

لاحظ أن الأسئلة في صفحتين

(درجة الامتحان 50 درجة) (10 درجة لكل سؤال)

أجب عن خمسة أسئلة فقط مما يأتي:-السؤال الاول :-

(5 درجات)

أ- علل لما يأتي:-

1- لماذا يجب أن تكون السوائل خارج الخلايا في تقلب وحركة مستمرة.

2- الفائدة الميكانيكية لبعض عضلات الجسم تكون أقل من واحد

3- عمل ميل في التركيز في أوعية الفصل في جهاز الطرد المركزي التحضيرى.

4- عمل تبريد لورقة الترشيح عند عمل الهجرة الكهربائية باستخدام ورقة ترشيح.

5- عدم استخدام المصادر المصدرة لجسيمات ألفا في التشخيص.

ب- إثبت قانون فيك للانتشار - ثم احسب كتلة المادة المنتشرة خلال ساعة عبر أنبوب اسطوانى الشكل نصف قطر مقطعه

15 mm وطوله 5cm وفرق التركيز بين طرفيه $1.6 \times 10^{-3} \text{ gm cm}^{-3}$ إذا كان ثابت الانتشار لهذه المادة هو

(5 درجات)

 $12.5 \times 10^{-10} \text{ m}^2/\text{s}$ السؤال الثانى:-

(5 درجات)

أ- اشرح ميكنة الانتقال النشط من خلال عمل مضخة الصوديوم - بوتاسيوم مع التوضيح بالرسم

ب- اذا اراد شخص وزنه 120 ثقل كيلو جرام انقاص وزنه بمقدار 20% من وزنه عن طريق التمرينات الرياضية التي تستهلك

17 kcal/min فكم يلزمه من الوقت لانقاص هذا الوزن اذا علمت ان كل 1gm من الدهون يعطي طاقة مقدارها

(5 درجات)

9.5 kcal/gm

السؤال الثالث:-

لتعيين كتلة الجزيئات البيولوجية باستخدام قوة الطرد المركزي توصلنا إلى

$$m_i = \frac{KT}{D \left(1 - \frac{\rho_L}{\rho_i}\right)} \frac{dx}{dt} \frac{1}{\omega^2 x}$$

وصادفنا بعض المشاكل الفنية - اشرح باختصار كيف تم التغلب على تلك المشاكل باستخدام كل من جهاز الطرد المركزي التحليلي

وكذلك جهاز الطرد المركزي التحضيرى.

(10 درجات)

السؤال الرابع:-

أ- عرف الالكترود غير المستقطب ثم اشرح مع الرسم كيف تحضر الكترود غير مستقطب من نوع Ag-AgCl (5 درجات)

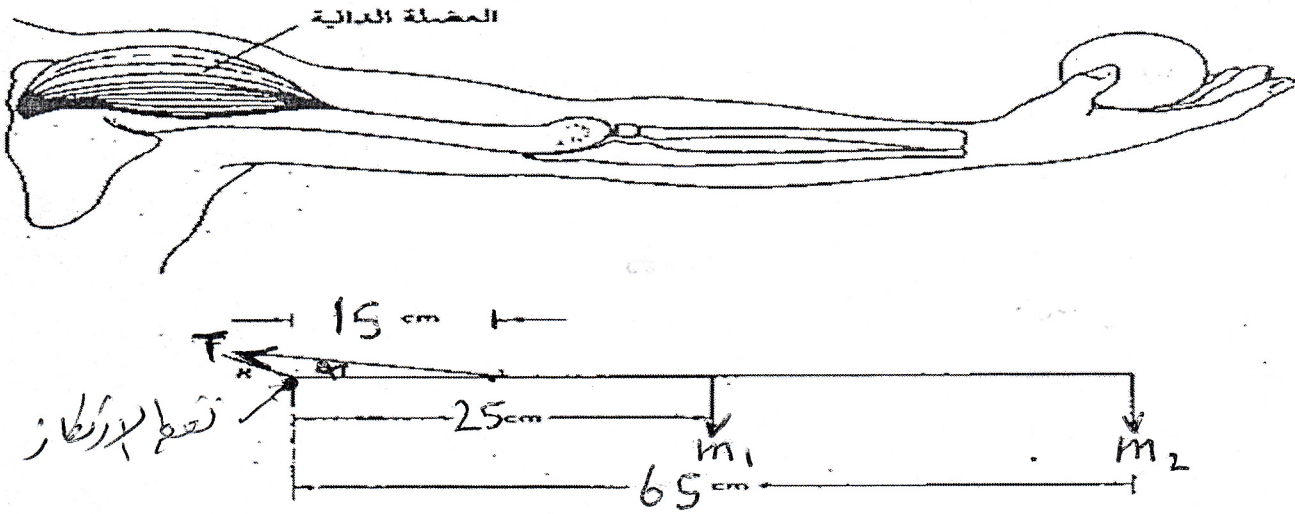
ب- الرسم التالي يوضح الذراع فى وضع افقى والكتل المؤثرة كالآتى: كتلة اليد وما تحمله $m_2=10\text{Kg}$

فأوجد قيمة الشد على العضلة T لتظل الذراع أفقية

كتلة الذراع ممثل فى مركز كتلتها $m_1=12\text{Kg}$

(5 درجات)

أعتبر $g=10\text{m/s}^2$ ، الزاوية $\alpha=15^\circ$



السؤال الخامس:-

أ- عرف كلاً من :-

النظام البيوفيزيائى - التغذية الرجعية السالبة ثم اشرح مع التوضيح بالرسم دور التغذية الرجعية السالبة فى تنظيم ضغط الدم بالجسم. (5 درجات)

ب- استخدمت ورقة ترشيح طولها 20 سم لعمل هجرة كهربية عند قيمة معينة من PH وذلك لفصل جزيئات حمض أمينى معين واستخدم لذلك فرق جهد مقداره 2500 فولت تسبب فى حركة الجزيئات بسرعة مقدارها $8 \times 10^{-4} \text{m/s}$ فأوجد قابلية الحركة لهذه الجزيئات تحت هذه الظروف. (5 درجات)

السؤال السادس:-

عرف كلاً من :- الكورى والعمر النصفى الفعال ومن ثم احسب معدل الجرعة الأولية وكذلك الجرعة المكافئة المتراكمة نتيجة حقن 20 ميكروكورى من اليود المشع فى غدة مريض وذلك خلال 24 يوماً إذا كانت كتلة الغدة 0.015 Kg ومتوسط طاقة جسيمات بيتا الخارجة من اليود 0.187MeV وأن العمر النصفى لليود 8 أيام والعمر النصفى البيولوجى 70 يوماً. (10 درجات)

=====انتهت الأسئلة ،،،، ومع تمنياتى لكم بالنجاح والتفوق،،،،=====

Question No.1: (15 deg.)

Choose the correct answer-(Or answers):

1-The diode is :

- a- electronic device b- semiconductor device
c- one-way current gate d- all of the above

2. The forward resistance R_F equal to: a- 0Ω b- $\infty \Omega$

So the ideal diode is a (an): a- short b- open .. Circuit
for the region of : a- conduction b- non-conduction

3. Advantage of Ge & Si semiconductors resulting from:

- a- effect of Doping b- change the conductivity
c- effect of heat and light d- crystal structure
d- all of the above

4. An increase in temperature can result in...:

- a- a decrease b- an increase in resistance of metal

5. A semiconductor material that has been subjected to the doping process:

- a- Intrinsic semi.. b- Extrinsic semi.. c- n-type d- p-type

6. Introducing elements that have 3 valence e"s to a semiconductor :

- a- n-type b- p-type c- donor atoms d- Acceptor atoms

7. What does OLED stand for?

- a. Old Light Emitting Display b. Ohm Low Energy Display
c. Organic Light Emitting Diode d. Organic Light Emitting Detector

8. What does LEP stand for?

- a. Light Emitting Photo b. Low Energy Picture
c. Light Emitting Power d. Light Emitting Polymer

9. Name the three leads of a common transistor?

- a. Collector Bias Omitter b. Base Collector Case
c. Emitter Collector Bias d. Collector Base Emitter

10 An inverter :

- a-performs the NOT operation b-changes a HIGH to a LOW
c-changes a LOW to a HIGH d-does all the above

11 The device used to convert a decimal number into some coded form (binary code) is:

a- multiplexer

b-encoder

c-decoder

d-register

12 The device used to convert a binary number to a decimal form is:

a- multiplexer

b-encoder

c-decoder

d-register

13. A function that required to retain binary data for a period of time:

a- counting

b-printing

c- Storage

d-register

14- an example of a devices used for storing large n's of bits is :

a-semiconductor

b-the flip flop

c-ROM & RAM

d-the register

15- an example of a device used LASER beams to store and retrieve data is:

a- semiconductor memories

b-the flip flop

c- magnetic memories

d-the register

Question No. 2: (16 deg.)

Choose and discuss the correct answer-(Or answers):

1. The diode is device :

a- 2- terminal

b- 3- terminal

c- 4- terminal

.....
.....
.....
.....

2. An increase in temperature can result in...:

a- a decrease

b- an increase

... in resistance of semiconductor

.....
.....
.....
.....

3. . Energy associated with the electron is measured in (unit):

- a- joule b- erg c- eV d-- All of the above

4. How much energy in joules is required to move a charge of 6C through a difference of potential 3 V?

- a. 18 eV b. 18 j c. 9 j

5. Introducing elements that have 5 valence e"s (pentavalent) to a semiconductor :

- a- n-type b- p-type c- donor atoms d- Acceptor atoms

6- In p-type material, the is called the majority Carrier and the is called the minority carrier:

- a- hole – electron b- electron – hole c- vacancy - hole

7- What does LED stand for?

- a. Light Emitting Display b. Low Energy Display
c. Light Emitting Diode d. Light Emitting Detector

8- Diode changes into

(A) AC DC

(B) DC AC

.....

.....

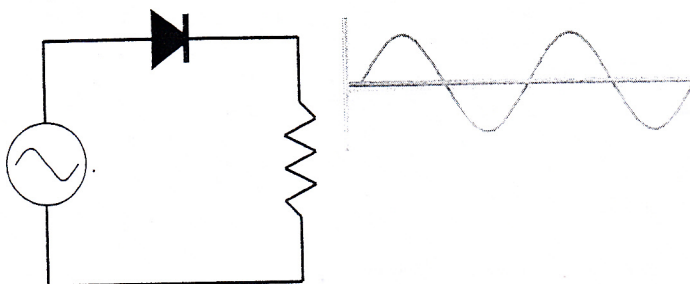
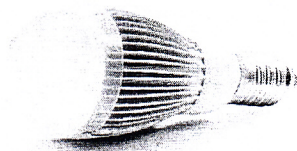
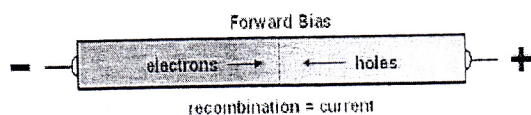
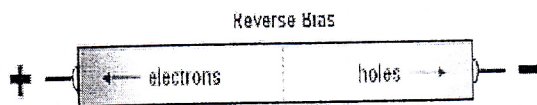
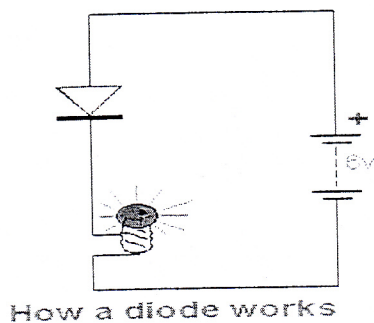
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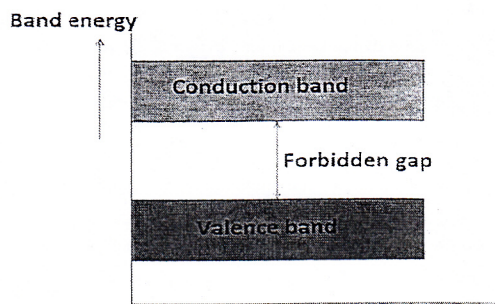
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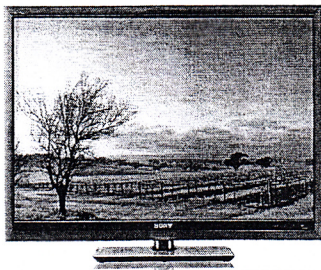
Question No.3 (19 deg.)

(A). Comment shortly on the following shapes :(12 deg.)





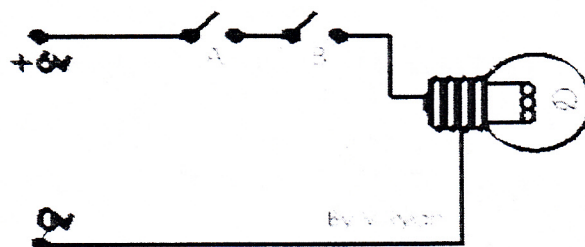
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(B) Complete the following tables:(7 deg.)

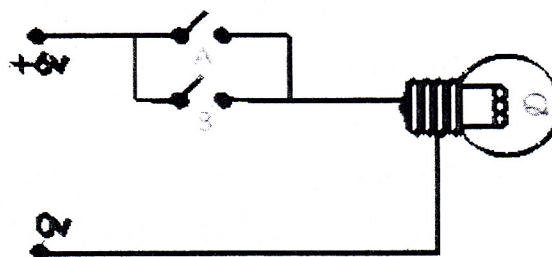
A	B	$Z=A.B$

AND GATE



A	B	x

OR GATE



.....انتهت الاسئلة مع التمنيات بالتوفيق.....



Course Title: Nuclear Physics 1 – Code P342 – Final Exam. (50%)

Instructor Prof. Dr. Ahmed A. Ebrahim

Constants:

$$R_0 = 1.3 \text{ fm}, \quad e^2 / 4\pi\epsilon_0 = 1.44 \text{ MeV} \cdot \text{fm}, \quad m_e = 0.511 \text{ MeV}, \quad 1 \text{ amu} = 931.5 \text{ MeV}$$

Part I: Circle the correct answer of the following questions: (10 Points)

- The distance of closest approach of a 12 MeV deuteron ${}^2_1\text{H}$ to a Silver nucleus ${}^{108}_{47}\text{Ag}$ is :
a) 27 fm b) 43 fm c) 1.44 fm d) 5.6 fm
- Nucleus "a" contains 5 protons and 5 neutrons and has radius R . The radius of nucleus "b", which contains 35 protons and 45 neutrons, is closest to:
a) $8R$ b) R c) $2R$ d) $1.4R$
- The end product of the radioactive element ${}^{232}_{90}\text{Th}$ is an isotope of lead ${}^{208}_{82}\text{Pb}$. The number of alpha and beta particles emitted are :
a) $\alpha = 4$ and $\beta = 6$ b) $\alpha = 6$ and $\beta = 0$ c) $\alpha = 6$ and $\beta = 4$ d) $\alpha = 3$ and $\beta = 3$
- The Coulomb barrier height which prevents ${}^4_2\text{He}$ to interact with ${}^{230}_{90}\text{Th}$ is:
a) 33.59 MeV b) 25.85 MeV c) 32.54 MeV d) 931.5 MeV
- Nucleus of mass number $A=234$ was divided into two nuclei with mass ratio 2:3, the radii of the products in fm:
a) 5.9, 6.76 b) 9.36, 14.1 c) 10.1, 11.6 d) none of these

Part II : Answer the following questions (40 Points)
(all questions carry the same weight 8 points)

- Discuss** the basic principles of Rutherford's alpha scattering experiment. Prove the interaction cross-section is given by $\sigma = \frac{n t}{4r^2} \left(\frac{q_\alpha q_t}{2K_\alpha} \right)^2 \left(\sin^4 \frac{\phi}{2} \right)^{-1}$.
- Alpha particles with kinetic energy 6.8 MeV are coulomb scattered by a gold foil.
a) **What** is the impact parameter for particles which are scattered through 90° ?
b) **What** is the distance of closest approach of the alpha particle to the gold nucleus in this case of 90° scattering?
- The masses of ${}^{64}_{28}\text{Ni}$, ${}^{64}_{29}\text{Cu}$ and ${}^{64}_{30}\text{Zn}$ are as tabulated below. It follows that ${}^{64}_{29}\text{Cu}$ is radioactive. **Detail** the various possible decay modes to the ground state of the daughter nucleus and **give** the maximum energy of each component, ignoring the recoil energy.

Nucleus	${}^{64}_{28}\text{Ni}$	${}^{64}_{29}\text{Cu}$	${}^{64}_{30}\text{Zn}$
Atomic mass	63.927959	63.929759	63.929145

4. *Show* that the electric quadrupole moment of a nucleus vanishes for :

a) spherically symmetric charge distribution.

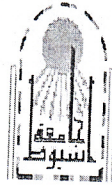
b) nuclear spin $I = 0$ or $I = \frac{1}{2}$.

5. The empirical mass formula is:

$${}^A_Z M = 0.99198 A - 0.000841 Z + 0.01968 A^{2/3} + 0.0007668 Z^2 A^{-1/3} + 0.09966 (Z - A/2)^2 A^{-1} - \delta$$

in atomic mass units, where $\delta = \pm 0.01204 A^{-1/2}$ or 0. *Determine* whether or not the nucleus ${}^{27}_{12}\text{Mg}$ is stable to β^- decay.

***** *Good Luck* *****



Summer course's Exam. "In Solid state physics" (353 P)

Aug , 2016

Time: 3hours

Answer only Five questions:

1. a) Consider a monatomic lattice in one dimension, find the equation of motion of the n^{th} atom to prove that:
$$\omega^2 = \pm \left(\frac{4B}{M} \right)^{1/2} \sin\left(\frac{ka}{2}\right)$$
, mark the ω vs. K plots. Prove that the propagation velocity is a constant at low frequency.
b) Explain and drive Bragg's law of X-ray diffraction from a crystal.
2. a) Apply two boundary conditions on Schrödinger eqn.: $\frac{d^2\psi}{dx^2} + \frac{2mE}{\hbar^2}\psi = 0$ to describe the wave form associated the electron at each energy level.
b) Find the lattice constant dependence on the atomic radius of the FCC crystal structure, calculate the density of Cu ($r = 1.28 \text{ \AA}$, atomic weight = 63.5).
3. a) Illustrate with the eqns that the current density J depends on the drift velocity v_D of the electron. Prove that both the electrical resistivity and electron mobility depend on the mean free path.
b) Explain the different types of the point defects of the crystalline structure.
4. a) Using the average energy of the crystal oscillator: $U = h\nu [\exp(h\nu / k_B T) - 1]^{-1}$, find the condition of an agreement between Einstein and classical theories of specific heat capacity.
b) The spacing between successive (100) plane in NaCl is $2.82 \text{ \AA}$, calculate the wave length of X-rays if the given 1st order Bragg's reflection angle is 8.8° .
5. a) If the crystalline plane ABC intercepts the (x,y,z)- axis by the ratios $2a:3b:2c$, determine the M. indices. Draw a Schematic diagram of the crystalline plane inside a cubic system.
b) Using the assumptions of the kinetic theory, to explain the conductivity dependence of temperature, explain the mathematical correction the resulting equation.
6. a) Use X-ray diffraction to explain an identification of the crystallographic planes. If the Miller indices satisfies:
$$h^2 + k^2 + \ell^2 = 3, 8, 12$$
, respectively. Determine the different available crystalline planes.
b) compare between the different kinds of dielectric molecules, draw a Schematic diagram of the different fields acting on a dielectric material located between two parallel plate capacitor.

بسم الله الرحمن الرحيم

جامعة أسيوط

كلية العلوم - قسم الجيولوجيا

امتحان التحريرى لطلاب كلية العلوم شعب الجيولوجيا والجيوفيزياء والجيوكيمياء

(الفصل الدراسى الصيفى)

المادة: (306G) (Field Geology)

الزمن: ساعة اثنان

٢٠١٥/٢٠١٦م

الدرجة: ٥٠ درجة

ملحوظة: الامتحان يتكون من صفحتين:

أجب عن الأسئلة الآتية:

السؤال الأول: (15 Marks)

- 1- Write on the following geological features, illustrating your answer by drawing: (9 Marks)
 - i- Criteria of unconformity
 - ii- Flame structure
 - iii- Vesicular structure
- 2- Explain only two of the following concepts: (6 Marks)
Datum section – dykes – Paraconformity
(Illustrate your answer by drawing)

السؤال الثانى: (15 Marks)

- 1- By using your information about the field trip, draw a stratigraphic section for the rock units at the iron-ore mine at El-Gadidah in the Bahariya Oasis (scale not important) (5 Marks)
- 2- Write on the uses of only two of the following instruments: (4Marks)
Tape – Compass – Thloedolite
- 3- Compare between the following geological structures: (6 Marks)
 - i- Symmetrical and asymmetrical ripple marks
 - ii- Igneous and sedimentary rocks

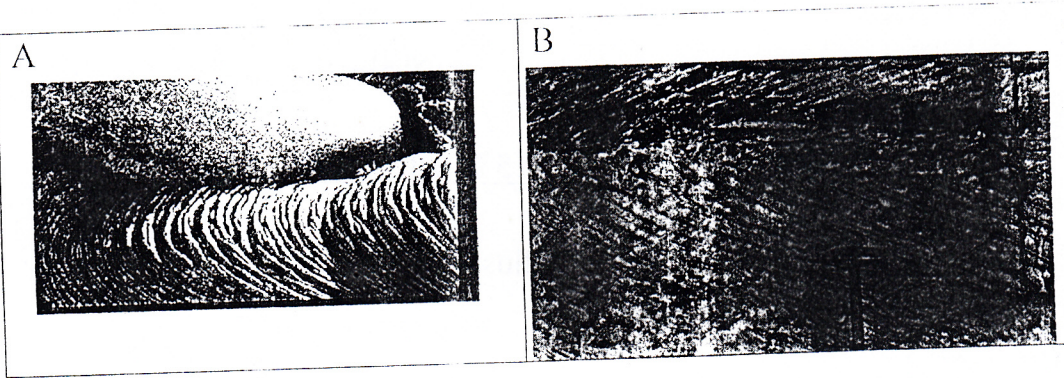
أنظر خلف الصفحة

السؤال الثالث (20 Marks)

1- Discuss the type of contacts between the rock units. (8 Marks)

2- Write the type of structures in the following field photos and explain the reasons of their formation (redraw these photos in your answer).

(12 Marks)



انتهت الأسئلة مع اطيب الأمنيات بالنجاح والتفوق

أ.د/ ناجح عبدالرحمن عبيدالله

تنبيه هام: امتحان الشفوى بعد الانتهاء من امتحان التحريرى مباشرة



May: 2016

Time: 2 hours

Answer only Four Questions:

- 1-a) Use the equation of motion of the electron in a metal conductor to find an expression of the drift velocity of the electron, then find the dependence of the electrical conductivity on the electron mobility.
- 1-b) Prove that: $U = h\nu [\exp(h\nu / K_B T) - 1]^{-1}$ is the average energy of the crystal oscillator. Rewrite this equation at high temperature range.
- 1-c) X-ray beam of wavelength $1.542 \text{ \AA}$ reflected from (110) plane of BCC- Fe with angle of 22° , calculate the lattice constant and density of Fe.
-
- 2-a) Using the assumptions of the kinetic theory, to explain the resistivity dependence of the temperature.
- 2-b) Apply the boundary conditions assumptions in Schrödinger eqn. $\frac{d^2\psi}{dx^2} + \frac{2mE}{\hbar^2}\psi = 0$ to describe the wave accompanied the electron in different energy states.
- 2-c) If the crystallographic plane intercepts the (x, y, z)-axis by the ratios: $2a: 4b: 2c$, respectively, determine M.indices
-
- 3-a) Consider one dimension lattice vibration of similar atoms to prove that the angular frequency of the n^{th} atom: $\omega = \pm(4B/m)^{1/2} \sin(Ka/2)$, calculate the max.& min. values of ω and mark it's on the ω vs. K -plots.
- 3-b) Determine the unit cell dimension when Bragg's angle of 45° is observed during 1^{st} order reflection in cubic crystal with Miller indices (100) (the wavelength of X-ray used is $2 \text{ \AA}$).
- 3-c) Compare between edge and screw dislocations which represented a linear defects.
-
- 4-a) Explain the effect of dielectric material on the capacitance of a condenser located between its parallel plates, compare between the ferroelectric and ferromagnetic materials.
- 4-b) Illustrate with the equations the total specific heat contribution of atom and electron.
- 4-c) Satisfied that the atomic radius of BCC to FCC- crystal structure 1.74: 1.41

انتهت الأسئلة

تمنياتى بالتوفيق والتفوق

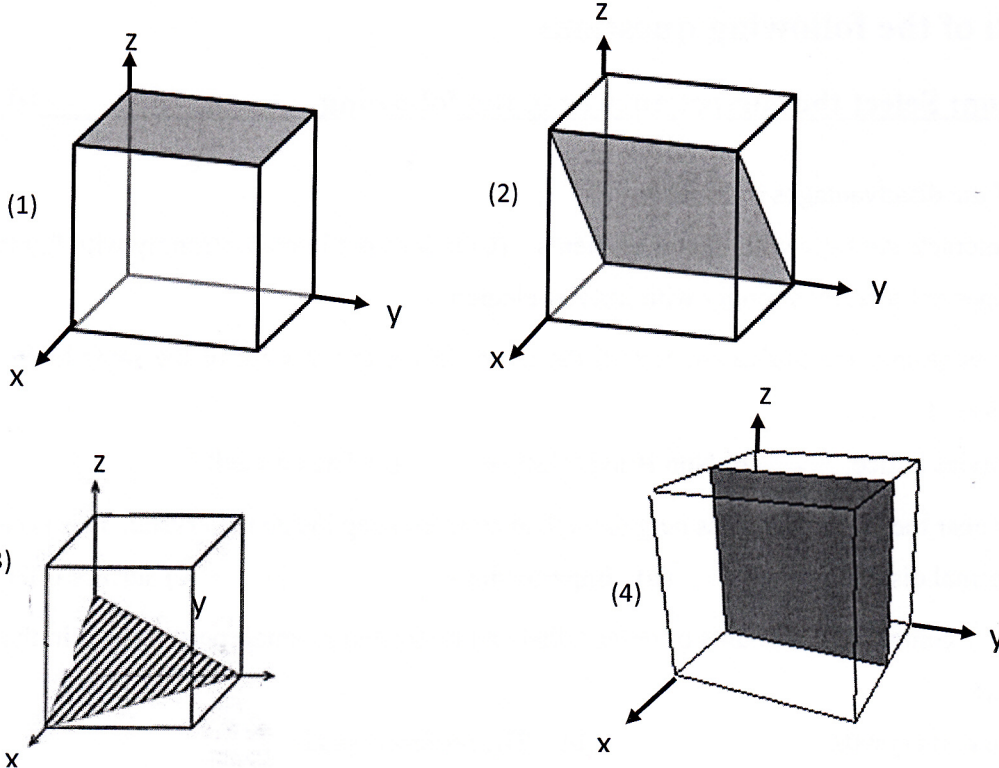
أ.د. عبد المنعم سلطان

Answer all of the following questions**First question: Select the correct answer in the following (10 marks)**

- One of the disadvantages of X-ray:
 - It interacts strongly with lighter elements
 - It does not interact strongly with lighter elements
 - It does not interact strongly with heavier elements
- All lattice points are equivalent and all the atoms in the crystals are of the same kind. This is the definition of
 - Bravias lattice
 - Non Bravias lattice
 - The unit cell
- Atoms near the surface see less neighbors than an atom deep inside the crystal. This is called
 - thermal distortion
 - imperfections
 - surface effects
-contain few amounts of defects that can be treated as small perturbation in the crystalline structure.
 - The real crystals
 - The prefect crystals
-is caused by light bending around the edge of an object or slit.
 - Light reflection
 - light refraction
 - light diffraction
- For NaCl lattice the structure factor F equal zero if
 - All the indices (h,k,l) are even
 - All the indices (h,k,l) are odd
 - one of the indices is odd and other two are even
 - none of these
- What is kept stationary/constant with laue method
 - crystal
 - wavelength
 - both crystal and wavelength
 - none of these
- The X-ray K_{α} line are produced by moving the electron from
 - M to K level
 - M to L level
 - L to K level
 - none of these
- X-rays are produced by bombarding a metal target (Cu, Mo usually) with a beam of
 - electrons
 - photons
 - neutrons
 - protons
- What are the miller indices for the plane with intercepts 2a, -3b and 4c along the crystallographic axes?
 - (643)
 - (463)
 - ($\bar{6}43$)
 - (643)

Second question**(10 marks)**

(a) Determine the Miller indices of the planes shown in the following figures:



(b) Prove that for the body centered cubic crystal structure (bcc), the unit cell edge length a and the atomic radius R is related through: $a = \frac{4R}{\sqrt{3}}$

(c) Prove that for the body centered cubic crystal structure (bcc), the atomic packing factor (ATF) is **68%**

Third question**(10 marks)**

(a) Derive the Bragg's law for x-ray diffraction.

(b) Why we cannot use visible light in the diffraction by crystals? Explain.

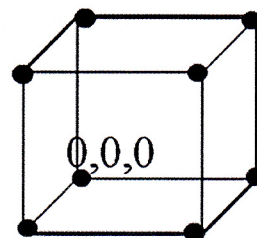
(c) Using Bragg's law, calculate the diffraction angles (2θ) for the (111) and (200) lines for Al which is an fcc metal of lattice constant $a = 4.04 \text{ \AA}$. The wavelength (λ) of x-ray is $1.542 \text{ \AA}$.

Fourth question**(10 marks)**

- (a) Find the perpendicular distance between the two planes indicated by the Miller indices (1 2 1) and (2 1 2) in a unit cell of a cubic lattice with a lattice constant parameter 'a'.
- (b) Explain how the X-ray generator is working?
- (c) Explain in detail how can the rotating crystal method is used for X-ray diffraction in crystal.

Fifth question**(10 marks)**

- (a) What are the advantages and disadvantages of using the electrons and neutrons in diffraction?
- (b) For a simple cubic lattice, the unit cell has a base of single atom ($j = 1$). The coordinates of this atom (u_j, v_j, w_j) = 0, 0, 0. Prove that the diffraction lines from all planes are allowed regardless of the values of h, k, l (Miller indices).



- (c) Which of the following reflections would be missing in a bcc and fcc lattice: (100), (110), (111). (200), (210), (220), (221)?

End of questions----- Best wishes

Dr. Mansour Abdel Sattar



Faculty of Science
Physics Department

Date: 13 June, 2016
Time: 3 hours

Final Examination in (Crystal Growth 354 P)

Answer 5 questions from the following:

- 1- (a): How laue technique particularly convenient for checking the orientation of crystals. Show why laue method can not be used for crystal structure determination?
(b): Compare using examples between Temperature Gradient Method and Crystallization by Sublimation for growing single crystals?
(c): Show that for neutrons when $\lambda = 1 \text{ \AA}$ this yields an energy of same order of magnitude as thermal energy (kT). What is the wavelength of thermal neutrons at 0°C and 100°C ?
- 2- (a): How we can grow protein crystals of high quality, Why go after these proteins and Why these crystals are grown in space?
(b): Define each of the following: i- Multipass technique ii- Epitaxial growth iii- The quality of the substrate surface has a direct effect upon the perfection of the epitaxial film.
(c): Write on both: Hydrothermal growth and Fluxed-melt technique.
- 3- (a): What is the difference between Czochralski and Bridgman methods for crystal growth from the melt?
(b): Write short notes on: i- Advantages of the LHPG technique ii- The most common form of heating in melt growth techniques iii- Encapsulation technique iv- Chemical analysis is not the most effective crystal structure determination method.
- 4- (a): Define the following: i- Crystal twins ii- Solvent selection iii- Seed preparation iv- Crystal perfection and perfect crystal.
(b): Write on both: i- Progress Non-melt techniques should improve on the perfection of crystals grown by other ways ii- The method used for growing single crystal fibers.
(c): Show the technique of X-ray structure determination in which a single crystal specimen is rotated in a beam of monochromatic X-rays?
- 5- (a): Write on brief: i- Crystallization by reactant diffusion ii- Unassisted nucleation growth iii- Why crystals grow at different rates in different directions? And why different crystals have different shapes and sizes?
(b): Explain the structure determination method by powder technique. What is the advantage of this technique and what is the case if the grain size of the material used is fairly large?
- 6- (a): The purity level of germanium and silicon required for semiconductor devices is extremely high and the as-grown crystals are usually too impure for practical use. Fortunately they can be further purified by a method of zone melting refining. Explain using diagram this method?
(b) Many crystals have been grown successfully in a very high state of purity at relatively low temperatures using gel method. Explain in details the procedure of this technique and the major problems facing this technique?
(c): Show the differences between Vernul method and chemical transport method.

Best wishes

$h = 6.626 \times 10^{-34} \text{ J.s}$, $k = 1.38 \times 10^{-23} \text{ J.K}^{-1}$, $c = 3 \times 10^8 \text{ m/sec}$, $e = 1.6 \times 10^{-19} \text{ C}$, $m_e = 9.11 \times 10^{-31} \text{ kg}$, $m_n = 1.67 \times 10^{-27} \text{ kg}$
Prof. Dr. Abdulaziz Abualfal



Answer the following question: (all questions carry the same weight 10 points)

Question #1

A quantum mechanical particle confined to move in one dimension between $x = 0$ and $x = L$ is found to have a state described by the wavefunction $\psi(x) = A \sin\left(\frac{2\pi}{L}x\right)$

- (a) **Determine** the constant A such that the wavefunction is normalized.
(b) **Find** the probability that the particle will be found between $x = 0$ and $x = L/3$.

Question #2

A particle in the infinite square well has the initial wave function:

$$\psi(x, 0) = A[\psi_1(x) + \psi_2(x)]$$

Here ψ_1 and ψ_2 are stationary states with the lowest two energies respectively.

- (a) **Normalize** $\psi(x, 0)$.
(b) **Find** $\psi(x, t)$ and $|\psi(x, t)|^2$.

Question #3

If a Cartesian 2-d harmonic oscillator potential, $V(x, y) = \frac{1}{2}m\omega^2(x^2 + y^2)$.

The Laplacian in 2-d Cartesian coordinates is $\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}$.

- (a) **Write** the time independent Schrödinger equation for this case.
(b) **Separate** the equation using $\psi(x, y) = X(x)Y(y)$. **Name** your separation constants.
Write the two ordinary differential equations you get and **write** how the original energy from the full time independent Schrödinger equation is related to your new separation constants.

Question #4

Determine in each of the following cases if the function in the second column is an eigenfunction of the operator in the 1st column. If so, **state** what the eigenvalue is.

Operator	Function
$\frac{d^2}{dx^2} - 2$	$\cos x \sin x$
$\frac{1}{\sin \theta} \frac{d}{d\theta} \left(\sin \theta \frac{d}{d\theta} \right)$	$\cos \theta$

Question #5

Work out the radial wave function $R_{32}(r)$ **and normalize it to construct** $\psi_{322}(r, \theta, \phi)$.

***** Good Luck *****

Prof. Dr. A. A. Ebrahim

بسم الله الرحمن الرحيم

جامعة أسيوط
كلية العلوم - قسم الجيولوجيا

امتحان التحريرى لطلاب كلية العلوم شعب الجيولوجيا والجيوفيزياء والجيوكيمياء

المادة: (G 306) (Field Geology)

الزمن: ساعتان

2016/2015م

الدرجة: 50 درجة

ملحوظة: الامتحان يتكون من صفحتين:

أجب عن الأسئلة الآتية: الرجاء توضيح الإجابة بالرسم كلما أمكن:

1- A: Write on three only of the following geological features: (9 Marks)

i- Ripple marks ii- Graded bedding iii- Lamination iv - Columnar jointing

1- B: Explain two only of the following concepts: (6 Marks)

i- Datum section ii- Nonconformity iii- Disconformity

2- A: By using your information about the field trip of Bahariya Oasis, outline in a stratigraphical section the Late Cretaceous geological rock units of the oasis. (Scale not important) (4 Marks)

2- B: Mention two functions only for the following instruments: (4 Marks)

i- GPS ii- Total station iii- Compass iv- Level

2- C: Compare between the following geological structures: (4 Marks)

i- Sill - dike ii- bahoehoe lava - Aa lava

2- D: Summarize the main criteria of the faults. (3 Marks)

انظر خلف الصفحة

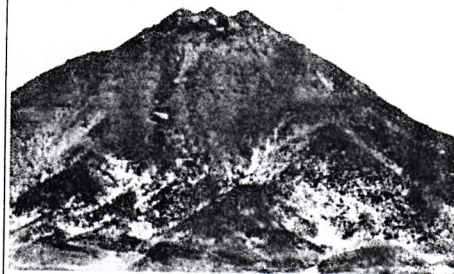
3- Write the geological features of the underlying field photographs then discuss their geological significance.
(20 Marks)



1



2



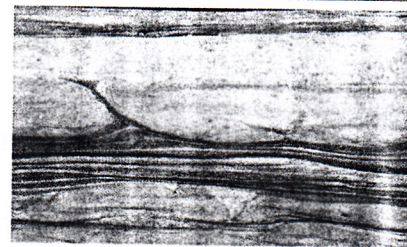
3



4



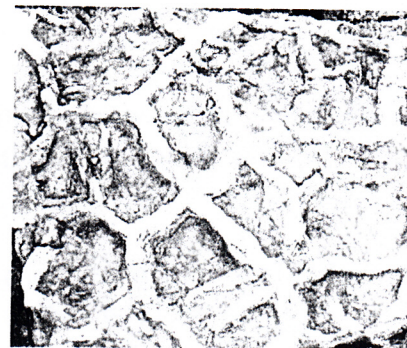
5



6



7



8



9



10

Good Luck.

Prof. Dr. Nageh A. Obaidalla



Assiut University
Faculty of Science
Department of Physics

Undergraduate
Final Exam (50%)

Second semester 2015-2016

Course : EM Theory
Code : P312
Section : Physics
Time : 3 Hours
Date : 5/6/2015

Answer the following question:

Question (1):

(10 Mark)

Write number of each statement and put [$\checkmark$] or [$\times$], then discuss your answer (if $\checkmark$ or $\times$):

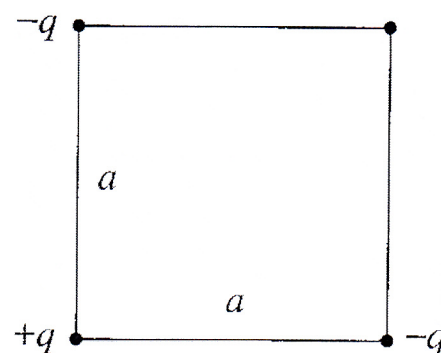
- 1- The magnetic monopoles do not exist.
- 2- The curl of irrotational fields equals zero.
- 3- In EM waves, the amplitude of electric field is much smaller than the amplitude of magnetic field.
- 4- The varying of electric field is not capable of creating magnetic field.
- 5- The curl of electric field is always equal to zero.
- 6- All types of dielectric materials will have electric polarization under external electric field.
- 7- The quantity $\mu_0 \epsilon_0$ has a unit of inverse square velocity.
- 8- The units of both electric displacement $\vec{D}$ and polarization $\vec{P}$ are not the same.
- 9- Poisson's Equation applies in the region where there is no charge.
- 10- In most dielectrics, the charge separation is directly proportional to, and in the opposite direction of external electric field.

Answer four (4) only of the following questions:

Question (2):

(10 Mark)

- a) Derive the electrostatic potential energy work would it take to assemble an entire collection of n point charges. (6 points)
- b) Three charges are situated at corners of a square (side a)
 - How much work does it take to bring in another charge, $+q$ from far away and place it in the fourth corner?
 - How much work does it take to assemble the whole configuration of four charges? (4 points)



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

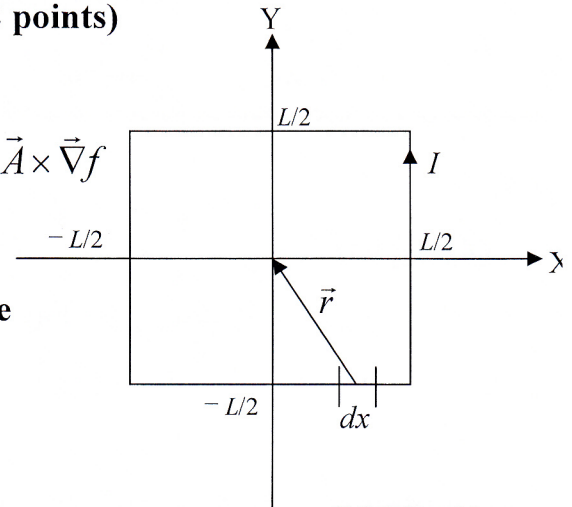
a) Derive the divergence of magnetic field $\vec{B}$ in its integral and differential form. (5 points)

What is the important result of the derived equation? (2 points)

Note, you can take the following as given quantities

$$d\vec{B} = \frac{\mu_0}{4\pi} I \frac{(d\vec{l} \times \vec{r})}{|\vec{r}|^3}, \quad \vec{\nabla} \frac{1}{|\vec{r}|} = -\frac{\vec{r}}{|\vec{r}|^3}, \quad \vec{\nabla} \times f \vec{A} = f \vec{\nabla} \times \vec{A} - \vec{A} \times \vec{\nabla} f$$

b) By using Biot-Savart, find $\vec{B}$ at the center of the a square current loop of side L . (3 points)

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

a) Prove that $\vec{E} = -\text{grad } V$ and then derive Poisson and Laplace equations (consider

$$\vec{\nabla} \cdot \vec{E} = \frac{\rho_c}{\epsilon_0}). \text{ (6 points)}$$

b) Consider a parallel conductor, where $V = 0$ at $z = 0$ and $V = 100$ at $z = d$. Assuming the region between the plates is charge free ($\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = 0$), calculate the potential and electric field. (4 points)

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

a) Derive the differential form of the Faraday's law. (7 points)

b) Discuss the physical meaning of this equation in terms of solenoidal and irrotational fields. (3 points)

$$\text{Note, use Stokes's theorem for vector } \vec{A} \text{ is: } \int_l \vec{A} \cdot d\vec{l} = \int_s (\vec{\nabla} \times \vec{A}) \cdot d\vec{a}$$

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

a) Write Maxwell's equation in presence of charge and then reduce them in free space. (4 points)

b) Prove that both electric and magnetic field satisfy the wave equation. (6 points)

$$\text{Note, use the property } \vec{\nabla} \times (\vec{\nabla} \times \vec{A}) = \vec{\nabla}(\vec{\nabla} \cdot \vec{A}) - \nabla^2 \vec{A}$$

Final Exam. "Diffraction rays & its applications" (352 P)

May: 2016

Time: 2 hours

Answer only Four Questions:

- 1-a) Illustrate with the eqns the conditions of the d-spacing dependence on Miller indices of the crystalline planes.
- 1-b) Explain, briefly, the powder diffraction's method to study the crystal structure. Show a schematic diagram of the experimental set-up.
-
- 2-a) Prove that the wavelength of X-ray beam depends on its energy, calculate the max. energy corresponding $0.2 \text{ \AA}$
- 2-b) Compare between linear and continuous X-ray spectrum.
-
- 3-a) Use X-ray diffraction to explain an identification of the crystallographic planes. If the Miller indices satisfies:
 $h^2 + k^2 + \ell^2 = 3, 8, 12$, respectively. Determine the different available crystalline planes.
- 3-b) Explain with the eqns the required conditions for studying the crystal structure by neutron beam.
-
- 4-a) 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.
- 4-b) Explain and drive Bragg's law of X-ray diffraction from a crystal
-
- 5-a) Use the Bragg's law to find the dependence of the wavelength of the incident electron-beam as a function of the diffraction diameter and d-spacing. Draw a schematic diagram of experimental set-up.
- 5-b) State what do you understand by: (i) Absorption of x-ray, and (ii) Bragg's reflections.

انتهت الأسئلة

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

Question 1 (20 points)

(3 points) Compare the number of bytes of stack taken due to NEAR and FAR CALLs

(3 points) Assume that DS=1120, SI=2498, and AX=17FE. Show the contents of memory locations after the execution of

MOV [SI], AX

(14 points) Based on the machine code format given below

Opcode	D	W	MOD	REG	R/M
--------	---	---	-----	-----	-----

REG	W = 0	W = 1
000	AL	AX
001	CL	CX
010	DL	DX
011	BL	BX
100	AH	SP
101	CH	BP
110	DH	SI
111	BH	DI

MOD=11			EFFECTIVE ADDRESS CALCULATION			
R/M	W=0	W=1	R/M	MOD=00	MOD=01	MOD=10
000	AL	AX	000	(BX) + (SI)	(BX) + (SI) + D8	(BX) + (SI) + D16
001	CL	CX	001	(BX) + (DI)	(BX) + (DI) + D8	(BX) + (DI) + D16
010	DL	DX	010	(BP) + (SI)	(BP) + (SI) + D8	(BP) + (SI) + D16
011	BL	BX	011	(BP) + (DI)	(BP) + (DI) + D8	(BP) + (DI) + D16
100	AH	SP	100	(SI)	(SI) + D8	(SI) + D16
101	CH	BP	101	(DI)	(DI) + D8	(DI) + D16
110	DH	SI	110	DIRECT ADDRESS	(BP) + D8	(BP) + D16
111	BH	DI	111	(BX)	(BX) + D8	(BX) + D16

Write the machine code for the following X86 instructions; assume Opcode 000000 for MOV, and 111111 for ADD

Mov AX, BX
Add CX, 1234
Mov AX,[SI]
Mov DX, [BP]+1234h
Add [BX],BL

Question 2 (10 points)

Consider a 32-bit microprocessor whose bus cycle is the same duration as that of a 16-bit microprocessor. Assume that, on average, 20% of the operands and instructions are 32 bits long, 40% are 16 bits long and 40% are only 8 bits long.

- Which micro-processor will give better performance.
- Calculate the improvement achieved when fetching instructions and operands with micro processor you mentioned in part i.

Question 3 (10 points)

Assume that SP=1288H before a subroutine CALL. Show the contents of the Stack Pointer and the exact memory contents of each memory address of the stack after PUSHF for the following:

Assume any values for registers if needed and include them in your answer

1132:0450 CALL PROC1

1132:0453 INC BX

```
PROC1      PROC
            PUSH AX
            PUSH BX
            PUSH CX
            PUSH DX
            PUSH SI
            PUSH DI
            PUSHF
```

```
            ....
PROC1      ENDP
```

Hint: PUSHF pushes the flag register

Question 4 (10 points)

Assume the machine code table for the following program is in the table below

Load

3

ADD

5

Stop

Instructions		Load ACC				Add to ACC				Stop			
Opcode		2				1				0			
Pres. State		00	01	02	03	00	01	02	03	00	01	02	03
Description	Pin Number												
Next State Bit	1-0	01	00	00	00	01	00	00	00	01	01	00	00
Load IR	2	1	0	0	0	1	0	0	0	1	0	0	0
Write	3	0	0	0	0	0	0	0	0	0	0	0	0
Read	4	1	1	0	0	1	1	0	0	1	0	0	0
ACC to Data Bus	5	0	0	0	0	0	0	0	0	0	0	0	0
Load ACC	6	0	1	0	0	0	1	0	0	0	0	0	0
Load MAR	7	0	0	0	0	0	0	0	0	0	0	0	0
Use PC	8	1	1	0	0	1	1	0	0	1	0	0	0
A Only	9	X	0	0	0	X	1	0	0	X	0	0	0
Invert	10	X	1	0	0	X	1	0	0	X	0	0	0
Arith / Logic	11	X	X	0	0	X	0	0	0	X	0	0	0
X	12	X	X	0	0	X	X	0	0	X	X	0	0
X	13	X	X	0	0	X	X	0	0	X	X	0	0
X	14	X	X	0	0	X	X	0	0	X	X	0	0
X	15	X	X	0	0	X	X	0	0	X	X	0	0
		0115	0550	0000	0000	0115	0750	0000	0000	0115	0001	0000	0000

For the TI-850 processor shown in the next figure, (hint, for an opcode that has two operands, the opcode would be executed on both operands)

- Write down the machine code table for the previous code. (3 points)
- Is it possible to have an opcode with 4 operands with this PROM, why/How (2 points)
- Since in every instruction we either load the incremented PC, or load a value through the Load MAR register. Can we replace the USE_PC and the LOAD MAR wires with only one wire (variables). Justify (3 points)
- Why do we need an IR bit in the PROM (2 points)

