

This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

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**001** (part 1 of 2) 5 points

A deuteron (a nucleus that consists of one proton and one neutron) is accelerated through a 3.46 kV potential difference.

How much kinetic energy does it gain? Answer in units of J.

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**002** (part 2 of 2) 4 points

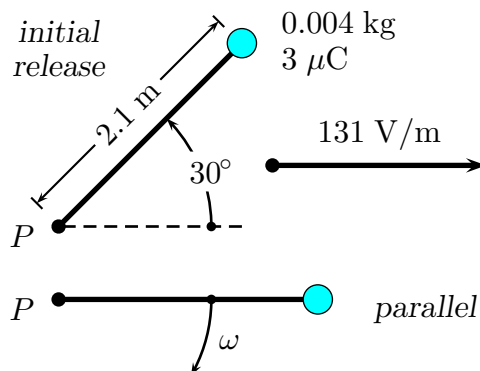
How fast is it going if it starts from rest? Answer in units of m/s.

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**003** (part 1 of 1) 6 points

*Note:* The force of gravity does not enter into this problem.

A charged particle is connected to a string that is tied to the pivot point  $P$ . The particle, string, and pivot point all lie on a horizontal table (consequently the figure below is viewed from above the table). The particle is initially released from rest when the string makes an angle  $30^\circ$  with a uniform electric field in the horizontal plane (shown in the figure).



Determine the speed of the particle when the string is parallel to the electric field. An-

swer in units of m/s.

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**004** (part 1 of 1) 7 points

Consider an equilateral triangle with sides of lengths  $3.2 \mu\text{m}$  and charge  $-0.2 \mu\text{C}$ ,  $2 \mu\text{C}$  and  $1.6 \mu\text{C}$  located at the corners of the triangle.

Find the minimum work required to move the first point charge to infinity. Answer in units of J.

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**005** (part 1 of 1) 7 points

Particles A (of mass  $m$  and charge  $Q$ ) and B (of  $m$  and charge  $5Q$ ) are released from rest with the distance between them equal to 1.874 m.

If  $Q = 16 \mu\text{C}$ , what is the kinetic energy of particle B at the instant when the particles are 3.874 m apart? Answer in units of J.

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**006** (part 1 of 1) 7 points

Two insulating spheres having radii 0.42 cm and 0.62 cm, masses 0.15 kg and 0.35 kg, and charges  $-4 \mu\text{C}$  and  $5 \mu\text{C}$  are released from rest when their centers are separated by 0.6 m.

How fast is the smaller sphere moving when they collide? Answer in units of m/s.

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**007** (part 1 of 1) 7 points

A charge of 14.219 nC is uniformly distributed along the  $x$ -axis from  $-2$  m to  $2$  m.

What is the electric potential (relative to zero at infinity) of the point at 5 m on the  $x$ -axis? Answer in units of V.

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**008** (part 1 of 1) 7 points

A charge of  $9 \mu\text{C}$  is distributed uniformly along the circumference of a circle with a radius of 36 cm.

The Coulomb constant is  $8.98755 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$ .

How much external energy is required to bring a charge of  $45 \mu\text{C}$  from infinity to the center of the circle? Answer in units of J.