Mass vs Weight (Secondary 1)

Passage

Many students think mass and weight mean the same thing, but in physics they are two different ideas. Mass is the amount of matter in an object. It does not change, even if the object is taken to the Moon or into space. A book with a mass of 1 kg on Earth still has a mass of 1 kg on the Moon.

Weight, however, is the force of gravity acting on an object. Because gravity is different on different planets, weight can change. On Earth, gravity pulls objects with a strength of about 10 N/kg. This means a 1 kg object has a weight of about 10 N. On the Moon, gravity is much weaker, so the same object would weigh less.

Scientists use the formula Weight = Mass × g, where g is the gravitational field strength. Mass is measured in kilograms (kg), while weight is measured in newtons (N).

Understanding the difference between mass and weight helps us describe motion and forces more accurately. It also explains why astronauts feel lighter on the Moon even though their bodies have not changed.

Questions

Part A — Multiple Choice

1. Which statement about mass is correct?

A. It changes when gravity changes

B. It is measured in newtons

C. It stays the same everywhere

D. It depends on the planet you are on

2. What is the unit of weight?

A. kg

B. N

C. m/s

D. J

3. A 3 kg object on Earth has a weight of:

A. 3 N

B. 10 N

C. 30 N

D. 300 N

Part B — Short Questions

4. Explain why weight changes on different planets.

5. A student says, “I weigh 40 kg.” Is this scientifically correct? Explain.

Part C — Data Interpretation

Use g = 10 N/kg unless stated otherwise.
A rock has a mass of 8 kg.

6. What is its weight on Earth?

7. On the Moon, gravity is 1.6 N/kg. What is the rock’s weight on the Moon?

Part D — Challenge Question

8. An astronaut’s mass is 60 kg on Earth. On the Moon, the astronaut weighs much less. Does the astronaut’s mass change? Explain.

Answer Key

Part A

1. C

2. B

3. C

Part B

4. Weight changes because it depends on gravity. Different planets have different gravitational strengths, so the force acting on the object changes.

5. Kilograms (kg) measure mass, not weight. Weight should be measured in newtons (N) because weight is a force caused by gravity. When someone says “I weigh 40 kg,” they are actually giving their mass, not their weight. A correct scientific statement would be: “My mass is 40 kg.” Or if they want to express weight: “My weight is 400 N on Earth.”

Part C

6. Weight = 8 × 10 = 80 N

7. Weight = 8 × 1.6 = 12.8 N

Part D

8. No, the astronaut’s mass does not change. Mass is the amount of matter in the body and stays the same everywhere. Only weight changes because gravity changes.