

科目：普通物理 適用：電機系二 應化系二 應光系二

編號：332 342 352

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. A 9.00 kg hanging block is connected by a string over a pulley to a 5.00 kg block that is sliding on a flat table (Fig. 1). The string is light and does not stretch; the pulley is light and turns without friction. The coefficient of kinetic friction between the sliding block and the table is 0.200. Find the tension in the string. (10%)

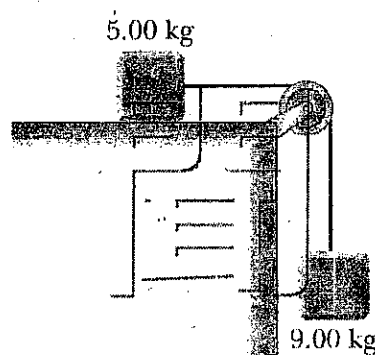


Fig. 1

2. A single conservative force acts on a 5.00 kg particle. The equation $F_x = (2x+4)$ N describes the force, where x is in meters. As the particle moves along the x axis from $x = 1.00$ m to $x = 5.00$ m, calculate (a) the work done by this force on the particle, (b) the change in the potential energy of the system, and (c) the kinetic energy the particle has at $x = 5.00$ m if its speed is 3.00 m/s at $x = 1.00$ m. ((a) 5%, (b) 5%, (c) 5%)
3. What conditions will the radio waves not interfere with each other as long as they are broadcast? (10%)

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4. A thin, square conducting plate 50.0 cm on a side lies in the xy plane. A total charge of 4.00×10^{-8} C is placed on the plate. Find (a) the charge density on the plate, (b) the electric field just above the plate, and (c) the electric field just below the plate. You may assume that the charge density is uniform. ((a) 5%, (b) 5%, (c) 5%)

$$(k = 8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2, \epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2, \mu_0 = 4\pi \times 10^{-7} \text{ T} \cdot \text{m}/\text{A})$$

5. Find the equivalent capacitance between points a and b in the combination of capacitors shown in Fig. 2. (10%)

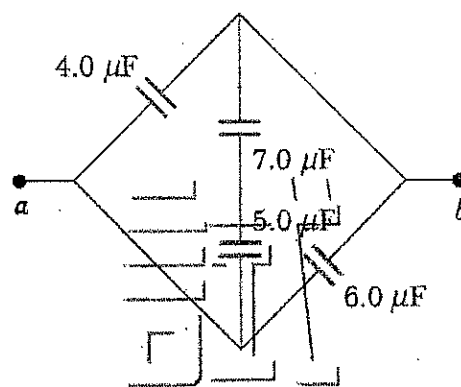


Fig. 2

6. A laser beam is incident at an angle of 60.0° from the vertical onto a solution of corn syrup in water. The beam is refracted to 30.0° from the vertical. (a) What is the index of refraction of the corn syrup solution? Assume that the light is red, with vacuum wavelength 632.8 nm. Find its (b) frequency, (c) speed, and (d) wavelength in the solution. ((a) 5%, (b) 5%, (c) 5%, (d) 5%)

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7. Calculate the power delivered to each resistor in the circuit shown in Fig. 3.

(20%)

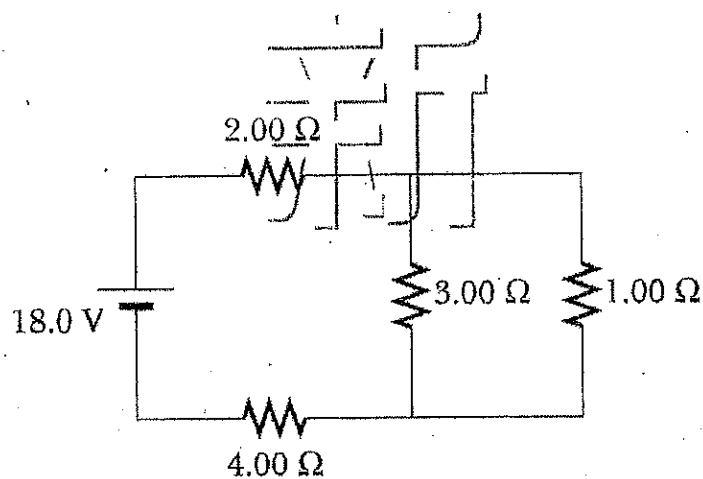


Fig. 3

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