	TANTA NIVERSITY FACULTY OF SCIENCE DEPARTMENT OF CHEMISTRY		
	Final Exam for Third level students (All Double Sections + BC + Materials Sciences)		
	Course Title: "Instrumental 2"	Term: First Term	Code: CH3149 + CH3119
DATE: 22-1-2023	TOTAL ASSESSMENT MARKS: 100		Time Allowed: 2 h

Answer the following Questions:-

Question (1): Write on the following:.....(15 mark)

A) Define "Selectivity factor" of ion exchange resins then explain the factors affecting on the selectivity.

B) Definition of electrophoresis and explain its types.

C) Draw schematic diagram with liable its parts of GC,then state its advantages.

****

Question (1): Compare between the following:.....(15 mark)

A) HPLC and GC chromatography.

B) Normal phase and reverse phase chromatography.

C) Paper and Thin Layer chromatography.

****

Question (2): Explain the following:.....(10 mark)

A) Detection of spots on planar chromatography.

B) Using of GC in identification and quantitative ofcomponents.

****

Question (4): Chose the correct answer:.....(50 mark)

1. Which force is involved in the Chromatography?

a) Hydrogen bonding, b) London force, c) Electric static force, d) All of the above

2. There is no need of support if packed into a column when the stationary phase is:

a) Gas, b) Liquid, c) Solid, d) None of the mentioned

3. The relative solubility of solute in both the phases determines the _____

a) Rate of movement of solute
b) Rate of movement of solvent
c) Rate of disappearance of solvent
d) Rate of disappearance of solute

4. What is Eluent?

a) is a liquid solution
b) is a liquid solution that is a result from Elution.
c) It is a solvent used for separation of absorbed material from stationary phase.
d) None of the above

5. Select the correct statement from the following options.

a) The lesser the polarity of solute, more strongly it will be adsorbed on a polar surface.
b) The greater the polarity of solute, more strongly it will be adsorbed on a polar surface.
c) The greater the polarity of solute, more weakly it will be adsorbed on a polar surface.
d) All of the mentioned option

6. If the mobile phase is gas, movement of solute is determined by its _____

a) Boiling point, b) Melting point, c) Solubility, d) Volatility

7. Which of the following cannot be used as adsorbent in Column adsorption chromatography?

a) Potassium permanganate b) Magnesium oxide, c) Silica gel, d) Activated alumina.

8. The components of the mixture in column chromatography are eluted in order of :

a) Increasing polarity and decreasing distribution ratio
b) Increasing polarity and increasing distribution ratio
c) Decreasing polarity and increasing distribution ratio
d) Decreasing polarity and decreasing distribution ratio

9. The elution power of a solvent is determined by _____

a) Its overall polarity b) The polarity of the stationary phase
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10. Which of the following steps takes place after injection of feed in Column chromatography?

a) Detection of components, b) Separation in column.
c) Elution from the column, d) Collection of eluted component

11. Liquid chromatography is a technique for separating _____

a) Ions that are not dissolved in a solvent, b) Ions that are dissolved in a solute,
c) Ions that are dissolved in a solvent d) All of the mentioned

12. What happens during the 'elution from the column' phase chromatography?

a) Components with the greatest affinity elute first,
b) Components with least affinity elute first, c) Components elute in a random manner
d) Components elute according to their concentration in the mixture

13. In chromatogram, the position of peaks on the time axis can be used to determine which of the following?

a) Components of sample, b) Amount of component in sample
c) Column efficiency, d) Column resolution

14. The substance used as an adsorbent in the column chromatography is_____

a) Na_2O, b) Na_2SO_4, c) Al_2O_3 d) alum

15. Two compounds I and II eluted by column chromatography (adsorption of I> II). Which one of the following is a correct statement?

a) II moves slower and has higher Rf value than I.
b) II moves faster and has higher Rf value than I.
c) I move faster and have a higher Rf value than II.
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16) Which of the following(s) is/are the advantage of HPLC over traditional LPLC (low-pressure liquid chromatography)?

a) Greater sensitivity and reusable columns, b) Sample recovery
c) Ideal for ionic species and large molecules, d) All of the above

17. Which sentence is true about batch ion exchange method?

a) This is single step process. b) It is not used for preparation of the demineralized water.
c) It is multiple step process. d) In this process more than two containers.

18. Which is not application of ion Exchange?

a) It is used for softening of water. B) It is used for demineralization of water.
c) It is used for separation of similar ion in one sample. D. It is used in preformulation.

19. Which technique separates charged particles using electric field?

a) Hydrolysis, b) Electrophoresis, c) Protein synthesis, d) Protein denaturing

20. The speed of migration of ions in electric field depends upon:

a) Shape and size of molecule. b) Magnitude of charge, shape and mass of molecules.
c) Magnitude of charge and shape of molecules
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21. What does the electrophoresis apparatus consist of?

a) Gel, buffer chamber and fire pack, b) Buffer chamber and electrophoresis unit
c) Electrophoresis unit and gel separator, d) Power pack and electrophoresis unit

22. Which of the following statements is true about migration of biomolecules?

a) Rate of migration is directly proportional to current
b) The rate of migration is directly proportional to the resistance of medium
c) Low voltage is used for separation of high mass molecules
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23. Which of the following factors does not influence electrophoretic mobility?

a) Molecular weight, b) Shape of molecule,
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24. Which of the following is not an ideal characteristic of a detector used in gas chromatography?

a) Linear response to the solutes, b) Short response time
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25) What does the selectivity factor describe?

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Question (5): Choose [True (✓) or False (X)]:.....(10 mark)

1. Retention distance is the distance between point of injection and minimum peak in the recorder or computer generated chart.
   a) True b) False
2. The stationary phase could be a viscous liquid coated over a surface of solid particles.
   a) True b) False
3. Components with a strong attraction to the support move more slowly than components with weak attraction.
   a) True b) False
4. Chromatography cannot be used to purify volatile substances.
   a) True b) False
5. The technique of TLC incorporates a liquid stationary phase and a moving gas phase to effect the separation of the constituents in a mixture.
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9. Cl_2 is the most famous non-specific derivatizing agent.
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10. Resolution increase with increasing the length of the column and decrease with increasing the diameter.
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**********Good luck**********

Examiners: ***Prof. Ahmed Rehab and Prof. Tarek Fayed***

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Examiners: ***Prof. Ahmed Rehab and Prof. Tarek Fayed***

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	MATERIAL SCIENCE		
COURSE TITLE:	Crystallography		MS3141
DATE: 3/ 1/ 2023	ASSESSMENT MARKS: 100		TIME ALLOWED: 2 HOURS

N_A =6.02X1023 MOL

First Question

1-The free volume at bcc lattice occupied by atoms with radius r and the lattice constant is

a- $0.32a^3$ **b -** $0.52a^3$ **c -** $0.26a^3$ **d -** $0.72a^3$

2- The number of atoms per cm^2 in (111) plane for Pb crystal which is Fcc with lattice constant a = 4.93A^0

a- $4.99x10^{14}$ **b -** $2.99x10^{14}$ **c -** $1.0x10^{15}$ **d -** $5.81x10^{15}$

3 - The coordination number for bcc is

a – 8 **b –** 12 **c –** 6 **d –** 9

4- Tetragonal crystal has a = 4.5Å, c = 6Å thus(d) for planes (222) equals

a- 1.4 Å **b-** 2.4 Å **c-** 0.7 Å **d-** 0.41 Å

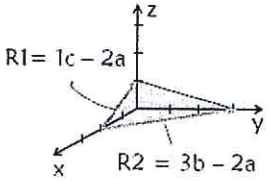
5 - The radius of Fcc Cu atom = 1.276 A^0, its atomic mass = 63.57 so its density is

a – 9 **b-** 10 **c-** 12 **d-** 5

6 - The λ=d for the second order of diffraction when the diffraction angle equal

a- $\theta = \frac{\pi}{2}$ **b-** $\theta = 0$ **c-** $\theta = \pi$ **d-** $\theta = 2\pi$

7- The miller indices for the given plane in figure is



a- (236) **b-** (336) **c-** (623) **d-** (326)

8- X-ray with energ E =50kev , so the minimum wavelength for its continues spectra is

a- 0.11 **b-** 0.24 **c-** 0.23 **d-** 0.54

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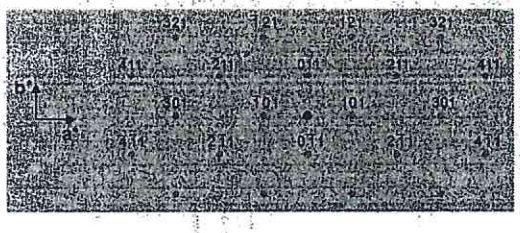
9- The following diffraction pattern represent unit cell of type

a- Fcc b- bcc

c- primitive d- hexagonal



10- The number of Bravais unit cells in the tetragonal crystal system is:

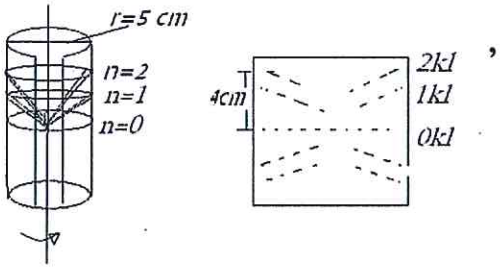
a- (4) b-(3) c- (2) d-(1)

Second Question:

1 - Determine the condition that an ion with radius r to occupy the tetrahedral sites.

2 - Determine the structure factor of the diffracted x-Ray for Fcc crystal and discuss the condition for the appearance of diffracted x-ray from the crystal planes.

3-The figure show the diffraction pattern of x-ray using rotation method determine the lattice constant of the used crystal , if the x-ray wavelength is 1.54A



Third Question

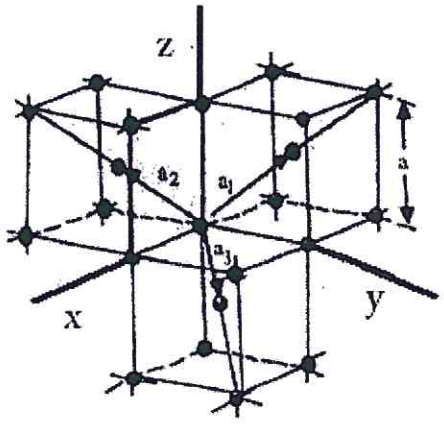
1- Define Ewald sphere and show how we can determine the unit vector of reciprocal lattice G and inter planer distance d from the diffraction pattern.

2-The Molybdenum crystal has bcc unit cell, if its density is 10.2 g/cm^3 and the atomic weight is 95.94, from these data, find the filling factor for this crystal. .

3-- Find miller indices for the common face shared the two zones [(0110) ,(3253)], [(1233),(2021)] in cubic crystal.

Fourth question

1-The given figure, represent real unit cell for bcc lattice determine the basic vector for the reciprocal unit cell and the volume of reciprocal unit cell(note that V_c in real lattice = (a^3 / 2)



2- Determine the d- spacing of the crystal planes using Debby Scherer powder method of x-ray diffraction.

3- Draw the possible positions for octahedral sites in face center cube and mention their coordination

	TANTA UNIVERSITY Faculty of Science Department of Physics			
	EXAMINATION FOR THIRD LEVEL STUDENTS OF PHYSICS			
	COURSE TITLE:	Solid state physics 1		COURSE CODE :*PH3161*
DATE:	5 / 01 / 2023	TERM :FIRST	TOTAL ASSESSMENT MARKS : 100	TIME ALLOWED :2 HOURS

Answer the following

First question:

Write short notes about:

A) Crystal systems and fourteen Bravais lattices.

B) Diffraction of x-ray and deduce Bragg's law.

Second question:

A) In a cubic unit cell draw the planes (134), (111), (101) and (200). Calculate the inter planer distances for these planes if a = 3.4 A°

B) Derive an expression for the determination of unit cell dimensions of a rectangular unit cell.

Third question:

A) Explain only powder photograph **or** single crystal rotation photograph.

B) Discuss in detail the interatomic forces in solids.

Fourth question:

Explain in detail the free electron model in a metal and derive an expression for the energy level in three dimensions.

Good luck

Examiner: Prop Dr. Abd El Razik Abdeen

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS			
	THIRD YEAR (PHYSICS+MATERIAL SCIENCE)			
	COURSE TITLE:	Computational Physics		COURSE CODE: PH3181
DATE:	24-01-2023	TERM: FIRST	TOTAL ASSESSMENT MARKS:100	TIME ALLOWED: 2 HOUR

Please Answer the Following:

Q1) a) Put True or false: **[12 Marks]**

1- All physical problems could be solved analytically:

2- Computational and numerical methods always produce exact solutions.

3- There is no difference between true errors and relative true errors.

4- The error propagation in measurements and calculations is the algebraic summation of true error of all quantities.

b) Compare between Bisection method and Newton's method: The algorithm, advantages, and disadvantages. **[13 Marks]**

Q2) a) The strain in an axial member of a square cross-section is given by $\epsilon = F/(h^2 E)$, where the axial force in the member is $F = 72 \pm 0.9$ N, the length or the width of the cross section is $h = 4 \pm 0.1$ N, and Young's modulus is $E = 70 \pm 1.5$ GPa. Find the maximum possible error in the measured strain. **[12 Marks]**

b) The velocity of an object is given by

$$v(t) = 2000\, ln(\frac{14\times10^4}{14\times10^4-2100\,t})\text{-}9.8t$$

Use the backward, forward, and difference approximation to calculate the force affect that object if its mass is 1000 Kg at t=16 s and a time step of $\Delta t = 2\ Sec.$ **[13 Marks]**

Q3) a) Find solutions of the equation x^2-7x+10=0 by using Newton's method. For the starting point, use (a) x=1 and (b) x=7. Five iterations are enough and show the relative approximate error for each. **[13 Marks]**

b) Explain sources of numerical errors with examples. **[12 Marks]**

Q4) a) An object moves from rest with a velocity v(t)= 5 t^2 m/sec. Find the exact distance that the object can move in 5 sec. Use trapezoidal method to estimate the distance covered by the object, assume 5 intervals and find the true error.

[12 Marks]

b) Prove that the second order derivative could be approximated as

$$f''(x_i) \approx \frac{f(x_{i+2}) - 2\,f(x_{i+1}) + f(x_i)}{\Delta x^2}$$

[13 Marks]

☺ ☺ **Best Wishes** ☺ ☺

A. Prof. Dr. Mohammed Shihab

	Tanta university Faculty of Science DEPARTMENT OF PHYSICS			
	EXAMINATION FOR (Third YEAR) STUDENTS OF PHYSICS			
			Environmental Physics (فيزياء بيئية)	
DATE	1/1/2023	TERM: First	Code (PH3191)	TIME ALLOWED: 2h

ANSWER ALL THE QUESTIONS:

Question (1)

1. Describe the Classification of radiation in details and discuss the interaction of radiation in matter?
2. Defined: 1-energy fluence, 2-Kerma, Cema, 3-absorbed dose, 4-exposure, 5-equivalent dose, 6-Effective dose?

Question (2)

1. Describe the stopping power, Cavity theory and Spencer–Attix cavity theory?
2. Discuss the method of radioactive decay and give an example for each method?
3. What is the advantage and disadvantage of power tower design?

Question (3)

1. What are the general principles for the establishment of nuclear radiation detectors and describe each in details?
2. Energy resources can be classified into A renewable and non-renewable resource, give an example for every resource and descript it in details?

Question (4)

1. Describe the regions for structure and composition of the atmosphere?
2. Defined: 1-Solar Radiation, 2-Diffused Solar Radiation, 3-Direct Solar Radiation, 4-Solar thermal energy (STE), 5-Low-temperature collectors, 6-Medium-temperature collectors, 7-High-temperature collectors, 8-Parabolic trough designs, 9-Boiling water reactor, 10-Pressurized Water Reactors.

Good Luck

Dr. Ahmed Elmekawy