Physics lessons essay

ASSIGN BUSTER

University of the Philippines College of Science PHYSICS 72 SET A Second Semester 2010-2011 First Long Examination National Institute of Physics 2nd Sem AY 2010-2011 Physics 72 INSTRUCTIONS: Choose the best answer and shade the corresponding circle on your answer sheet. To change your answer, cross-out and sign your original answer and then shade your new answer. No computational devices allowed (e. g. calculators, mobile phones). Following instructions is part of the exam. Useful formulas: Area Sphere (radius = r) Cylinder (radius = r, height = h) 1. Volume Useful constants: e me ? o k -1. 60 x 10-19 C 9. x 10-31 kg 8. 854 x 10-12 C2/Nm2 8. 988 x 109 Nm2/C2 Consider three identical metal spheres, A, B, and C. Sphere A carries a charge of 2. 0 µC; sphere B carries a charge of -6. 0 µC; and sphere C is neutral. Spheres A and B are touched together and then separated. Spheres B and C are then touched and separated. What will be the new net charge of sphere C? A. -6. 0 µC B. -2. 0 µC C. 0 D. -1. 0 µC E. +4. 0 µC Charges Q1 = q and Q2 = +9q are placed as shown below. Of the five positions indicated by the numbered dots, at which point is the electric field E zero? Points 2, 3 and 4 have equal spacing in between Q1 and Q2. . A. B. C. D. E. 3. 1 2 3 4 5 An electric dipole is released from rest in a uniform electric field with the orientation shown. Which of the following correctly describes the rotation and the net force on the dipole? A. No rotation; net force is zero B. Rotation is clockwise; net force is zero C. Rotation is counterclockwise; net force is zero D. Rotation is clockwise; net force is non-zero E. Rotation is counterclockwise; net force is non-zero 1| A National Institute of Physics 2nd Sem AY 2010-2011 Physics 72 4. Five particles of the same mass are released into a region of uniform electric field.

The numbered lines show the paths taken by the five particles. A particle with a charge +6Q follows path 5 while it moves through this field. Which path would be taken by a charge of -3Q? A. 1 B. 2 C. 3 D. 4 E. 5 An electric dipole of moment p is placed in a uniform external electric field as shown in the diagram below. If the dipole is to have minimum potential energy, in what direction should p be? A. B. C. D. E. positive x. negative x. positive y. negative y. positive z. 5. 6. 7. Outcast. If a positive point charge is placed near one corner of the cube, which of the following statements will most likely to happen?

A. It will move closer to the cube. B. It will move away from the cube. C. It will stay on its position. D. It will move sideward tracing the side of the cube. E. It will move back and forth about its position. Ecstatic. If the three marbles are in contact, determine the relative net charges of each marble (at electrostatic equilibrium) in terms of the electronic charge, | e|. A. A: 0, B: 0, C: 0 B. A: e, B: e, C: e C. A: -e, B: -e, C: -e D. A: 3e, B: e, C: -e E. A: -3e, B: -e, C: e For the next two numbers, consider three point charges placed at the corners of a square with side-length 2S.

An electron is placed at the center of the square. 8. Feel the force. Determine the directions of the net electric field experienced by the electron and the net electric force acting on it. A. E: towards –Q, F: towards –Q 2| A National Institute of Physics B. C. D. E. 9. 2nd Sem AY 2010-2011 Physics 72 E: towards –Q, F: away from –Q E: away from –Q, F: towards –Q E: away from –Q, F: away from –Q None, since E= 0, F= 0 Codename E zero. Which of the following steps will make the electron stay at the center? A. Putting +Q on

the fourth corner. B. Putting –Q on the fourth corner. C. Putting +2Q on the fourth corner.

D. Putting –2Q on the fourth corner. E. The electron is already stationary at the center. 10. Smiley inside. Consider three charged smileys with each smiley surrounded by a Gaussian surface shown to the right. Rank them in terms of the magnitude of electric field at point P. A. J= K= L B. K> J= L C. K> J> L D. J= K> L E. L> J> K 11. Box and arrows. Electric fields passing through a Gaussian box (pointed inward) as shown in the figure to the right. Which of the following is a possible charge system inside the box? A. +4e and -3e B. 3e, -4e and +2e C. 16e, -23e and +7e D. +13e, -34e and +20e E.

Cannot be determined 12. Find my charge. Two parallel infinite line of charge are separated by a distance 2L. A point P is located at exactly midway between the two lines of charge as shown in the figure. The charge density of line of charge 1 is +3?. What should by the charge density of charge 2 if the net electric field at point P is given by A. +3? B. -3? C. +(3/2)? D. –(3/2)? E. 0? € ? E = 0? 3| A 13. Rank the E-field. Consider a solid with a total charge Q and radius figure. Rank the points W, X, Y and magnitude of electric field. Point Y the conductor. A. Y= X= W> Z B. Z> Y= X= W C. Z> Y> X= W D. W= X> Y> Z E.

Y> Z> X= W conducting sphere R as shown in the Z according to the is on the surface of 14. Concentric. Consider two concentric metal spheres. Spheres 1 and 2 are both hollow as shown in the figure. A negative point charge (-e) is located at the center of the two spheres. Initially, spheres 1 (S1) and 2 (S2) have charges +2e and –e respectively. At static equilibrium,

what is the charge at the outer surface of sphere 2? A. –e B. +e C. -2e D. +2e E. zero 15. Applications of Gauss's Law. A point charge –Q and an infinite line of charge with linear charge density +? are situated a distance 2L from each other.

What is the electric field at point P situated midway between the point charge and the line charge, as shown? A. Zero B. (kQ/L2 + 2k? /L)i C. (kQ/L2 – 2k? /L)i D. (-kQ/L2 + 2k? /L)i E. (-kQ/L2 – 2k? /L)i 16. Electric Flux. A positive charge Q, a negative charge -q and an unknown charge Y are inside a spherical surface. If the total flux across the surface is -q/? 0, what is the charge of Y? A. Q B. -Q C. q D. -q E. Zero 17. Gaussian Surfaces. Three surfaces X, Y and Z, whose cross sections are shown in the figure (X, Y – spherical; _____ _____ A-

National Institute of Physics 2nd Sem AY 2010-2011 Physics 72 Z – cubic), enclose charges of the same magnitude +Q. What can be said about the flux across each surface? A. ? X > ? Y > ? Z B. ? X < ? Y < ? Z C. ? X = ? Y > ? Z D. ? X = ? Y < ? Z E. ? X = ? Y = ? Z 18. True! Which of the following statements is/are true for the flux across a closed surface? I. Net flux is directly proportional to the surface area of the surface. II. Flux is negative if the field lines are pointing inward. III. The total flux is dependent on the magnitude of the total charge inside it. A. I B. II C. III D.

I and II E. II and III 19. Parallel Plates. A pair of parallel plates are charged with +? and -? and are separated by a distance d. What is the potential difference between the two plates ? V? A. ? V = 2? d/? 0 B. ? V = ? d/? 0 C. ?

V = ? d/2? 0 D. ? V = ? d/4? 0 E. ? V = 0 20. Electric Field. In cos(ax) – exp(by). A. E(x, y, z) B. E(x, y, z) C. E(x, y, z) D. E(x, y, z) E. E(x, y, z) a certain region of space the potential is given by V(x, y, z) = What is the electric field? = a*sin(ax) i + b*exp(by) j = -a*sin(ax) i – b*exp(by) j = sin(ax)/a i + exp(by)/b j = -sin(ax)/a i – exp(by)/b j = 0 21. Electric Field.

An electric quadrupole and its' corresponding equipotential surfaces is shown on the right. What is the electric field of the quadrupole? No answer, no E line across two like charges, kindly revise the choices. C 5| A A. B. C. E. D. There is no electric field. 22. Work. Two charges are placed at a distance d from each other as shown in the right. How much work will the electric field do if the two charges are moved to a distance 2d apart? A. W = kq2/d B. W = -kq2/d C. W = kq2/2d D. W = -kq2/2d E. W = 0 23. Potential Gradient. Charged Spheres. There are two charged conducting spheres that are connected by a conducting wire.

Sphere 1 has twice the radius of sphere 2 (R1 = 2R2). At equilibrium, the charge in sphere 2 is Q2, how much charge must be at sphere 1? A. Q1 = 4Q2 B. Q1 = 2Q2 C. Q1 = Q2 D. Q1 = Q2 /2 E. Q1 = -Q2 24. Two Paths. Which of the following statements is/are TRUE if the electric field and charges have the same magnitude for both cases? I. Work done in path M is a negative work done by the electric field. II. Work done in path M is a positive work done by the electric field. III. Work done in path S is a negative work _____ _____ A- National Institute of Physics nd Sem AY 2010-2011 Physics 72 done by an external force. A. I only B. II only C. III only D. I and II E. I and III 25. Voltmeter1. A voltmeter tells you that the magnitude of the potential

difference between two points, A and B is 5. 0 V. You are told that point A is at 2. 0 V. A proton will freely move from point A to point B. This means that the electric potential at point B is _____. A. +7. 0 V B. + 3. 0 V C. Zero D. -3. 0 V E. -7. 0 V 26. Electric Potential. Consider an electron that is transferred from point A to point B and vice versa, as shown in the figure to the right. Which of the following statements is/are TRUE? I.

The magnitude of the energy required to move the charge from A to B is greater than that from B to A. II. The work done by the electric force in moving from A to B is positive. III. The work done by the electric force for the two paths are both negative. A. I only B. II only C. III only D. I and II E. I and III 27. Electric to B? A. B. C. D. E. Potential. Calculate the work done by in moving a neutron from point A -6eV -4eV +6eV +4 eV zero 28. Electric Potential and Electric Field. Consider an electric potential function (V vs. r) plot as show. Which of the plots below best correspond to its electric field plot as a function of r (E vs.)? C 1| A National Institute of Physics 2nd Sem AY 2010-2011 Physics 72 A. B. C. D. E. ____ 29. PARALLEL. The total capacitance of several capacitors in parallel is the sum of the individual capacitances for which of the following reasons? A. Capacitors in a circuit always combine like resistors in series. B. Equivalent capacitance is always greater than the largest capacitance. C. The parallel combination increases the effective separation of the plates. D. The charge on each capacitor depends on its capacitance, but the potential difference across each is the same. E.

The charge is the same on each capacitor, but the potential difference across each capacitor depends on its capacitance. 2| A National Institute of Physics

2nd Sem AY 2010-2011 Physics 72 30. EQUIVALENT. In the network of capacitors shown in the figure, all capacitors have 1 µF capacitance. What is the effective capacitance across points a and b? A. 1/4 µF B. 2/5 µF C. 1 µF D. 5/2 µF E. 4 µF 31. VOLTAGE DROP. The voltage across the plates of an isolated charged capacitor decreases from 10 V to 1 V when the dielectric is inserted between the capacitor plates. If the final capacitance value is 10 nF, what is its initial value?

A. 10 nF B. 5 nF C. 2 nF D. 1 nF E. 0. 1 nF 32. MICA. A sheet of mica is inserted between the plates of an isolated charged parallel-plate capacitor. Which of the following statements is true? A. The capacitance decreases. B. The energy of the capacitor does not change. C. The charge on the capacitor plates decreases. D. The potential difference across the capacitor decreases. E. The electric field between the capacitor plates increases. 33. DIELECTRIC EFFECT. Capacitor C1 is created with two parallel square conducting plates of area A, dielectric of relative permittivity ? and distance between the plates d1 = 3mm.

Capacitor C2 is created with two parallel square conducting plates of the same area A, dielectric of relative permittivity ? and distance between the plates d2 = 1mm. If Cs is the capacitor equivalent to C1 in series with C2 and Cp is the capacitor equivalent to C1 in parallel with C2, what is the ratio Cs/Cp? A. 3/16 B. 1/4 C. 3/8 D. 3/4 E. 4/3 34. Bridge. Three identical capacitors (1. 0 F) are connected as shown in the figure below. If the potential difference between the two ends of the setup is 5. 0 V, what is the voltage on C1? A. 1/3 V B. 2/3 V C. 5/3 V 3| A National Institute of Physics D.

E. 10/3 V 20/3 V 2nd Sem AY 2010-2011 Physics 72 35. Packed. A parallel plate capacitor is fully-charged. Without disconnecting from the voltage source, the plate separation is then doubled. What happens to the energy density stored in the capacitor? A. Quadrupled B. Doubled C. Unchanged D. Halved E. Quartered 36. Plates. In a parallel-plate capacitor, what should be the plate surface area (in terms of ? 0) such that the capacitance is 1. 0 F, if the two plates are separated by 5. 0 mm? A. 1. 0x10-3/? 0 B. 2. 0x10-3/? 0 C. 3. 0x10-3/? 0 D. 4. 0x10-3/? 0 E. 5. 0x10-3/? 0 37. Tulak.

A parallel-plate capacitor (capacitance C) is fully charged (charge Q) and then disconnected from the voltage source. What happens to the potential energy stored in the capacitor if the plate separation is halved while the plate area is unchanged? A. Quadrupled B. Doubled C. Unchanged D. Halved E. Quartered 38. CORD. Which of the following is/are TRUE for a discharging RC circuit with initial charge Q? I. Discharging time decreases as C increases II. The initial current is zero III. The current approaches equilibrium exponentially with time A. I only B. II only C. III only D. I and III E. II and III 39.

Oo-mic. Which of the following plots is NOT CORRECT for an ohmic material? Assume that the resistivity for all plots is constant, V= voltage, I= current, A= crosssectional area, R= resistance and L= length. A 4| A National Institute of Physics 2nd Sem AY 2010-2011 Physics 72 40. Dissipation. Consider an ideal emf source of potential difference V connected to a series combination of three identical resistors of resistance R. If the wires do not have resistance, what is the relationship between the magnitudes of the power dissipated by a single resistor, PR, and the total power supplied by the emf source, PS ?

A. PR = PS B. PR = 3PS C. PR = 9PS D. 3PR = PS E. 9PR = PS 41. Halved cube. A cube with side s is made up of a material with resistivity ?. What will be its resistance if all of its sides are halved? A. ?/s B. 2? /s C. 4? /s D. ?/2s E. ?/4s 42. I (heart) wire. Three wires are made up of the same material and have the same length but different cross-sections as shown in the right. Describe their conductivities. A. ? A = ? B = ? C B. ? A < ? B < ? C C. ? A > ? B > ? C D. ? A < ? B = ? C E. ? A = ? B < ? C A B C 5| A National Institute of Physics 2nd Sem AY 2010-2011 Physics 72 43. Parisukat.

Charged oxygen ions (q = -2e) are moving through a wire at a drift speed of 0. 2 m/s. The wire has a square cross-section and the ions are uniformly distributed through its volume. What will happen to its current density if its cross section is doubled? A. Quadrupled B. Doubled C. Remains the same D. Halved E. Quartered For the next two numbers, consider the circuit below. All resistors have resistance 1 ?. 44. X1. What is the current passing through nodes a and b? A. 1 A B. 2 A C. 5 A D. 10 A E. 20 A 45. X2. What is the voltage across any resistor? A. 1 V B. 2 V C. 2. 5 V D. 5 V E. 10 A ? END OF EXAM ? 1| A