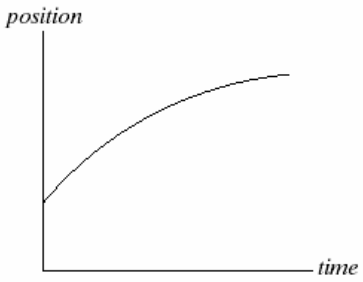
Multiple Choice Review for Final Exam ~ Physics 1020

1. You are throwing a ball straight up in the air. At the highest point, the ball's
   a) velocity and acceleration are zero
   b) velocity is nonzero, but its acceleration is zero
   c) acceleration is nonzero, but its velocity is zero
   d) velocity and acceleration are nonzero

2. Convert the diffusion coefficient of sugar in water at 20°C, 4.6×10^{-10} m^2/s, to units of nanometres squared per microsecond.
   (n = nano = 10^{-9}; μ = micro = 10^{-6})
   a) 4.6×10^{-7} $nm^2/\mu s$
   b) 4.6×10^{7} $nm^2/\mu s$
   c) 4.6×10^{2} $nm^2/\mu s$
   d) 4.6×10^{-2} $nm^2/\mu s$

3. A train car moves along a straight track. The graph shows the position as a function of time for this train. The graph shows that the train:



   a) speeds up all the time
   b) slows down all the time
   c) speeds up part of the time, and slows down part of the time
   d) moves at a constant velocity

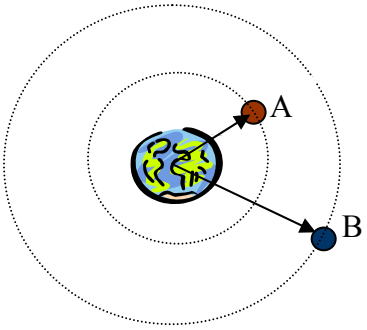
4. A person standing at the edge of a cliff throws one ball straight up and another ball straight down at the same initial speed. Neglecting air resistance, the ball to hit the ground below with the greater speed is the one initially thrown:
   a) upward
   b) downward
   c) neither – they both hit with the same speed
   d) not enough information available to determine which hits with greater speed

5. A force is exerted on a cart that is at rest. The force acts for a short time interval and gives the cart a certain final speed. The same force is exerted for the same length of time on another cart, also initially at rest, but with twice the mass of the first cart. The final speed of the heavier cart relative to the lighter cart is: (neglect friction)
   a) one-fourth
   b) four times
   c) half
   d) double
   e) the same as

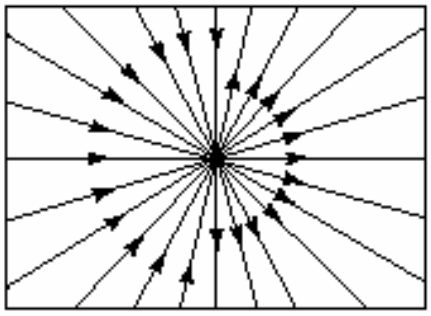
6. Consider a person standing in an elevator that is moving upward at constant speed. The upward normal force F_N exerted by the elevator floor on the person is:
   a) larger than
   b) smaller than
   c) equal to

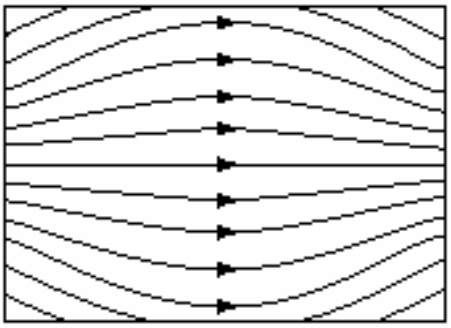
   the downward force of gravity F_G on the person.

7. Two satellites A and B, of the same mass, are going around the Earth (see figure). The distance of satellite B from Earth's centre is twice that of satellite A. What is the ratio of the centripetal force acting on B, compared to the force acting on A?
   a) ⅛
   b) ¼
   c) ½
   d) √½
   e) 1
   f) 2
   g) 4

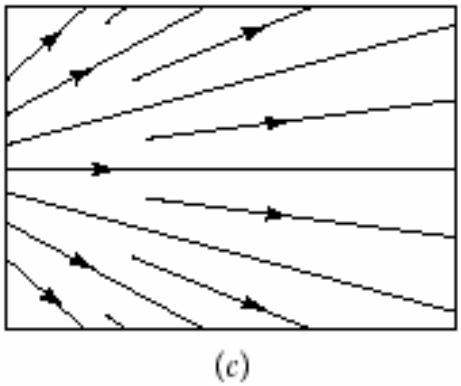


8. Consider the 3 electric field patterns shown. Assuming there are no charges in the regions shown, which of the patterns represent(s) a possible electrostatic field:





a)



a) a b) b c) c d) b and c e) a and c

9. A large box is sitting on a horizontal floor. A horizontal force of magnitude 72 N is applied to the box, but the box does not move. While the 72 N force is being applied, the static friction force acting on the box must have a magnitude:
    a) greater than 72 N
    b) equal to 72 N
    c) equal to $\mu_s \cdot F_N$, where F_N equals the gravitational force on the box
    d) less than 72 N

10. A skier of mass m is skiing down a slope inclined at an angle θ to the horizontal. What is the magnitude of the normal force exerted on the skier?
    a) mg/sinθ b) mg/cosθ c) mg d) mg sinθ e) mg cosθ

11. A projectile is fired from ground level at y = 0 m on level terrain. The initial velocity components are v_{ox} = 100 m/s and v_{oy} = 49 m/s. How far from the initial position in the horizontal direction does the projectile reach its maximum height in its trajectory?
    a) 120 m b)500 m c) not enough information given to determine this
    d) 380 m e) 620 m

12. An airplane undergoes the following displacements: first it flies 50 km in a direction 30˚ east of north. Next, it flies 60 km due south. Finally, it flies 100 km 30˚ north of west. Determine how far the airplane ends up from its starting position.
    a) 70 km b) 72 km c) 69 km d) 65 km e) 71 km

13. A train starts from rest and accelerates uniformly at 0.096 m/s^2, until it has traveled 3.0 km and acquired a velocity of 24 m/s. The train then moves at a constant velocity of 24 m/s for 430 s. The average speed of the train over the entire trip is:
    a) 18 m/s b) 12 m/s c) 24 m/s d) 20 m/s e) 16 m/s

14. A satellite travels around the earth once every 24 hours, at a distance of 4.23×10^7 m from the centre of the earth (mass = 5.98×10^{24} kg). What is the magnitude of the centripetal force acting on this 1.65×10^5 kg satellite?
    a) 3.7×10^4 N b) 1.6×10^6 N c) 0 N d) 12 N

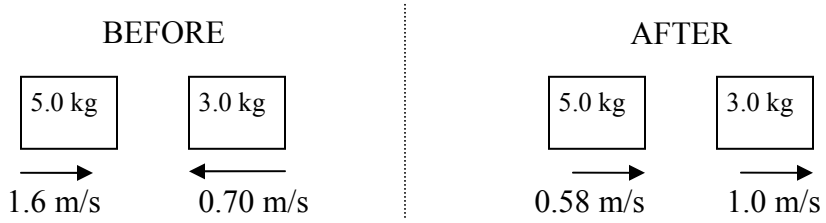
15. Use conservation of energy to determine the final speed of a penguin sliding down a frictionless iceberg from a vertical height of 5.0 m. If the penguin pushes off with an initial speed of 6.1 m/s, its final speed at the bottom is:
    a) 9.9 m/s b) 15 m/s c) 12 m/s d) 8.7 m/s e) 135 m/s

16. If a penguin, traveling at 14 m/s, hits a level patch of lichen at the bottom of the iceberg, with a coefficient of kinetic friction of 0.22, how far does the penguin slide before stopping?
    a) 31 m b) 45 m c) 90 m d) 22 m e) 37 m

17. An 8 kg block has a speed *v*, and is behind a 12 kg block with speed 0.5 m/s, both blocks moving in the same direction. The blocks collide and stick together. After the collision, the blocks have a common speed of 0.9 m/s. What was the initial speed *v* of the 8 kg block? (ignore friction)
    a) 0.15 m/s b) 0.75 m/s c) 1.4 m/s d) 1.5 m/s e) 1.7 m/s

18. Two point charges, q_1 = -1.0 μC and q_2 = +2.0 μC, are placed 1.6 m apart. The magnitude of the electric force on either charge is:
    a) 0.005 N b) 0.007 N c) 0.009 N d) 0.011 N e) 0.013 N

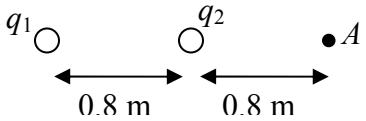
19. From the figure below, determine the nature of this collision. The masses of the blocks, and the velocities before and after are given. The collision is:
    a) elastic
    b) not possible because momentum is not conserved
    c) inelastic
    d) characterized by an increase in kinetic energy



20. From question 18, the number of excess electrons in charge q_1 is:
    a) 2.1 x 10^{11} b) 6.3 x 10^{11} c) 2.1 x 10^{12} d) 6.3 x 10^{12} e) 2.1 x 10^{13}

21. A pair of charged plates, 40 mm apart, produces an electric field of 12,000 N/C, directed toward the right, between the plates. An electron enters the region at the left-hand plate, with an initial velocity of 2.0 x 10^7 m/s (to the right). The velocity of the electron as it hits the right-hand plate is: (mass of an electron: 9.11 x 10^{-31} kg)
    a) 1.2 x 10^7 m/s b) 1.5 x 10^7 m/s c) 1.8 x 10^7 m/s d) 2.4 x 10^7 m/s

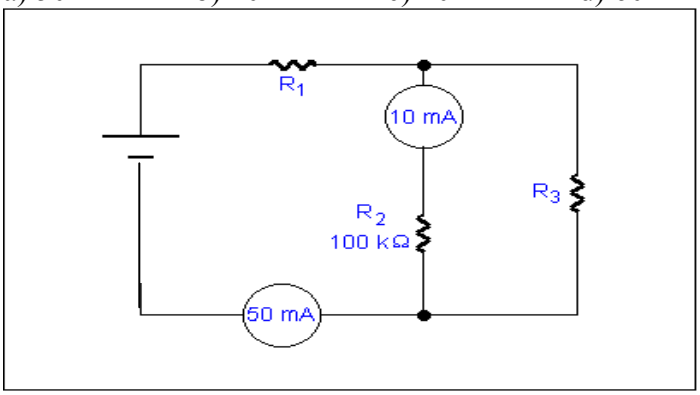
22. Charges q_1 (+60 nC) and q_2 (-90 nC) are placed as shown. What is the electric field at the position marked *A*?
    a) 1.1 x 10^3 N/C (left) b) 1.1 x 10^3 N/C (right) c) 1.5 x 10^3 N/C (left)
    d) 1.5 x 10^3 N/C (right) e) 4.2 x 10^2 N/C (left)



23. A proton with a speed of 2.00 x 10^5 m/s moves through a potential difference ΔV and thereby increases its speed to 4.00 x 10^5 m/s. What is the absolute value of ΔV? (mass of proton is 1.67 x 10^{-27} kg)
    a) 1.54 x 10^3 V b) 144 V c) 835 V d) 626 V e) 258 V

24. In the figure below, what is the current through resistor R_3?

a) 50 mA b) 10 mA c) 40 mA d) 60 mA e) 5 mA



25. In the figure in question 24, what is the resistance of R_3?

a) 25 kΩ b) 50 kΩ c) 100 kΩ d) 200 kΩ e) 400 kΩ

26. In the figure below, what does the ammeter read?

a) 5 mA b) 3 mA c) 15 mA d) 12 mA e) 6 mA