Course Specification

Course Report

Mid Exam

Model Answer Mid Exam

Final Exam

Model Answer Final exam

Best Mark

Mid Mark

Poor Mark

Curriculum Vitae

Course Specification

Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكة العربية السعودية
الهيئة الوطنية للتقويم
والاعتماد الأكاديمي

كلية العلوم التطبيقية
Faculty of Applied Sciences

Kingdom of Saudi Arabia
The National Commission for Academic Accreditation & Assessment

T6. Course Specifications (CS)

Course title: Electricity and Magnetism

Course code: 4032121-4

Course Specifications

Institution: **Umm AL – Qura University**	Date : **18/1/1438**
College/Department : **College of Applied Science – Department of Physics**	

A. Course Identification and General Information

1. Course title and code: **Electricity and Magnetism (code: 4032121)**			
2. Credit hours: **4 Hrs**			
3. Program(s) in which the course is offered. **BSc Physics** (If general elective available in many programs indicate this rather than list programs)			
4. Name of faculty member responsible for the course **One of the academic staff member**			
5. Level/year at which this course is offered : **2st Year / Level 3**			
6. Pre-requisites for this course (if any) : - **General physics 2 4031101-4**			
7. Co-requisites for this course (if any) : ---			
8. Location if not on main campus: **Main campus and Alzaher**			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	100%
b. blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other		What percentage?	
Comments:			

B Objectives

1. What is the main purpose for this course?

This course is designed to provide and define the fundamental properties of the electric charge, solve technical problems associated with the electrostatic force (Coulomb force), identify that at every point in the space surrounding a charged particle, the particle sets up an electric field , which is a vector quantity and thus has both magnitude and direction, identify how an electric field can be used to explain how a charged particle can exert an electrostatic force on a second charged particle even though there is no contact between the particles, explain how a small positive test charge is used (in principle) to measure the electric field at any given point, define electric capacitance and solve technical problems associated with capacitors of various symmetries, capacitors in series and parallel combination, the microscopic effect of dielectric materials on capacitance and stored energy, define electric current, current density, and solve technical problems involving DC networks of resistors, batteries, and capacitors, Ohm's Law, Kirchhoff's laws, and RC charging and decay circuits, calculate the potential difference between any two points in a circuit, distinguish a real battery from an ideal battery and, in a circuit diagram, replace a real battery with an ideal battery and an explicitly shown resistance.
9. Calculate the net rate of energy transfer in a real battery for current in the direction of the emf and in the opposite direction, define the magnetic field and magnetic flux, solve technical problems associated with the effect of static, non-uniform and uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic dipole, calculate the magnitude and direction of the magnetic field for symmetric current distributions using the Law of Biot-Savart and Ampere's Law, and state the limitations of Ampere's Law, state Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction, calculate inductance according to the fundamental definition, solve technical problems associated with LR circuits and coils, and calculate the stored energy in magnetic fields. In addition to these items, the students should gain practical skills through performance some experimental class, to demonstrate and consolidate the basic physics concepts in the branches of physics such as mechanics, properties of matter, heat and optics and also aims to link the mathematical equations to the applied physics.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

1- Outlines of the physical laws, principles and the associated proofs.
2. Highlighting the day life applications whenever exist.
3. Encourage the students to see more details in the international web sites and reference books in the library.
4- Encourage the student to build an example of different experiments related to course
5- Frequently check for the latest discovery in science

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:
The course will cover the principle of physics, electric charge and Coulomb's law, the electric field, Gauss law, Electric potential, capacitors and dielectric, current and resistance, DC circuits. The magnetic field and Ampere's law. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

1 Topics to be Covered

Topics	No of Weeks	Contact hours
Electric charge and Coulomb's law 1- Introduction. 2- Electric Charge 3- Conductors and Insulators 4- Coulomb's law 5- Charge is Quantized 6- Charge is Conserved	1	3
The Electric Field 1- Fields. 2- The Electric Field E 3- The Electric Field of a Point Charges and Lines of Force 4- The Electric Field of Continuous Charge Distributions 5- A Point Charge in an Electric Field 6- A Dipole in an Electric Field	1	3
❖ **Gauss Law** 1- IntroductionThe flux of a Vector Field 2- The Flux of the Electric Field 3- Gauss law 4- A Charged Insolated Conductor 5- Applications of Gauss law 6- Experimental Tests of Gauss law and Coulomb law	1	3
❖ **Electric Potential** 1- Electrostatic and Gravitational Forces 2- Electrical Potential Energy 3- Electric Potential 4- Calculating the Potential from the Field	2	6

5- Potential due to Point Charge 6- Potential due to a Collection of Point Charges 7- The Electric Potential of Continuous Charge distribution 8- Equipotential Surfaces 9- Calculating the Field from the Potential 10- An Insulated Conductor		
Capacitors and dielectrics 1- Capacitance 2- Calculating the Capacitance 3- Capacitors in Series and Parallel 4- Energy Storage in an Electric Field 5- Capacitor with Dielectric 6- Dielectrics: an Atomic View 7- Dielectrics and Gauss law	**1.5**	**5**
Current and Resistance 1. Electric Current 2. Current Denstiy 3. Resistance, Resistivity, and Conductivity 4. Ohm's law 5. Ohm's law: A Microscopic View 6. Energy Transfers in an Electric Circuit	**1.5**	**5**
DC Circuits 1. Electromotive Force 2. Calculating the Current in a Single Loop 3. Potential Differences 4. Resistors in Series and Parallel 5. Multiloop Circuits 6. RC Circuits	**1.5**	**5**
The Magnetic Field 1. The Magnetic Field B 2. The Magnetic Force on a Moving Charge 3. Circulating Charges 4. The Hall Effect. 5. The Magnetic Force on a Current 6. Torque on a Current LoopThe Magnetic Force on a Current 7. The Magnetic Dipole	**2**	**6**

Ampere's Law 1. The Biot-Savart Law. 2. Applications of the Biot-Savart Law 3. Lines of Magnetic Field 4. Two Parallel Conductors 5. Ampere's Law 6. Solenoids and Toroids.	**2**	**6**
	14 weeks	**42hrs**

Practical part:

1. Safety and Security at the lab.
2. Introduction.
3. Determining the capacitance of a capacitor / connecting capacitors in series and in parallel
4. Studying Ohm's Law / connecting two resistors in series and in parallel
5. Determining the time constant of an RC circuit
6. Kirchhoff's Rules (The Junction Rule and The Loop Rule)

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**42**		**42**			**84**
Credit	**3**		**1**			

3. Additional private study/learning hours expected for students per week.	4

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.
First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table).
Second, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes.
Third, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Define the physical quantities, physical phenomena, and basic principles.	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams .
1.2	Describe the physical laws and quantities using mathematics		
1.3	Determine the physical quantities at the Lab.	1. Doing team research or team project. 2.Doing team work to perform some experiments 3. Perform the experiments correctly. 4. Demonstrate the results correctly. 5. Write the reports about the experiment. 6. Discussion with the student about the results	Writing scientific Reports. Lab assignments Exam.

2.0	**Cognitive Skills**		
2.1	Apply the laws of physics to calculate some quantities.	1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	1. Exams (Midterm, final, quizzes) 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course. 4. Discussions of how to simplify or analyze some phenomena.
2.2	Solve problems in physics by using suitable mathematics.		
2.3	Analyse and interpret quantitative results.		
2.4	Apply physical principle on day life phenomena.		
2.5	Derive the physical laws and formulas.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and the library. • Small group discussion. • Enhance self-learning skills. • Develop their interest in Science through : (lab work, visits to scientific and research institutes).	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific reports. • Evaluate the team work in lab and small groups. • Evaluation of students presentations.
3.2	Work effectively in groups and exercise leadership when appropriate.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate effectively in oral and written form.	• Incorporating the use and utilization of computer, software, network and multimedia through courses • preparing a report on some topics related to the course depending on web sites	• Evaluating the scientific reports. • Evaluating activities and homework
4.2	Collect and classify the material for the course.		
4.3	Use basic physics terminology in English.		
4.4	Acquire the skills to use the internet communicates tools.		
5.0	**Psychomotor**		
5.1	Use experimental tools safely and correctly.	Follow up the students in lab and during carryout all experimental work.	• Practical exam. • Giving additional marks for the results with high and good accuracy
5.2	Determine the physical quantity correctly at the Lab.		

5. Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	Program Learning Outcomes (Use Program LO Code #s provided in the Program Specifications)															
	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	3.1	3.2	4.1	4.2	4.3	4.4	5.1	5.2
1.1	✓															
1.2		✓														
1.3			✓													
2.1				✓												
2.2					✓											
2.3						✓										
2.4							✓									
2.5								✓								
3.1									✓							
3.2										✓						
4.1											✓					
4.2												✓				
4.3													✓			
4.4														✓		
5.1															✓	
5.2																✓

6. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Exercises & Home works	All weeks	10 %
2	Participation in activities lectures and labs	All weeks	10 %
3	Midterm Exam (theoretical)	6th week	10%
4	Lab. Reports (Practical)	11th week	10%
5	Final Exam (Practical)	15th week	20%
6	Final Exam (theoretical)	16th week	40%

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4hrs per week)

E Learning Resources

1. List Required Textbooks

Physics, 4th edition , By: Halliday, Resnick, and Krane, Wiley (1992)

2. List Essential References Materials (Journals, Reports, etc.)

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

University Physics with modern Physics, 13th edition, by: Hugh D. Young and Roger A. Freedman, Addison-Wesley, (2012).

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. (eg. www.youtube.com.)
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • Class room is already provided with data show • The area of class room is suitable concerning the number of enrolled students (68) and air conditioned. • Library • Laboratory for fundamental of physics
2. Computing resources (AV, data show, Smart Board, software, etc.) • . Computer room • Scientific calculator.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Each Class room and laboratories require a TV screen at least 65 inch-and smart, and double layer white board.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Questionaries • Open discussion in the class room at the end of the lectures
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3 Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific flash and movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)

- The instructors of the course are checking together and put a unique process of evaluation.
- Check marking of a sample of papers by others in the department.
- Feedback evaluation of teaching from independent organization.
- Independent evaluation by another instructor that give the same course in another faculty.
- Evaluation by the accreditation committee in the university.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

1- The following points may help to get the course effectiveness
   - Student evaluation
   - Course report
   - Program report
   - Program Self study
2- According to point 1 the plan of improvement should be given.

Name of Instructor Assoc. Prof. Dr. Ahmed M. El-hadi_____

Signature: _____ Date Report Completed: _____

Name of Field Experience Teaching Staff _____

Program Coordinator: _____

Signature: _____ Date Received: _____

7-4-14.

Course Report

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T5. COURSE REPORT
(CR)

Course title: Course title: Electricity and Magnetism

Course code: (4032121-4)

First Semester

Academic Year 1438-1439H -2017-2018

Dr. Mongi Ben Moussa
Department of Physics
College of Applied Science
msbenmoussa@uqu.edu.sa
phmoussa@yahoo.fr
PO Box 10130
Makkah 21955
Kingdom of Saudi Arabia

A separate Course Report (CR) should be submitted for every course and for each section or campus location where the course is taught, even if the course is taught by the same person. Each CR is to be completed by the course instructor at the end of each course and given to the program coordinator

A combined, comprehensive CR should be prepared by the course coordinator and the separate location reports are to be attached.

Course Report

For guidance on the completion of this template refer to the NCAAA handbooks.

Institution Umm Al-Qura University	Date of CR 4/1/2018
College/ Department: Applied Sciences College- Physics department	

A Course Identification and General Information

1. Course Electricity and Magnetism Code # 4032121-4 Section #
2. Name of course instructor Dr. Mongi Ben Moussa Location: Main campus- Al-Abdia
3. Year and semester to which this report applies. 1438-1439 H- 1st Semester
4. Number of students starting the course? 55 Students completing the course? 52
5. Course components (actual total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	45		30			75
Credit	3		1			4

B- Course Delivery

1 Topics to be Covered		
Topics	**No of Weeks**	**Contact hours**
Electric charge and Coulomb's law 1- Introduction. 2- Electric Charge 3- Conductors and Insulators 4- Coulomb's law 5- Charge is Quantized 6- Charge is Conserved	1	3
The Electric Field 1- Fields. 2- The Electric Field E 3- The Electric Field of a Point Charges and Lines of Force 4- The Electric Field of Continuous Charge Distributions 5- A Point Charge in an Electric Field 6- A Dipole in an Electric Field	1	3
❖ **Gauss Law** 1- IntroductionThe flux of a Vector Field 2- The Flux of the Electric Field 3- Gauss law 4- A Charged Insolated Conductor 5- Applications of Gauss law 6- Experimental Tests of Gauss law and Coulomb law	1	3
❖ **Electric Potential** 1- Electrostatic and Gravitational Forces 2- Electrical Potential Energy 3- Electric Potential 4- Calculating the Potential from the Field 5- Potential due to Point Charge 6- Potential due to a Collection of Point Charges 7- The Electric Potential of Continuous Charge distribution 8- Equipotential Surfaces 9- Calculating the Field from the Potential 10- An Insulated Conductor	2	6

Capacitors and dielectrics 1- Capacitance 2- Calculating the Capacitance 3- Capacitors in Series and Parallel 4- Energy Storage in an Electric Field 5- Capacitor with Dielectric 6- Dielectrics: an Atomic View 7- Dielectrics and Gauss law	**1.5**	**5**
Current and Resistance 1. Electric Current 2. Current Denstiy 3. Resistance, Resistivity, and Conductivity 4. Ohm's law 5. Ohm's law: A Microscopic View 6. Energy Transfers in an Electric Circuit	**1.5**	**5**
DC Circuits 1. Electromotive Force 2. Calculating the Current in a Single Loop 3. Potential Differences 4. Resistors in Series and Parallel 5. Multiloop Circuits 6. RC Circuits	**1.5**	**5**
The Magnetic Field 1. The Magnetic Field B 2. The Magnetic Force on a Moving Charge 3. Circulating Charges 4. The Hall Effect. 5. The Magnetic Force on a Current 6. Torque on a Current LoopThe Magnetic Force on a Current 7. The Magnetic Dipole	**2**	**6**
Ampere's Law 1. The Biot-Savart Law. 2. Applications of the Biot-Savart Law 3. Lines of Magnetic Field 4. Two Parallel Conductors 5. Ampere's Law 6. Solenoids and Toroids.	**2**	**6**

	14 weeks	42hrs

2. Consequences of Non Coverage of Topics

For any topics where the topic was not taught or practically delivered, comment on how significant you believe the lack of coverage is for the course learning outcomes or for later courses in the program. Suggest possible compensating action.

Topics (if any) not Fully Covered	Effected Learning Outcomes	Possible Compensating Action

3. Course learning outcome assessment.

	List course learning outcomes	List methods of assessment for each LO	Summary analysis of assessment results for each LO
1	1. Learning fundamentals of Naturally Occurring Radioactivity and Types of exposure 2.Learning operational radiation quantities 3. Learning protection radiation quantities 3. Understand Calibration of thermo luminscence dosimeters 4. Understand students different methods of medical internal dosimetry 7. Learning fundamentals of Decontamination concept and reduction factor 8- understanding the importance of Skin equivalent dose calculation	1. Home work 2. Interactive discussion 3. Short exam1 4. Short exam2 5. Final exam	All pass in short exam 1, short exam2 and final exam

2	1. Analysis and explain natural variations of radiation background 2.Develop ability to think creatively to find a relationship between operational radiation quantities and protection radiation quantities 3. Develop ability to think creatively in the different methods of medical internal dosimetry. 4. Develop decontamination procedures 8- learning understanding the importance of Skin equivalent dose calculation 5- Develop ability to think creatively in penetration of different types of radiations.	1.Oral questions 2.Presentations 3.Quizzes 4. Problem solving	Poster presentation
3	.1. Develop ability to work independently 2. Develop ability to work productively with others 3. Improve self study 4. Develop leader ship skills	1. Marking the home works 2. Working closely with the different groups 3. Evaluate the efforts of each student in preparing the report 4. Evaluate the scientific values of reports 5. Evaluate the work in team 6.	Poster presentation
4	- 1. Enhancement the ability of students to use computers and internet	1. Give the students research assignments 2. Ask the student to search the internet for the solution	

	2. Know how to write a report 3. Perform effective communication with colleagues and faculty members 4. Ability to use programs designed for medical internal radiation dose software 5- Problem solving and ability to interpret the results.	of a specific problem 3. Evaluate of presentations and reports	

Summarize any actions you recommend for improving teaching strategies as a result of evaluations in table 3 above. Encouraging students to prepare the next lecturer and introduce power point presentation Initiating reactive learning

4. Effectiveness of Planned Teaching Strategies for Intended Learning Outcomes set out in the Course Specification. (Refer to planned teaching strategies in Course Specification and description of Domains of Learning Outcomes in the National Qualifications Framework)

List Teaching Methods set out in Course Specification	Were They Effective?		Difficulties Experienced (if any) in Using the Strategy and Suggested Action to Deal with Those Difficulties.
	No	Yes	
seminar presentation by the students and web-interactions.		Yes	The students need to gain more experience via sharing in national and international conference .
Students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course		Yes	

All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions		Yes	
Encouraging students to collect the new information about what the new procedures in radiation measurements.		Yes	
Enable the reference books and scientific sites concerning radiology in internet		Yes	
Lectures **Discussion**		Yes	
Lab work Case Study Active learning Small group discussion Data presentation Learning methods: „ Power point, . E-learning		Yes	

Note: In order to analyze the assessment of student achievement for each course learning outcome, student performance results can be measured and assessed using a KPI, a rubric, or some grading system that aligns student work, exam scores, or other demonstration of successful learning.

C. Results

Result Summary:

Passed: No 39 Percent 71 % Failed No Percent 19%

Did not complete No Percent

. Distribution of Grades

Letter Grade	Number of Students	Student Percentage	Analysis of Distribution of Grades
A	2		
B	10		
C	11		
D	16		Success percentage = 71% Because a few number of students
F	13		
F			
Denied Entry	3		
In Progress			
Incomplete			
Pass	39		
Fail	13		
Withdrawn	3		

2. Analyze special factors (if any) affecting the results

none

3. Variations from planned student assessment processes (if any) (see Course Specifications).

a. Variations (if any) from planned assessment schedule (see Course Specifications)	
Variation	Reason
b. Variations (if any) from planned assessment processes in Domains of Learning (see Course Specifications)	
Variation	Reason

4. Student Grade Achievement Verification (eg. cross-check of grade validity by independent evaluator).	
Method(s) of Verification	Conclusion
The instructors of the course are checking together and put a unique process of evaluation	True
Check marking of a sample of papers by others in the department	Equal with the level of student in written tests
Feedback evaluation of teaching from independent organization	True

D Resources and Facilities

1. Difficulties in access to resources or facilities (if any)	2. Consequences of any difficulties experienced for student learning in the course.
Shortage WEB rooms available for student to be useful at any time between lectures	All students must take all of the requirements before start in this course

E. Administrative Issues

1 Organizational or administrative difficulties encountered (if any)	2. Consequences of any difficulties experienced for student learning in the course.

F Course Evaluation

1 Student evaluation of the course (Attach summary of survey results)
a. List the most important recommendations for improvement and strengths
b. Response of instructor or course team to this evaluation
2. Other Evaluation (eg. by head of department, peer observations, accreditation review, other stakeholders)
a. List the most important recommendations for improvement and strengths
b. Response of instructor or course team to this evaluation

G Planning for Improvement

1. Progress on actions proposed for improving the course in previous course reports (if any).			
Actions recommended from the most recent course report(s)	Actions Taken	Action Results	Action Analysis
a. New lecture was added to cover the new of the direct and indirect doses assessment.		Was applied successfully	

2. List what other actions have been taken to improve the course (based on previous CR, surveys, independent opinion, or course evaluation).

3. Action Plan for Next Semester/Year				
Actions Recommended for Further Improvement	Intended Action Points (should be measurable)	Start Date	Completion Date	Person Responsible
a. Updating the course according to the recent publications ▪ Visit to Researches Lab.				

Name of Course Instructor: _ Dr. Mongi Ben Moussa Signature : _
Date Report Completed: 22-1-2018
Program Coordinator:
Signature ....Date Received:

Mid Exam

Umm al-Qura University
Faculty of Applied Science
Physics Department
Date 26/02/1439 H

Mid-term Exam
Electro-magnetism
physics Students
Duration: 120 min

Student Name: ..... Student ID Number :..... Serial Number: .....

Constants:

$k = \frac{1}{4\pi\varepsilon_0} = 8{,}99\times10^{9}$ $\quad \varepsilon_0 = 8.85\times10^{-12} C^2/Nm^2$ $\quad$ electron charge $= 1.6\times10^{-19}$C

Choose the most correct answer

1- In figure 1, The magnitude of the electrostatic force in Coulomb's law is

a) $F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$

b) $F = 0$

c) $F = \frac{1}{4\pi\varepsilon_0}\frac{q_1}{r^2}$

d) $F = \frac{1}{4\pi\varepsilon_0}\frac{q_2}{r^2}$

2- What is the magnitude of the repulsive electrostatic force between two of the protons that are separated by 4.00×10^{-15} m?

a) F= 14N b) F=24 N c) F=34 N d) F=44 N

3- The units of $\frac{1}{4\pi\varepsilon_0}$ are:

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

4- A 5.0C charge is 10 m from a – 2.0C charge. The electrostatic force on a positive charge is:

a) $9\ 10^8$ N toward the negative charge

b) $9\ 10^8$ N away from the negative charge

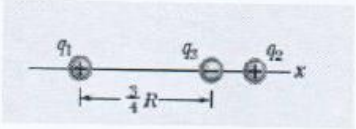
c) $9\ 10^9$ N toward the negative charge

d) $9\ 10^9$ N away from the negative charge

5- A particle of charge 3.00×10^{-6} C is 12.0 cm distant from a second particle of charge -1.50×10^{-6}C. the magnitude of the electrostatic force between the particles is:

a) F= 11N b) F= 4 N c) F= 2.81 N d) F= 65.4 N

6- The Figure shows three charged particles fixed in place on an x axis. The charges are $q_1 = 1.60 \times 10^{-19}$ C , $q_2 = 3.20 \times 10^{-19}$ C and $q_3 = -3.20 \times 10^{-19}$ C . R = 2 cm. What is the magnitude of the net electrostatic force on particle 1 due to particles 2 and 3 ?



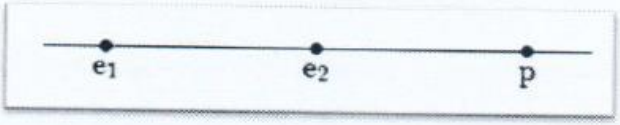
a) 0

b)) 9.00×10^{-19} N

c) 44.00×10^{-20} N

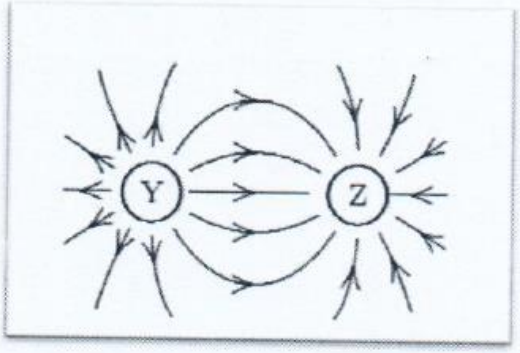
d) 9.00×10^{-25} N

7- Two electrons (e_1 and e_2) and a proton (p) lie on a straight line, as shown. The direction of the force of e_2 on e_1, the force of p on e_1 and the total force on e_1, respectively, are:



a) →, ←, → b) ←, →,→ c) →, ←, ← d) ←, →, ←

8- The diagram shows the electric field lines in the region space containing two small charged spheres (Y and Z). Then:



a) Y is negative and Z is positive

b) The magnitude of the electric field is the same everywhere

c) The electric field is strongest midway between Y and Z

d) Y is positive and Z is negative

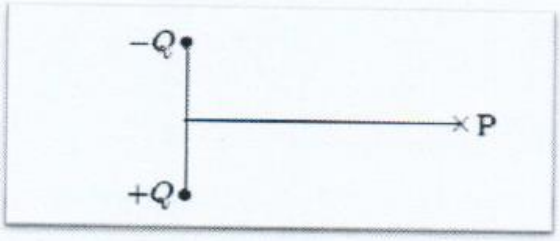
9- The electric field at a distance of 10 cm from an isolated point particle with a charge of $2\ 10^{-9}$ C is:

a) 180 N/C b) 1.8 N/C c) 1800 N/C d) 18 N/C

10- An isolated charged point particle produces an electric field with magnitude E at a point 2 m away. At a point 1 m from the particle the magnitude of the field is:

a) E b) 4 E c) 2 E d) E/2

11- The diagramsshows a particle with positive charge Q and a particle with negative charge – Q. The electric field at point P on the perpendicular bisector of the line joining them is:

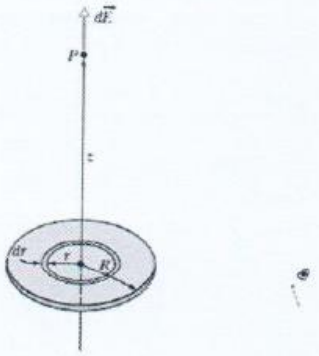


a) ↑ b) ↓ c) → d) ←

12- Two point particles, one with charge 8. 10^{-9} C and the other with charge – 2.10^{-9} C, are separated by 4 m. The electric field im N/C midway between them is:

a) 9 10^{9} b) 13.5 c) 22.5 d) 36 10^{-9}

13-The magnitude of the electric field E produced by a flat, circular, charged disk at points on its central axis is $E = \frac{\sigma}{2\varepsilon_0}(1 - \frac{z}{\sqrt{z^2 + R^2}})$. At the center of this disk, E is equal to :



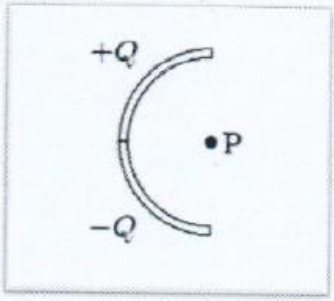
a) 0

b) $E = \frac{\sigma}{2\varepsilon_0}$

c) $E = \frac{\sigma}{2\varepsilon_0}(1 - R)$

d) none of the above

14- Positive charge + Q is uniformly distributed on the upper half a semicircular rod and negative charge –Q is uniformly distributed on the lower half. What is the direction of the electric field at point P, the center of the semicircle?

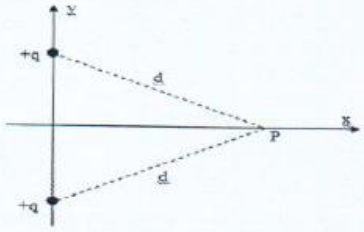


a) ↑ b) ↓ c) → d) ←

15- The electric field due to a uniform distribution of charge on a spherical shell is zero:

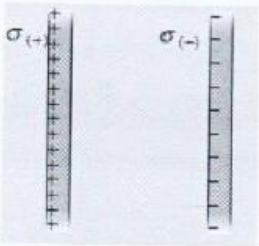
a) everywhere b) nowhere c) only inside the shell d) only outside the shell

16-Tow positive charges have equal magnitude and are placed as shown in the figure. Do we conclude the E_{net} at point P as:



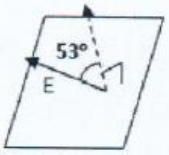
a) Vertically upward
b) Horizontally left
c) Horizontally right
d) Vertically downward

17- Figure below shows portions of two large, parallel, nonconducting sheets, each with a fixed uniform charge on one side. The magnitudes of the surface charge densities are $\sigma(+) = 6.8\ \mu C/m^2$ for the positively charged sheet and $\sigma(-) = 4.3\ \mu C/m^2$ for the negatively charged sheet. Find the electric field between the sheets



a) 0
b) 1.4×10^5 N/C
c) 6.3×10^5 N/C
d) 43×10^5 N/C

18-A uniform electric field E = 25000 N/C makes an angle of 53° with the vertical on the surface as shown in the figure. The area of the surface is 0.0153 m^2 (Figure 7). The electric flux ϕ (Nm^2/C) through this surface is:



a) $\phi = 0$

b) $\phi = 230.2$

c) $\phi = 350.9$

d) $\phi = 1122$

19-Gauss' law relates the net flux ϕ of an electric field through a closed surface (a Gaussian surface) to the net charge q_{enc} that is enclosed by that surface.

a) $\varepsilon_0 \phi = q_{enc}$ b) $\varepsilon_0 q_{enc} = \phi$ c) $\phi = \frac{\varepsilon_0}{q_{enc}}$ d) none of the above

20- The flux within a closed surface is $2.9 \times 10^8 \text{ Nm}^2/\text{C}$, then the charge Q (C) enclosed by this surface

a) 25.66×10^{-4} b) 2.6 c) 32.7×10^{-19} d) 0

21- A point particle with charge q is at the center of a Gaussian surface in the form of a cube. The electric flux through any one of the cube is:

b) a) q/ε_o b) $q/(4 \pi \varepsilon_o)$ c) $q/(6 \varepsilon_o)$ d) $q/(3 \varepsilon_o)$

22- Charge Q is distributed uniformly throughout a spherical insulating shell. The net electric flux in $N.m^2/C$ through the inner surface of the shell is:

c) a) Q/ε_o b) $Q/(4 \pi \varepsilon_o)$ c) $2 Q/ \varepsilon_o$ d) 0

23- To make an uncharged object have a negative charge we must:

a) Add some atoms b) remove some atoms c) add some electrons d) remove some electrons

24- An electrical insulator is a material:

a) Containing no electrons b) through which electrons do not easily c) cannot be a pure chemical element d) must be a crystal

25- A conductor is distinguished from an insulator with the same number of atoms by the number of:

a) nearly free atoms b) electrons c) nearly free electrons d) protons

(25)

جامعة أم القرى
كلية العلوم التطبيقية
قسم الفيزياء

امتحان دوري ثاني كهربية و مغناطيسية (٢٠١٧)
الزمن: ٢ساعة
أستاذ المادة :.د/ احمد محمد الهادي

الاسم :
الرقم الجامعي:

Answer only three of the following questions

1. Choose the correct alternatives for the following

i. The electric field between two oppositely charged plates is equal to the product of the voltage and the plate separation. : (a) True, (b) False.

ii. When a negative charge is moved from a point of low potential to a point of high potential, its potential energy. : (a) increases; (b) decreases; (c) increases and then decreases; (d) all of above.

iii. If plates of capacitor are oppositely charged then total charge is equal to (a) positive; (b) negative; (c) zero; (d) infinite.

iv. If charge stored on plates of capacitor is large, then capacitance will be (a) small; (b) large; (c) zero; (d) all of above.

v. Rate of flow of charge through cross-sectional area is known as (a) current; (b) voltage; (c) acceleration); (d) meter.

2. Define Electric Potential Energy at point P. One charge q1 = 3-nC is located 2 m away from another charge q2 =40 μC. what is the potential energy.?.

3. State the law for connecting the parallel and series capacitors.
If capacitance of a parallel plate capacitor is 100μF and potential difference is 70V, what is quantity of charge stored on each plate .

4. Write the electric current, current density and drift speed (v_d).
What is the current flowing through a conductor, when 2×10^7 electrons pass in 1 μsec .

With the wishes of all the success
Assoc. Prof. Dr. El-hadi, Ahmed

جامعة أم القرى
كلية العلوم التطبيقية
قسم الفيزياء
الأسبوع الخامس

امتحان دوري اول كهربية ومغناطيسية
الزمن: ٢ساعة
أستاذ المادة : د/ احمد محمد الهادي

الاسم :	الرقم الجامعي:

(اختار 3 فقرات، كل فقرة 5 درجه)

Choose only 3 question.

1. What must be the distance between charge $q_1 = 26.3\ \mu c$ and charge $q_2 = -47.1\ \mu c$. If the attractive force between them is = 5.66 N.
2. Cupper penny (coin) with mass m = 3.1 g having electrically neutral, contains equal amount of positive and negative charge. What is the magnitude of these equal charges. (if molar mass of copper 63.5 g/mol. , Avogadro number = 6.02×10^{23} atoms/ mol. , atomic number for copper =29, electron charge = 1.6×10^{-19}).
3. Define the electrical flux, derivation of Gauss's Law from Coulomb's Law.
4. Two sheets carry charges with surface charge density $+\sigma$ and $-\sigma$. Find the electric field at point (a) to left sheets, (b) between them, (c) to right sheets, if the non-conducting.

5. Define the electrical dipole, An electrical dipole consists of charges +2e and -2e separated by 0.78 nm in electric field = 3.4×10^{6} N/C. calculate the magnitude of the torque on the dipole when the dipole moment is (a) parallel, (b) at right angle, (c) opposite to electric field.

مع تحياتي للجميع بالتوفيق و النجاح
د/ احمد محمد الهادي

جامعة أم القرى
كلية العلوم التطبيقية
قسم الفيزياء

Quiz in electricity and امتحان
(2017) magnetic
الزمن: ٢ساعة
أستاذ المادة :.د/ احمد محمد الهادي

الرقم الجامعي:

الاسم :

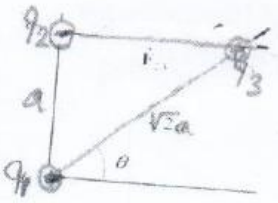
1. Choose the correct alternatives for the following

i. If we have a positive and a negative charge, then force between them is: (a) positive, (b) negative, (c) zero and (d) infinite.

ii. Electrical force applied by two point charges on each other is inversely proportional to: (a) sum of their charges; (b) product of their charges ; (c) distance between them; (d) square of distance between them.

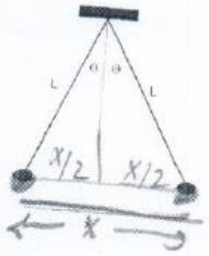
2.

Three charges are arranged as shown in Figure 2.3.1. Find the force on the charge q_3 assuming that $q_1 = 6.0\times10^{-6}C$, $q_2 = -q_1 = -6.0\times10^{-6}C$, $q_3 = +3.0\times10^{-6}C$ and $a = 2.0\times10^{-2}m$.



3. Two tiny conducting balls of identical mass m and identical charge q hang from non-conducting threads of θ length L. Assume that θ is so small that tan θ can be replaced by sin θ; show that. for equilibrium.

$$X = \left(\frac{q^2 L}{2\pi\varepsilon_0 mg}\right)^{1/3}$$



With the wishes of all the success
Assoc. Prof. Dr. El-hadi. Ahmed

Final Exam

Umm Al-Qura University
College of Applied Sciences
Physics Department

جامعة ام القرى
كلية العلوم التطبيقية
قسم الفيزياء

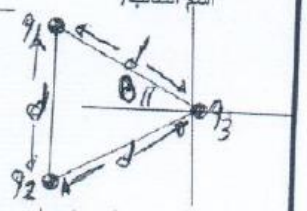
مقرر: كهربية و مغناطيسية برنامج: ١٤٣٧ الفصل الدراسي: الاول فرع: العابدية الاختبار: النهائي
استاذ المادة: د/...احمد الهادي كود المقرر: 4- 4032121 الفترة: الزمن ساعتين. التاريخ: ١٥/ ٩/ 1439
اسم الطالب/ الرقم الجامعي/ شعبة/ الدرجة الكلية/ 40 درجة

Please answer Five questions only: أجب عن أربعة اسئلة فقط مما يلى

Question One [10 markts]

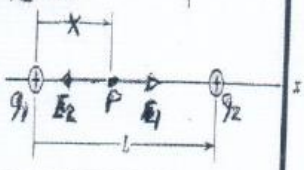
1. Three point charges of $q_1 = 1\mu C$, $q_2 = 1\mu C$, and $q_3 = 1\mu C$ are located at the corners of an equilateral triangle as shown in the figure. Calculate the net electric force on q_3 charge , d =1cm. $\theta = 30°$

توجد ثلاث شحنات نقطية من $q1 = 1\mu C$ ، $q2 = 1\mu C$ و $q3 = 1\mu C$ موضوعة في زوايا مثلث متساوي الأضلاع كما هو في الشكل المبين .
احسب صافي القوة الكهربائية على الشحنة q3 ، d = 1cm.



2. In the figure two positive point charges, $q_1 = +1.5\ \mu C$ and $q_2 = +2.3\ \mu C$ are separated in a vacuum by a distance of L=13 m. Find the point X at the net electric field is zero.

في الشكل يوجد اثنين من الشحنات النقطة الإيجابية، $q_1 = +1.5\ \mu C$ و $q_2 = +2.3\ \mu C$ يتم الفصل بينهم بمسافة $L = 13$ m . اوجد قيمة X التي عندها يصبح قيمة محصلة المجال الكهربائي هو صفر.



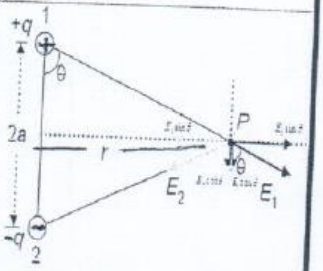
Question Two [10 markts]

1. Find the electric field due to electric dipole along x-axis at point p, which is a distance r from the origin, then assume $r >> a$.

أوجد المجال الكهربائي الناتج بسبب ثنائي القطب الكهربائي على طول المحور x في نقطة P، وهو مسافة r من الاصل، ثم افتراض r >>a.

2. An electric dipole consists of charges + 2e and -2e separated by 0.78 nm. It is an electric field of strength 3.4×10^6 N/C. Calculate the magnitude of torque on the dipole when the dipole moment is (a) parallel, (b) at right angle , and opposite to the electric field.

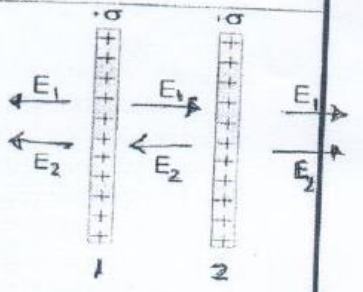
يتكون ثنائي القطب الكهربائي من شحنتين 2e- و 2e + مفصولة بمسافة ٠,٧٨ نانومتر .وقوة المجال الكهربائي تساوي 3.4×10^6 N/C . احسب عزم الدوران لثنائي القطب عندما تكون لحظة ثنائي القطب على مجال الكهربائي (أ) موازية، (ب) في الزاوية اليمنى، (ت) ومعاكس للمجال الكهربائي



Question Three [10 markts]

1. Two large non-conducting sheets of +ve charge face each other as shown in figure and carry charges with surface density $+\sigma$, What is E at points (i) to the left of the sheets (ii) between them and (iii) to the right of the sheets?.

شريحتين كبيرتان معزولين يحملان شحنة موجبة في وجه بعضهما البعض كما هو مبين في الشكل وتحمل الكثافة السطحية $\sigma +$ ، ما هو اجمالي E عند النقطة '١' إلى يمين الشريحة '٢' بينهما و '٣' على يسار الشريحة؟.



2. Define Electric Potential Energy at point P. One charge q1 = 3-nC is located 2 m away from another charge q2 =40 μC. what is the potential energy.?.

اوجد الطاقة الكهربائية المحتملة عند نقطة P. شحنة واحدة $q_1 = 3$-nC يقع ٢ متر بعيدا عن شحنة أخرى $q_2 = 40\ \mu C$. ما هي الطاقة الوضع الكهربية.

3. An electron is accelerated with kinetic energy 350 ev. It then enters a uniform magnetic field of magnitude 200 mT with its velocity perpendicular to the field. Calculate (a) the speed of the electron and (b) the radius of its path in the magnetic field.

يتم تسريع الإلكترون بواسطة الطاقة الحركية 350 ev. ثم يدخل حقل مغناطيسي منتظم قيمته 200 mT مع سرعته عمودي على المجال .أحسب (أ) سرعة الالكترون و (ب) نصف قطر مسارها في المجال المغناطيسي.

Question Four [10 markts]

1. What is a Capacitor?; type of capacitors, derivation the law of each type of capacitors.

ما هو المكثف؟ انوع المكثفات، اشتق القانون لكل نوع من المكثفات.

2. A capacitor has parallel metal plates of dimensions 1 cm×2 cm, separated by 8.85 mm. The plates have opposite charges of ± 100 μC. (i) How large is the capacitance?. (ii) What is a

Umm al-Qura University
Faculty of Applied Science
Physics Department
Date 16/04/1439 H

Final Exam
Electro-magnetism
physics Students
Duration: 120 min

Student Name: ..... Student ID Number :..... Serial Number: .....

Constants:

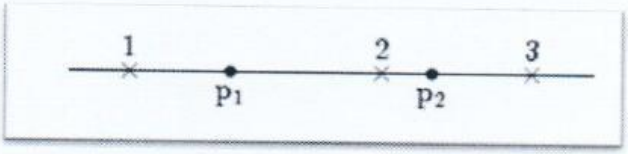
$k = \frac{1}{4\pi\varepsilon_0} = 8{,}99\times10^{9}$ $\quad \varepsilon_0 = 8.85\times10^{-12} C^2/Nm^2$ $\quad$ electron charge $= 1.6\times10^{-19}$C

Exercice 1: Choose the most correct answer (40 marks)

1- The magnitude electric field at a distance r from isolated point particle with charge q is:

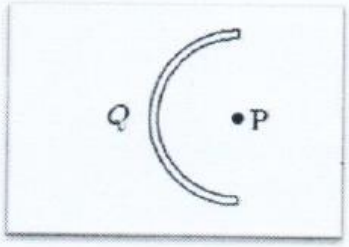
a) kq/r b) kr/q c) kr/r^3 d) kq/r^2

2- Two protons (p_1 and p_2) are on the axis, as shown below. The direction of the electric field at points 1, 2 and 3, respectively, are:



a) →, ←, → b) ←, →, ← c) →, ←, ← d) ←, ←, →

3- Positive charge Q is uniformly distributed on a semicircular rod. What is the direction of the electric field at a point P, the center of the semicircle?



a) ↑ b) ↓ c) → d) ←

4- A total charge of 6.3 10^{-8} C is distributed uniformly throughout a 2.7 cm radius sphere. The volume charge density is:

a) 3.7 10^{-7} C/m^3 b) 2.5 10^{-4} C/m^3 c) 6.9 10^{-6} C/m^3 d) 7.6 10^{-4} C/m^3

5- Charge is placed on the surface of a 2.7-cm radius isolated conducting sphere. The surface charge density is uniform and has the value 6.9 10^{-6} C/m^2. The total charge on the sphere is:

a) 5.6 10^{-10} C b) 2.1 10^{-8} C/ c) 6.3 10^{-8} C d) 9.5 10^{-3} C

6- When a piece of paper is held with on face perpendicular to a uniform electric field the flux through it is 25 $N.m^2/C$. When the paper is turned 25^0 respect to the field, the flux through it is:

a) 0 $N.m^2/C$ b) 23 $N.m^2/C$ c) 21 $N.m^2/C$ d) 12 $N.m^2/C$

7- A charged point particle is placed at the center of a spherical Gaussian surface. The electric flux ϕ_E is changed if:

a) the point charge is moved to just outside the sphere
b) the sphere is placed by a cube of the same volume
c) the sphere is replaced by a cube of one-tenth the volume
d) the point charge is removed off center (but still inside the original sphere)

8- A particle with charge of 5.5 10^{-8} C is 3.5 cm from a particle with charge of – 2.3 10^{-8} C. The potential energy of this two particle system, relative to the potential energy at infinite separation, is:

a) 3.2 10^{-4} J b) - 3.2 10^{-4} J c) 9.3 10^{-3} J d) – 9.3 10^{-3} J

9- The potential difference between two points is 100 V. If a particle with charge of 2 C is transported from one of these points to the other, the magnitude of the work done is:

a) 200 J b) 100 J c) 50 J d) 2 J

10- The equipotential surfaces associated with a charged point particles are:

a) radially outward from the particle
b) vertical planes
c) concentric spheres centred at the particle
d) horizontal planes

11- The units of capacitance are equivalent to:

a) J/C b) C^2/J c) V/C d) C/J

12- Each plate of a capacitor stores a charge of magnitude 1 mC when a 100 V potential difference is applied. The capacitance is:

a) 10 μF b) 5 μF c) 50 μF d) 100 μF

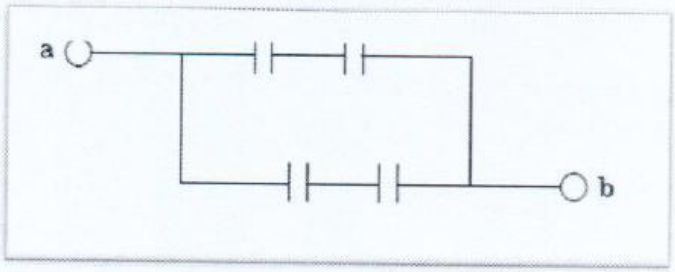
13- A parallel-plate capacitor has a plate area of 0.2 m^2 and a plate separation of 0.1 m. if the charge on each plate has a magnitude of 4.10^{-6} C the potential difference across the plates is approximately:

a) 4.10^{-2} V b) 10^2 V c) 2.10^{-2} V d) 4.10^8 V

14- Capacitors C_1 and C_2 are connected in series. The equivalent capacitance is given by:

a) $C_1C_2/(C_1 + C_2)$ b) $(C_1 + C_2)/C_1C_2$ c) $1/(C_1 + C_2)$ d) $C_1 + C_2$

15- The diagram shows four 6-μF capacitors. The capacitance between points **a** and **b** is:



a) 3 μF b) 4 μF c) 6 μF d) 9 μF

16- A charged capacitor stores 10 C at 40 V. Its stored energy is:

a) 400 J b) 4 J c) 0.2 J d) 200 J

17- The quantity $(1/2)\,\varepsilon_0 E^2$ has the sgnificance of:

a) energy /coulomb b) energy/farad c) Energy/volume d) energy/volt

18- In the formul a $\vec{F} = q\vec{v} \times \vec{B}$:

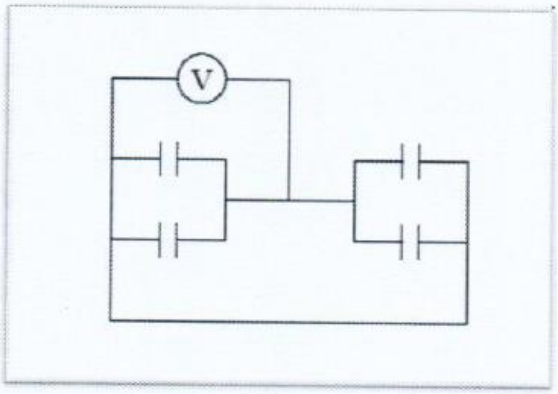
a) $\vec{F}$ must be perpendicular to $\vec{v}$ but not necessarily to $\vec{B}$

b) $\vec{F}$ must be perpendicular to $\vec{B}$ but not necessarily to $\vec{v}$

c) all three vectors must be mutually perpendicular

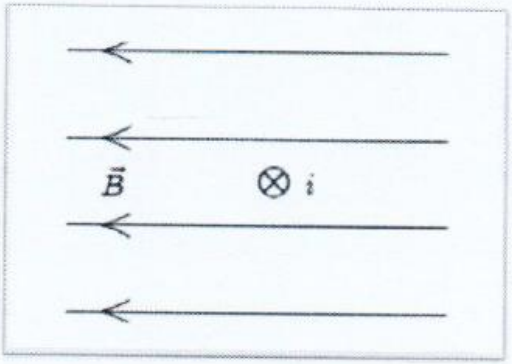
d) $\vec{F}$ must be perpendicular to both $\vec{v}$ and $\vec{B}$

19- Each of the four capacitors shown is 500 μF. The voltmeter reads 1000 V. The magnitude of the charge, in coulombs, on each capacitor plate is:



a) 0.2 b) 0.5 c) 20 d) 50

20 - The figure shows a uniform magnetic field $\vec{B}$ directed to the left and a wire carrying a current into the page. The magnetic force acting on the wire is:



a) Toward the top of the page

b) Toward the bottom of the page

c) Toward the left

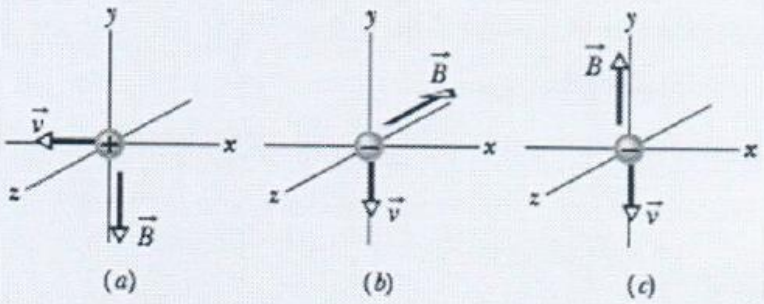
d) Toward the right

Exercice 2: (6 marks)

A parallel-plate capacitor has a capacitance of 100 pF, a plate area of 100 cm^2, and a mica dielectric ($\kappa = 5.4$) completely filling the space between the plates. At 50 V potential difference, calculate (a) the electric field magnitude E in the mica, (b) the magnitude of the free charge on the plates, and (c) the magnitude of the induced surface charge on the mica.

Exercice 2: **(4 marks)**

The figure shows three situations in which a charged particle with velocity $\vec{v}$ travels through a uniform magnetic field $\vec{B}$. In each situation, what is the direction of the magnetic force $\vec{F}_B$ on the particle?



Umm al-Qura University
Faculty of Applied Science
Physics Department
Date 16/04/1439 H

Final Exam
Electro-magnetism
physics Students
Duration: 120 min

Student Name: ..... Student ID Number :..... Serial Number: .....

Constants:

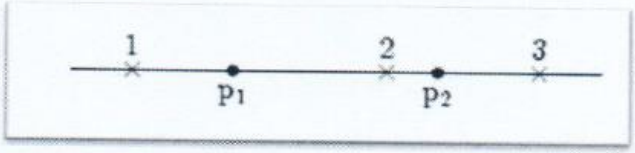
$k = \frac{1}{4\pi\varepsilon_0} = 8{,}99\times10^{9}$ $\quad \varepsilon_0 = 8.85\times10^{-12} C^2/Nm^2$ $\quad$ electron charge $= 1.6\times10^{-19}$ C

Exercice 1: Choose the most correct answer (40 marks)

1- The magnitude electric field at a distance r from isolated point particle with charge q is:

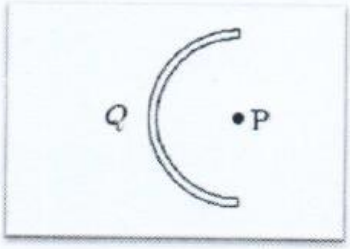
a) kq/r b) kr/q c) kr/r^3 d) <u>kq/r^2</u>

2- Two protons (p_1 and p_2) are on the axis, as shown below. The direction of the electric field at points 1, 2 and 3, respectively, are:



a) →, ←, → b) ←, →, ← c) →, ←, ← <u>d) ←, ←, →</u>

3- Positive charge Q is uniformly distributed on a semicircular rod. What is the direction of the electric field at a point P, the center of the semicircle?



a) ↑ b) ↓ c) <u>→</u> d) ←

4- A total charge of 6.3 10^{-8} C is distributed uniformly throughout a 2.7-cm radius sphere. The volume charge density is:

a) 3.7 10^{-7} C/m^3 b) 2.5 10^{-4} C/m^3 c) 6.9 10^{-6} C/m^3 d) <u>7.6 10^{-4} C/m^3</u>

5- Charge is placed on the surface of a 2.7-cm radius isolated conducting sphere. The surface charge density is uniform and has the value 6.9 10^{-6} C/m^2. The total charge on the sphere is:

a) 5.6 10^{-10} C b) 2.1 10^{-8} C/ c) <u>6.3 10^{-8} C</u> d) 9.5 10^{-3} C

6- When a piece of paper is held with on face perpendicular to a uniform electric field the flux through it is 25 $N.m^2/C$. When the paper is turned 25^0 respect to the field, the flux through it is:

a) 0 $N.m^2/C$ b) 23 $N.m^2/C$ c) 21 $N.m^2/C$ d) 12 $N.m^2/C$

7- A charged point particle is placed at the center of a spherical Gaussian surface. The electric flux ϕ_E is changed if:

a) the point charge is moved to just outside the sphere
b) the sphere is placed by a cube of the same volume
c) the sphere is replaced by a cube of one-tenth the volume
d) the point charge is removed off center (but still inside the original sphere)

8- A particle with charge of 5.5 10^{-8} C is 3.5 cm from a particle with charge of – 2.3 10^{-8} C. The potential energy of this two particle system, relative to the potential energy at infinite separation, is:

a) 3.2 10^{-4} J b) - 3.2 10^{-4} J c) 9.3 10^{-3} J d) – 9.3 10^{-3} J

9- The potential difference between two points is 100 V. If a particle with charge of 2 C is transported from one of these points to the other, the magnitude of the work done is:

a) 200 J b) 100 J c) 50 J d) 2 J

10- The equipotential surfaces associated with a charged point particles are:

a) radially outward from the particle
b) vertical planes
c) concentric spheres centred at the particle
d) horizontal planes

11- The units of capacitance are equivalent to:

a) J/C b) C^2/J c) V/C d) C/J

12- Each plate of a capacitor stores a charge of magnitude 1 mC when a 100 V potential difference is applied. The capacitance is:

a) 10 μF b) 5 μF c) 50 μF d) 100 μF

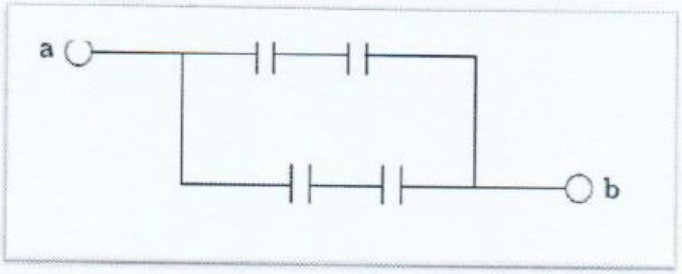
13- A parallel-plate capacitor has a plate area of 0.2 m^2 and a plate separation of 0.1 m. if the charge on each plate has a magnitude of 4.10^{-6} C the potential difference across the plates is approximately:

a) 4.10^{-2} V b) 10^2 V c) 2.10^{-2} V d) 4.10^8 V

14- Capacitors C_1 and C_2 are connected in series. The equivalent capacitance is given by:

a) $C_1C_2/(C_1 + C_2)$ b) $(C_1 + C_2)/C_1C_2$ c) $1/(C_1 + C_2)$ d) $C_1 + C_2$

15- The diagram shows four 6-μF capacitors. The capacitance between points **a** and **b** is:



a) 3 μF b) 4 μF c) 6 μF d) 9 μF

16- A charged capacitor stores 10 C at 40 V. Its stored energy is:

a) 400 J b) 4 J c) 0.2 J d) 200 J

17- The quantity $(1/2)\ \varepsilon_0 E^2$ has the significance of:

a) energy /coulomb b) energy/farad c) Energy/volume d) energy/volt

18- In the formul a $\vec{F} = q\vec{v} \times \vec{B}$:

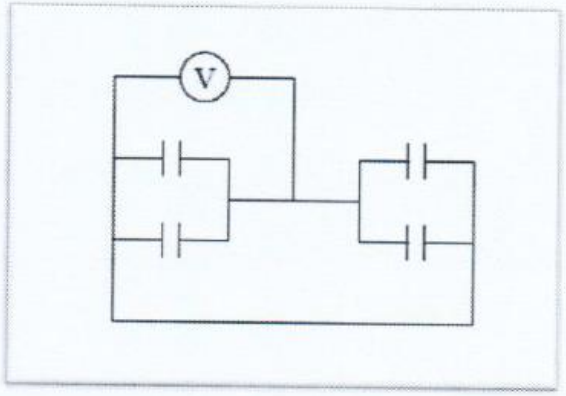
a) $\vec{F}$ must be perpendicular to $\vec{v}$ but not necessarily to $\vec{B}$

b) $\vec{F}$ must be perpendicular to $\vec{B}$ but not necessarily to $\vec{v}$

c) all three vectors must be mutually perpendicular

d) $\vec{F}$ must be perpendicular to both $\vec{v}$ and $\vec{B}$

19- Each of the four capacitors shown is 500 μF. The voltmeter reads 1000 V. The magnitude of the charge, in coulombs, on each capacitor plate is:



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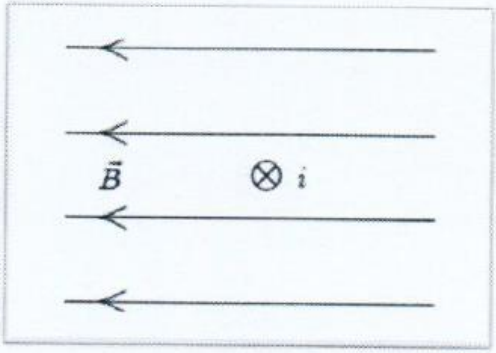

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Exercice 2: (6 marks)

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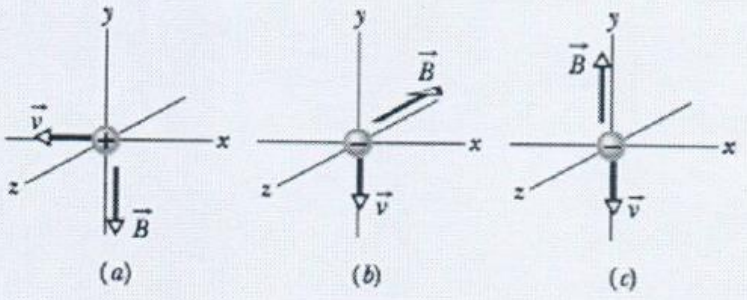


Model Answer Mid exam

①

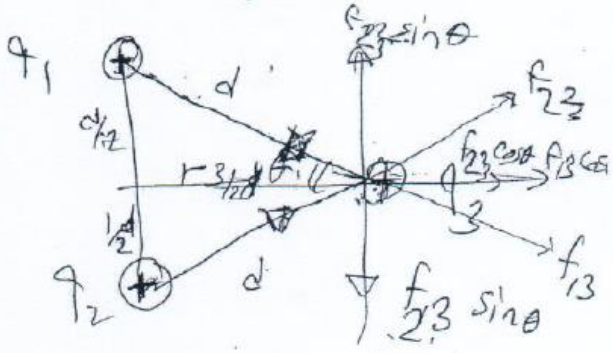
$f_{13} = \frac{K q_1 q_3}{d^2}$

$= \frac{9\times10^{+9}\times10^{-12}}{d^2}$

$f_{13} = \frac{9\times10^{-3}}{d^2}$

$f_{23} = K q_2 q_3$

$= \frac{9\times10^{9}\times10^{-12}}{d^2} = \frac{9\times10^{-3}}{d^2}$



$= d^2 - \frac{1}{4}d^2$

$= d^2\left(1-\frac{1}{4}\right) = \frac{3}{4}d^2$

$\theta = 30$

$f_x = f_{23}\cos\theta + f_{13}\cos\theta$

$f_{13} = \frac{9\times10^{-3}}{(0{,}01)^2} = \frac{9\times10^{-3}}{10^{-4}} = 90$

$f_{23} = 90$

$\frac{\sqrt{3}/2\, d}{d}$

$f_x = 90\times\frac{\sqrt{3}}{2} + 90\times\frac{\sqrt{3}}{2}$

$f_x = 2\times90\times\frac{\sqrt{3}}{2} = 90\sqrt{3}$

$f_y = 0$

$f_R = \sqrt{f_x^2 + f_y^2} = \sqrt{(90\sqrt{3}) + 0}$

$f_R = 90\sqrt{3}\ N = 155{,}8\ N = \boxed{156\ N}$

②

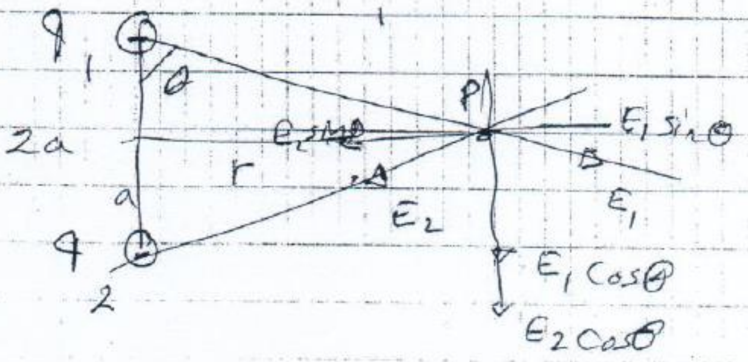
$\frac{K q_1}{x^2} = \frac{K q_2}{(L-x)^2}$

$x = \frac{L}{1+\sqrt{q_2/q_1}} = \frac{13\ cm}{1+\sqrt{2{,}3/1{,}5}} = 5{,}8\ cm$

Q2

Q_2

(a)



$$E_1 = \frac{kq_1}{a^2+r^2} = E_2 \qquad \cos\theta = \frac{a}{\sqrt{a^2+r^2}}$$

$$E_x = E_2 \sin\theta - E_1 \sin\theta = 0$$

$$E_y = E_1 \cos\theta + E_2 \cos\theta = 2E_1 \cos\theta$$

$$E_P = \frac{2kq}{(a^2+r^2)^1} \cdot \frac{a}{(a^2+r^2)^{1/2}}$$

when $r \geq a$.

$$E = \frac{k\,2aq}{(a^2+r^2)^{3/2}} = \frac{kP}{r^3}$$

(b) $\tau = P \cdot E \sin\theta$

E [illegible] p [illegible] θ [illegible]

$$P = q \cdot a = 2e \cdot a =$$

$$= 2\left[1{,}6\times10^{-19}\,C \times 0{,}78\times10^{-19}\,m\right]$$

$$= 2{,}5\times10^{-28}\,C \times 3{,}4\times10^{6}\,N/C = 8{,}5\times10^{-22}\,N\,m$$

(i) For parallel case $\theta = 0$, so $\sin\theta = 0$ and $\tau = 0$

(ii) For perpendicular $\cos\theta = 90^\circ$, so $\sin 90 = 1$, $\tau = 8{,}5\times10^{-22}$

(iii) For anti parallel $\cos\theta$ $\theta = 180^\circ$, so $\sin\theta = 0$, $\tau = 0$

Q (3)

السؤال الثالث

$$E = \frac{\sigma}{2\varepsilon_0}$$

(a) at point to left of two parallel sheets

$$E_T = -E_1 + (-E_2) = -2E$$

$$E = -\frac{\sigma}{\varepsilon_0}$$

(b) at point between the two sheets

$$E_T = E_1 + (-E_2) = \text{Zero}$$

(c) at point to the right of the two parallel sheets

$$E_T = E_1 + E_2 = 2E \Longrightarrow E = \frac{\sigma}{\varepsilon_0}$$

$$U = \frac{k q_1 q_2}{r}$$

(2)

$$U = \frac{9\times10^9 \times -3\times10^{-9} \times 40\times10^{-6}}{3}$$

$$U = 9 \times -3 \times 20 \times 10^{-6} = 540\ \mu J$$

(3)

$$B = 200\times10^{-3}\ T = 0,2\ T$$

$$K.E = 350\ eV = 350 \times 1,6\times10^{-19}\ J$$

$$V = \sqrt{\frac{2K.E}{m_e}} = 1,11\times10^7\ m/s$$

$$r = \frac{m_e v}{eB} = \frac{9,11\times10^{-31} \times 1,11\times10^7}{1,6\times10^{-19} \times 0,2} = 0,316\ mm$$

$r = 0,316$ mm

[illegible]

Q4

capacitor is consists of two conductors

(a) capacitor is devices To store the charge and to store energy

* parallel plate capacitors

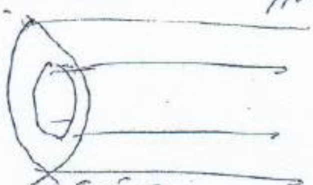
$\varepsilon_0 E dA = q$

$q = \varepsilon_0 E \cdot A$, $V_f - V_i = E \cdot d$

$C = Q/V = \varepsilon_0 E \cdot A / E \cdot d$

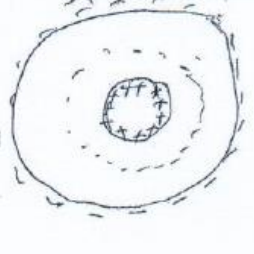
$$C = \varepsilon_0 A/d$$, $\varepsilon_0 = 8.85 \times 10^{-12}\ C^2/N \cdot m^2$

* cylindrical capacitor



$q = \varepsilon_0 E A = \varepsilon_0 E\, 2\pi r L$

$E = q / 2\pi\varepsilon_0 L r$



$V = \int_-^+ E ds = -\frac{q}{2\pi\varepsilon_0 L}\int_b^a \frac{dr}{r}$

$= \frac{q}{2\pi\varepsilon_0 L} \ln\left(\frac{b}{a}\right)$

$$C = Q/V = \frac{2\pi\varepsilon_0 L}{\ln(b/a)}$$

*** spherical capacitor

$q = \varepsilon_0 E A = \varepsilon_0 E (4\pi r^2)$

$\Rightarrow E = \frac{kq}{r^2}$, $V = \int_-^+ E ds = -kq\int_b^a \frac{dr}{r^2}$

$= kq\left[\frac{1}{a} - \frac{1}{b}\right] = kq\left[\frac{b-a}{a \cdot b}\right]$

$$C = Q/V = 4\pi\varepsilon_0 \frac{ab}{b-a}$$

*** isolated sphere

~~$C = 4\pi\varepsilon_0 \frac{a}{4\pi a}$~~ $C = 4\pi\varepsilon_0 R$

$A = 4\pi r^2 = 2\times10^{-4}\ m^2$

$d = 8{,}85\times10^{-3}\ m$

$q = 100\,\mu C$

$$C = \frac{q}{V}$$

$$C = \frac{\varepsilon_0 A}{d} = \frac{8{,}85\times10^{-12}\cdot 2\times10^{-4}}{8{,}85\times10^{-3}}$$

$$C = 2\times10^{-13} = 0{,}20\times10^{-12} = 0{,}2\ pf$$

(ii) $$U = \frac{1}{2}\frac{q^2}{C} = \frac{q^2}{2C} = \frac{(100)^2}{2\times0{,}2\times10^{-12}}$$

$$= \frac{10^4}{4\times10^{-13}} = 925\times10^{17}$$

$$U = 25\times10^{15}\ J =$$

(iii) $V = E\cdot d \Rightarrow E = V/d$

$$C = q/V \Rightarrow V = \frac{q}{C} = \frac{100}{0{,}2\times10^{-12}}$$

$$= \frac{10^2}{2\times10^{15}} = \frac{1}{2}\frac{\times10^2\times10^{-4}}{10^{-15}} = 0{,}5\times10^{15}\ Volt = 5\times10^{12}\ Volt$$

$10^{-2}\times10^{13}$

10^{11}

$$E = \frac{5\times10^{12}}{8{,}85\times10^{-3}} = 0{,}564\times10^{15}$$

Q5 السؤال الخامس

$A = 3\times10^{-6}\ m^2$, $I = 10\ A$

$$v_d = \frac{J}{n\cdot e} \quad , J = \frac{I}{A}$$

$$v_d = \frac{I}{n\cdot e\cdot A} = \frac{10}{3\times10^{-6}\cdot 1,6\times10^{-19}\times 8,48\times10^{22}}$$

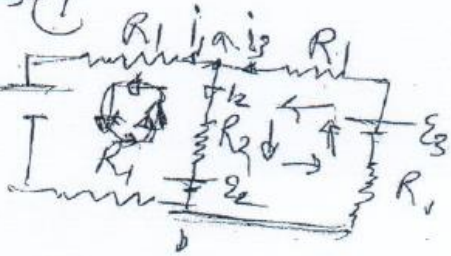
$$v_d = \frac{10}{3\times1,6\times8,48\times10^{-3}}$$

$$= \frac{10}{3\times16\times848\times10^{-6}} = \frac{10^7}{3\times16\times848}$$

$$v_d = \frac{10^7}{40704} = 245,6\ m/s$$

$$v_d \simeq 246\ m/s$$

$i_3 = i_2 + i_1$ → (1)



Loop I

$\varepsilon_2 - \varepsilon_1 - 2R_1 i_1 + R_2 i_2 = 0$

$4 - 2\times1\times i_1 + 2i_2 = 0$ → (2)

$2 - 2i_1 + 2i_2 = 0$ → (2)

Loop II

$\varepsilon_3 - \varepsilon_1 - 2R_1 i_3 - R_2 i_2 = 0$

$0 - 2i_3 - 2i_2 = 0$ → (3)

(3) و (2) نطرح

$-2i_1 - 2i_3 = -2$ → (4)

(1) نعوض في (4)

$-2i_1 - 2[i_2 + i_1] = -2 \Rightarrow -4i_1 - 2i_2 = -2$ → (5)

$2 - 2i_1 + 2i_2 = 0$ → (2)

$2 - 4i_1 - 2i_2 = 0$ → (5)

(5) + (2) نجمع

$4 - 6i_1 = 0$

$4 = 6i_1 \Rightarrow i_1 = \frac{4}{6}$

$i_1 = \frac{2}{3} = 0,66\ A$

$2 - 2\times0,66 + 2i_2 = 0$

$2 - 1,32 + 2i_2 = 0$

$0,68 + 2i_2 = 0$, $i_2 = \frac{-0,68}{2}$

$i_2 = -0,34$

السؤال السادس

Q6

(i) (a)

(ii) (a)

(iii) (a)

(iv) (b)

(v) $R = \frac{V}{I}$ ⇒ (b)

(VI) (b)

(VII) (b)

(VIII) (c)

(IX) (a)

(X) (b)

(Xi) (d)

Best Mark

Umm Al-Qura University

College of Applied Sciences

Physics Department

جامعة ام القرى

كلية العلوم التطبيقية

قسم الفيزياء

Exam:..... Date:.....

Program:	Course:	Course Code:

Name:..... Student I.D: 437005501.....

Academic year:..... Level /Semester .....

Question	Mark	Signature
Question 1	5	
Question 2		
Question 3	5	
Question 4	4	
Question 5	8	
Question 6	9	
Question 7		
Question 8		
Question 9		
Total mark	27/40	Exam Committee

(الاجابة النموذجية)

① ① left

$E = -E_1 - E_2 = -2E$

$= -\frac{\sigma}{2\varepsilon_0} - \frac{\sigma}{2\varepsilon_0} = \frac{-2\sigma}{2\varepsilon_0}$

② betwen

$E = E_1 - E_2 = zero$

$= \frac{\sigma}{2\varepsilon_0} - \frac{\sigma}{2\varepsilon_0} = zero$

③ right

$E = E_1 + E_2 = 2E$

$= \frac{\sigma}{2\varepsilon_0} + \frac{\sigma}{2\varepsilon_0} = \frac{2\sigma}{2\varepsilon_0}$

② $E = \frac{k q_1 q_2}{r^2}$

$q_1 = 3\,nC \Rightarrow 3\times10^{-9}\,C$

$q_2 = 40\,\mu C \Rightarrow 40\times10^{-6}\,C$

$r = 4\,m$

$= \frac{(9\times10^{9})(3\times10^{-9})(40\times10^{-6})}{4^2}$

$= 6.75\times10^{-5}\ C/m$

(5)

(4.1/1.5/6)

(1)

① $C = 4\pi\varepsilon_0 R$

② $C = 2\pi\varepsilon_0 \frac{L}{\ln(\frac{b}{a})}$

③ ~~$C = \frac{\varepsilon_0}{d}$~~ $C = \frac{\varepsilon \cdot A}{d}$

④ $C = 4\pi\varepsilon \frac{b \cdot A}{b - A}$

(2)

$A = A_1 \times 10^{-4}\ m$

$d = 8.85 \times 10^{-3}\ m$

$q = 100 \times 10^{-6}\ C$

$C = \frac{\varepsilon \cdot A}{d}$ (2)

$= \frac{(8.85 \times 10^{-12})(1 \times 10^{-4})}{8.85 \times 10^{-3}}$

$= 1 \times 10^{-13}$

(السؤال الخامس)

$R_1 = 1\,\Omega$

$R_2 = 2\,\Omega$

$\varepsilon_1 = 2\,V$

$\varepsilon_2 = \varepsilon_3 \Rightarrow 4\,V$

(2) $I_3 - I_1 - I_2 = 0$ ← (1)

$-R_1 I_1 - \varepsilon_1 - R_1 I_1 + \varepsilon_2 + R_2 I_2 = 0$

$-1 I_1 - 2 - 1 I_1 + 4 + 2 I_2$

$-2 I_1 + 2 I_2 = 2$ ← (2)

(5)

$\varepsilon_3 - R_1 I_3 - R_2 I_2 - \varepsilon_2 - R_1 I_3 = 0$

$-1 I_3 - 2 I_2 - 1 I_3 = 0$

$-2 I_3 - 2 I_2 = 0$ ← (3)

$I_3 - I_1 - I_2 = 0$

$-2 I_1 + 2 I_2 = 2$

$-2 I_3 \quad - 2 I_2 = 0$

$I_3 = 0.33$

$I_2 = -0.66$

$I_1 = 0.33$

(الإجابات النموذجية)

1) a ✓

2) a ✓

3) a ✓

4) b ✓

5) b ✓

6) a ✗

7) a ✗

8) c ✓

9) a ✓

10) b ✓

11) d ✓

a

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جامعة ام القرى

كلية العلوم التطبيقية

قسم الفيزياء

Exam:..... Date:.....

Program:	Course:	Course Code:

Name:.....محمد سالم العوفي..... Student I.D:...4.3.6.0.1.8.7.3.1.....

Academic year:..... Level /Semester .....

Question	Mark	Signature
Question 1	26	
Question 2	0	
Question 3	2	
Question 4		
Question 5		
Question 6		
Question 7		
Question 8		
Question 9		
Total mark	28/50	Exam Committee

(C)

$\{F = 0$

(2)

(a)

$\{F = v \cos$

$B \sin$

(B)

$\{F = v \sin$

$B \{ \cos \theta$

$\sin \theta$

$8,99 \times 10^{9}$

السؤال الثاني

$$E = k\frac{F}{A}$$

$$= 5.4\ \frac{100\times10^{-12}}{100\times10^{-2}} = 5.4\times10^{-12}\ \ N/m^2$$

$$\frac{V}{q} = \frac{50}{5.4\times10^{-10}} = 9.25\times10^{10}$$

Umm al-Quraa University
Faculty of Applied Science
Physics Department
Date 16/04/1439 H

Final Exam
Electro-magnetism
physics Students
Duration: 120 min

Student Name: ..... Student ID Number :...436019731..... Serial Number: .....

Constants:

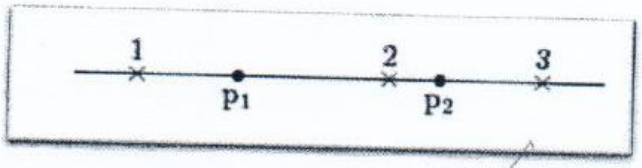
$k = \frac{1}{4\pi\varepsilon_0} = 8{,}99\times10^{9}$ $\quad \varepsilon_0 = 8.85\times10^{-12}\,C^2/Nm^2$ $\quad$ electron charge $= 1.6\times10^{-19}$ C

Exercice 1: Choose the most correct answer (40 marks)

1- The magnitude electric field at a distance r from isolated point particle with charge q is:

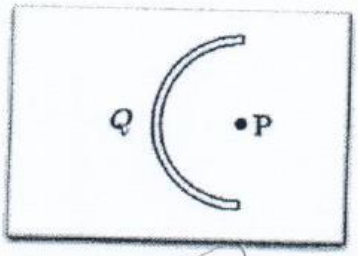
a) kq/r b) kr/q c) kr/r^3 d) kq/r^2

2- Two protons (p_1 and p_2) are on the axis, as shown below. The direction of the electric field at points 1, 2 and 3, respectively, are:



a) →, ←, → b) ←, →, ← c) →, ←, ← d) ←, ←, →

3- Positive charge Q is uniformly distributed on a semicircular rod. What is the direction of the electric field at a point P, the center of the semicircle?



a) ↑ b) ↓ c) → d) ←

2,33 **4-** A total charge of 6.3 10^{-8} C is distributed uniformly throughout a 2.7 cm radius sphere. The volume charge density is:

a) 3.7 10^{-7} C/m^3 b) 2.5 10^{-4} C/m^3 c) 6.9 10^{-6} C/m^3 d) 7.6 10^{-4} C/m^3

5- Charge is placed on the surface of a 2.7-cm radius isolated conducting sphere. The surface charge density is uniform and has the value 6.9 10^{-6} C/m^2. The total charge on the sphere is:

a) 5.6 10^{-10} C b) 2.1 10^{-8} C/ c) 6.3 10^{-8} C d) 9.5 10^{-3} C

6- When a piece of paper is held with on face perpendicular to a uniform electric field the flux through it is 25 $N.m^2/C$. When the paper is turned 25^0 respect to the field, the flux through it is:

a) 0 $N.m^2/C$ b) 23 $N.m^2/C$ c) 21 $N.m^2/C$ d) 12 $N.m^2/C$

7- A charged point particle is placed at the center of a spherical Gaussian surface. The electric flux ϕ_E is changed if:

a) the point charge is moved to just outside the sphere
b) the sphere is placed by a cube of the same volume
c) the sphere is replaced by a cube of one-tenth the volume
d) the point charge is removed off center (but still inside the original sphere)

8- A particle with charge of 5.5 10^{-8} C is 3.5 cm from a particle with charge of $-$ 2.3 10^{-8} C. The potential energy of this two particle system, relative to the potential energy at infinite separation, is:

a) 3.2 10^{-4} J b) - 3.2 10^{-4} J c) 9.3 10^{-3} J d) $-$ 9.3 10^{-3} J

9- The potential difference between two points is 100 V. If a particle with charge of 2 C is transported from one of these points to the other, the magnitude of the work done is:

a) 200 J b) 100 J c) 50 J d) 2 J

10- The equipotential surfaces associated with a charged point particles are:

a) radially outward from the particle
b) vertical planes
c) concentric spheres centred at the particle
d) horizontal planes

11- The units of capacitance are equivalent to:

a) J/C b) C^2/J c) V/C d) C/J

12- Each plate of a capacitor stores a charge of magnitude 1 mC when a 100 V potential difference is applied. The capacitance is:

a) 10 μF b) 5 μF c) 50 μF d) 100 μF

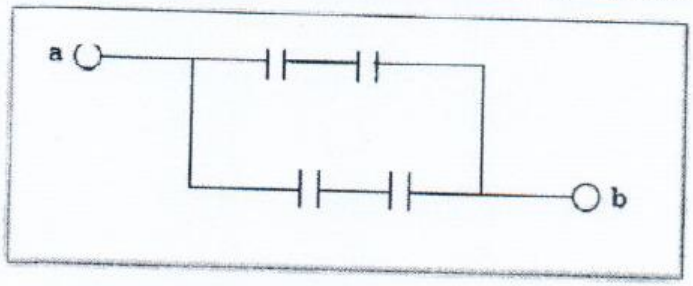
13- A parallel-plate capacitor has a plate area of 0.2 m^2 and a plate separation of 0.1 m. if the charge on each plate has a magnitude of 4.10^{-6} C the potential difference across the plates is approximately:

a) 4.10^{-2} V b) 10^2 V c) 2.10^{-2} V d) 4.10^8 V

14- Capacitors C_1 and C_2 are connected in series. The equivalent capacitance is given by:

a) $C_1C_2/(C_1 + C_2)$ b) $(C_1 + C_2)/C_1C_2$ c) $1/(C_1 + C_2)$ d) $C_1 + C_2$

15- The diagram shows four 6-μF capacitors. The capacitance between points **a** and **b** is:



a) 3 μF b) 4 μF c) 6 μF d) 9 μF

16- A charged capacitor stores 10 C at 40 V. Its stored energy is:

a) 400 J b) 4 J c) 0.2 J d) 200 J

17- The quantity $(1/2)\ \varepsilon_0 E^2$ has the sgnificance of:

a) energy /coulomb b) energy/farad c) Energy/volume d) energy/volt

18- In the formul a $\vec{F} = q\vec{v} \times \vec{B}$:

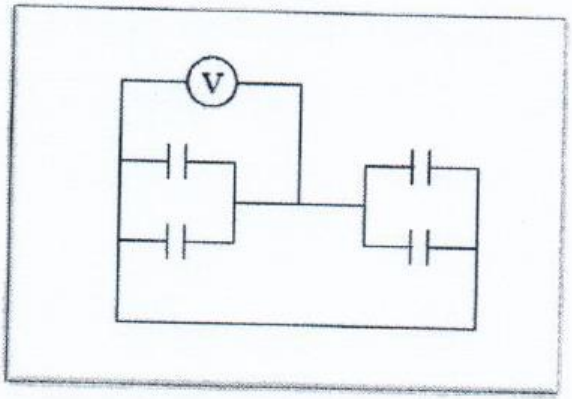
a) $\vec{F}$ must be perpendicular to $\vec{v}$ but not necessarily to $\vec{B}$

b) $\vec{F}$ must be perpendicular to $\vec{B}$ but not necessarily to $\vec{v}$

c) all three vectors must be mutually perpendicular

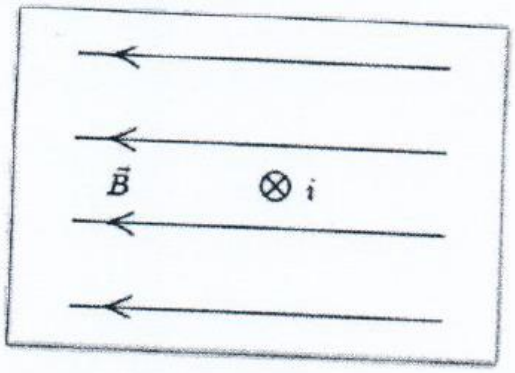
d) $\vec{F}$ must be perpendicular to both $\vec{v}$ and $\vec{B}$

19- Each of the four capacitors shown is 500 μF. The voltmeter reads 1000 V. The magnitude of the charge, in coulombs, on each capacitor plate is:



a) 0.2 b) 0.5 c) 20 d) 50

20 - The figure shows a uniform magnetic field $\vec{B}$ directed to the left and a wire carrying a current into the page. The magnetic force acting on the wire is:



a) Toward the top of the page

b) Toward the bottom of the page

c) Toward the left

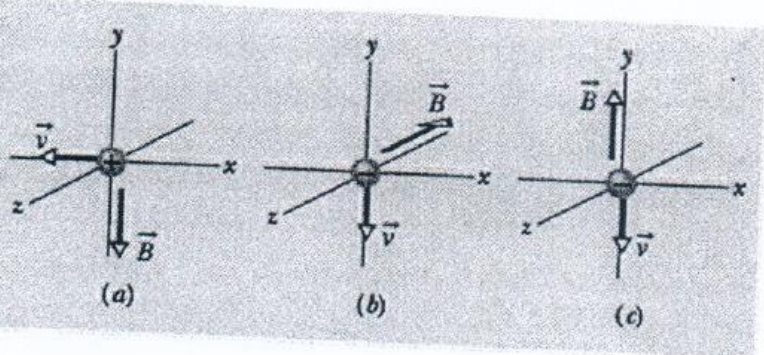
d) Toward the right

Exercice 2: (6 marks)

A parallel-plate capacitor has a capacitance of 100 pF, a plate area of 100 cm², and a mica dielectric ($\kappa = 5.4$) completely filling the space between the plates. At 50 V potential difference, calculate (a) the electric field magnitude E in the mica, (b) the magnitude of the free charge on the plates, and (c) the magnitude of the induced surface charge on the mica.

Exercice 3: (4 marks)

The figure shows three situations in which a charged particle with velocity $\vec{v}$ travels through a uniform magnetic field $\vec{B}$. In each situation, what is the direction of the magnetic force $\vec{F}_B$ on the particle?



Mid Mark

Umm Al-Qura University

College of Applied Sciences

Physics Department

جامعة ام القرى

كلية العلوم التطبيقية

قسم الفيزياء

Exam:.................................. Date:..................................

Program:	Course:	Course Code:

Name:.........[illegible]. Student I.D: 4370313..........

Academic year:.............................. Level /Semester ....

Question	Mark	Signature
Question 1	2	
Question 2	—	
Question 3	6	
Question 4	2	
Question 5	—	
Question 6	7	
Question 7		
Question 8		
Question 9		
Total mark	17 / 40	Exam Committee

Q1

1) $F_{13} = \frac{K q_1 q_3}{r_{13}^2} = \frac{(9\times10^9)(1\times10^{-6})(1\times10^{-6})}{1}$

$F_{23} = \frac{K q_2 q_3}{r_{23}^2} = \frac{(9\times10^9)(1\times10^{-6})(1\times10^{-6})}{1}$

2) $E = \frac{K q}{r^2}$

~~$q_1 = 1.5\times10^{-6}$~~

~~$q_2 =$~~

$q_1 = +1.5\times10^{-6}$

$q = 2.3\times10^{-6}$

$L = 13$

~~K~~ $K = 9\times10^9$

$E_1 = \frac{K q_1}{r^2}$

$E_2 = \frac{K q_1}{r^2}$

$E_1 = 79.88165568$

$E_2 = 122.4855\,2671$

$E = E_2 - E_1 = 42.6035\,5503$

Q4 8.85×10^{-12}

(1) $C = \frac{q}{V}$

~~Series~~ Parallel

$C = C_1 + C_2$

توالي

Series $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \dots \dots , \frac{C_1 \cdot C_2}{C_1 + C_2}$

(2) $A = 2$

$d = 8.85 \times 10^{-3}$

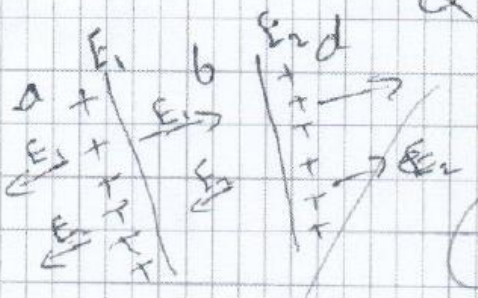
$q = 100 \times 10^{-6}$

(1) $C = \frac{E_0 \cdot A}{d}$

$C = \frac{8.85 \times 10^{-12} \times 2}{8.85 \times 10^{-3}} = 1 \times 10^{-21}$ F

$q = V \cdot C$ $V = \frac{q}{C} = 1 \times 10^{29}$ $\frac{C}{F}$

Q 3



(1)

(2)

a ⇒ $-E_1 - E_2$

b ⇒ $E_1 - E_2$

d ⇒ $E_1 + E_2$

(2) $U = \frac{K\, q_1 q_2}{r}$

$q_1 = 3 \times 10^{-9}$

$q_2 = 40 \times 10^{-6}$

$r = 2$

$U = \frac{(9\times10^{9})(3\times10^{-9})(40\times10^{-6})}{2}$

$U = 5.4 \times 10^{-4}$

(1)

3 $\frac{2Br}{m}$

Q#6

i) c ✗

ii) b ✓

iii) a ✓

iv) b ✓

v) b ✓

vi) c ✓

vii) b ✓

viii) a ✗

ix) a ✓

x) b ✓

xi) d ✓

7

Q5

(2)

$-2 + 1I_1 + 2I_1 - 2I_2 + 4 + 1I_1 = 0$

$$4I_1 - 2I_2 = -2$$

$-4 + 2I_2 - 2I_1 + 1I_2 + 4 + 1I_2$

$$4I_2 - 2I_1 = 0$$

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College of Applied Sciences

Physics Department

جامعة ام القرى

كلية العلوم التطبيقية

قسم الفيزياء

Exam:..... Date:.....

Program:	Course:	Course Code:

Name:..... عبد الله ... محمد ... كريطم ... محرس ... Student I.D:.....

Academic year:..... Level /Semester ....

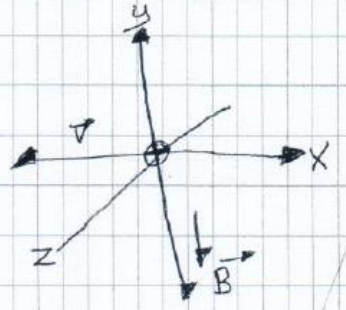
Question	Mark	Signature
Question 1	18	
Question 2	0	
Question 3	0	
Question 4		
Question 5		
Question 6		
Question 7		
Question 8		
Question 9		
Total mark	18 / 50	Exam Committee

Exercice1: (6 marks)

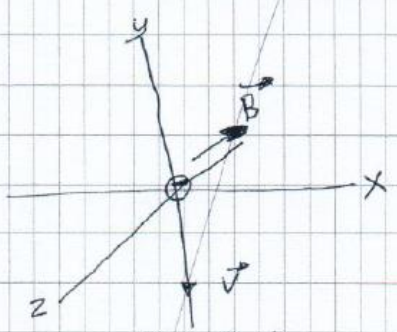
المعطيات:

100pF. a plate area of 100 cm^2

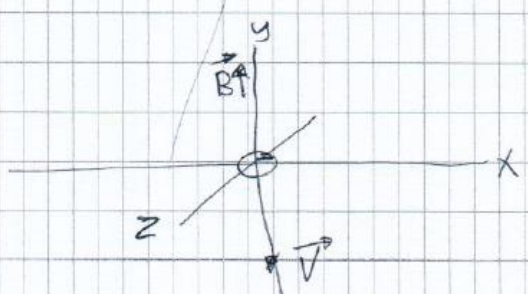
and a mica dielectric ($k = 5.4$) com.



(a) the electric field magnitude.



(b) the magnitude of the free charge on the free charg



(c) the magnitude of the induced surface on the mica.

Umm al-Quraa University
Faculty of Applied Science
Physics Department
Date 16/04/1439 H

Final Exam
Electro-magnetism
physics Students
Duration: 120 min

Student Name: ..... Student ID Number : 437030115 ..... Serial Number: .....

Constants:

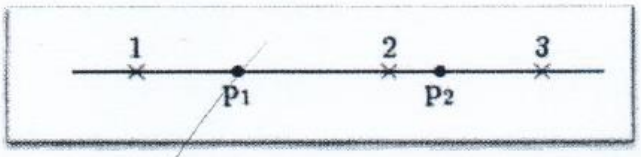
$k = \frac{1}{4\pi\varepsilon_0} = 8{,}99\times10^{9}$ $\quad \varepsilon_0 = 8.85\times10^{-12}\,C^2/Nm^2$ $\quad$ electron charge $= 1.6\times10^{-19}$ C

Exercice 1: Choose the most correct answer (40 marks)

1- The magnitude electric field at a distance r from isolated point particle with charge q is:

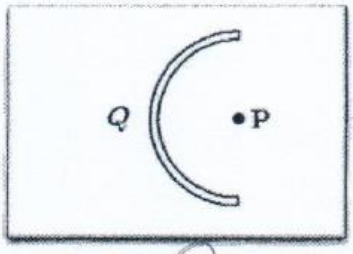
a) kq/r b) kr/q c) kr/r^3 (d) kq/r^2

2- Two protons (p_1 and p_2) are on the axis, as shown below. The direction of the electric field at points 1, 2 and 3, respectively, are:



a) →, ←, → (b) ←, →, ← c) →, ←, ← d) ←, ←, →

3- Positive charge Q is uniformly distributed on a semicircular rod. What is the direction of the electric field at a point P, the center of the semicircle?



a) ↑ b) ↓ (c) → d) ←

4- A total charge of 6.3 10^{-8} C is distributed uniformly throughout a 2.7 cm radius sphere. The volume charge density is:

(a) 3.7 10^{-7} C/m^3 b) 2.5 10^{-4} C/m^3 c) 6.9 10^{-6} C/m^3 d) 7.6 10^{-4} C/m^3

5- Charge is placed on the surface of a 2.7-cm radius isolated conducting sphere. The surface charge density is uniform and has the value 6.9 10^{-6} C/m^2. The total charge on the sphere is:

a) 5.6 10^{-10} C b) 2.1 10^{-8} C/ (c) 6.3 10^{-8} C d) 9.5 10^{-3} C

6- When a piece of paper is held with on face perpendicular to a uniform electric field the flux through it is 25 $N.m^2/C$. When the paper is turned 25^0 respect to the field, the flux through it is:

a) 0 $N.m^2/C$ b) 23 $N.m^2/C$ c) 21 $N.m^2/C$ d) 12 $N.m^2/C$

7- A charged point particle is placed at the center of a spherical Gaussian surface. The electric flux ϕ_E is changed if:

a) the point charge is moved to just outside the sphere
b) the sphere is placed by a cube of the same volume
c) the sphere is replaced by a cube of one-tenth the volume
d) the point charge is removed off center (but still inside the original sphere)

8- A particle with charge of 5.5 10^{-8} C is 3.5 cm from a particle with charge of – 2.3 10^{-8} C. The potential energy of this two particle system, relative to the potential energy at infinite separation, is:

a) 3.2 10^{-4} J b) - 3.2 10^{-4} J c) 9.3 10^{-3} J d) – 9.3 10^{-3} J

9- The potential difference between two points is 100 V. If a particle with charge of 2 C is transported from one of these points to the other, the magnitude of the work done is:

a) 200 J b) 100 J c) 50 J d) 2 J

10- The equipotential surfaces associated with a charged point particles are:

a) radially outward from the particle
b) vertical planes
c) concentric spheres centred at the particle
d) horizontal planes

11- The units of capacitance are equivalent to:

a) J/C b) C^2/J c) V/C d) C/J

12- Each plate of a capacitor stores a charge of magnitude 1 mC when a 100 V potential difference is applied. The capacitance is:

a) 10 μF b) 5 μF c) 50 μF d) 100 μF

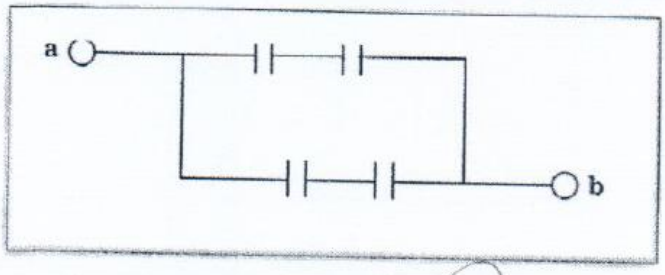
13- A parallel-plate capacitor has a plate area of 0.2 m^2 and a plate separation of 0.1 m. if the charge on each plate has a magnitude of 4.10^{-6} C the potential difference across the plates is approximately:

a) 4.10^{-2} V b) 10^2 V c) 2.10^{-2} V d) 4.10^8 V

14- Capacitors C_1 and C_2 are connected in series. The equivalent capacitance is given by:

a) $C_1C_2/(C_1 + C_2)$ b) $(C_1 + C_2)/C_1C_2$ c) $1/(C_1 + C_2)$ d) $C_1 + C_2$

15- The diagram shows four 6-μF capacitors. The capacitance between points **a** and **b** is:



a) 3 μF b) 4 μF c) 6 μF d) 9 μF

16- A charged capacitor stores 10 C at 40 V. Its stored energy is:

a) 400 J b) 4 J c) 0.2 J d) 200 J

17- The quantity $(1/2)\ \varepsilon_0 E^2$ has the sgnificance of:

a) energy /coulomb b) energy/farad c) Energy/volume d) energy/volt

18- In the formul a $\vec{F} = q\vec{v} \times \vec{B}$:

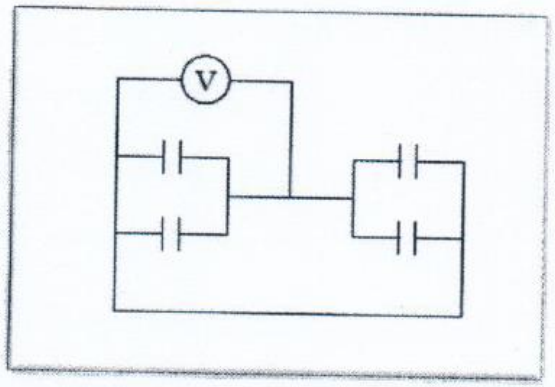
a) $\vec{F}$ must be perpendicular to $\vec{v}$ but not necessarily to $\vec{B}$

b) $\vec{F}$ must be perpendicular to $\vec{B}$ but not necessarily to $\vec{v}$

c) all three vectors must be mutually perpendicular

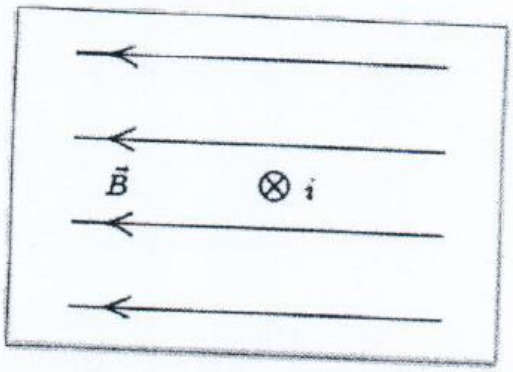
d) $\vec{F}$ must be perpendicular to both $\vec{v}$ and $\vec{B}$

19- Each of the four capacitors shown is 500 μF. The voltmeter reads 1000 V. The magnitude of the charge, in coulombs, on each capacitor plate is:



a) 0.2 b) 0.5 c) 20 d) 50

20 - The figure shows a uniform magnetic field $\vec{B}$ directed to the left and a wire carrying a current into the page. The magnetic force acting on the wire is:



a) Toward the top of the page

b) Toward the bottom of the page

c) Toward the left

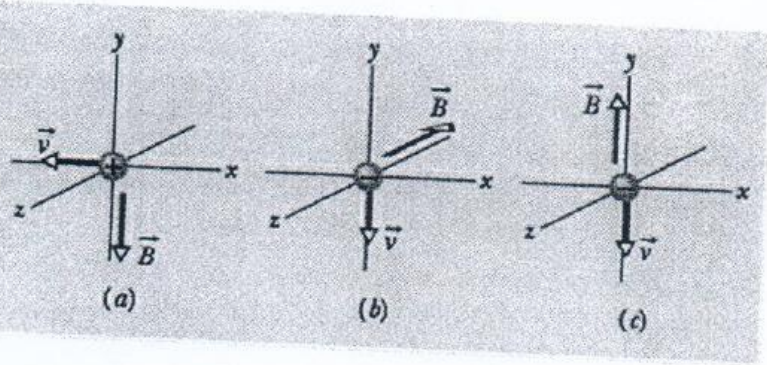
d) Toward the right

Exercice 2: (6 marks)

A parallel-plate capacitor has a capacitance of 100 pF, a plate area of 100 cm^2, and a mica dielectric ($\kappa = 5.4$) completely filling the space between the plates. At 50 V potential difference, calculate (a) the electric field magnitude E in the mica, (b) the magnitude of the free charge on the plates, and (c) the magnitude of the induced surface charge on the mica.

Exercice 3: (4 marks)

The figure shows three situations in which a charged particle with velocity $\vec{v}$ travels through a uniform magnetic field $\vec{B}$. In each situation, what is the direction of the magnetic force $\vec{F}_B$ on the particle?



Poor Mark

Umm Al-Qura University

College of Applied Sciences

Physics Department

جامعة ام القرى

كلية العلوم التطبيقية

قسم الفيزياء

Exam:..... Date:.....

Program:	Course:	Course Code:

Name:.....رضوان محمد حسين..... Student I.D:..437026533.....

Academic year:..... Level /Semester .....

Question	Mark	Signature
Question 1	2	
Question 2		
Question 3		
Question 4		
Question 5	4	
Question 6	5	
Question 7		
Question 8		
Question 9		
Total mark	10 / 40	Exam Committee

Question (1)

(1) فقرة

المعطيات :

$q_1 = 1\ \mu C$

$F = ?$

$q_2 = 1\ \mu C$

$q_3 = 1\ \mu C$

$d = 1\ cm \Rightarrow 0,01\ m$ نحولها

$\theta = 30°$

$F = k \frac{q_1 \cdot q_2}{d^2}$:الحل

$= \frac{(9 \times 10^9)(1)(1)}{(0,01)^2}$

$F = 9 \times 10^{13}\ N$

$F = q_3 \sin\theta$

$F = (9 \times 10^{13}) \sin 30°$

$F = 4,5 \times 10^{13}\ N$

Question (1)

(2) فقرة

المعطيات :

$q_1 = +1,5\ \mu C$

$q_2 = +2,3\ \mu C$

$L = 13\ m$

$X = ?$

$X = \frac{q_1 - q_2}{L}$:الحل

$= \frac{+1,5 - 2,3}{13}$

$X = 0,06 \times 10^{-11}\ m$

Qustion (3)

(2) فقرة

المعطيات :

$q_1 = 3\text{-}nC \Longrightarrow 3 \times 10^{-9}$

$q_2 = 40\ \mu C$

$r = 2\ m$

$E = ?$

الطاقة Electric Potential Energy

$E = \frac{k\, q_1 \cdot q_2}{r^2}$

$E = \frac{(9 \times 10^9)(3 \times 10^{-9})(40)}{(2)^2}$

$E = 270\ J$

Question 5

① المقاومة

المعطيات :-

$A = 3 \times 10^{-6}\ m^2$

$I = 10\ A$

$V_d = ?$

$J = ?$

$n = 8.48 \times 10^{22}$ electrons/cm^3

$e = 1.6 \times 10^{-19}\ C$

الحل :- نوجد أولا Aera

① $A = \frac{\pi}{4}(d)^2$

$= \frac{\pi}{4}(3 \times 10^{-6})^2$

$A = 7.07 \times 10^{-12}$

② $J = \frac{I}{A} = \frac{10}{7.07 \times 10^{-12}}$

$J = 1.41 \times 10^{12}$

③ $V_d = \frac{J}{ne}$

$= \frac{1.41 \times 10^{12}}{(8.48 \times 10^{22})(1.6 \times 10^{-19})}$

drift speed $V_d = 1.04 \times 10^{9}$

Question 5

② دارة

المعطيات :-

$R_1 = 1\ \Omega$

$R_2 = 2\ \Omega$

$\mathcal{E}_1 = 2\ V$

$\mathcal{E}_2 = 4\ V$

$\mathcal{E}_3 = 4\ V$

الحل :-

a) $I = \frac{\mathcal{E}}{R}$

$I_a = \frac{2}{1} = 2\ A$

$I_b = \frac{\mathcal{E}_2}{R_2} = \frac{4}{2} = 2\ A$

b)

$V_a - V_b$

$2 - 2 = 0$

Questio (6)

فقرة	أجابة	
1	a	✓
2	b	✗
3	a	✓
4	b	✓
5	c	✗
6	a	✗
7	a	✗
8	a	✗
9	a	✓
10	d	✗
11	d	✓

(5)

Curriculum Vitae

C.V.

Name:	Assoc. Prof. Dr. **Ahmed Mohamed El-Hadi**
	Ph.D. [Doctor of science (Dr. rar. nat.)] from Germany
	Permanent Address: 10 Ramadan city, magwra 23, El-Scharqie, Egypt.
	Mailing Address: Umm Al-Qura University , Makkah, Al-Abidiyya. Department physics, P.O. Box: 13174. Postal Code: 21955 , Kingdom of Saudi Arabia,
	Date - and place of birth: 17-10-1962, El sharkia-Egypt
	Nationality and Language speak: Egyptian, Arabic-Germany-English
	Families: Married, one son (Engineer) and two daughters (students)
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Academic career

Degree	*Institution*	country	*Year*
B. Sci.	Zagazig university	Egypt	1986
M. Sci.	Bielefeld university	Germany	1998
Ph.D,	Halle -Wittenberg university	Germany	2002
Dr.	Higher Institute of Eng. and Tech. 10 Ramadan city	Egypt	2003-2006
Dr.	Higher Institute of Eng. and Tech. El Arish	Egypt	2006-2007
Dr.	Umm Al Qura University	Saudi Arabia	2008-2017

Research and development projects over the last 5 years

project Name	Period	Amount of financing
1. Fabrication of Biopolymers nanofibers by electrospinning for medical applications and industries. (SABIC company for petrochemicals, Research & Consulting Center))	2011	
2. Improvement the physical properties of Poly lactic acid PLLA for medical applications and films for food packaging sectors (Institute of Scientific Research, project No. 43005001).	2012	
3. Manufacturing electrospun membranes from bioplastics for seawater desalination and wastewater treatment.	2017	

Industry collaborations over the last 5 years

Title	year
SABIC company for petrochemicals	2011

Important publications over the last 5 years

Author(s), Title, Publisher, place of publication, date of publication or name of periodical, volume, issue, page numbers

1. **Ahmed M. El-Hadi**, Fatma Y. Al-Jabri, Waleed J. Altaf: Higher dielectric properties of semiconducting biopolymer composites of poly(3-hydroxy butyrate) (PHB) with polyaniline (PANI), carbon black,and plasticizer, Polym. Bull. DOI 10.1007/s00289-017-2118-8.**(2017)**.

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2. **Ahmed M. El-hadi**: Increase the elongation at break of poly (lactic acid) composites for use in food packageing films, scientific Reports7:46767 | DOI: 10.1038/srep46767, nature.
3. **Ahmed M. El-Hadi**: Improvement of the Miscibility by Combination of Poly(3- hydroxy butyrate) PHB and Poly(propylene carbonate) PPC with Additives in Journal of Polymers and the Environment (**2016**).
4. **Ahmed M. El-Hadi**, Fatma Y. Al-Jabri: Influence of Electrospinning Parameters on Fiber Diameter and Mechanical Properties of Poly(3-Hydroxybutyrate) (PHB) and Polyanilines (PANI) Blends. Polymers 8 (3), 97, (**2016**).
5. GR Mitchell, SD Mohan, FJ Davis, K Ahn, M Al-Azab, **A El Hadi**, D Elliott, .: Structure Development in Electrospun Fibres, RSC Polymer Chemistry Series 14, 136-171(**2015**).
6. **Ahmed M. El-Hadi**: Development of novel biopolymer blends based on poly(L-lactic acid)(PLLA), poly((R)-3-hydroxybutyrate) (PHB) and plasticizer, in Polymer Engineering and Science 54 (6), 1394-1402, (**2014**),
7. **Ahmed M. El-Hadi**, Saeed D. Mohan, Fred J. Davis, Geoffrey R. Mitchell Enhancing the crystallization and orientation of electrospinning poly (lactic acid) (PLLA) by combining with additives, J. Poly. Res 21:605 (**2014**).
8. **Ahmed M. El-Hadi**: Investigation of the effect of nanoclay type on the non-isothermal crystallization kinetics and morphology of poly(3(R)-hydroxybutyrate) PHB/clay nanocomposites, polymer bulletin 71:1449-1470 (**2014**).
9. **Ahmed M. El-Hadi**: The Effect of Additives Interaction on the Miscibility and Crystal Structure of Two Immiscible Biodegradable Polymers, Polímeros 24 (1), 9-16 (**2014**).
10. **Ahmed M. El-Hadi**: Influence of microcrystalline cellulose fiber (MCCF) on the morphology of poly(3-hydroxybutyrate) (PHB), Colloid Polym Sci 91:743-756, (**2013**).
11. **Ahmed M. El-Hadi**: Effect of processing condition on the development of morphology features banded and non banded spherulites of poly (3-hydroxybutyrate) PHB and poly(lactic) PLLA blends. Polymer Engineering and Science 51 (11), 2191-2202, (**2011**) (www.freepatentsonline.com/article/ /272104919.html).
12. **Ahmed M. El-Hadi**: The effect of annealing treatments on spherulitic morphology and physical ageing on glass transition of poly lactic acid (PLLA). in Materials Sciences and Applications, 2011, Vol. 2, 439-443.
13. **Ahmed M. El-Hadi**: Study the influence of additives content on the thermal decomposition behaviour of poly (3-hydroxybutyrate) PHB in The 1 st International Conference of Chemical Industries Research Division, National Research Center, Cairo, 6-8 Des. 2004.

Supervision of Research Students:

Student Name	*Degree*	*Title*	*Year*
Nour Basfer	M.Sci.	Study of some Mechanical, Electrical and optical Properties of Silicon	2013
Fatma Al-gabri	M.Sci.	Biodegradable Conductive Composites: Preparation, Characterization and Applications	2015
Hanan makallawi	M.Sci.	Effect of Plasticizers type and concentration on mechanical Properties and Biodegradability of Cellulose Blends	2017

Research and Teaching Experience

1. My scientific research is focused on biodegradable polymers like poly(3-hydroxybutyrate) PHB, poly lactic acid (PLLA), starch and polysaccharides (cellulose, chitin). I am trying to study and understand the relations between macromolecular structure and physical properties and end use properties of polymers for development of new applications of biopolymer to use in medicine and packaging materials for deep drawing article in food sector. The mechanical, dielectrically , thermal, rheological, optical properties and also relaxation, glass transition temperature, crystallization kinetics, nucleation, morphology,

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spherulite growth, polymer composites.

2. Manufacturing and characterization of Nano fibers by electro spinning for used in medicine, wound dressing, pampers for children and the treatment of drinking water desalination and sewage treatment.
3. Study the effect of polyaniline (PANI), carbon black, multiwall carbon nano tube (MWCNT), graphite , graphene oxide and plasticizers on the electric properties of PHB or PLLA or Cellulose for used in medicine and industry.

Physics 101, 102 and 103, Radiation Physics, Medical physics, Biomaterials, Physics of Membrane and Macromolecules for medical physics students, Solid state Physics, Thermodynamics, Statistical thermodynamics, Nuclear physics, Electromagnetic, Polymer Physics and Polymer Technology.

Visiting Researcher in Uni-Reading , England.
Book, title Electrospinning Principles, Practice and Possibilities, chapter 8 with other Authors,
https://books.google.com.sa/books?isbn=1849735573.

I am reviewer for several scientific journals and research projects: Polymer Engineering & Science; polymer bulletin, European Polymer Journal; Polymer International Journal; Journal of Vinyl and Additive Technology and many high-impact factor journals.
I am one of developer's specialists in bioplastics in the world (label:bioplastics).

http://scholar.google.com/citations?user=pqROAtwAAAAJ&hl=no,
http://www.researchgate.net/profile/Ahmed_El-Hadi3/publications,
https://books.google.com.sa/books/about/Development_of_a_Biodegradable_Material.html?id=md0CHQAACAAJ&redir_esc=y