**Gloag – Robin *PHYSNEWTON* final exam.**

**Constants needed: g = 9.81 m/s2 G = 6.67 × 10-11 Nmkg-2**

**Conversions needed: 1 kg = 2.2 lbs 1 mile = 1609 meters**

1. A pitcher throws a baseball, pushing on it with a force of 90 Newtons. If the pitchers hand is in contact with the ball over a distance of 1.5 meters, what is the kinetic energy of the ball as it leaves the pitcher’s hand?
   1. 60 J
   2. 90 J
   3. 101 J
   4. 135 J
2. A 15 gram bullet is fired from a 1.8 kg gun. If the gun recoils at 2.5 m/s, at what velocity does the bullet leave the gun?
   1. 0.25 m/s
   2. 67.5 m/s
   3. 300 m/s
   4. 900 m/s
3. A 260 kg roller coaster car is 14 meters above ground level. What is the maximum kinetic energy it could gain by falling to a height of 5 meters on the first drop?
   1. 22,900 J
   2. 39,500 J
   3. 66,800 J
   4. 99,200 J
4. Which of the following best describes the trajectory of a football as it is passed between two players?
   1. The ball travels in a perfectly straight line between the players.
   2. The ball travels in a parabolic path as the vertical velocity is affected by gravity.
   3. The ball travels in a circular orbit, being accelerated towards the earth’s center at the same rate the ground curves away beneath it.
   4. The ball travels upward at a constant velocity before falling back to earth at a constant speed.
5. Which of the following best describes the trajectory of a satellite in a low earth orbit?
   1. The satellite travels in a perfectly straight line as it is not affected by gravity.
   2. The satellite travels in a parabolic path as the vertical velocity is affected by gravity.
   3. The satellite travels in a circular orbit, being accelerated towards the earth’s center at the same rate the ground curves away beneath it.
   4. The satellite moves along an octagonal path, occasionally changing direction by 45° to maximize the trajectory.
6. Three forces act on a 2.0 kg object as shown in the diagram to the right. What value could x be in order to keep the object from moving?

5 N

5 N

x

* 1. 0 Newtons
  2. 6 Newtons
  3. 12 Newtons
  4. 18 Newtons

1. Two forces act on an object as shown to the right. What will the motion of the object be?
   1. The object will remain motionless.

3 N

3 N

* 1. The object will move to the right.
  2. The object will move to the left.
  3. The object will begin to rotate.

1. A 60 kg man riding on a 20 kg bicycle is turning a corner at 10 m/s. If the radius of the curve is 5 meters, what force is acting on the bicycle in order to keep it turning?
   1. 20 Newtons
   2. 400 Newtons
   3. 1,000 Newtons
   4. 1,600 Newtons
2. The acceleration due to gravity at the Earth’s surface, a distance of 6.38 x 106 m from the Earth’s center, is 9.8 m/s2. What would the acceleration be at twice this distance, 1.28 x 107 m from the Earth’s center?
   1. 9.8 m/s2
   2. 4.9 m/s2
   3. 2.5 m/s2
   4. 1.7 m/s2
3. A moving car hits a stationary car at a stoplight. The road is very icy, and friction can be ignored. If the cars become tangled and move forward together, which of the following is conserved in this collision?
   1. Momentum only.
   2. Kinetic Energy only.
   3. Momentum and Kinetic Energy.
   4. Speed.
4. A man pushes on an un-moving wall with a force of 100 Newtons. What force does he feel the wall push back with?
   1. 0 Newtons – walls cannot “push”
   2. Less than 100 Newtons.
   3. Exactly 100 Newtons.
   4. More than 100 Newtons.
5. A yo-yo is whirled in a circle at a constant speed above a boy’s head. Does it experience any acceleration?
   1. No – since its speed is unchanging the acceleration must be zero.
   2. Yes – there is an outward acceleration that gives rise to the centrifugal force.
   3. Yes – there is an inward acceleration called centripetal acceleration.
   4. No – acceleration only applies to objects rolling down hills.
6. A 90 kg sumo wrestler pushes on a little girl with a force of 120 Newtons. The girl has a mass of 20 kg and pushes back with a force of 30 Newtons. What is the acceleration of the pair?
   1. 60 m/s2 in the direction of the little girl.
   2. 1.50 m/s2 in the direction of the little girl.
   3. 1.36 m/s2 in the direction of the little girl.
   4. 0.82 m/s2 in the direction of the little girl.
7. Two perpendicular forces act on a 50 kg body which sits on a smooth frictionless surface: a 50 Newton Force acting due North, and a 100 Newton Force acting East. What is the resulting acceleration of the body?
   1. 2.2 m/s2.
   2. 30 m/s2.
   3. 112 m/s2.
   4. 150 m/s2.
8. When the speed of an object approaches the speed of light, which of the following happens?
   1. Its mass decreases and it experiences time at a different rate to a stationary object.
   2. Its mass decreases and it experiences time at the same rate to a stationary object.
   3. Its mass increases and it experiences time at a different rate to a stationary object.
   4. Its mass increases and it experiences time at the same rate to a stationary object.
9. A projectile is launched from ground level at a speed of 35 m/s and angle an angle of elevation of 45°. What is the distance from the launch point to the impact point?
   1. 30 m
   2. 90 m
   3. 125 m
   4. 250 m
10. A car weighing 1900 lbs is traveling at 50mph. What is its Kinetic Energy measured in Joules?
    1. 950 J
    2. 215 kJ
    3. 325 MJ
    4. 400 GJ
11. A stationary train is suddenly acted on by a 1000 Newton force pulling it forward. What is the train’s momentum after 8 seconds?
    1. 800 Ns
    2. 1800 Ns
    3. 6600 Ns
    4. 8000 Ns
12. The gravitational attractive force between two objects ***increases*** when:
    1. The distance between them increases.
    2. The distance between them decreases.
    3. The mass of one object decreases.
    4. The mass of both objects decrease.
13. Impulse is ***most closely*** linked to a change in which quantity:
    1. Momentum
    2. Kinetic Energy
    3. Potential Energy
    4. Thermal Energy

**STOP! – Now go back and check your answers.**

Answer Key:1. D 2. C 3. A 4. B 5. C 6. B 7. D 8. D 9. C 10. A 11. C 12. C 13. D 14. C 15. C 16 C 17. B 18.D19.B 20.A