constant rate.
	<i>Experiment (G07 Charging a capacitor at constant rate)</i>
p.11	describe an experiment to determine the capacitance of a capacitor with reed switch.
	<i>Experiment R 6.2</i>
p.13-14	deduce the variation of charges stored in a capacitor / voltage across R / voltage across C / current in discharging / charging process.
p.15	state the physical meaning of time constant RC and its relation to half life
p.15	deduce the electric field energy stored in a capacitor

## Current Electricity

Page	Contents / Questions
p.4	what is drift velocity? Distinction between drift velocity and speed of electrical signal.
p.5	deduce $I = nqAv_D$
p.8	differentiate emf and potential difference
p.10	explain the meaning of resistance of a conductor and Ohm's law
p.10	define resistivity of conductors
p.16	experiment to determine the internal resistance of a battery
p.17	explain the heating effect of a resistor
p.18	Question (3)
p.22	explain the application of a rheostat as a potential divider
p.23	explain effect of internal resistor of meter to current / voltage of a circuit

## Electromagnetism (I)

Page	Contents / Questions
p.6	explain factors affecting the magnetic force (#C14 Measuring magnetic field-current balance) $F = BIL$
p.9	moving charge in a magnetic field, deduce $f = q v B$
p.12-13	derive Hall voltage $V_H = BI/nQt$
p.14-16	describe methods to measure magnetic field
	<i>Experiment (G08 Magnetic field around a current-carrying straight wire and a solenoid)</i>
p.17	Experiment # C15
p.19	Experiment # C16
p.19-20	5.7 Forces between two current-carrying conductors (1) – (3) , state definition of ampere
p.22	derive Torque = BANi sin $\phi$
p.25	explain the principle of design and operation of moving coil galvanometer, derive sensitivity = NBA / c

## Electromagnetism (II)

<i>Page</i>	<i>Contents / Questions</i>
p.4	state Faraday's and Lenz's law of EM induction
p.10	how search coil works?
p.11	explain working principle of a simple a.c. / d.c. generator derive emf induced by an a.c. generator
p.14	explain the occurrence and application of eddy current e.g. working principle of induction heating, Question on moving magnet
p.16	explain the Theory of Transformer, and deduce turn ratio = voltage ratio
p.17	deduce energy loss in transformer
p.18	Question
p.20	deduce $\varepsilon = -d\Phi/dt$ for inductors
p.21	explain the behaviour of an inductor (#C19)
p.22	deduce $I = I_0 (1 + e^{-Rt/L})$
p.23	explain implication for switch design
p.25	derive energy stored in an inductor $U = 1/2 LI^2$ .
p.27-28	explain the back e.m.f. in d.c. motor

## Alternating Current (a.c.)

<i>Page</i>	<i>Contents / Questions</i>
p.4	Define r.m.s. value of a.c.
p.4	deduce r.m.s. current = $I_0 / \sqrt{2}$ for sinusoidal current.
p.6-9	deduce reactance and the phase relationship from physical laws, say $V = IR$ , $Q = CV$ , $V = L di/dt$
p.10	Question
p.11	explain the physical origin of phase difference
p.12	deduce reactance, relationship between I and V, and the phase relationship using rotating vector model
p.18	deduce condition of resonance for series LRC circuit
p.24	describe the application of resonance in parallel LRC circuit, e.g. radio tuning circuit

## A.C. (II) / Electronics

<i>Page</i>	<i>Contents / Questions</i>
p.4	<i>describe and explain half-wave and full wave rectification using diodes</i>
p.5	<i>describe and explain rectification using Bridge rectifier (connection and principle)</i>
p.6-8	<i>describe and explain qualitatively smoothing using storage capacitor and inductor-capacitor circuit</i>

**END**