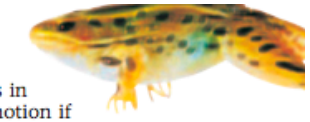
Chapter Review



USING VOCABULARY

To complete the following sentences, choose the correct term from each pair of terms listed below:

1. An object in motion tends to stay in motion because it has ___?___. (*inertia* or *terminal velocity*)
2. Falling objects stop accelerating at ___?___. (*free fall* or *terminal velocity*)
3. ___?___ is the path that a thrown object follows. (*Free fall* or *Projectile motion*)
4. A property of moving objects that depends on mass and velocity is ___?___. (*inertia* or *momentum*)
5. ___?___ only occurs when there is no air resistance. (*Momentum* or *Free fall*)

UNDERSTANDING CONCEPTS

Multiple Choice

6. A feather and a rock dropped at the same time from the same height would land at the same time when dropped by
   a. Galileo in Italy.
   b. Newton in England.
   c. an astronaut on the moon.
   d. an astronaut on the space shuttle.
7. When a soccer ball is kicked, the action and reaction forces do not cancel each other out because
   a. the force of the foot on the ball is bigger than the force of the ball on the foot.
   b. the forces act on two different objects.
   c. the forces act at different times.
   d. All of the above
8. An object is in projectile motion if
   a. it is thrown with a horizontal push.
   b. it is accelerated downward by gravity.
   c. it does not accelerate horizontally.
   d. All of the above
9. Newton's first law of motion applies
   a. to moving objects.
   b. to objects that are not moving.
   c. to objects that are accelerating.
   d. Both (a) and (b)
10. Acceleration of an object
    a. decreases as the mass of the object increases.
    b. increases as the force on the object increases.
    c. is in the same direction as the force on the object.
    d. All of the above
11. A golf ball and a bowling ball are moving at the same velocity. Which has more momentum?
    a. the golf ball, because it has less mass
    b. the bowling ball, because it has more mass
    c. They both have the same momentum because they have the same velocity.
    d. There is no way to know without additional information.

Short Answer

12. Explain how an orbit is formed.
13. Describe how gravity and air resistance combine when an object reaches terminal velocity.
14. Explain why friction can make observing Newton's first law of motion difficult.

Short Answer Space: _____

_____

_____

_____

_____

_____

_____

_____

Science number

Newton's Laws of Motion

Complete 3 drawings showing & stating Newton's 3 laws of Motion

Newton's First Law:
Newton's 2nd Law:
Newton's 3rd Law:

Name: _____ pd_____

Parent's signature_____

Science Number

Section 1: Gravity & Motion

1. **Aristotle** believed that the rate at which an object falls depends on the object's _____.
2. **Galileo** believed that all objects will land at the _____when they are dropped at the same time from the _____.
3. All objects accelerate towards Earth at a rate of _____m/s^2… this acceleration is the same for all objects regardless of their _____.
4. What fluid friction opposes the motion of objects through air? _____

Complete the table below.

	Definition	Example
5. *Terminal Velocity*		
6. *Free Fall*		
7. *Projectile Motion*		

Section 2: Newton's Laws of Motion

8.

Newton's First Law of Motion

An object at rest remains at rest and an object in motion remains in motion at a _____speed & in a _____line unless acted on by an unbalanced _____.

9. Label Figure 11 from page 145.

Formulas to Know!

Speed = Distance / Time
Distance= Speed x Time
Time = Distance / Speed
Velocity = Distance/Time w/Direction
Acceleration = V_f - V_i / Time
Velocity = Acceleration x Time
Time = Velocity / Acceleration

$$\text{Velocity} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

Force = Mass x Acceleration

Forces: Balanced or Unbalanced?

Calculate the net force for each. Remember to add forces in the same direction & subtract forces in the opposite direction. Please include units.

	Force 1	Force 2	Net Force & Direction	Balanced or Unbalanced? B or U?
1	1 N east	1 N east		
2	10 N north	10 N south		
3	5 N left	4.3 N left		
4	36 N up	36 N down		
5	25 N right	25 N right		
6	46 N left	43 N right		
7	9.5 N down	9.5 N up		
8	23 N right	13 N right		
9	3.6 N left	2.5 N right		
10	14.5 N down	14.5 N up		

10. Part 1 of Newton's 1st Law basically states that "objects will not start moving until a _____ or a _____ is exerted on them." Part 2 explains that "an object moving at a certain velocity will continue to move _____ at the same speed & in the same direction unless some _____ force acts on it."

11. What is inertia? _____

12.

Newton's Second Law of Motion

The acceleration of an object depends on the _____ of the object & the amount of _____ applied.

13. Name two ways to *increase* the acceleration of an object:
    - _____
    - _____

14. Name two ways to *decrease* the acceleration of an object:
    - _____
    - _____

15. What is the equation for Newton's 2nd law? _____

16.

Newton's Third Law of Motion

Whenever one object exerts a force on a second object, the second object exerts an _____ and _____ force on the first.

17. Newton's 3rd law can be simply stated as follows: _____

18. What are the two types of forces in Figure 17 on page 150?

19. In each of the examples of force pairs, state the action force & the reaction force, as done in the example.

Example	Action Force	Reaction Force
Rabbit Jumping	*Rabbit's legs push down on Earth*	*Earth pushes up on the rabbit's legs*
Baseball bat hitting baseball		
Shuttle launching		
Hand hits a table		

20. Momentum is a property of a moving object that depends on the object's _____ & _____.

Additional Notes: _____

_____

_____

_____

_____

_____-3-_____

ACCELERATION CALCULATIONS

Acceleration means a change in speed or direction. It can also be defined as a change in velocity per unit of time.

$$a = \frac{v_f - v_i}{t}$$ where a = velocity, v_f = final velocity, v_i = initial velocity, t = time

Calculate the acceleration for the following data.

	Initial Velocity	Final Velocity	Time	Acceleration
1.	0 km/hr	24 km/hr	3 s	_____
2.	0 m/s	35 m/s	5 s	_____
3.	20 km/hr	60 km/hr	10 s	_____
4.	50 m/s	150 m/s	5 s	_____
5.	25 km/hr	1200 km/hr	2 min	_____

6. A car accelerates from a standstill to 60 km/hr in 10.0 seconds.
   What is its acceleration? _____

7. A car accelerates from 25 km/hr to 55 km/hr in 30 seconds.
   What is its acceleration? _____

8. A train is accelerating at a rate of 2.0 km/hr/s.
   If its initial velocity is 20 km/hr, what is its velocity after 30 seconds? _____

9. A runner achieves a velocity of 11.1 m/s 9 s after he begins.
   What is his acceleration? _____
   What distance did he cover? _____

GRAVITY AND ACCELERATION (I)

The acceleration of a freely falling body is 9.8 m/sec/sec due to the force of gravity.

Using the formula, $a = \frac{V_f - V_i}{t}$, we can calculate the velocity of a falling object at any time if the initial velocity is known.

Example: What is the velocity of a rubber ball dropped from a building roof after 5 seconds?

Answer: $9.8 \text{ m/sec/sec} = \frac{V_f - 0}{5 \text{ sec}}$

$V_f = 49 \text{ m/sec}$

Solve the following problems.

1. What is the velocity of a quarter dropped from a tower after 10 seconds?

   Answer: _____

2. If a block of wood dropped from a tall building has attained a velocity of 78.4 m/s, how long has it been falling?

   Answer: _____

3. If a ball that is freely falling has attained a velocity of 19.6 m/s after two seconds, what is its velocity five seconds later?

   Answer: _____

4. A piece of metal has attained a velocity of 107.8 m/sec after falling for 10 seconds. What is its initial velocity?

   Answer: _____

5. How long will it take an object that falls from rest to attain a velocity of 147 m/sec?

   Answer: _____

GRAVITY AND ACCELERATION (II)

The distance covered by a freely falling body is calculated by the following formula,

$$d = \frac{at^2}{2}$$

where d = distance
a = acceleration
t = time

Example 1: How far will an object fall in 5 seconds?

Answer: $d = \frac{9.8 \text{ m/s}^2) (5\text{s})^2}{2} = 122.5 \text{ meters}$

Example 2: What is the average velocity of a ball that attains a velocity of 39.2 m/s after 4 seconds?

Answer: $V_a = \frac{V_f - V_i}{2} = \frac{39.2 - 0}{2} = 19.6 \text{ m/s}$

Solve the following problems.

1. How far will a rubber ball fall in 10 seconds?

   Answer: _____

2. How far will a rubber ball fall in 20 seconds?

   Answer: _____

3. How long will it take an object dropped from a window to fall a distance of 78.4 meters?

   Answer: _____

4. Calculate the final velocity of the ball in Problem 1.

   Answer: _____

5. What is the average velocity of the ball in Problem 1?

   Answer: _____

6. An airplane is traveling at an altitude of 31,360 meters. A box of supplies is dropped from its cargo hold. How long will it take to reach the ground?

   Answer: _____

7. At what velocity will the box in Problem 6 be traveling when it hits the ground?

   Answer: _____

8. What is the average velocity of the box in Problem 6?

   Answer: _____