ATTENTION: Fill in only one answer for each question, in the box given below.

UNIVERSITY OF GAZIANTEP
DEPARTMENT OF
ENGINEERING PHYSICS

EP106 General Physics II FINAL Exam

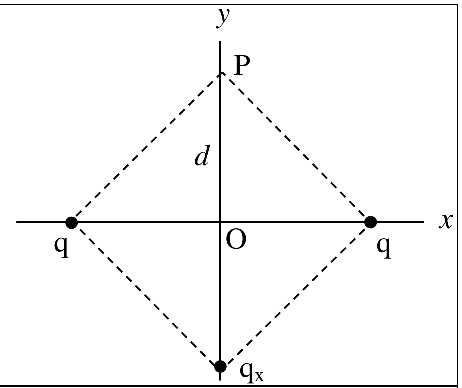
Date: 18/08/2006 Time: 120 min.

Name	Surname	Dep.	Signature

- **Fill in only one answer for each question.**
- You can write your answers in boxes provided.
- Constants: $g = 9.8\,m/s^2$, $e = -1.602x10^{-19}C$, $\mu_o=4\pi \times 10^{-7} T.m/A$ $\varepsilon_0= 8.85x10^{-12}\ C^2/Nm^2$, $k=1/(4\pi\varepsilon_o)=9.0x10^9\ N.m^2/C^2$

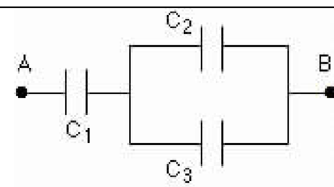
1	A	**B**	C	D	E	11	A	B	**C**	D	E
2	A	**B**	C	D	E	12	**A**	B	C	D	E
3	A	B	C	**D**	E	13	**A**	B	C	D	E
4	A	B	C	D	**E**	14	A	**B**	C	D	E
5	A	B	**C**	D	E	15	A	B	C	**D**	E
6	A	B	**C**	D	E	16	A	B	**C**	D	E
7	**A**	B	C	D	E	17	A	**B**	C	D	E
8	A	**B**	C	D	E	18	**A**	B	C	D	E
9	A	B	C	D	**E**	19	A	B	C	**D**	E
10	A	**B**	C	D	E	20	A	**B**	C	D	E

Q1) Three point charges are fixed on the corners of a square with |OP| = d as shown in the Figure. Assume that electric field at point P is zero. What is the value of charge q_x?



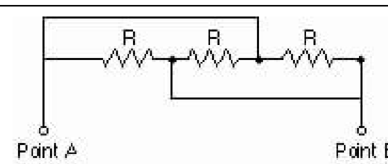
a) $\sqrt{2}\,q$ b) $-2\sqrt{2}\,q$ c) $-4\sqrt{2}\,q$ d) $-2\sqrt{2}\,q$ e) $-4\sqrt{2}\,q$

Q2) The three capacitors shown are *3 microF* each. If a *20 V* battery is connected across the terminals A and B, the energy stored in C_2 will be (in microJoules)



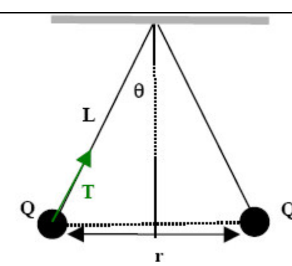
a) 67 b) 133 c) 200 d) 267 e) 400

Q3) What is the resistance, as measured from point A to point B, of this combination of resistances?



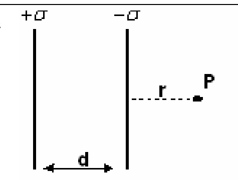
a) 3R/2 b) R/2 c) R d) R/3 e) 0

Q4) Two balls with *2.0 grams* of mass hang from lightweight insulating threads *50 cm* long from a common support point, as shown in the Figure. When equal charges Q are placed on each ball, they repel each making an angle of *10* degrees with the vertical. What is the magnitude of Q, in microC?



a) 110 b) 55 c) 0.55 d) 0.38 e) 0.11

Q5) Two conducting-infinite-parallel-plates are a distance **d** apart as shown in the Figure. If the plates have equal and opposite uniform surface charge density, σ, what is the magnitude of the electric field at point P?

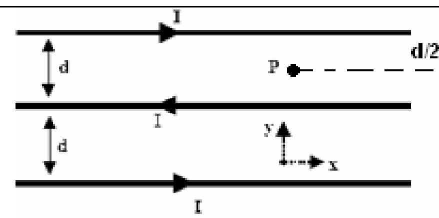


a) $\dfrac{\sigma}{2\varepsilon_0}$ b) $\dfrac{\sigma}{\varepsilon_0 r}$ c) 0 d) $\dfrac{2\sigma}{\varepsilon_0 r}$ e) $\dfrac{2\sigma}{4\pi\varepsilon_0 (d+r)^2}$

Q6) A time varying magnetic field is given by $B(t) = at+b$ with $a = 2$ *T/s* and $b = -1$ *T*. The field is perpendicular to a circular coil plane of *10 turns* with radius *0.2 m*. If the resistance of coil is *1.58 Ohms*, how much power (in Watts) is approximately dissipated at time $t = 1$ *s*?

a) 1 b) 2 c) 4 d) 6 e) 8

Q7) Three wires lie in the xy-plane, as in the Figure. The upper and lower wires carry a current of $I = 3A$ to the right, but the middle one carries a current of $I=3A$ to the left. If the wires are at distance $d = 1.0$ *m* apart from each other, what is the magnitude and direction of the magnetic field at the midpoint P between the top and middle wire? (Assume that the wires are infinitely long, parallel and straight.)



a) $5\mu_0/\pi(-\hat{z})$ b) $5\mu_0/\pi(+\hat{z})$ c) $15\mu_0/\pi(-\hat{z})$ d) $15\mu_0/\pi(+\hat{z})$ e) 0

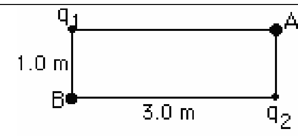
Q8) If a charged particle, $Q = 0.125$ *C*, with velocity $\vec{v} = 4\hat{x} + 6\hat{y} + 4\hat{z}$ (in m/s) enters a region with a uniform magnetic field $\vec{B} = 4\hat{x} + 6\hat{y} + 4\hat{z}$ (in Tesla), what will be the magnetic force vector on the particle?

a) $\vec{F} = +3\hat{x} + 2\hat{y}$ b) $\vec{F} = 3\hat{x} - 2\hat{y}$ c) $F = 3x - 2y$ d) $\vec{F} = -3\hat{x} - 2\hat{y}$ e) $\vec{F} = 3.6\hat{z}$

Q9) The electric power, from an electric central to the city center, is transmitted along a transmission line that is located at an average height of *20 m* above the earth's surface. It carries a current about *1000 Amps* from east to west, in a region where the earth's magnetic field is $1.0 \times 10^{-4} T$ due north at 60^0 below the horizontal. What is the magnitude of the force per meter on the line?

a) $87\,mN/m$ b) $1.73\,N/m$ c) $1\,mN/m$ d) $0.1\,mN/m$ e) $0.1\,N/m$

Q10) Two particles with charges, $q_1 = -4\mu C$ and $q_1 = +2\mu C$ are located as seen in Figure. If a third particle with charge $q_3 = +3\mu C$ were at point B, what would be the work done to move this third particle, at a constant speed, from B to A.

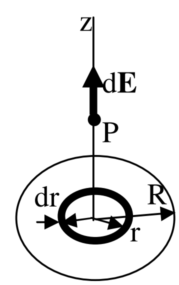


a) $-0.108J$	b) $0.108J$	c) $-0.432J$	d) $0.432J$	e)Insufficient info.

Q11) An electrically neutral penny, of mass m=3.1g, contains equal amounts of positive and negative charge. Assuming the penny is made entirely of copper, what is the magnitude q of the total positive (or negative) charge in the penny. Avogadro's number $N_A=6.02\text{x}10^{23}$atoms/mol, Atomic number of copper Z=29.

a) 200C	b) 3000C	c) 137000C	d) 0.35C	e) 0.035C

Q12) The ***disk*** in the figure has a radius R of 2.5cm and a surface charge density σ of +5.3 $\mu C/m^2$ on its upper face. What is the electric field at a point P on the central axis at a distance z=12cm from the disk?



a) $6.3\text{x}\ 10^3$ N/C	b) 6.3 N/C	c) $3\text{x}\ 10^8$ N/C	d) 6000 N/C	e) 600 N/C

Q13) A neutral water molecule (H_2O) in its vapor state has an electric dipole moment of $6.2\text{x}10^{-30}$ C.m. If the molecule is placed in an electric field of $1.5\text{x}10^4$ N/C, what maximum torque can the field exert on it?

a) $9.3\text{x}10^{-26}$N.m	b) $9\text{x}10^{+26}$N.m	c) $3\text{x}10^{-6}$N.m	d) $3\text{x}10^{+6}$N.m	e) $3\text{x}10^{-3}$N.m

Q14) What is the unit of electric flux?

a) N.C	b) $N.m^2/C$	c) N.m/C	d) $N.m/C^2$	e) V/m^2

Q15) What is the potential on the surface of a gold nucleus? (The radius R of the nucleus is $6.2\text{x}10^{-15}$m, and the atomic number Z of gold is 79.)

a) 80000V	b) 0.004V	c) 2V	d) $1.8\text{x}10^7$V	e) $18\text{x}10^{-7}$V

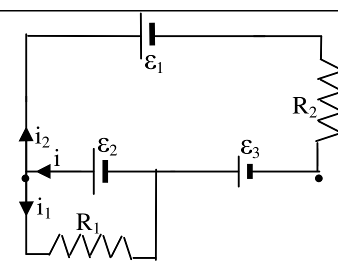
Q16) A copper wire has a diameter of 1.8mm. The copper wire carries a steady current I of 1.3A. In copper, there is very nearly one conduction electron per atom on the average. What is the drift speed of the conduction electrons in the copper wire? (Avogadro's number $N_A=6.02x10^{23}$atoms/mol, the density of copper $\rho=9x10^3$ kg/m^3, the molar mass of copper $M=64x10^{-3}$kg/mol.)

a) $2.4x10^{+7}$ m/s	b) $7.8x10^{-18}$ m/s	c) $3.8x10^{-5}$ m/s	d) $3.8x10^{-3}$ m/s	e) 2 m/s

Q17) A capacitor of capacitance C is discharging through a resistance R. In terms of the time constant, τ=RC, when will its charge be one-half of its initial value?

a) t=0.0009τ	b) t=0.69τ	c) t=$10^8\tau$	d) t=30τ	e) t=5τ

Q18) In the figure, find the current i if ε_1=6V, ε_2=5V, ε_3=4V, $R_1=100\Omega$, $R_2=50\Omega$.

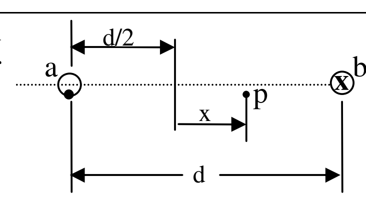


a) $i=11x10^{-2}$A	b) $i=100x10^3$A	c) i=33A	d) i=3343.3A	e) i=0A

Q19) A 10eV electron is circulating in a plane at right angles to a uniform magnetic field of $1x10^{-4}$T. What is its orbit radius? (The mass of an electron $m_e=9.1x10^{-31}$kg, the charge of an electron $e=1.6x10^{-19}$C, $1eV=1.6x10^{-19}$J.)

a) $3x10^{31}$m	b) 2.345m	c) 1.1m	d) 0.11m	e) $3x10^{-5}$m

Q20) Two parallel wires a distance ***d*** apart carry equal currents i=2A in opposite directions as in the figure. Find the magnetic field ***B*** for the point ***P*** between the wires at a distance $x=2cm$ from the midpoint. (Take $d=10cm$, $\mu_o=4\pi \times 10^{-7}T.m/A$.)



a) $1.9x10^{-10}$T	b)$1.9x10^{-5}$T	c) 0.1T	d) 2T	e) $3x10^4$T