AP Physics C: Mechanics

Syllabus Checklist · 大纲自查表

Tick one box per statement: ☐ not yet ☐ nearly ☐ confident. 每条打一个勾：尚未掌握 / 快会了 / 有把握。

1. Kinematics 运动学

1.1 Scalars and Vectors 标量与矢量

☐☐☐ Describe a scalar or vector quantity using magnitude and direction, as appropriate.

1.2 Displacement, Velocity, and Acceleration 位移、速度与加速度

☐☐☐ Describe a change in an object's position.

☐☐☐ Describe the average velocity and acceleration of an object.

☐☐☐ Describe the instantaneous position, velocity, and acceleration of an object as a function of time.

1.3 Representing Motion 运动的表示

☐☐☐ Describe the position, velocity, and acceleration of an object using representations of that object's motion.

1.4 Reference Frames and Relative Motion 参考系与相对运动

☐☐☐ Describe the reference frame of a given observer.

☐☐☐ Describe the motion of objects as measured by observers in different inertial reference frames.

1.5 Motion in Two or Three Dimensions 二维或三维运动

☐☐☐ Describe the motion of an object moving in two or three dimensions.

2. Force and Translational Dynamics 力与平动动力学

2.1 Systems and Center of Mass 系统与质心

☐☐☐ Describe the properties and interactions of a system.

☐☐☐ Describe the location of a system's center of mass with respect to the system's constituent parts.

2.2 Forces and Free-Body Diagrams 力与受力图

☐☐☐ Describe a force as an interaction between two objects or systems

☐☐☐ Describe the forces exerted on an object or system using a free-body diagram.

2.3 Newton's Third Law 牛顿第三定律

☐☐☐ Describe the interaction of two objects or systems using Newton's third law and a representation of paired forces exerted on each object or system.

2.4 Newton's First Law 牛顿第一定律

☐☐☐ Describe the conditions under which a system's velocity remains constant.

2.5 Newton's Second Law 牛顿第二定律

☐☐☐ Describe the conditions under which a system's velocity changes.

2.6 Gravitational Force 万有引力

☐☐☐ Describe the gravitational interaction between two objects or systems with mass.

☐☐☐ Describe situations in which the gravitational force can be considered constant.

☐☐☐ Describe the conditions under which the magnitude of a system's apparent weight is different from the magnitude of the gravitational force exerted on that system.

☐☐☐ Describe inertial and gravitational mass.

☐☐☐ Describe the gravitational force exerted on an object by a uniform spherical distribution of mass.

2.7 Kinetic and Static Friction 动摩擦与静摩擦

☐☐☐ Describe kinetic friction between two surfaces.

☐☐☐ Describe static friction between two surfaces.

2.8 Spring Forces 弹簧力

☐☐☐ Describe the force exerted on an object by an ideal spring.

☐☐☐ Describe the equivalent spring constant of a combination of springs exerting forces on an object.

2.9 Resistive Forces 阻力

☐☐☐ Describe the motion of an object subject to a resistive force.

2.10 Circular Motion 圆周运动

☐☐☐ Describe the motion of an object traveling in a circular path.

☐☐☐ Describe circular orbits using Kepler's third law.

3. Work, Energy, and Power 功、能与功率

3.1 Translational Kinetic Energy 平动动能

☐☐☐ Describe the translational kinetic energy of an object in terms of the object's mass and velocity.

3.2 Work 功

☐☐☐ Describe the work done on an object or system by a given force or collection of forces.

3.3 Potential Energy 势能

☐☐☐ Describe the potential energy of a system.

3.4 Conservation of Energy 能量守恒

☐☐☐ Describe the energies present in a system.

☐☐☐ Describe the behavior of a system using conservation of mechanical energy principles.

☐☐☐ Describe how the selection of a system determines whether the energy of that system changes.

3.5 Power 功率

☐☐☐ Describe the transfer of energy into, out of, or within a system in terms of power.

4. Linear Momentum 线动量

4.1 Linear Momentum 线动量

- ☐☐☐ Describe the linear momentum of an object or system.

4.2 Change in Momentum and Impulse 动量变化与冲量

- ☐☐☐ Describe the impulse delivered to an object or system.
- ☐☐☐ Describe the relationship between the impulse exerted on an object or system and the change in momentum of the object or system.

4.3 Conservation of Linear Momentum 线动量守恒

- ☐☐☐ Describe the behavior of a system using conservation of linear momentum.
- ☐☐☐ Describe how the selection of a system determines whether the momentum of that system changes.

4.4 Elastic and Inelastic Collisions 弹性碰撞与非弹性碰撞

- ☐☐☐ Describe whether an interaction between objects is elastic or inelastic.

5. Torque and Rotational Dynamics 力矩与转动动力学

5.1 Rotational Kinematics 转动运动学

- ☐☐☐ Describe the rotation of a system with respect to time using angular displacement, angular velocity, and angular acceleration.

5.2 Connecting Linear and Rotational Motion 联系线运动与转动

- ☐☐☐ Describe the linear motion of a point on a rotating rigid system that corresponds to the rotational motion of that point, and vice versa.

5.3 Torque 力矩

- ☐☐☐ Identify the torques exerted on a rigid system.
- ☐☐☐ Describe the torques exerted on a rigid system.

5.4 Rotational Inertia 转动惯量

- ☐☐☐ Describe the rotational inertia of a rigid system relative to a given axis of rotation.
- ☐☐☐ Describe the rotational inertia of a rigid system rotating about an axis that does not pass through the system's center of mass.

5.5 Rotational Equilibrium and Newton's First Law in Rotational Form 转动平衡与转动形式的牛顿第一定律

- ☐☐☐ Describe the conditions under which a system's angular velocity remains constant.

5.6 Newton's Second Law in Rotational Form 转动形式的牛顿第二定律

- ☐☐☐ Describe the conditions under which a system's angular velocity changes.

6. Energy and Momentum of Rotating Systems 转动系统的能量与动量

6.1 Rotational Kinetic Energy 转动动能

- ☐☐☐ Describe the rotational kinetic energy of a rigid system in terms of the rotational inertia and angular velocity of that rigid system.

6.2 Torque and Work 力矩与功

- ☐☐☐ Describe the work done on a rigid system by a given torque or collection of torques.

6.3 Angular Momentum and Angular Impulse 角动量与角冲量

- ☐☐☐ Describe the angular momentum of an object or rigid system.
- ☐☐☐ Describe the angular impulse delivered to an object or rigid system by a torque.
- ☐☐☐ Relate the change in angular momentum of an object or rigid system to the angular impulse given to that object or rigid system.

6.4 Conservation of Angular Momentum 角动量守恒

- ☐☐☐ Describe the behavior of a system using conservation of angular momentum.
- ☐☐☐ Describe how the selection of a system determines whether the angular momentum of that system changes.

6.5 Rolling 滚动

- ☐☐☐ Describe the kinetic energy of a system that has translational and rotational motion.
- ☐☐☐ Describe the motion of a system that is rolling without slipping.
- ☐☐☐ Describe the motion of a system that is rolling while slipping.

6.6 Motion of Orbiting Satellites 轨道卫星的运动

- ☐☐☐ Describe the motions of a system consisting of two objects or systems interacting only via gravitational forces.

7. Oscillations 振动

7.1 Defining Simple Harmonic Motion (SHM) 简谐运动的定义

- ☐☐☐ Describe simple harmonic motion.

7.2 Frequency and Period of SHM 简谐运动的频率与周期

- ☐☐☐ Describe the frequency and period of an object exhibiting SHM.

7.3 Representing and Analyzing SHM 简谐运动的表示与分析

- ☐☐☐ Describe the displacement, velocity, and acceleration of an object exhibiting SHM.

7.4 Energy of Simple Harmonic Oscillators 简谐振子的能量

- ☐☐☐ Describe the mechanical energy of a system exhibiting SHM.

7.5 Simple and Physical Pendulums 单摆与物理摆

☐☐☐ Describe the properties of a physical pendulum.