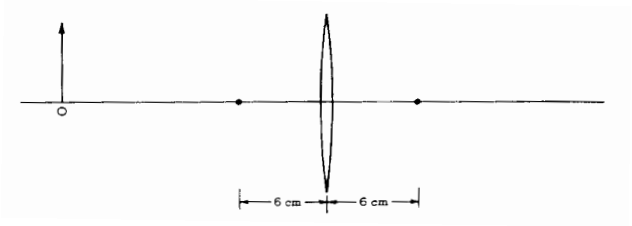
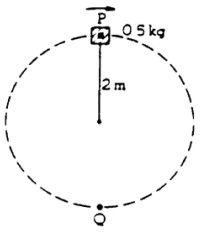
AP PHYSICS II SUMMER ASSIGNMENT

1. An object O is placed 18 centimeters from the center of a converging lens of focal length 6 centimeters as illustrated. a) On the illustration, sketch a ray diagram to locate the image. b) Is the image real or virtual? Explain your choice. c) Using the lens equation, compute the distance of the image from the Lens.



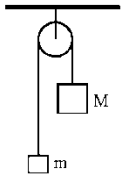
2. A block of mass 4 kilograms, which has an initial speed of 6 meters per second at time t = 0, slides on a horizontal surface. a) Calculate the work W that must be done on the block to bring it to rest.
If a constant friction force of magnitude 8 Newton's is exerted on the block by the surface, determine the following. b)The speed v of the block as a function of the time t**.** c)The distance x that the block slides as it comes to rest.

3. A 0.5-kilogram object rotates freely in a vertical circle at the end of a string of length 2 meters as shown above. As the object passes through point P at the top of the circular path, the tension in the string is 20 newtons. Assume g = 10 meters per second squared. a)On the following diagram of the object, draw and clearly label all significant forces on the object when it is at point P. b)Calculate the speed of the object at point P.



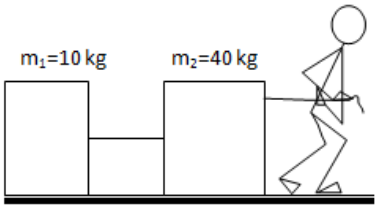
4. A person of weight 480 N stands on a scale in an elevator. What will the scale be reading when the elevator is accelerating downward at 4.00 m/s^2?

5. In the Atwood machine shown, if M = 6000 gr and m = 4000 gr, what is the magnitude of tension on the rope? (Ignore friction and the mass of the pulley.)

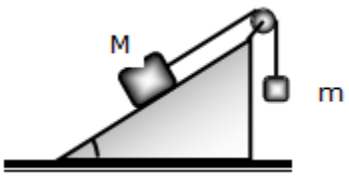


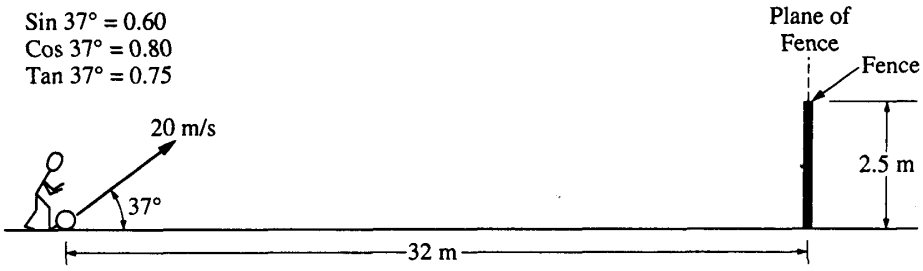
6. A student pulls a box of books on a smooth horizontal floor with a force of 100 N in a direction of angle 37 above the horizontal. If the mass of the box and the books is 40.0 kg, what is the acceleration of the box?

7. If the child is pulling the block system with 100N find the tension on the string between the blocks



8. Two masses m=0.2kg & M=0.8 kg are connected to each other .If the surfaces are frictionless, what is the acceleration of the system when the plane is inclined with an angle of 37^o with the horizontal?

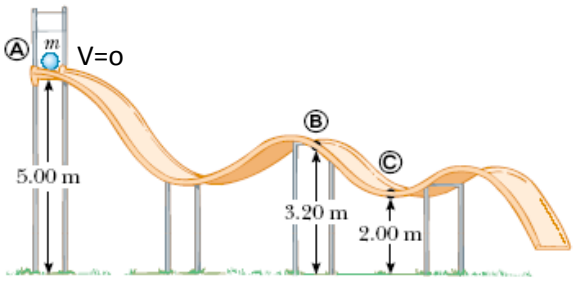




Note: Diagram not drawn to scale.

9. A ball of mass 0.5 kilogram, initially at rest, is kicked directly toward a fence from a point 32 meters away, as shown above. The velocity of the ball as it leaves the kicker's foot is 20 meters per second at an angle of 37° above the horizontal. The top of the fence is 2.5 meters high. The ball hits nothing while in flight and air resistance is negligible. a) Determine the time it takes for the ball to reach the plane of the fence. b) Will the ball hit the fence? If so, how far below the top of the fence will it hit? If not, how far above the top of the fence will it pass?

10. A particle of mass *m* =5 kg is released from point A and slides on the frictionless track shown in figure

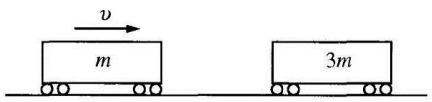


Determine the particle's

a) Total mechanical energy at any point
b) speed at point B
c) speed at point C

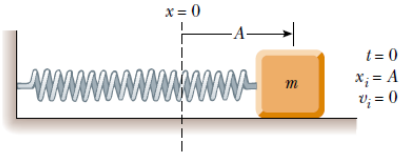
11. A railroad flatcar of mass 2,000 kilograms rolls to the right at 10 meters per second and collides with a flatcar of mass 3,000 kilograms that is rolling to the left at 5 meters per second. The flatcars couple together. What is their speed after the collision?

12. A railroad car of mass *m* is moving with speed *v* when it collides with and connects to a second railroad car of mass 3*m*, initially at rest, as shown above. How do the speed and kinetic energy of the connected cars compare to those of the single car of mass m before the collision?



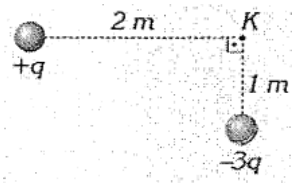
13. Point objects *A* and *B* are separated by distance *R*. Object *A* exerts a gravitational force of *F* on object *B*. If the mass of *A* is doubled and distance *R* is tripled, what is the new gravitational force that *A* exerts on *B*?

14. A 200-g block connected to a light spring for which the force constant is 5.00 N/m is free to oscillate on a horizontal, frictionless surface. The block is displaced 5.00 cm from equilibrium and released from rest, as in Figure **(A)** Find the period of its motion. **(B)** Determine the maximum speed of the block.

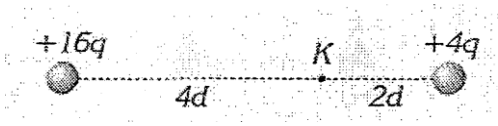


15. An electric field of 900 N/C is produced by a charge of 4×10^{-11} C. For this field strength, what is the distance to the charge? ($k = 9 \times 10^9$ N•m^2/C^2)

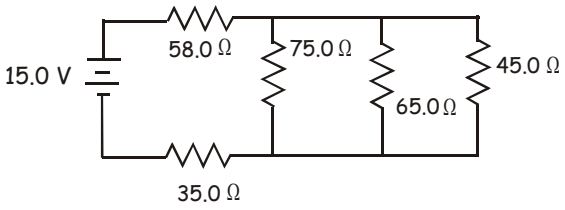
16. If the electric potential of charge q at point K is 6V, what is the potential of charge -3q at point K, in volts?



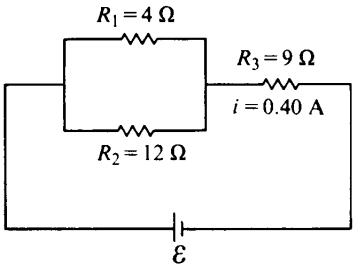
17. Two charges are fixed as shown in the figure. The magnitude of the electric field at point K due to the charge of +4q is E. What is the magnitude of the resultant electric field at point K, in terms of E?



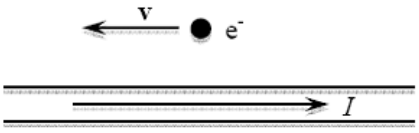
18. Given this lovely circuit: (a) Find the equivalent resistance for this circuit. (b) Find the current supplied by the battery. (c) Find the current through the 65.0 Ω resistor.



19. Three resistors are arranged in a circuit as shown above. The battery has an unknown but constant emf E and a negligible internal resistance. a) Determine the equivalent resistance of the three resistors. The current I in resistor R_3 is 0.40 ampere. b) Determine the emf E (Voltage) of the battery. c) Determine the potential difference across resistor R_1 d) Determine the power dissipated in resistor R_1. e) Determine the amount of charge that passes through resistor R_3 in one minute.



20. A wire has a conventional current *I* directed to the right. At the instant shown in the figure, an electron has a velocity directed to the left. The magnetic force on the electron at this instant is



21. A string is firmly attached at both ends. When a frequency of 60 Hz is applied, the string vibrates in the standing wave pattern shown. Assume the tension in the string and its mass per unit length do not change. Determine the first, second, and the third harmonics of the string.

22. $y = \frac{1}{2}at^2$ Solve for t

23. $x = v_o t + \frac{1}{2}at^2$ Solve for v_o

24. $v = \sqrt{2ax}$ Solve for x

25. $a = \frac{v_f - v_o}{t}$ Solve for t

26. $a = \frac{v_f - v_o}{t}$ Solve for v_f

27. $F = k\frac{m_1 m_2}{r^2}$ Solve for *r*

28. $F = k\frac{m_1 m_2}{r^2}$ Solve for m_2

29. $T = 2\pi\sqrt{\frac{L}{g}}$ Solve for *L*

30. $T = 2\pi\sqrt{\frac{L}{g}}$ Solve for *g*

The following are ordinary physics problems. Write the answer in scientific notation and simplify the units.

31. $T_s = 2\pi\sqrt{\dfrac{4.5\times10^{-2}\text{kg}}{2.0\times10^{3}\ \text{kg/s}^2}} =$

32. $K = \dfrac{1}{2}\left(6.6\times10^{2}\ \text{kg}\right)\left(2.11\times10^{4}\ \text{m/s}\right)^2 =$

33. $F = 9x10^{-9}\ \dfrac{\text{N}\cdot\text{m}^2}{\text{C}^2}\left(\dfrac{(3.2x10^{-9}\text{C})(9.6x10^{-9}\text{C})}{(0.32\ \text{m})^2}\right) =$

34. $\dfrac{1}{R_p} = \dfrac{1}{4.5\times10^{2}\ \Omega} + \dfrac{1}{9.4\times10^{2}\ \Omega}$ R_p =

35. $e = \dfrac{\left(1.7\times10^{3}\ \text{J}\right)-\left(3.3\times10^{2}\ \text{J}\right)}{\left(1.7\times10^{3}\ \text{J}\right)} =$

36. $(1.33)\sin 25.0^\circ = (1.50)\sin\theta$ ϑ =

37. $K_{\max} = (6.63\times10^{-34}\ \text{J}\cdot\text{s})(7.09\times10^{14}\ \text{s}^{-1}) - (2.17\times10^{-19}\ \text{J}) =$

38. $\gamma = \dfrac{1}{\sqrt{1-\dfrac{2.25\times10^{8}\ \text{m/s}}{3.00\times10^{8}\ \text{m/s}}}} =$