

$$a_c = \frac{v^2}{r}$$

$$F_c = m \cdot a_c$$

1. B Freefall is...
A. The natural downward motion of objects under Earth's gravity.
B. Because of gravity attraction force between the Earth and the object.
C. Affected by air resistance
D. All of the above.
2. B Air resistance affects a moving object _____ as the object moves.
A. In the same direction C. In the up direction
B. In the opposite direction D. In the down direction
3. B Terminal velocity is the
A. Slowest freefall velocity a falling object can have.
B. The fastest freefall velocity a falling object can have.
C. The velocity of an object floating in the air.
D. The velocity of an object when it impacts the ground.
4. D Which object has the strongest gravity field?
A. Atom B. Grain of sand C. Baseball D. Human man
5. D Which object has the strongest gravity field?
A. Earth B. Jupiter C. Moon D. Sun
6. A Gravity is universal because...
A. All objects in our universe attract all other objects in our universe
B. The force of one object pulling on another is equal and opposite the force of the other object pulling back
C. The greater the mass of the object, the more gravity attributed to that object.
D. Gravity is proportional to the mass of the object and inversely proportional to the distance squared.
7. C Two objects gravitationally attract each other. Object 1 has a mass of 1000 kg. Object 2 has a mass of 1000 kg. Which is true?
A. Object 1 pulls on Object 2 with a greater force than Object 2 pulls on Object 1.
B. Object 1 pulls on Object 2 with a weaker force than Object 2 pulls on Object 1.
C. Object 1 pulls on Object 2 with a force equal to the force that Object 2 pulls on Object 1.
D. The strength of gravity depends on the distance between the objects and not the masses.

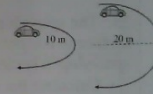
- 8 C Two objects gravitationally attract each other. Object 1 has a mass of 1000 kg. Object 2 has a mass of 10 kg. Which is true?
 A. Object 1 pulls on Object 2 with a greater force than Object 2 pulls on Object 1.
 B. Object 1 pulls on Object 2 with a weaker force than Object 2 pulls on Object 1.
 C. Object 1 pulls on Object 2 with a force equal to the force that Object 2 pulls on Object 1.
 D. The strength of gravity depends on the distance between the objects and not the masses.
- You stand on the deck of a bridge. You hold two rocks of the same size. Rock 1 has a mass of 10 kg. Rock 2 has a mass of 30 kg. You release both at the same time from the same height. Which hits the ground first?
 9 C
 A. Rock 1 B. Rock 2 C. Both impact at the same time. D. Both float away
 → assuming no air resistance
- You hold a rubber ball and a feather in your hands at the same height above the floor. You release the rubber ball and the feather at the same time. Which hits the floor first?
 10 C
 A. Rubber ball. B. Feather C. Both impact at the same time. D. Both float away
 → assuming no air resistance
- A cannonball is launched from a cannon with *parabolic projectile motion*. Which is true?
 11 A
 A. The cannonball's horizontal velocity is constant with time and distance away from the cannon.
 B. The cannonball's horizontal velocity increases with time and distance away from the cannon.
 C. The cannonball accelerates upward then accelerates downward.
 D. The cannonball's horizontal velocity is zero, it only moves up and down.
- A cannonball is launched from a cannon with *parabolic projectile motion*. Where is the cannonball moving the fastest in the up direction?
 12 A
 A. At launch position C. At the instant of impact with the ground.
 B. At highest position above the ground. D. Always moves with the same upward velocity.
- Horizontal projectile motion. Cannon #1 is 2.0 meters above the ground. Cannon #2 is 4.0 meters above the ground. Cannon #1 launches a cannonball horizontally with launch with the velocity of 20 m/s.
 13 C
 Cannon #2 launches a cannonball with the velocity of 20 m/s. Both cannonballs are launched at the same time. Both cannonballs are 10 kg. Which is true?
 A. Cannonball #1 will have the greater range and greater time of flight.
 B. Cannonball #1 will have the greater range, but shorter time of flight.
 C. Cannonball #2 will have the greater range, and longer time of flight.
 D. Cannonball #2 will have the greater range, however, both have equal times of flight.
- Which combination of objects has the strongest gravitational attraction force?
 14 B
 A. Object 1 = 10 kg; Object 2 = 10 kg; distance = 2 meters
 B. Object 1 = 10 kg; Object 2 = 20 kg; distance = 2 meters
 C. Object 1 = 5 kg; Object 2 = 20 kg; distance = 2 meters
 D. Object 1 = 5 kg; Object 2 = 10 kg; distance = 2 meters
- Which combination of objects has the weakest gravitational attraction force?
 15 D
 A. Object 1 = 10 kg; Object 2 = 10 kg; distance = 2 meters
 B. Object 1 = 10 kg; Object 2 = 10 kg; distance = 4 meters
 C. Object 1 = 10 kg; Object 2 = 10 kg; distance = 8 meters
 D. Object 1 = 10 kg; Object 2 = 10 kg; distance = 16 meters
- If you double the distance between two objects, and mass remains the same, the new gravity force will be
 16 D
 A. 2-times greater than the original C. $\frac{1}{2}$ as strong as the original
 B. 4-times greater than the original D. $\frac{1}{4}$ as strong as the original

- 17 B _____ is when an object moves around another object. _____ is when an object spins on its axis around its center of mass.

A. Rotation; Revolution
B. Revolution; Rotation
C. Centripetal acceleration; Revolution
D. Centripetal force; Rotation

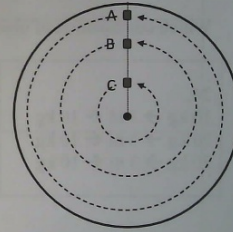
- 18 B Two cars move at the same speed. Car 1 moves around a curve with a turn radius of 10 meters. Car 2 moves around a curve with a turn radius of 20 meters. Which is true about centripetal acceleration?

A. Car 1's centripetal acceleration equals Car 2's.
B. Car 1's centripetal acceleration is 2-times greater than Car 2's.
C. Car 1's centripetal acceleration is 4-times greater than Car 2's.
D. Car 2's centripetal acceleration is 2-times greater than Car 1's.



- 19 A Three boys (Boy A, B, and C) ride on the merry-go-round. It rotates 1 time in 10 seconds. Which statement is true?

A. Boy A has the strongest centripetal acceleration and the fastest rotation speed.
B. Boy A has the strongest centripetal acceleration, but all three boys have equal rotation speed.
C. Boy C has the strongest centripetal acceleration, but Boy A has the fastest rotation speed.
D. Boy C has the strongest centripetal acceleration and the fastest rotation speed.



- 20 A Which is true about centripetal acceleration?

A. Direction is constantly changing, but always points inward toward the center of the circle.
B. Direction remains constant, and points outward away from the center of the circle.
C. Direction is parallel to the tangential velocity of the moving object.
D. Direction is constantly changing, but points perpendicular to the plane of the circular path.

21. You swing a ball on the end of a rope. The rope length is 1.65 m (the radius). The mass of the ball is 3.0 kg. You swing it 28 times in 1 minute.