Particle (Point Mass)

Physics with Tiaotiao 跳跳 · Kinematics · High School Physics
Study sheet for the video "Point Mass (Particle) Explained": key ideas and practice questions (answers are in a separate answer key)

Key ideas

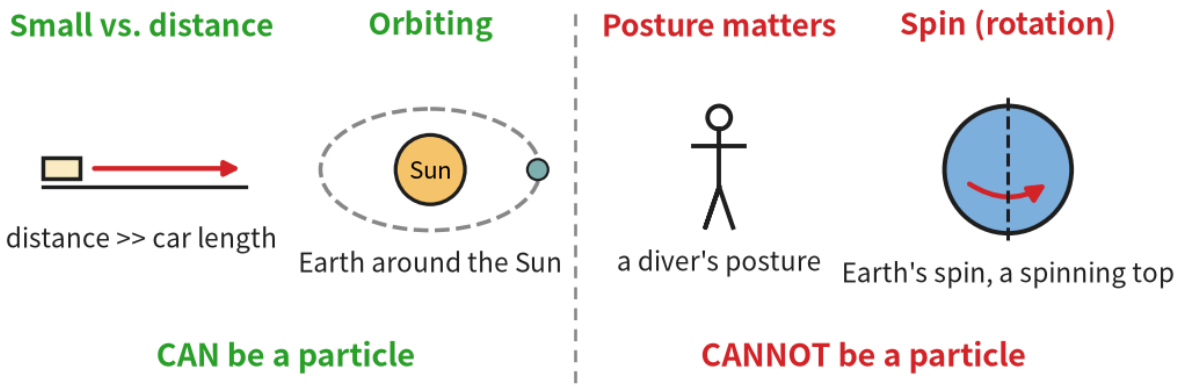
Particle: a point that has only **mass**; its shape and size are ignored (not a geometric point!)

Physical meaning: it simplifies the problem (being lazy). It is an **idealized model** and does not exist in reality.



The one condition: its shape and size have **no effect** (or little effect) on the problem being studied.
Whether something is a particle depends on the problem, not on the object.

Commonly tested



Can be treated as a particle	Cannot be treated as a particle
A vehicle much smaller than the distance it travels e.g. a 1 km long train travels 12,000 km: to find its average speed, treat it as a particle.	Its posture (body movements) matters e.g. can a bird land on a branch? A diver's posture.
Orbiting (revolution), when the body is small compared with its orbit	Studying its own spin (rotation) Exam tip: if its own rotation is involved, don't treat it as a particle.

Practice

Try these first. The answers are in a separate answer key.

1. In physics, introducing the concept of the "particle" belongs to which scientific method? ( )

A. Observation and experiment

B. Building an idealized model

C. Analogy

D. Logical reasoning

Answer: _____ Why?

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2. Decide whether each statement is true (T) or false (F).

_____ (1) Any object with very small mass and very small volume can be treated as a particle.

_____ (2) If an object's shape and size have no effect, or little effect, on the problem being studied, it can be treated as a particle.

_____ (3) A particle has no size, so it is the same as a geometric point.

_____ (4) A particle is just a very small ball.

_____ (5) A particle is an idealized model that does not actually exist, so introducing this concept is not very meaningful.

3. (2021 Zhejiang gaokao) The four photos were taken with a high-speed camera. Which statement is correct? ( )

Gaokao is China's national college entrance exam.



Photo 1

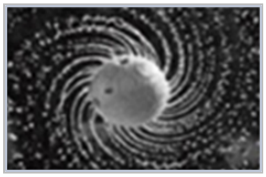


Photo 2



Photo 3



Photo 4

A. Studying the velocity of the cat walking on the floor (Photo 1), the cat can be treated as a particle

B. Studying why the water drops take their shape (Photo 2), the rotating ball can be treated as a particle

C. Studying whether the flying bird can land on the stump (Photo 3), the bird can be treated as a particle

D. Studying whether the rider and horse can clear the obstacle (Photo 4), the horse can be treated as a particle

Answer: _____ Why are the others wrong?

One-line summary

Shape and size don't matter for *this* problem → particle. Posture or spin matters → not a particle.

Key terms

Term	Meaning	Chinese

particle, point mass	an object treated as a point that has mass	质点 zhìdiǎn
idealized model	a simplified picture that keeps only what matters	理想模型 lǐxiǎng móxíng
mass	how much matter an object has	质量 zhìliàng
orbiting, revolution	moving around another body, e.g. Earth around the Sun	公转 gōngzhuàn
spin, rotation	turning around its own axis	自转 zìzhuàn
scientific method	a way of doing science, e.g. building models, experiments	科学方法 kēxué fāngfǎ