

Physics 1 is graded on reasoning, and a reasoning point almost always begins with a definition used precisely. Write the definition, then say which quantity is constant and which changes. A qualitative answer that never names the conserved quantity scores nothing. 物理题的推理分要求准确使用定义, 并指明哪个量守恒、哪个量变化。

Kinematics

Displacement 位移 — the change in position of an object, a vector from start point to end point; it is not the distance travelled

Velocity 速度 — the rate of change of displacement with time, a vector

Acceleration 加速度 — the rate of change of velocity with time; an object changing direction at constant speed is still accelerating

Average velocity 平均速度 — total displacement divided by total time, which equals the slope of the line joining two points on a position-time graph

Forces and translational dynamics

Free-body diagram 受力图 — a diagram showing every force acting ON one chosen object as a labelled arrow, and no forces exerted BY it

Newton’s second law 牛顿第二定律 — the acceleration of an object is proportional to the net force on it and inversely proportional to its mass

Newton’s third law pair 牛顿第三定律作用力对 — two forces equal in magnitude and opposite in direction, acting on DIFFERENT objects and of the same type

Static friction 静摩擦力 — the force that opposes impending relative sliding; it takes whatever value is needed up to a maximum

Centripetal acceleration 向心加速度 — the acceleration of an object in circular motion, directed toward the centre, of magnitude v^2/r

Energy and momentum

Work 功 — the energy transferred by a force, equal to the component of force along the displacement multiplied by that displacement

Kinetic energy 动能 — the energy an object has because of its motion, equal to $\frac{1}{2}mv^2$

Potential energy 势能 — energy stored in the configuration of a system of interacting objects; it belongs to the system, not to one object

Conservation of energy 能量守恒 — the total energy of a closed system is constant; energy is transferred between forms rather than created or destroyed

Power 功率 — the rate at which energy is transferred or work is done

Momentum 动量 — the product of an object’s mass and velocity, a vector

Impulse 冲量 — the product of net force and the time it acts, equal to the change in momentum

Elastic collision 弹性碰撞 — a collision in which total kinetic energy is conserved as well as momentum

Inelastic collision 非弹性碰撞 — a collision in which momentum is conserved but kinetic energy is not

Rotation

Torque 力矩 — the turning effect of a force, equal to the force multiplied by the perpendicular distance from the axis to the line of action

Rotational inertia 转动惯量 — the resistance of an object to angular acceleration; it depends on both mass and how that mass is distributed about the axis

Angular momentum 角动量 — the rotational analogue of momentum, conserved when the net external torque on a system is zero

Oscillations and fluids

Simple harmonic motion 简谐运动 — motion in which the restoring force is proportional to the displacement from equilibrium and directed toward it

Period 周期 — the time for one complete oscillation; for a mass on a spring it is independent of amplitude

Amplitude 振幅 — the maximum displacement from the equilibrium position

Spring constant 弹簧劲度系数 — the force needed per unit extension of a spring, the slope of a force-extension graph

Density 密度 — mass per unit volume

Pressure 压强 — force per unit area exerted perpendicular to a surface

Buoyant force 浮力 — the upward force on a submerged object, equal in magnitude to the weight of the fluid it displaces