



**UNITED NATIONS SCHOOL IED
PREPARATION WORKSHOP
3rd TERM
PHYSICS
GRADE 10**

NOTE: The questions and answers must be copied and solved in the physics notebook as a requirement to take the competency-based test.

DUE DATE: November 6, 2024

Problems on Newton's First Law (Law of Inertia):

1. **Problem 1:** A car is traveling at 80 km/h on a straight road, and the driver suddenly brakes. According to Newton's First Law, what happens to the passengers who are not wearing seat belts?
2. **Problem 2:** An object is at rest on a table. Explain which forces are acting on the object and why it remains at rest according to Newton's First Law.
3. **Problem 3:** A train is traveling at a constant speed in a straight line. What is the net force acting on the train and why?
4. **Problem 4:** A ball is at rest on the ground. Someone kicks it. According to Newton's First Law, what happens to the ball before and after the force is applied?
5. **Problem 5:** An astronaut in space pushes a box, and it continues to move indefinitely at a constant speed. Explain this phenomenon using Newton's First Law.
6. **Problem 6:** A person pushes a piece of furniture but is unable to move it. According to Newton's First Law, why doesn't the furniture move if a force is being applied?
7. **Problem 7:** A cyclist is traveling at 20 km/h and suddenly stops pedaling on a flat road. What will happen to the cyclist's movement according to Newton's First Law?

Problems on Newton's Second Law ($F = ma$):

8. **Problem 8:** A car weighing 1000 kg is accelerating at 2 m/s². What is the net force acting on the car?
9. **Problem 9:** A child pushes a shopping cart with a force of 30 N, causing it to accelerate at 0.5 m/s². What is the mass of the cart?
10. **Problem 10:** If an object has a mass of 5 kg and a force of 20 N is applied to it, what will its acceleration be?

11. **Problem 11:** A 3000 kg truck brakes and experiences a deceleration of 4 m/s^2 . What net force is required to achieve this deceleration?
12. **Problem 12:** A rocket has a mass of 10,000 kg and needs an acceleration of 30 m/s^2 to take off. What force must the engine exert to achieve this?
13. **Problem 13:** An object with a mass of 12 kg experiences an acceleration of 5 m/s^2 . What net force is acting on the object?
14. **Problem 14:** If you push a 10 kg box with a force of 50 N and it experiences an acceleration of 3 m/s^2 , what is the frictional force opposing the motion?
15. **Problem 15:** A train weighing 5000 kg experiences an acceleration of 1.5 m/s^2 . If the train is moving on a frictionless track, what is the total force driving the train?
16. **Net force on a sliding box**
A box with a mass of 15 kg is pushed across a floor with a force of 90 N. If the frictional force opposing the motion is 30 N, what is the acceleration of the box?
17. **Acceleration of a sled**
A sled with a mass of 25 kg is pulled with a force of 100 N on a frictionless surface. What will be its acceleration?
18. **Braking force on a car**
A car with a mass of 1500 kg decelerates at 3 m/s^2 when the brakes are applied. What is the braking force?
19. **Net force on a bicycle**
A cyclist with a total mass (bike + rider) of 80 kg accelerates at 1.5 m/s^2 . What net force is causing this acceleration?
20. **Force required to lift a weight**
A weightlifter lifts a barbell with a mass of 200 kg, accelerating it upward at 1.2 m/s^2 . What is the net force applied to the barbell?
21. **Rocket propulsion force**
A spacecraft with a mass of 12,000 kg accelerates at 15 m/s^2 . What force must the rocket engine produce?
22. **Force on a falling object with air resistance**
A 50 kg object is falling under the influence of gravity (9.8 m/s^2), but air resistance exerts an upward force of 100 N. What is the net acceleration of the object?
23. **Acceleration of a dragged crate**
A crate with a mass of 100 kg is dragged across the floor with a force of 250 N. If the frictional force is 100 N, what is the crate's acceleration?
24. **Force on a soccer ball**
A soccer player kicks a ball with a mass of 0.45 kg, and the ball accelerates at 30 m/s^2 . What is the force exerted on the ball?
25. **Deceleration of a motorcycle**
A motorcycle with a mass of 200 kg decelerates at 5 m/s^2 when the brakes are applied. What is the braking force?

26. Acceleration of a helicopter

A helicopter with a mass of 5000 kg lifts off the ground, accelerating upward at 4 m/s^2 . What force is produced by the helicopter's rotors?

27. Net force on a runner

A sprinter with a mass of 70 kg accelerates at 2.5 m/s^2 . What is the net force required for this acceleration?

28. Force acting on a boat

A boat with a mass of 3000 kg is accelerating at 2 m/s^2 . What is the net force applied to the boat?

29. Force to push a cart up a hill

A person pushes a 40 kg cart uphill, applying a force of 160 N. If the cart accelerates at 2 m/s^2 , what is the frictional force resisting the motion?

30. Force to stop a speeding truck

A truck with a mass of 5000 kg is moving at a certain speed and needs to be brought to a stop. If a force of 20,000 N is applied in the opposite direction, what deceleration will the truck experience?