Force, Motion, and Energy Assessment

Introduction

This assessment is designed to evaluate students' understanding of the relationship between force, motion, and energy, as well as their ability to identify types of forces and explain Newton's laws of motion.

The assessment is aligned with the Texas Essential Knowledge and Skills (TEK) 7.3A and is intended for 14-15 year old students.

Section 1: Multiple Choice Questions

Choose the correct answer for each question.

1. What is the relationship between force and motion?
   A. Force causes motion
   B. Motion causes force
   C. Force and motion are unrelated
   D. Force opposes motion

2. Which type of force is responsible for opposing motion between two surfaces that are in contact?
   A. Friction
   B. Gravity
   C. Normal
   D. Applied

3. According to Newton's First Law of Motion, what happens to an object at rest or in motion when no net force is applied?
   A. It accelerates
   B. It decelerates
   C. It remains at rest or in motion
   D. It changes direction

Section 2: Short Answer Questions

Answer each question in complete sentences.

1. Describe the difference between a contact force and a non-contact force. Provide an example of each.

2. Explain how Newton's Second Law of Motion relates to the concept of acceleration.

3. Describe a scenario where Newton's Third Law of Motion is observed.

4. What is the relationship between force, mass, and acceleration? Use an equation to support your answer.

Section 3: Diagram Labeling Tasks

Label each diagram with the correct forces.

1. Label the following forces on the diagram: friction, gravity, normal, applied.

   [Insert diagram]

2. Identify and label the type of motion (linear, circular, rotational) in the given diagram.

   [Insert diagram]

3. Label the forces acting on an object in the given scenario, including the net force.

[Insert diagram]

Section 4: Critical Thinking Questions

Answer each question in complete sentences.

1. A car is traveling at a constant speed on a flat road. What forces are acting on the car?

2. A ball is thrown upwards into the air. What forces are acting on the ball as it rises and falls?

3. A bicycle is moving along a straight path. What forces are acting on the bicycle as it moves?

Section 5: Case Study

Read the scenario and answer the questions that follow.

A 10 kg box is pushed across a frictionless floor with a force of 20 N. What is the acceleration of the box? Use Newton's Second Law of Motion to support your answer.

1. What is the net force acting on the box?

2. What is the acceleration of the box?

3. What would happen to the acceleration of the box if the force applied was increased to 30 N?

Conclusion

This assessment is designed to evaluate students' understanding of the relationship between force, motion, and energy, as well as their ability to identify types of forces and explain Newton's laws of motion.

The assessment includes multiple choice questions, short answer questions, diagram labeling tasks, critical thinking questions, and a case study.

Answer Key

The answers to the questions can be found below.

Multiple Choice Questions

1. A) Force causes motion
2. A) Friction
3. C) It remains at rest or in motion

Short Answer Questions

1. A contact force is a force that is applied directly to an object, while a non-contact force is a force that is applied without physical contact. Example: Friction is a contact force, while gravity is a non-contact force.
2. Newton's Second Law of Motion states that the force applied to an object is equal to the mass of the object multiplied by its acceleration.
3. A scenario where Newton's Third Law of Motion is observed is when a car accelerates forward, the ground exerts an equal and opposite force on the car.
4. The relationship between force, mass, and acceleration is F = ma, where F is the net force, m is the mass, and a is the acceleration.

Diagram Labeling Tasks

1. Friction, gravity, normal, applied
2. Linear, circular, rotational
3. Forces acting on an object: friction, gravity, normal, applied; net force: 20 N

Critical Thinking Questions

1. The forces acting on the car are friction, gravity, and the force applied by the engine.
2. The forces acting on the ball as it rises and falls are gravity and air resistance.
3. The forces acting on the bicycle as it moves are friction, gravity, and the force applied by the rider.

Case Study

1. The net force acting on the box is 20 N.
2. The acceleration of the box is 2 m/s^2.
3. If the force applied was increased to 30 N, the acceleration of the box would increase to 3 m/s^2.