# Hong Kong Physics Olympiad 2011
# 2011 香港物理奧林匹克
## Scope of Competition (Junior Level) 比賽範圍(初級組)

The scope of the Hong Kong Physics Olympiad 2011 **(Junior Level)** includes the following topics:
2011香港物理奧林匹克**(初級組)**的比賽範圍涉及以下範疇：

**矢量可以是3維的。不要求微積分。**
**Vectors can be 3-dimensional. Calculus is not required.**

**1. 質點的運動 Motion of Point Particles**

1.1 匀加速直線運動
Uniformly accelerated linear motion
1.2 匀加速 2 維運動
Uniformly accelerated motion in two dimensions
1.3 匀速圓周運動
Uniform circular motion
1.4 相對運動和參照系
Relative motion and reference frame

**2. 力學 Mechanics**

2.1 力學中常見的力：重力、彈力、摩擦力、拉力，等等
Common forces in mechanics: gravity, elastic force, friction, tension, etc.
2.2 牛頓第一、二、三運動定律
Newton's first, second and third laws of motion
2.3 力矩 Torque
2.4 物體的平衡條件和平衡的種類
Conditions for equilibrium of objects and types of equilibrium
2.5 萬有引力定律
Law of Universal Gravitation
2.6 行星和人造衛星匀速圓周運動
Uniform circular motion of planets and satellites
2.7 慣性系和平動、匀速轉動參照系裏的慣性力
Non-inertial frame and inertial force in translational and constant speed rotational frames

**3. 功和機械能 Work and Mechanical Energy**

3.1 功和功率
Work and power
3.2 機械能，包括動能, 地球表面附近的重力勢能，均匀球體的萬有引力勢能，叠加原理，彈性勢能，等等
Mechanical Energy, including but not limited to, kinetic energy, Gravitational potential energy near Earth surface, Gravitational potential energy of solid spheres, superposition principle, and elastic energy
3.3 功能原理和機械能守恆定律
Work-energy theorem and Law of conservation of mechanical energy

**4. 動量和衝量 Momentum & Impulse**

4.1 動量和衝量
Momentum & Impulse
4.2 動量定理和動量守恆定律
Theorem of momentum and Law of conservation of momentum
4.3 彈性碰撞、非彈性碰撞和完全非彈性碰撞
Elastic collision, inelastic collision and the completely inelastic collision
4.4 質心 Center of mass

# Hong Kong Physics Olympiad 2011
# 2011 香港物理奧林匹克
## Scope of Competition (Senior Level) 比賽範圍(高級組)

The scope of the 2011 Hong Kong Physics Olympiad **(Senior Level)** is mainly based on the HKCEE Physics Syllabus, but also includes the following topics:
2011香港物理奧林匹克**(高級組)**的比賽範圍主要以中學會考物理課程爲基礎，亦會涉及以下範疇：

**Mechanics**力學
1. Application of Newton's second law of motion in two dimensions, projectile motion 牛頓運動第二定律在二維空間的應用、拋體運動
2. Application of Newton's second law of motion with constant rate of change of mass 牛頓運動第二定律在質量有勻速變化情況的應用
3. Uniform circular motion 勻速圓周運動
4. Gravity Force and Potential 萬有引力、引力勢
5. Hooke's Law 虎克定律
6. Density, buoyancy, pressure (solid and liquid) 密度、浮力、壓力(固體和液體)
7. Centre of mass 質心
8. Coefficient of friction, static friction and limiting friction 摩擦系數、靜摩擦、極限摩擦
9. Conservation of momentum in 2-D 二維空間的動量守恆
10. Equilibrium of coplanar forces 共面力的平衡

**Mechanics of Rigid Bodies** 剛體力學
1. Torque 轉矩 2. Balance of rigid bodies 剛體平衡

**Oscillations and waves** 振盪與波
1. Interference in thin film 薄膜干涉
2. Huygen's principle 惠更斯原理
3. Simple harmonic motion 簡諧振盪

**Electric Charge and Electric Field** 電荷與電場
1. Electric field strength and potential gradient 電場強度和電勢梯度
2. Internal resistance of power supply and meters 電源和電錶的內電阻
3. Force experienced by a charged particle in a uniform electric field($F = qE$) 勻電場中帶電粒子所受的力

**Current and Magnetic Field** 電流與電場
1. Lorentz force experienced by a moving charged particle in a uniform magnetic field($\boldsymbol{F} = q\boldsymbol{v}\times\boldsymbol{B}$) 移動中帶電粒子在勻磁場中所受的洛倫茲力
2. Electromagnetic induction, magnetic flux and Faraday's law of electromagnetic induction, magnetic field due to currents (e.g. solenoid, coil, straight line, etc). 電磁感應、磁通量與法拉第電磁感應定律、電流產生的磁場(例：螺線管、線圈、直導線等)
3. Magnetic field due to long straight wire, circular loop and long solenoid 載電流在長直導線、圓形線圈和長螺線管所產生的磁場
4. Kirchhoff's laws for Double-loop circuits 基爾霍夫定律在雙繞環電路的應用

**Optics**光學
1. Lens formula 透鏡公式
2. Optics include planar and curved mirrors 光學包括平面和曲面的反射鏡
3. Phase change during reflection 反射時的相位變化