

Final Exam – Fisi 3162/3172

Name: _____

Friday August 20, 2010

Section: _____

Prof. _____

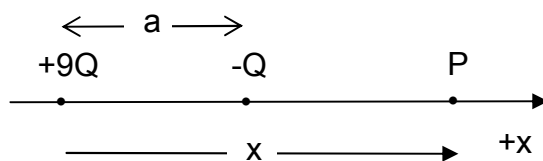
- **Read the instructions carefully.**
- **Select the best answer.**
- **You are required to answer only 16 of the 20 questions.**
- **When you finish the exam you have to select and identify the 16 questions you want to be corrected by putting a mark in the square spaces provided beside the question's number in this page, and write the answers in the square spaces adjacent the selected questions.**
- **If you choose not to indicate which questions are the chosen ones, the first 16 questions will be the ones corrected.**
- **All answers must be justified, either by some analytical procedure or by some physics principle unless otherwise indicated in the question's text.**
- **If there is no justification for the answer then it will be considered a wrong answer. In other words 'to guess' the answer is not valid.**
- **The points assigned will be: 6.25% to a correct answer with a correct justification, 3.13 % to an incorrect answer with a correct justification, and 0% to a correct or incorrect answer either with no justification or an incorrect one.**

Question #	Answer	%
1.	<input type="checkbox"/>	_____
2.	<input type="checkbox"/>	_____
3.	<input type="checkbox"/>	_____
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5.	<input type="checkbox"/>	_____
6.	<input type="checkbox"/>	_____
7.	<input type="checkbox"/>	_____
8.	<input type="checkbox"/>	_____
9.	<input type="checkbox"/>	_____
10.	<input type="checkbox"/>	_____

Question #	Answer	%
11.	<input type="checkbox"/>	_____
12.	<input type="checkbox"/>	_____
13.	<input type="checkbox"/>	_____
14.	<input type="checkbox"/>	_____
15.	<input type="checkbox"/>	_____
16.	<input type="checkbox"/>	_____
17.	<input type="checkbox"/>	_____
18.	<input type="checkbox"/>	_____
19.	<input type="checkbox"/>	_____
20.	<input type="checkbox"/>	_____

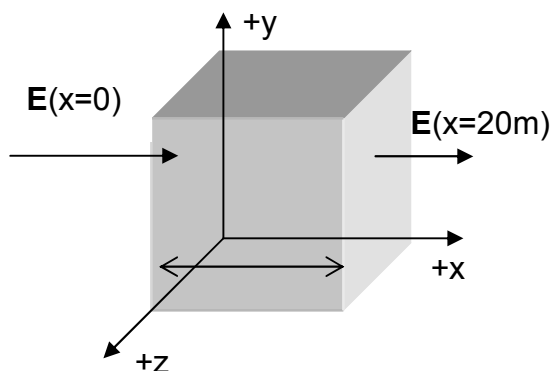
1. The value of x (in terms of a) for the electric field \mathbf{E} at point P to be null ($E_P = 0$) is:

- a) $3^a/4$
- b) a
- c) $9^a/8$
- d) $3^a/2$
- e) Another answer. Which one?: _____



2. In certain region of space, the electric field is constant in direction but decreases in magnitude from $E(x=0) = 850 \text{ N/C}$ to $E(x=20 \text{ m}) = 450 \text{ N/C}$. The net electric charge inside a cubic box with 20 m sides put in this region is approximately:

- a) $0 \mu\text{C}$
- b) $17.8 \mu\text{C}$
- c) $-1.42 \mu\text{C}$
- d) $-17.80 \mu\text{C}$
- e) Another answer. Which one?: _____



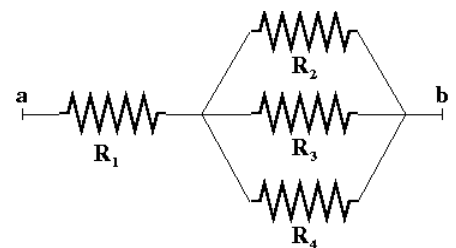
3. A solid non-conducting sphere of radius R has a total charge Q uniformly distributed over its volume. The electric field inside the sphere at a distance $r < R$ from the center is:

- a) $E = 0$
- b) $E = Q/(4\pi\epsilon_0 r^2)$
- c) $E = Q/(4\pi\epsilon_0 R^2)$
- d) $E = Q/[4\pi\epsilon_0 (R-r)^2]$
- e) Another answer. Which one?: _____

4. A conducting sphere with a 5.00 cm radius has a surface charge density of $2.00 \times 10^{-6} \text{ C/m}^2$. The electric potential at its surface (relative to infinity) is:
- a) $1.13 \times 10^4 \text{ V}$ b) $2.26 \times 10^4 \text{ V}$ c) 2.36×10^5
d) $3.69 \times 10^5 \text{ V}$ e) $7.24 \times 10^6 \text{ V}$

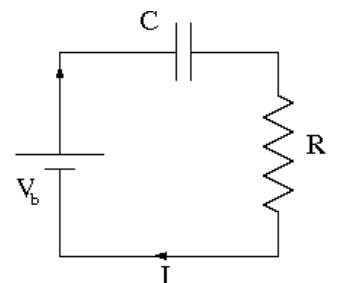
5. A 1.0 pF capacitor is connected in parallel to a 2.0 pF capacitor. The combination is in turn connected in series to a 3.0 pF capacitor. The equivalent capacitance of the combination is:
- a) 1.5 pF b) 3.0 pF c) 4.5 pF d) 5.0 pF e) 6.0 pF

6. In the resistor's combination shown in the figure at right $R_1 = 1.0 \Omega$, $R_2 = 10 \Omega$, $R_3 = 5.0 \Omega$ y $R_4 = 2.0 \Omega$. If the current in R_3 , $I_3 = 2.0 \text{ A}$, then the voltage between points a and b is:



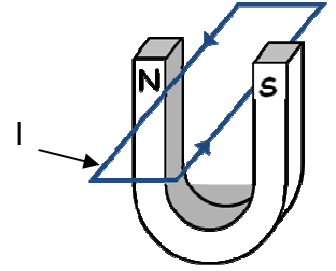
- a) 2 V. b) 10 V. c) 11 V.
d) 18 V. e) Another answer. Which one?: _____

7. In the RC circuit shown in the figure at right $V_b = 5.0 \text{ V}$, $C = 25 \mu\text{F}$ and $R = 200 \Omega$. At the instant the current in the circuit is $I = 5.0 \text{ mA}$, the energy stored in the capacitor is:



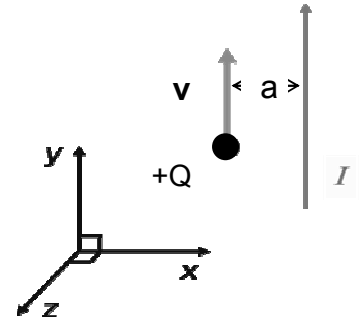
- a) $40 \mu\text{ J}$ b) $80 \mu\text{ J}$ c) 0.10 m J
d) 0.20 m J e) Another answer. Which one? : _____

8. If there is a current I in the rectangular loop in the direction shown in the figure at right, at that instant the loop will (write the mathematical expression used to reach your answer):



- a) move upward.
- b) move downward.
- c) rotate clockwise.
- d) rotate counterclockwise.
- e) rotate and move to the right.

9. A positive charge $(+Q)$ moves with a velocity \mathbf{v} parallel to a vertical wire. Suddenly a current I is established in the wire in the direction shown in the figure at right. As a consequence, the charge will experience a force in the direction of (write the mathematical expression used to reach your answer):



- a) $+z$ (out of the plane of the paper)
- b) $-z$ (into the plane of the paper)
- c) $+x$
- d) $-x$
- e) $+y$

10. In the previous exercise the magnitude of the force acting on the charge is:

- a) $\mu_0 QvI / 2\pi a$
- b) $\mu_0 QvI / 2\pi a^2$
- c) $\mu_0 QvI / 4\pi a$
- d) $\mu_0 QvI / 4a$
- e) $\mu_0 QaI / 2\pi v$

11. A 20 A current (uniform across its cross section) is established in a 2.0 mm in diameter conducting wire. The magnitude of the magnetic field at the surface of the wire is:

- a) 6.3 μT
- b) 80 μT
- c) 4.0 mT
- d) 6.3 mT
- e) 20 mT

12. The magnetic flux through 20 turn coil with a 100 Ω resistance changes at a constant rate from -5.8 Tm^2 to 3.8 Tm^2 in 0.48 s. The induced current in the coil is approximately:

- a) 0.042 A
- b) 0.20 A
- c) 0.42
- d) 0.83 A
- e) 4.0 A

17. In a Young's double slit interference experiment, the slit separation is 0.320 mm. A 500 nm wavelength beam of light strikes the double slit and produces an interference pattern. The number of interference maxima observed in a screen in the angular range $-30^\circ \leq \theta \leq 30^\circ$ is:

- a) 641 b) 320 c) 16 d) 1109 e) Another answer. Which one?: _____

18. A 600 nm wavelength beam of light strikes a slit in a single slit diffraction experiment. There are 160 diffraction minima in the angular range $-37^\circ \leq \theta \leq 37^\circ$. The slit width is:

- a) 8.0 mm. b) 1.6 mm. c) 0.80 mm. d) 0.16 mm. e) 0.08 mm.

19. The energy of a red photon with a $\lambda = 750$ nm wavelength is:

- a) 4.1×10^{-5} eV. b) 1.7 eV. c) 2.9 eV. d) 410 eV. e) 29 eV.

20. A 450 nm wavelength photon strikes a metal surface with work function $W=2.5$ eV. The maximum energy of the emitted electrons is:

- a) 0.26 eV. b) 0.51 eV. c) 2.76 eV. d) 3.53 eV. e) 4.55 eV.