First term Exam - (2017/2018) - Faculty of Science
Biophysics P- 323 - Time: 3 h - Prof. Dr. Ahmed Sedky

Answer the following questions:

Q1 (12 marks) Complete the following:

1- The average pressure of a young person = _____ **D/cm^2**

2- If **HVT** of sound intensity by the brain tissue = **4.25 cm**, the **μ** = _____

3- **5.145 g** from fat tissue of a person gives _____**Joule** in the form of energy

4- A good ear normally needs about _____more intensity to detect a sound at **300 Hz** than that of **1000 Hz**

5- If the critical kinetic energy for turbulent flow through the aorta is **1500 erg**, the mass of blood =_____ **g**

6- P- wave of ECG represents _____,
while T-wave represents _____

Q2 (10 marks): Put √ or X for the following:

1- Conduction velocity is inversely related to the time constant per unit length ( )
2- Cryosurgery is made by freezing tip of the probe at a temperature of 188 K ( )
3-The refractive index of the eye layers increases towards its interior part ( )
4-A tube of 25 cm length and 0.3 cm diameter is convenient for stethoscope ( )
5-A change from 37° to 0° increases the viscosity of blood by a factor of 2.5 ( )
6-The SA node initiates depolarization of the nerves and muscles of atria. ( )
7-If the radius of pipes is doubled, the flow rate increases by a factor of 16 ( )
8-The periodic time of the voice is about 4.35 ms for females ( )
9-The corrected system of farsightedness has a smaller focal length ( )
10-The relaxed eye view the distant objects at about 6 m and beyond ( )

Q3 (10 marks),Write only the reason:

1- The bats can hear/see even better than we can.

2- The myelin axons have conducting velocities higher than un-myelin axons.

3- The systolic pressure is always higher than diastolic pressure.

4-The height of Hg in the capillary tube is negative

5- The higher velocity of the blood in the capillaries is necessary.

Q4 (6 marks):

(a) If the human ear can detect at angular frequency of 6000 Hz correspond to an intensity of 10^{-6} (W/m^2). Determine the amplitude and pressure associated with these two limits.

(b) With sketch the diagram write short account about ERG for the eye diagnostic.

Q5 (6 marks):

(a) Calculate the heat loss by convection of an individual in water (A_c= 1.75 m^2 ,T_a = 36 °C, T_s = 40 °C and σ_c = 2.3 Cal/m^2h°C).

(b) With sketch the diagram explain in details how the acting potential is produced inside the axon.

Q6(6 marks):

(a) If V_m for K ions is (- 80 mV) at 327 °C, calculate the increase of V_m when K ions are replaced by Ca ions and the membrane is permeable for Ca ($Ca_o = 300$, $Ca_i = 100$).

(b) With sketch the diagram show that Doppler effect can be used to measure the velocity of blood.

Physics department
Faculty of science
Assiut university

3rd year students: Physics

1st term exam 2017/2018
Subject: electronics (361P)

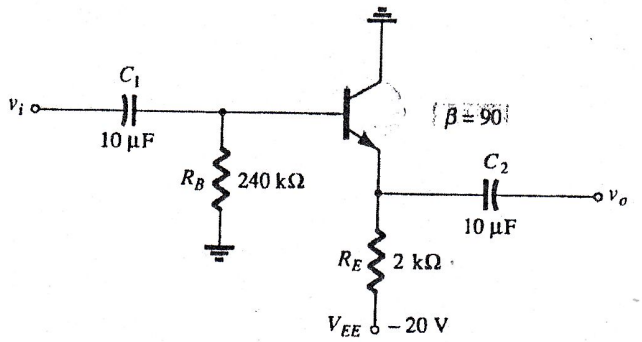
Time : 3 hours
Total degree: 50

ANSWER THE FOLLOWING QUESTIONS الإمتحان فى صفحتين

Question1

(a) Describe in your own words the conditions established by forward- and reverse-bias conditions on a p-n junction diode and how the resulting current is affected.

(b) Determine V_{CE} and I_E for the following network



Question2

Calculate the voltage gain ($Av = V_L/V_i$) for the following network, if :

(1) V_i= 500 mV and R = 1 kΩ.

(2) The source has an internal resistance of 100 Ω in series with V_i.

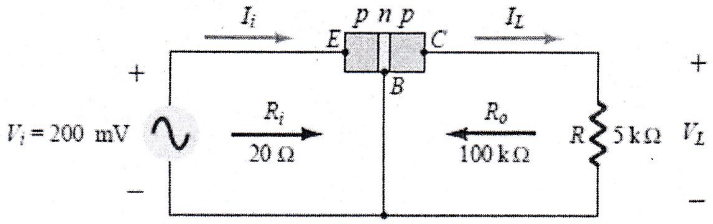
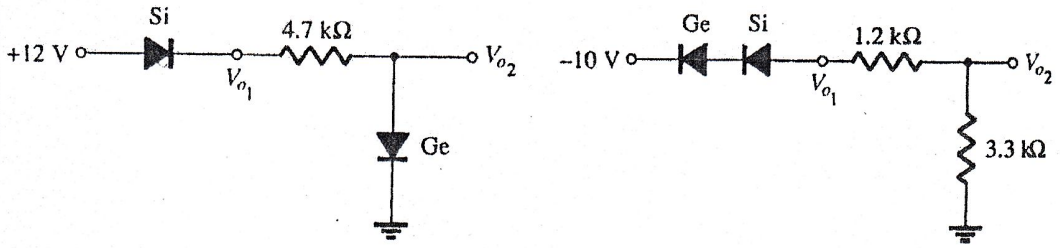


Figure 2

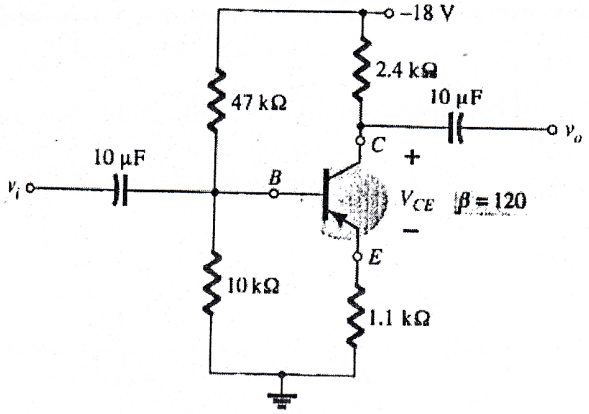
Question3

Determine V_{o1} and V_{o2} for the following networks.



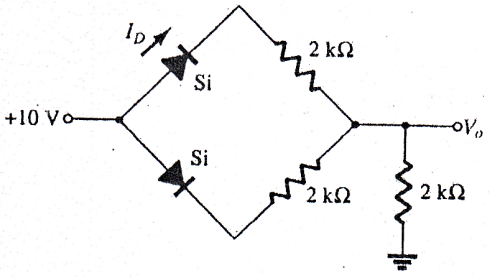
Question4

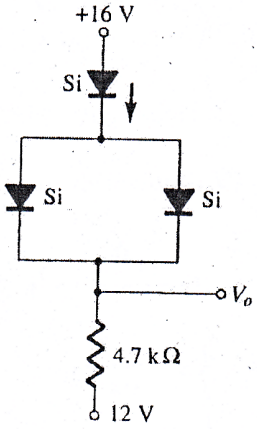
Determine V_{CE} for the voltage-divider bias configuration of the following network



Question5

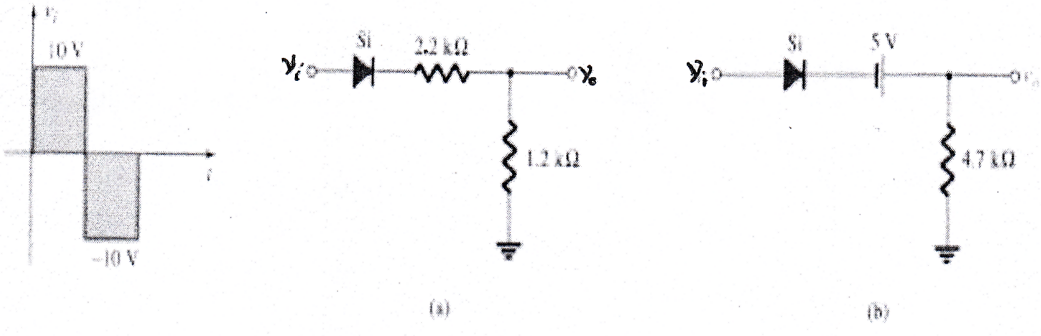
Determine V_o and I for the following networks.





Question6

Determine v_o for each network of the following for the input shown.



GOOD LUCK

Assiut University
Faculty of Science
Department of Physics

Undergraduate
Final Exam (50%)

First semester 2017-2018

Course: Quantum Mechanics (1)
Code : P311
Section: Phys. and Phys./Chem.
Time : 3 Hours
Date : 4/1/2018

Answer the following question:

Question (1): (10 Mark)

Write number of each statement and put [√] or [×], then discuss your answer (if √ or ×):

1- In classical mechanics, the state of a system means knowing the instantaneous values of some the dynamical variables.

2- In classical mechanics, the complete information of state of a system at any instant time t_0 can be known by determining only the position coordinates of the particles.

3- In classical electromagnetic theory, if the state of the fields $\vec{E}(\vec{r},t)$ and $\vec{B}(\vec{r},t)$ at some instant time t_0 is given, then the state at any other time can be determined uniquely.

4- Classical theory predicts that the heat capacity at constant volume depends on temperature.

5- The wave function Ψ that is associated to the particle motion can be simple plane wave.

6- Good localized wave packet can be formed by combination of only two waves.

7- The uncertainties principle can be derived from our representation of wave packet.

8- One form of uncertainty principle is $\Delta E \Delta t \leq \frac{\hbar}{2}$.

9- According to our representation of wave packet, the group velocity of the wave packet can be associated with the velocity of a particle.

10- The de Broglie wavelength of an object increases as the velocity of the particle increases.

Answer four (4) only of the following questions:

Question (2): (10 Mark)

a) If you know the wave function $\Psi(x,t) = A\, e^{i(k_x x - \omega t)}$ is the wavefunction of free particle in one dimension space, deduce the one dimensional time dependent Schrödinger equation. (7 points)

b) Select the mathematical acceptable wave functions in quantum mechanics:

1) $\psi = x^n$ 2) $\psi = e^x$ 3) $\psi = e^{(-x^2)}$ (3 points)

Question (3): **(10 Mark)**

a) Prove that the motion of free particle described by Schrödinger equation obey to continuity equation $\frac{\partial P(\vec{r},t)}{\partial t} + \vec{\nabla} \cdot S(\vec{r},t) = 0$, where $P(\vec{r},t)$ is probability density and $S(\vec{r},t)$ is probability current density. (7 points)

b) Prove that $S(\vec{r},t)$ is real quantity. (3 points)

Question (4): **(10 Mark)**

a) State the Ehrenfest Theorem and then prove that $\frac{d}{dt}\langle x\rangle = \frac{\langle p_x\rangle}{m}$, where $\langle x\rangle$ and $\langle p_x\rangle$ are the expectation values of position and momentum in x direction. (6 points)

b) Show the commutator relation for: 1) $[\hat{y}, \hat{p}_y]$ 2) $[\hat{T}_x, \hat{p}_x]$, and then discuss can each pair of operators be measured simultaneously or not? (4 points)

Question (5): **(10 Mark)**

a) Prove that the eigenvalues of a Hermitian operator are real. (3 points)

b) If the ground state of the oscillator is given by eigenfunction $\psi_0 = A exp(-\frac{x^2}{2a^2})$, where A and a are constants. If the Hamiltonian for the oscillator is: $\hat{H} = \frac{-\hbar^2}{2m}\frac{d^2}{dx^2} + \frac{1}{2}m\omega_0 x^2$, find the total energy in this state. (3 points)

c) Which of the following functions are eigenfunctions of operator $\frac{d^2}{dx^2}$? Find the eigenvalue if exist. 1) $\psi = A\sin(mx)$ 2) $\psi = C\,x^2$ (4 points)

Question (6): **(10 Mark)**

a) Derive one dimensional time independent Schrödinger equation. (7 points)

b) At time $t = 0$ a particle is represented by the wave function $\psi = A\frac{x}{a}$, where A and a are constants. Normalize ψ and find A in terms of a . (3 points)

Useful relations and constants:

- $\vec{\nabla} \cdot [f(\vec{\nabla}g) - g(\vec{\nabla}f)] = f(\nabla^2 g) - g(\nabla^2 f)$ for any two scalar quantity f and g.
- $\frac{i\hbar}{2m}\int_{-\infty}^{+\infty}\frac{d^2\Psi^*}{dx^2}\,x\,\Psi\,dx = \frac{i\hbar}{2m}\int_{-\infty}^{+\infty}\Psi^*\frac{d^2(x\Psi)}{dx^2}\,dx$

BEST WISHES Instructor: Dr. Sherif Rashad MOKHTAR

جامعة أسيوط – قسم الفيزياء – الاختبار النهائي للفصل الدراسي الأول للفيزياء الإحصائية (ف ٣١٣) ٢٠١٧/ 2018. اجب عن أربعة أسئلة فقط – الزمن: ثلاث ساعات.

السؤال الأول

١– عرّف لانجرانيات النظام L و كذلك دالة هاملتون H .

٢– اكتب تعريفا رياضيا للمؤثر الخطي.

٣– اذكر ثلاث كميات سعوية extensive و ثلاث أخرى كميات كثافة intensive.

٤– اذكر ثلاث دوال حالة و ثلاث أخرى دوال مسار و اثنتان من معادلات الحالة.

٥– لدالة ما $f(x,y)$ توصل للشرط الضروري و الكافي لأن يكون df تفاضلا تاما. ما هو المقابل الديناميكي الحراري لهذا المصطلح.

السؤال الثاني

١– اكتب صيغة عامة لمؤثر هاملتون.

٢– مستخدما مؤثر طاقة الحركة في بعد واحد توصل لصيغة مؤثر كمية التحرك الخطية.

٣– بيّن أن e^{ikx} هى دالة مميزة لمؤثر كمية التحرك. ما هى القيمة المميزة.

٤– في عبارة وجيزة، فرّق بين الفراغ μ و الفراغ Γ.

السؤال الثالث

ا– توصل لتعبير عام للفرق بين نوعي السعة الحرارية و من ثّم تعرف على الضغط الداخلي.

ب– احسب الضغط الداخلي لواحد مول من غاز تصفه معادلة الحالة $P(V_m - b) = RT$

و من ثّم اثبت أن الطاقة الداخلية له لا تعتمد على الحجم (V_m الحجم المولي، b مقدار ثابت).

في ضوء ما تعرف عن معادلة الحالة لفانديرفال، علّق على النتيجة التي حصلت عليها.

السؤال الرابع

مستخدما المقاربة الديناميكية الحرارية، احسب التغير في الانتروبي لغاز مثالي يحتوي على N من الجزيئات يتمدد إلى ضعف حجمه ايزوثيرميا. اعد حل المسألة مستخدما المقاربة الإحصائية.

السؤال الخامس

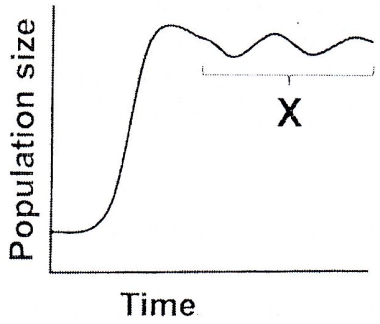
١– فرّق بين ثلاث أنواع من مجمعات النظم.

٢–في ضوء المجمع الميكروقانوني، انشئ المنطقة المتاحة في فراغ الطور لمتذبذب توافقي في بعد واحد و من ثّم عرّف كثافة الاحتمال للمجمع الميكروقانوني.

Assiut University **Faculty of Science** **Department of Physics**		**Term: 1st Semester, 2017 - 2018** **Date: Dec. 18th, 2017** **Exam duration: 3 hours**
Course Title: Environmental Physics- Code: P383 - **Final Exam (50 Marks)**		

I. Choose the correct answer. **(18 Marks)**

1. The following graph is shown the change in wild horse population over time. Which statement best explains the section of the graph labeled X?



(a) The horses are no longer in competition for resources with other species.
(b) Interbreeding is occurring between members of different species.
(c) Predation is low and resources are high.
(d) The horse population has reached the carrying capacity of its environment.

2. Humans have been adding more carbon dioxide into our atmosphere which had caused?

(a) global warming
(b) ozone depletion
(c) acid rain
(d) none of these

3. What do ecologists call the transfer of energy that begins with the Sun and passes from one organism to the next in a food chain?

(a) food web
(b) energy flow
(c) a top consumer
(d) a pyramid of numbers

4. Sulfur oxides react with water in the atmosphere to form sulfates or sulfuric acid. Sulfuric acid would then be classified as.....

(a) A synthetic pollutant
(b) A particulate
(c) A primary air pollutant
(d) A secondary air pollutant

11. Energy from the sun enters Earth as longwave radiation, and leaves as shortwave radiation

(a) True (b) False

12.....is a result of average atmospheric conditions in a certain region over a long period of time.

(a) Weather
(b) Climatology
(c) Climate
(d) Meteorology

13. Hard water contains an abundance of .....

(a) sodium
(b) lead
(c) iron
(d) calcium carbonate

14. What is the purpose of coagulation and flocculation?

(a) control corrosion
(b) to kill disease causing organisms
(c) to remove leaves, sticks, and fish debris
(d) to remove particulate impurities and suspended matter

15.....% of the sun's energy is absorbed by the Earth.

(a) 50%
(b) 40%
(c) 0%
(d) 10%

16. What layer of the atmosphere does the most filtering for the UV radiation?

(a) Troposphere
(b) Stratosphere
(c) Thermosphere
(d) Mesosphere

17. 15 g of NaCl occupy a volume of 75 mL. What is the molarity of the solution? (MW of Na= 22.98 u and Cl= 35.45 u).

(a) 3.4 M
(b) 0.29 M
(c) 0.019 M
(d) 0.0034 M
(e) None of these are correct.

II. Give a definition for the following key terms: **(3 Marks)**

Albedo:

Flocculation:

Aerosol:

III. Answer the following questions briefly. **(9 Marks)**

1. What are the environmental effects caused by green house?

(a) .....

(b) .....

(c) .....

(d) .....

2. What are the environmental effects caused by artificial fertilizer?

(a) On human and animals:.....

.....

(b) On plants:.....

.....

3. What is the difference between primary and secondary air pollutants? Give examples of each.

IV. Choose two alternative energy sources and explain at least two advantages and two disadvantages of these alternative energy sources in comparison to fossil fuels energy sources.
(4 Marks)

V. There is a considerable difference between the amount of solar energy that strikes the outer atmosphere and that actually reaches the earth's surfaces. Why? (Clarify your answer by drawing)
(4 Marks)

VI. When measuring the temperature of the atmosphere versus altitude, distinct changes are apparent. Discuss these changes. (Clarify your answer by drawing) **(4 Marks)**

VII. Answer the following questions: **(8 Marks)**

1. List three examples of natural air pollution.

(a) .....

(b) .....

(c) .....

2. Name at least three major direct effects of sea level rise on humans.

(a) .....

(b) .....

(c) .....

3. List four of the human activities that profoundly affect the environment

(a) .....

(b) .....

(c) .....

(d) .....

4. List the main five processes in water treatment and describe one of them briefly.

(a) .....

(b) .....

(c) .....

(d) .....

(e) .....

"Best of luck for your exam"
Dr. Ayman A. Abdelaziz

Faculty of Science **Date: 5 January, 2018**

Physics Department **Time: 2 hours**

Final Examination in (Introduction to Solid State Physics 350P)

Teaching Staff: Prof. Dr. Abdulaziz Abualfadl

Constants: h= 6.626 x 10^{-34}J.s, 1 eV= 1.6 x 10^{-19} J, k_B= 1.38 x 10^{-23}J/K, e=1.6 x 10^{-19}c, C= 3 x 10^{8}m/s, N_A= 6.02 x1 0^{23} atom/mole. m_e=9.1x10^{-31} kg, m_n=6.7x10^{-27} kg

Answer 4 questions from the following:

1- (a)- Discuss in brief the factors affecting X-ray spectrum. The minimum wavelength observed in X-ray radiation is 1.23 °A. What is the kinetic energy of the primary electrons hitting the target?

(b)- A beam of 150 eV electrons falls on a powder nickel sample (FCC). Find the three smallest Bragg angles at which reflection takes place.

(c)- Find the allowed and missed diffraction from the lattice of base centered cubic.

2-(a)- Write down the equation of motion for one dimensional chain of atoms with mass *M* and a spring constant α. Find its traveling wave solution. Establish the dispersion law of the wave and explain its meaning.

(b)- Aluminum has FCC structure with the atomic radius 1.43 A^0. If energetic X-ray beam of 7.38 KeV incidents on (100) plane, calculate the Bragg's angle considering the1St order reflection.

(c)- Why is the energy of a neutron so much smaller than that of an electron in radiation beams employed in crystal diffraction? Can a light beam be used in the analysis of crystal structure? Why is the neutron more useful than the proton in structure analysis?

3-(a)- The edge of a unit cell in a simple cubic crystal is a = 2.62 °A. Find the Bragg angle corresponding to reflection from the planes (110), (210) and (211), given that the monochromatic X-ray has a wavelength of 1.54 °A.

(b)- The Bragg angle for reflection from the (110)-planes in BCC iron is 22◦ for an X-ray wavelength of 1.54 °A

(i) Calculate the cube length. (ii) What is the Bragg angle for reflection from the (111)-planes? (iii) Calculate the density of BCC iron. The atomic weight is 55.8 kg/kmol.

(c)- The packing ratio is defined as the fraction of the total volume of the cell that is filled by atoms. Determine the maximum values of this ratio for equal spheres located at the points of BCC type crystals.

4- (a)- Which of the following reflections would be missing in a BCC lattice: (100), (110), (111), (200), (210), (220) and (211)? Answer a similar question for an FCC lattice.

(b)- Show the schematic diagram of cubic crystallographic planes having Miller indices $(01\bar{1}), (11\bar{1}), (\bar{1}00), (222)$.

(c)- Describe, briefly, the determination of the crystal structure using a single crystal, give a schematic diagram of the experimental tools to show the produced diffraction pattern of the transmitted X-ray beam.

5- (a)- What is the basic difference between Einstein's model and Debye model?

(b)- State the value of specific heat according to classical theory. What is the draw back? Write the cutoff frequency ω_D in terms of velocity of sound (υ_s) and the number of atoms per unit volume (n). Derive an expression for specific heat capacity using Debye model. Explain its behavior in high and low temperature range.

----------**Good Luck**----------

كلية لعلوم – قسم الفيزياء

جامعة أسيوط

Jan: 2018

"Solid state Physics" (353 P)

Time: 3 hours

Answer only Five Questions:

1.a) Use the current density eqn. $J = ne\upsilon_d$ to find the parameters that depends on the electrical resistivity. If an electric field varying with time is applied, find the corresponding eqn. of J to compare between the electrical and optical conductivities.

b) Prove that:(i)The atomic heat capacity contribution is higher than that of the electron,(ii)The P.F of BCC is less than that of FCC.

2.a) Explain an applicability of applying the momentum and energy conservation lows in S.C during the electron transition.

b) X-ray beam with wavelength λ incident on a certain cubic crystal, prove that the Miller indices of their crystalline planes depends on the resulting reflected angle. Determine the glassing angle for the first and third order spectrum if the 2nd order is 31^0

3.a) If the average energy of the crystal oscillator: $U = h\nu/exp(h\nu / K_B T) - 1/^{-1}$ show its agreement with the classical theory.

b) Find the resulting electric field due to the presence of dielectric between the parallel plate capacitor, then prove that: $D = \varepsilon_0 E + P$. Use this eqn. to find the dependence of electrical susceptibility on the relative permittivity.

4.a) Compare between:(i) The ferroelectric and ferromagnetic materials, (ii) Status of an interstitial atom creation in crystal defects.

b) BCC crystal reflects monochromatic X-ray with energy 75 KeV at Bragg's angle of 30^0, calculate the atomic radius for the 1St order spectrum reflected on (111) plane ($h = 6.62\times10^{-34}$J.sec.).

5.a) Express the eqn. of motion of n^{th} atom of monatomic vibration in one dimension to prove: $\omega = \pm(4B/m)^{1/2} sin(Ka/2)$, then explain the physical significance of obtaining a min. wavelength.

b) Find the total contributions of: (i) Magnetic flux density , (ii) Electrical resistivity of metallic material

---

6.a) consider the wave function of the electron (Ψ) can be described by: $d^2\Psi/dx^2 + (2mE/\hbar^2)\Psi = 0$, apply a certain boundary conditions to find the wave form accompanied the electron at each energy state.

b) Prove that the magnetic dipole moment associated the Loop depends on the radius. If the electron angular momentum (L) is related to M_{Loop} as: $M_{Loop} = -(e/2m)L$ with the acted torque: $\tau = MxB$, use the eqn. of motion of the dipole to find its angular frequency.

انتهت الأسئلة

تمنياتي بالتوفيق والتفوق.....ا.د. عبد المنعم سلطان.....

كلية لعلوم – قسم الفيزياء

جامعة أسيوط

Jan: 2018

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Time: 3 hours

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انتهت الأسئلة

تمنياتي بالتوفيق والتفوق.....ا.د. عبد المنعم سلطان.....