

國立彰化師範大學九十六學年度碩士班招生考試試題

系所：科學教育研究所

組別：乙組

科目：普通物理

★★請在答案紙上作答★★

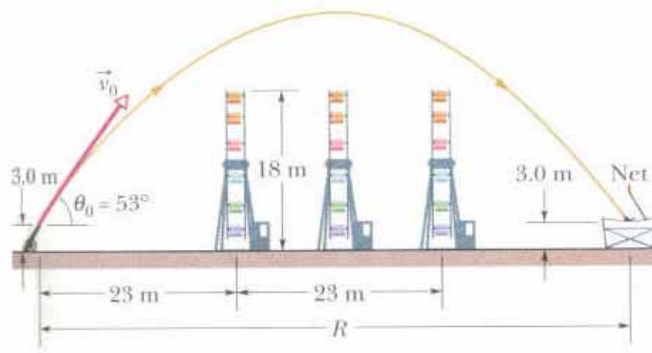
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1. The figure illustrates the flight of Emanuel Zacchini over three Ferris wheels, located as shown and each 18 m high . Zacchini is launched with speed $v_0=26.5\text{m/s}$, at an angle $\theta_0=53^\circ$ up from the horizontal and with an initial height of 3.0m above the ground. The net in which he is to land is at the same height.

(a) If he reaches his maximum height when he is over the middle Ferris wheel, what is his clearance above it?

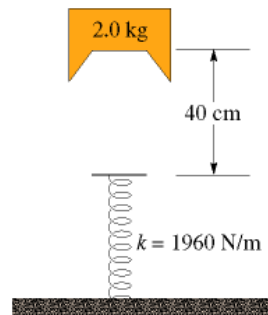
(b) How far from the cannon (大砲) should the center of the net be positioned?

(10%)

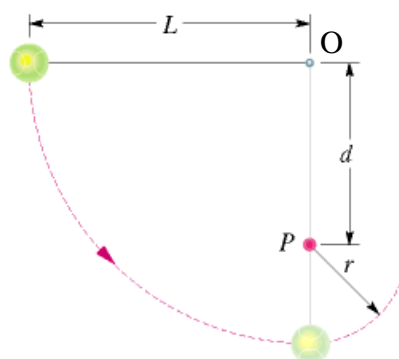


2. Ethanol of density $d = 791 \text{ kg/m}^3$ flows smoothly through a horizontal pipe that tapers in cross-sectional area from $A_1 = 1.20 \times 10^{-3} \text{ m}^2$ to $A_2 = A_1/2$. The pressure difference between the wide and narrow sections of pipe is 4120 Pa. What is the volume flow rate R_v of the ethanol? (10%)

3. A 2.0 kg block is dropped from a height of 40 cm onto a spring of spring constant $k=1960 \text{ N/m}$. Find the maximum distance the spring is compressed. (10%)



4. Show that, if the ball is to swing completely around the fixed peg, then $d > 3L/5$. The string has a ball attached to one end, and is fixed at its other end O. The distance from the point O to the fixed peg at point P is d. (10%)



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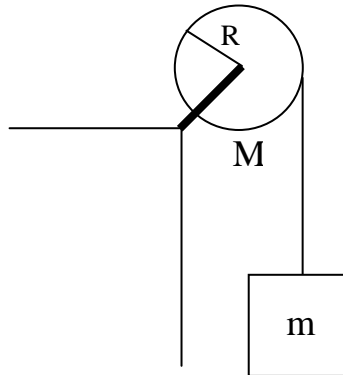
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5. A uniform disk, with mass $M = 2.5$ kg and radius $R = 20$ cm, mounted on a fixed horizontal axle. A block with mass $m = 1.2$ kg hangs from a massless cord that is wrapped around the rim of the disk. Find the acceleration of the falling block, the angular acceleration of the disk, and the tension in the cord. The cord does not slip, and there is no friction at the axle. (10%)



六、有 n 莫耳理想氣體，在絕熱自由膨脹過程中，體積膨脹為原來的 5 倍，試問在此過程中，(a)理想氣體內能的變化為何？(b)熵(entropy)的變化為何？(10%)

七、一半徑為 R 的均勻帶電實心球體，電荷密度為 ρ ，求空間任意點的(a)電場 (b)電位 (c)試求此球體的電位能為何？(10%)

八、一質量為 m ，帶電量為 e 的電子，在均勻磁場 B 中運動，其速度為 v ，且運動平面與磁場 B 垂直，試求出 (a)電子運動的軌跡半徑為何？(b)電子運轉的頻率為何？(10%)

九、(a)請說明感應電場與靜電場有何不同？如何區別這二種電場？(b)何謂霍爾效應 (Hall Effect)？有何用途？試分別說明如何計算或判別的過程？(10%)

十、請由光學的觀點，說明(a)雨過天晴時，看物體會比較近或比較遠？(b)晴空時天空為藍色，而落日餘暉時天空為紅色？(10%)