

Physical Science II
Newton's 2nd Law of Motion

Mr. Menin NAME _____ SEC _____ DATE _____

1. Write Newton's second law of motion here:

1.5. What does each letter stand for? _____

2. Write the two equations of motion that have "a" in them:

Basic Problems

3. A toy plane has a mass of 5 kg. You want to accelerate it at 3 m/s/s. How much force do you need?

4. A toy car has a mass of 2 kg. You want to accelerate it at 5 m/s/s. How much force do you need?

5. You are designing a real car. Its mass will be 1400 kg. Your boss wants it to accelerate at 3.2 m/s/s. How much force must the engine provide?

6. A plane has a mass of 210,000 kg. To take off it must accelerate at 2.5 m/s/s. What force do the engines have to produce?

7. A toy car has a mass of 2 kg. The engine produces a force of 10 N. What is the acceleration of the car?

8. A toy car has a mass of 6 kg. The engine produces a force of 18 N. What is the

acceleration of the car?

9. A small plane's engine produces 3300 N of force. The plane has a mass of 1700 kg. What is the plane's acceleration?

10. A car with a mass of 1300 kg has an engine that produces 6000 N of force. What is the car's acceleration?

11. An engine produces 12 N of force in a toy boat. The boat's acceleration is 2 m/s/s. What is the mass of the boat?

12. (B-question) A car with a mass of 1200 kg has an acceleration of 3 m/s/s. When 5 people get in the car, they add 400 kg to the mass. What is the acceleration now? (Assume that the engine force stays the same.)

13. (B-question) A truck with a mass of 2000 kg has an acceleration of 2 m/s/s. You put a 600 kg machine in the bed of the pickup. What is the acceleration now?

Newton's Second Law and Net Force

14. A toy car has a mass of 4 kg. The engine produces 15 N of force, but there is 3 N of friction force acting against it.

a) What is the net force on the car?

b) What is the car's acceleration?

15. A toy plane has a mass of 2 kg. The engine produces 20 N of force, but there is a friction force of 6 N acting against it.

a) What is the net force on the plane?

b) What is the plane's acceleration?

16. A car's engine produces 7500 N of force, but there is 1200 N of friction force opposing this. The car has a mass of 1600 kg. What is the car's acceleration?

17. The total friction force on a plane is 2200 N. The plane's engine produces a force of 12,000 N. The mass of the plane is 4700 kg. What is the plane's acceleration?

Newton's Second Law and the Equations of Motion

18. A toy truck has a mass of 3 kg. Its velocity changes from 0 to 10 m/s in 5 seconds.
- What is its acceleration?
 - How much force is needed?
19. A toy plane has a mass of 2 kg. Its velocity changes from 0 to 12 m/s in 4 seconds.
- What is its acceleration?
 - How much force is needed?
20. Your boss wants a new car to go from 0 to a velocity of 30 m/s in just 6 seconds. The car's mass is 1500 kg. How much force is needed to do this?
21. A plane must accelerate from 0 to 70 m/s in 40 seconds. The plane's mass is 150,000 kg. How much force is needed to do this?
22. You are an automotive engineer. You want your 900 kg compact sports car to reach 30 m/s in just 4.5 seconds. How much force must the engine produce?

23. You are a sprinter. Your goal is to reach a speed of 12 m/s in just 4.1 seconds. If your mass is 85 kg, how much force must your legs produce?

24. A tiger has a mass of 250 kg. Its legs can exert a force of 1850 N. It starts from rest and begins to accelerate.

How fast is it going after 3 seconds?

25. An 1100 kg car has an engine that produces a force of 5000 N. The car starts from rest and accelerates. How fast is it going after 5 seconds?

26. (B-question) A car's engine provides 3400 N of force. Friction is 400 N. The car's mass is 1000 kg. The car starts from rest. How far does it go in 4 seconds?

27) (B-question) A car's engine provides 2800 N of force. Friction is 500 N and the car's mass is 900 kg. How long does it take the car, starting from rest, to go 30 m?