

Version

Quiz #2 Form #225

Name: _____

A

Physics 2212 K Summer 2015

Recitation Section: _____

- Print your name, quiz form number (3 digits at the top of this form), and student number (9 digit Georgia Tech ID number) in the section of the answer card labeled "Student Identification."
- Bubble the Quiz Form Number in columns 1–3, skip column 4, then bubble your Student Number in columns 5–13.
- Free-response questions are numbered I–II. For each, make no marks and leave no space on your card. Show all your work clearly, including all steps and logic. Box your answer.
- Multiple-choice questions are numbered 1–10. For each, select the answer most nearly correct, circle this answer on your quiz, and bubble it on your answer card. Do not put any extra marks on the card.
- Turn in your quiz and answer card as you leave. Your score will be posted when your quiz has been graded. Quiz grades become final when the next quiz is given.
- You may not use a calculator or any other aids or electronic devices.

 e Fundamental charge m_e Mass of an electron K Coulomb constant $= 1/4\pi\epsilon_0$ g Magnitude of Free Fall Acceleration*Unless otherwise directed, drag should be neglected.**Any integrals in free-response problems must be evaluated. Questions about magnitudes will state so explicitly.*

YOUR form number is **225**

Recitation Sections

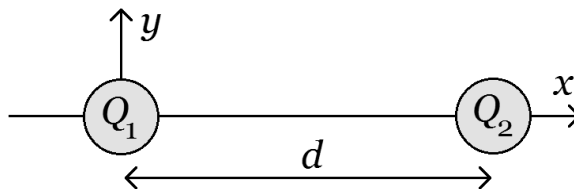
	Room 125
TUESDAY	
2:20–3:10 pm	K04 Sharma, Kamal
3:20–4:10 pm	K03 Sharma, Kamal
4:20–5:10 pm	K01 Koh, Daegene
WEDNESDAY	
2:20–3:10 pm	K06 Krygier, Michael
3:20–4:10 pm	K05 Krygier, Michael
4:20–5:10 pm	K02 Koh, Daegene
THURSDAY	
2:20–3:10 pm	K08 Nguyen, Khai
3:20–4:10 pm	
4:20–5:10 pm	K09 Nguyen, Khai

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- I. (20 points) A very long, uniformly charged insulating cylinder has radius R and linear charge density λ . Find the electric field magnitude at a distance $r = R/2$ from the cylinder axis. Express your answer in terms of parameters defined in the problem, and physical or mathematical constants.

1. (6 points) A very long conducting cylinder has radius R and linear charge density λ . How does the electric field magnitude at a distance $r = R/2$ from the cylinder axis compare to the field you found for the insulating cylinder above?
- (a) The field magnitude in the conducting cylinder is greater, because the field in the insulating cylinder must be zero.
 - (b) The field magnitude in the conducting cylinder is less, because it must be zero.
 - (c) The field magnitude in the conducting cylinder is greater, even though the field in the insulating cylinder is not zero.
 - (d) The field magnitude in the conducting cylinder is the same.
 - (e) The field magnitude in the conducting cylinder is less, but it is not zero.

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2. (6 points) Particles with charges $Q_1 = 3e$ and $Q_2 = -9e$ are fixed in place with separation d , as shown. Letting the electric potential be zero at infinity, in what region or regions of the x axis will there be a finite x position at which the electric potential is also zero?

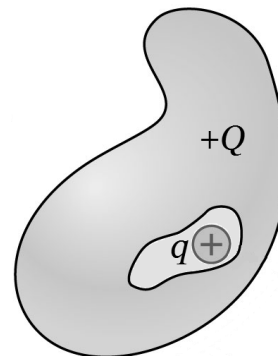
- (a) Only $0 < x < d$
- (b) Only $x > d$
- (c) $x < 0$ and $0 < x < d$
- (d) $0 < x < d$ and $x > d$
- (e) $x < 0$ and $x > d$



- II. (20 points) In the question above, find a finite position on the x axis at which the electric potential is zero. Express your answer in terms of parameters defined in the problem, and physical or mathematical constants.

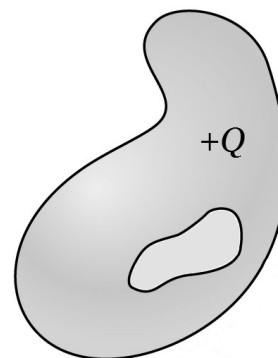
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3. (6 points) A conducting object has a void within it. A positive point charge $+q$ is placed within the void. If the object carries a net positive charge $+Q$, what is the charge on the outer surface of the object, and on the surface of the void?

- (a) $Q + q$ on outer surface, $-q$ on surface of void.
- (b) $+Q$ on outer surface, $-q$ on surface of void.
- (c) $Q + q$ on outer surface, zero on surface of void.
- (d) $+Q$ on outer surface, zero on surface of void.
- (e) $Q - q$ on outer surface, $+q$ on surface of void.



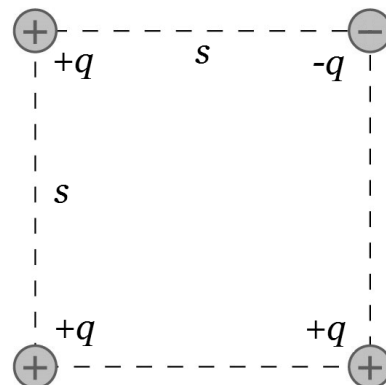
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4. (6 points) A conducting object has a void within it. If the object carries a net positive charge $+Q$, what is the charge on the surface of the void?

- (a) $+Q$
- (b) $-Q/2$
- (c) $-Q$
- (d) $+Q/2$
- (e) Zero.



5. (6 points) Three positively-charged particles and one negatively-charged particle, each with charge magnitude q , are placed at the vertexes of a square with sides of length s . What is the potential energy of this system of charges, with respect to zero at infinite separation?

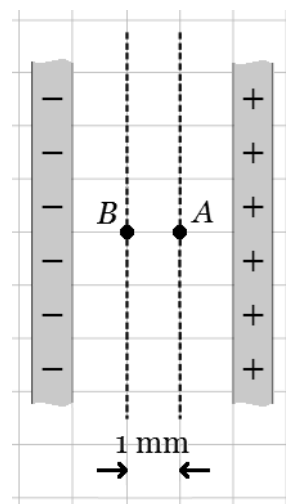
- (a) $Kq^2 \left(\frac{2}{s} + \frac{1}{s\sqrt{2}} \right)$
- (b) Zero
- (c) $Kq^2 \left(\frac{2}{s} - \frac{1}{s\sqrt{2}} \right)$
- (d) $Kq^2 \left(\frac{4}{s} + \frac{2}{s\sqrt{2}} \right)$
- (e) $Kq^2 \left(\frac{4}{s} - \frac{2}{s\sqrt{2}} \right)$



6. (6 points) In the problem above, an external force is used to remove the negatively-charged particle from the system, by taking it infinitely far away. What is the sign, if any, of the work done by this external force? How, if at all, does the potential energy of the system change?
- (a) The force does negative work. The potential energy of the system increases.
 - (b) The force does negative work. The potential energy of the system decreases.
 - (c) The force does positive work. The potential energy of the system increases.
 - (d) The force does zero work. The potential energy of the system remains the same.
 - (e) The force does positive work. The potential energy of the system decreases.

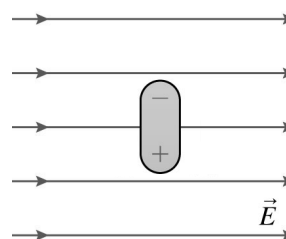
7. (6 points) A charged particle ($q = +2\text{ C}$), is released from rest at point A inside an ideal parallel-plate capacitor. At point B , the kinetic energy of the particle is 4 J . If the electric potential of the positively charged plate is $+8\text{ V}$, what is the electric potential of the negatively charged plate?

- (a) $+20\text{ V}$
- (b) -2 V
- (c) $+2\text{ V}$
- (d) -4 V
- (e) $+14\text{ V}$



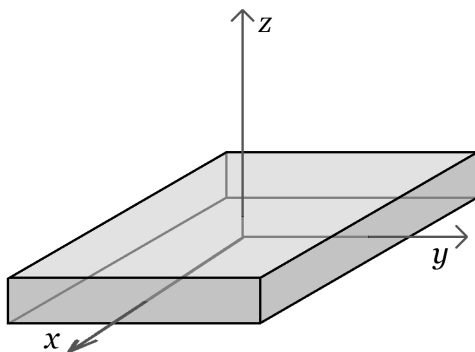
8. (6 points) An electric dipole is held at rest in a uniform electric field, as shown. Which motion, if any, would require an external agent to do positive work on the system consisting of the dipole and the electric field?

- (a) Rotating the dipole counter-clockwise would require positive external work.
- (b) Rotating the dipole clockwise would require positive external work.
- (c) No motions would require positive external work.
- (d) Translating the dipole to the left would require positive external work.
- (e) Translating the dipole to the right would require positive external work.



9. (6 points) The field *outside* a uniformly charged infinite solid slab is uniform, like that of an infinite uniform sheet of charge. What is the electric field magnitude like *inside* the slab?

- (a) It is uniform but non-zero inside, the same as the field outside.
- (b) It is uniform but non-zero inside, less than the field outside.
- (c) It is zero everywhere inside, jumping discontinuously at the surface to match the field outside.
- (d) It is zero at the center, increasing linearly to the surface, where it matches the field outside.
- (e) It is uniform but non-zero inside, greater than the field outside.



10. (6 points) A positively-charged particle will be placed on the axis of a cylinder, either centered, or nearer the left end, as shown. In which configuration is the net flux through the cylinder greatest? In which is the net flux through the left end greatest?

- (a) The net flux through the cylinder is the same in each configuration.
The net flux through the left end is the same in each configuration.
- (b) The net flux through the cylinder is greatest when the particle is nearer the left end.
The net flux through the left end is the same in each configuration.
- (c) The net flux through the cylinder is the same in each configuration.
The net flux through the left end is greatest when the particle is nearer the left end.
- (d) The net flux through the cylinder is greatest when the particle is nearer the left end.
The net flux through the left end is greatest when the particle is nearer the left end.

