	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	EXAMINATION OF 4 TH YEAR BIOPHYSICS STUDENTS		
COURSE TITLE:	Astrobiology I		COURSE CODE: PH4 103
4/1/2022	TERM: FINAL	TOTAL ASSESSMENT MARKS:50	TIME ALLOWED: 2 HOURS

Answer the following questions:-

Question One: (15 MARKS)

1. Explain how Earth's magnetic field exist and protect our life.
2. Explain how to determine the age of a rock?

Question Two: (15 MARKS)

1. What is Urey-Miller experiment? Did it make life?
2. What are the physical conditions that make our planet habitable?

Question Three: (10 MARKS)

1. Life on Earth has at least three key features that are likely to be shared by any life, Explain these features.
2. Could extraterrestrial life exist? Explain your answer.

Question Four: (10 MARKS)

Earth and Moon lie at the same distance from the Sun. Explain how Earth is warm while Moon's daytime temperatures range is -175°C to 125°C .

(Best wishes ----- Dr. Yasser Abdou)



TANTA UNIVERSITY

EXAM OF 4TH YEAR.

COURSE TITLE:	BIOPHYSICS I.		COURSE CODE: PH 4105
25/1/2023	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

I-Choose the correct answer:

(40 mark)

- 1-Triplet state mean's the spin quantum numbers is ($s = 0 - s = 1 - s = 2$).
- 2-A plot of difference in refractive index i.e ($n_L - n_R$) versus the wavelength is called (CD curve – ORD curve – CD and ORD curve – cotton effect).
- 3-The (permanent – induced) dipole moment gives rise to Raman scattering.
- 4-The (spherical – chromatic) aberration arises from the fact that the focal length of the lens is different for different wavelengths.
- 5-Diatomic molecules such as H_2 , O_2 and N_2 (do not exhibit – do exhibit – sometimes exhibit – often exhibit) for Raman scattering microscopy .
- 6- The magnetic moment of an unpaired electron is about(7 times – 70 times – 700 times – 7000 times) that of protons .
- 7- Bacterial flagella with diameter ~ 20nm can be followed in motion using a very strong light source and (Phase contrast – fluorescence– bright filed – dark filed) microscopy .
- 8- If light is composed of two plane waves of unequal amplitude are related in phase by 90° then the light is said to be (circular – elliptical – plane) polarized light .
- 9-The ESR can be detected only for (paired electron – unpaired electron).
- 10-The Rhodamine absorbs(red – green – blue) light and emits red light.

II –Fill in the spaces:

(30 mark)

- 1-Real images are images that.....be captured on a screen .
- 2- Chromophores is a functional group not conjugate with other group which exhibits a characteristic..... spectrum inregion.
- 3- Rayleigh suggested that objects could be considered as resolved, if in diffraction pattern , The first..... of one object overlapped with the first.....of the other.
- 4- In CD and ORD spectroscopy the extent of rotation $[\alpha]_\lambda^t$ depends on.....

.....

5- When, due to the incident radiation, electrons in the outer shell are raised by one energy level, the phenomenon is known as

6- In carbon dioxide a symmetric stretching vibrations of O-C bonds is IR-..... While asymmetric stretching or bending vibration are IR-.....

7- For wet specimens the..... which has to be carried out gradually in order that the sudden of water does not distort the structure.

8- In Raman spectroscopy the light scattered with longer frequency is called,while this scattered light with the same frequency as incident is called.....

9-The resolution of a microscope is its ability toclosely spaced objects.

10-.....is a method used to prepare samples when only the surface features are of interest.

.....

III-Write the scientific name of the following: (20 mark)

1-It is a functional group not conjugate with other group which exhibits a characteristic absorption spectrum in UV/V region. (.....)

2-Molecules which rotate plane polarized light. (.....)

3- It is a phenomenon by which certain substances absorbs light with particular wavelength after a very short time the light is re-emitted with its wavelength altered. (.....)

4- The one type of microscopy that used polarized light . (.....)

5-These compounds absorb green light and emit red light. (.....)


.....

IV- Mention the four steps of the specimen preparation for electron microscopy. (10 mark)

.....

With best wishes

Dr.F.Elhussiny

	جامعة طنطا كلية العلوم قسم الفيزياء	
	المستوى الرابع	PH4113
	Date: 14/1/2023	Final exam – First semester
	شعبة الفيزياء - شعبة الفيزياء الحيوية	Total mark =100
	د/فاطمة الزهراء فخري فهمي د/ماجدة نكي سعيد	Physical electronics

Answer the following questions:

First question:

- 1- Talk about the periodic structures (drawing the shape). [10 marks]
- 2- What happened when the photon with energy $h\nu$ enters a semiconductor mater? [5 marks]
- 3- A Si crystal is to be grown by the Czochralski method, and it is desired that the ingot contain 10^{16} Phosphorus. What concentration of Phosphorus atoms should the melt contain to give this impurity concentration in the crystal during the initial growth ? for P in Si, $k_d=0.35$. [5 marks]

Second question:

- 1- Discuss the energy band bending under the application of an electric field. [10 marks]
- 2- What is the meaning of: [20 marks]
 - a- MBE.
 - b- EHP.
 - c- n-type.
 - d- LCAO.
 - e- LPE.


Third question:

- 1- Define: drift current, diffusion current, and mobility. [10 marks]
- 2- Find the difference between metal, semiconductor, and insulator. [15 marks]

Fourth question:

- 3- What are the absorption coefficient and its equation? [10 marks]
- 4- Explain the PN junction, forward, and reverse bias. [15 marks]

Good luck

	TANTA UNIVERSITY- Faculty of Science - Department of Physics			
	Physics & Biophysics - امتحان المستوى الرابع			
COURSE TITLE:	Defectors & Accelerators		COURSE CODE: PH4163	
DATE:	28 - 12 - 2022	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer the following questions in Part A and Part B:

Part A: Choose the correct answer (1 mark each, Total 40 marks) Version: A001

- 1) To detect the fast electrons, slowing down the fast neutron in a moderating material is carried out before its detection as a _____.

(a) thermal neutron	<input type="checkbox"/>	(c) charged particle	<input type="checkbox"/>
(b) high energy neutron	<input type="checkbox"/>	(d) positive ion	<input type="checkbox"/>

- 2) _____ detectors can be sensitive to all types of radiation at all energies.

(a) Some	<input type="checkbox"/>	(c) All	<input type="checkbox"/>
(b) No	<input type="checkbox"/>	(d) Most	<input type="checkbox"/>

- 3) The relatively thick dead layer in diffused junction diode is a particularly disadvantageous as the energy lost in this layer _____.

(a) stays for long time in this area	<input type="checkbox"/>	(c) is always recoded	<input type="checkbox"/>
(b) produces electron-hole pairs	<input type="checkbox"/>	(d) goes unrecorded	<input type="checkbox"/>

- 4) The strong forces have a range of the order of _____ cm.

(a) 10^{-6}	<input type="checkbox"/>	(c) 10^{-13}	<input type="checkbox"/>
(b) 10^{-9}	<input type="checkbox"/>	(d) 10^{-15}	<input type="checkbox"/>

- 5) _____ efficiency is the ratio of the number of particles detected to the number of particles incident on the detector surface.

(a) Absolute detection	<input type="checkbox"/>	(c) Extrinsic detection	<input type="checkbox"/>
(b) Intrinsic detection	<input type="checkbox"/>	(d) Geometrical	<input type="checkbox"/>

- 6) In the _____ accelerator, a homogeneous magnetic field selects ions with a particular (e/m) to enters the accelerator.

(a) Van de Graff	<input type="checkbox"/>	(c) Cyclotron	<input type="checkbox"/>
(b) Cockcroft and Walton	<input type="checkbox"/>	(d) Tandem	<input type="checkbox"/>

- 7) Ionizing radiation, passing through the space between the electrodes in a gas-filled detector, dissipates part or all of its energy by generating _____.

(a) only electron	<input type="checkbox"/>	(c) electron-ion pairs	<input type="checkbox"/>
(b) only positive ion	<input type="checkbox"/>	(d) scintillation light	<input type="checkbox"/>

- 8) Neutrons are generally detected through _____.

(a) nuclear reactions	<input type="checkbox"/>	(c) molecular interactions	<input type="checkbox"/>
(b) atomic scattering	<input type="checkbox"/>	(d) electrostatic forces	<input type="checkbox"/>

- 9) _____ acts in proportional counter as ionizing gas.

(a) Argon	<input type="checkbox"/>	(c) Alcohol	<input type="checkbox"/>
(b) Krypton	<input type="checkbox"/>	(d) Water	<input type="checkbox"/>


- 10) At room temperature, the drift speed of electrons is _____ that for positive ions.

(a) thousand times	<input type="checkbox"/>	(c) ten times	<input type="checkbox"/>
(b) hundred times	<input type="checkbox"/>	(d) about the same as	<input type="checkbox"/>

- 11) The _____ accelerator consists of a belt made of isolated material looped around two rollers and an isolated dome.
- (a) Cyclotron (c) Van de Graff
 (b) Tandem (d) Cockcroft and Walton
-
- 12) Detector sensitivity is _____ for a given type of radiation and energy.
- (a) the capability of discriminating between different types of radiation (c) the capability of producing a usable signal
 (b) the ability to discriminate between closer energies (d) the ability to determine the Energy of the radiation
-
- 13) _____ are among the important influences on the operation of photomultiplier tubes.
- (a) Magnetic fields (c) Exposure to ambient light
 (b) temperature (d) all of the above
-
- 14) In pulse chamber, _____ may be measured.
- (a) charge produced by the radiation may be transformed into a pulse (c) motion of electrons induces a current on the electrodes
 (b) motion of charge carriers induces a current on the electrodes (d) All of the above
-
- 15) _____ acts as quenching gas in Geiger Muller counter.
- (a) Argon (c) Alcohol
 (b) Krypton (d) Water
-
- 16) _____ semiconductor is formed with equal amounts of donor and acceptor impurities.
- (a) Pure (c) Extrinsic
 (b) Intrinsic (d) compensated
-
- 17) Gas proportional counters can be used to measure fast neutrons through the recoil process where the fill gas is usually _____.
- (a) high-Z gas (c) water vapor
 (b) medium-Z gas (d) hydrogen or methane
-
- 18) Normally, gas detectors are manufactured to operate in _____.
- (a) only one region (c) ionization and recombination regions
 (b) ionization and proportional regions (d) all available regions
-
- 19) _____ are crystals of the alkali metals that contain a small concentration of an impurity.
- (a) gas (c) Inorganic scintillators
 (b) Plastic Scintillators (d) Organic scintillators
-
- 20) Ionization chamber is mainly used for measuring _____.
- (a) gamma-ray energy (c) beta particles energy
 (b) beta particles exposure (d) gamma-ray exposure
-
- 21) _____ consist of planar molecules made up of benzenoid rings and formed by combining appropriate compounds.
- (a) gas (c) Inorganic scintillators
 (b) Plastic Scintillators (d) Organic scintillators
-
- 22) Photomultiplier tubes are _____.
- (a) gas tubes (c) liquid tubes
 (b) fluid tubes (d) vacuum tubes


- 23) In proportional region of gas-filled detectors, _____ occurs very quickly near the anode.
 (a) non-localized avalanche (c) deionization
 (b) localized avalanche (d) recombination
- 24) A widely used detector for slow neutrons is the _____ proportional tube.
 (a) BCl_3 (c) BF_2
 (b) BF_3 (d) He
- 25) Elastic scattering of fast neutron by _____ aims to transfer some portion of the neutron kinetic energy to the target nucleus, resulting in a recoil nucleus.
 (a) light nuclei (c) atomic electrons
 (b) heavy nuclei (d) free electrons
- 26) Limitations of scintillation detectors include _____.
 (a) noise (c) range of energy
 (b) time response (d) all of the above
- 27) In a gas-filled detector, both electrons and ions move under the influence of _____.
 (a) the electrical field (c) their charge
 (b) their velocity (d) external force
- 28) Except for silicon, semiconductors generally require _____ before they can be operated.
 (a) no cooling (c) heating to high temperatures
 (b) cooling to low temperatures (d) no cooling or heating
- 29) In semiconductor detectors, the passage of ionizing radiation creates _____.
 (a) electrons (c) electron-hole pairs
 (b) electron-ion pairs (d) positive ions
- 30) The forbidden energy bandgap in conductors, semiconductors, and insulators are EG_1 , EG_2 , and EG_3 respectively. The relation among them is _____.
 (a) $EG_1 < EG_2 < EG_3$ (c) $EG_1 > EG_2 > EG_3$
 (b) $EG_1 = EG_2 = EG_3$ (d) $EG_3 < EG_1 < EG_2$
- 31) _____ band is above the Fermi level.
 (a) Conduction (c) Valence
 (b) Low energy (d) High energy
- 32) The amount of ionization produced by radiation in a detector should be _____ the energy it loses in the sensitive volume.
 (a) directly proportional (c) almost independent of
 (b) inversely proportional (d) not related to
- 33) _____ accelerator is a high voltage generator based on a system of rectifiers.
 (a) Van de Graff (c) Cyclotron
 (b) Cockcroft and Walton (d) all of the above
- 34) _____ such as gallium, boron and indium are used to make p-type semiconductors.
 (a) Donor impurities (c) n-elements
 (b) Acceptor impurities (d) p-elements
- 35) The advantage of diffusion junction detectors is _____.
 (a) their ruggedness (c) their color
 (b) their greater resistance to contamination (d) both (a) and (b)
- 36) Slow neutrons interact with ^3He and produce _____.
 (a) $^4\text{He} + p$ (c) $^3\text{H} + p$
 (b) $^4\text{H} + \alpha$ (d) $^3\text{He} + \alpha$

-
- 37) The _____ accelerator uses rapidly changing high frequency voltages instead of direct voltages.
- | | | | |
|------------------|--------------------------|----------------------|--------------------------|
| (a) Van de Graff | <input type="checkbox"/> | (c) linear | <input type="checkbox"/> |
| (b) Cyclotron | <input type="checkbox"/> | (d) both (b) and (c) | <input type="checkbox"/> |
-
- 38) In semiconductor materials, the average energy required to create a charge carrier is _____ than that required for gas ionization.
- | | | | |
|----------------------|--------------------------|-----------------------|--------------------------|
| (a) 100 times larger | <input type="checkbox"/> | (c) 10 times smaller | <input type="checkbox"/> |
| (b) 10 times larger | <input type="checkbox"/> | (d) 100 times smaller | <input type="checkbox"/> |
-
- 39) The spectrum of pulse heights will be _____ if a particle loses all its energy in the detector.
- | | | | |
|--|--------------------------|---|--------------------------|
| (a) a Gaussian peak with low energy tail | <input type="checkbox"/> | (c) a Gaussian peak with high energy tail | <input type="checkbox"/> |
| (b) a Gaussian peak | <input type="checkbox"/> | (d) a linear function | <input type="checkbox"/> |
-
- 40) _____ accelerators are now widely used in a variety of applications for scientific research, applied physics, medicine, industrial processing.
- | | | | |
|----------------------|--------------------------|-------------|--------------------------|
| (a) Charged particle | <input type="checkbox"/> | (c) Light | <input type="checkbox"/> |
| (b) Electromagnetic | <input type="checkbox"/> | (d) Neutron | <input type="checkbox"/> |
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	Physics & Biophysics - امتحان المستوى الرابع			
COURSE TITLE:	Defectors & Accelerators		COURSE CODE: PH4163	
DATE:	28 - 12 - 2022	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Part B: (Total 60 marks)

- 1) (a) What are the main components of the photomultiplier tube and what are their functions? (15 marks)
 (b) What are the sources of the dark current in photomultiplier tubes? (5 marks)
- 2) (a) Discuss and sketch the alpha-particles' spectrum from a large BF_3 tube and then explain the wall effect and it could be overcome. (10 marks)
 (b) Sketch and explain the relationship between charges collected and applied voltage for gas counters. (10 marks)
- 3) (a) Explain the mechanism of the scintillation process in organic scintillators. Use drawing for the energy levels. (10 marks)
 (b) Give an account of the acceleration process of ONLY one, either the linear accelerator OR the Cyclotron. (10 marks)

	TANTA UNIVERSITY- Faculty of Science -Department of Physics			
	EXAM FOR SENIORS STUDENTS OF PHYSICS			
COURSE TITLE:	Solid State Physics II		COURSE CODE: PH4171	
DATE: 31-12-2022	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS	

Answer the following questions:

1-A-State only without explanation the four types of electric polarization in dielectric materials. (8 Marks)

B- Explain the ionic polarization clarifying your answer by the necessary drawings. (22 Marks)

2- A- Complete the following statement of Bloch theorem: (10 Marks)

Bloch showed that the solutions to the SE are the of a plane wave and a function $u(\vec{r})$ with the of the lattice:

$$\psi_{\vec{k}}(\vec{r}) = (\dots)(\dots)$$

; where

$$u_{\vec{k}}(\vec{r} + \vec{T}) = u_{\vec{k}}(\vec{r})$$

And the equation defining \vec{T} is: $\vec{T} = \dots + \dots + \dots$

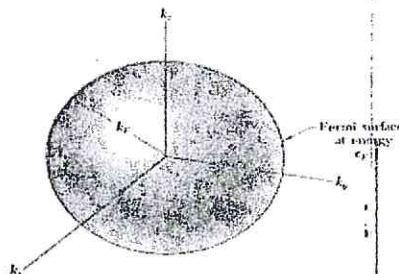
And it is called the

$$f(\epsilon) = \frac{1}{\exp[(\epsilon - \mu)/k_B T] + 1}$$

B- What does the above equation represent? (3 Marks)

What is its physical meaning? (2 Marks)

What does every symbol represent? (5 Marks)



3- A-In the ground state of a system of N free electrons the occupied orbitals of the system fill a sphere in the k-space, of radius k_f , where $\epsilon_f = \hbar^2 k_f^2 / 8\pi^2 m$ is the energy of an electron having a wave vector k_f .

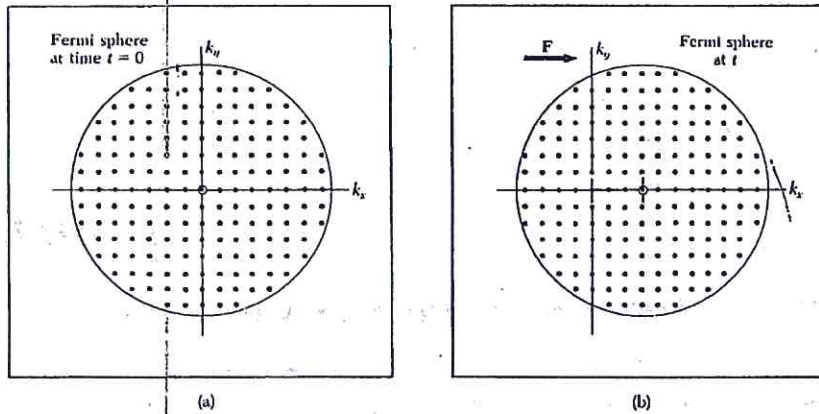
provided that the components of the wavevector k satisfy

$$k_x = 0; \pm \frac{2\pi}{L}; \pm \frac{4\pi}{L}; \dots,$$

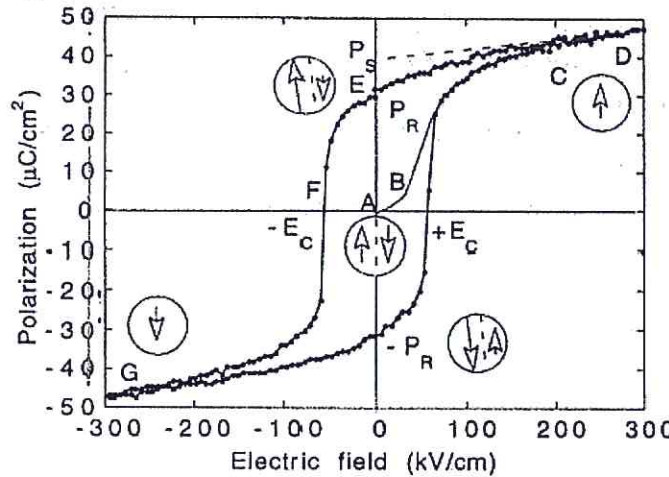
and similarly for k_y and k_z .

Find the total number of orbitals and Then find k_f . (10 Marks)

B- Deduce the electrical conductivity in a metal described by the free electron model, and explain during your deduction the following figure: (10 Marks)



4- A- Explain the following figure: (10 Marks)

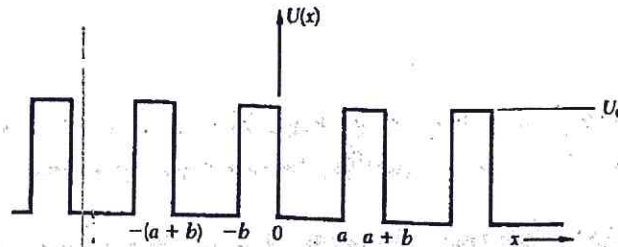


B- State some applications of ferroelectrics. (5 Marks)

C- Define the Curie point in ferroelectric materials, and define the transition temperatures too if existed. (10 Marks)

D- Complete:

Bloch's theorem allows us to calculate the energy bands of electrons in a crystal if we know the potential energy function experienced by the electron. This was first done the model of Krönig and Penney.



Each atom is represented by a finite of width and depth The atomic spacing is (5 Marks)

EXAMINER

PROF. DR. SAMIA AHMED SAAFAN

☺ BEST WISHES