Term Information

Effective Term	Spring 2021

General Information

Course Bulletin Listing/Subject Area	Physics
Fiscal Unit/Academic Org	Physics - D0684
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	1231
Course Title	Physics for Engineering Technology: Electricity and Magnetism
Transcript Abbreviation	ET Elec., Mag.
Course Description	Calculus-based introduction to electricity and magnetism, for students in Engineering Technology
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Recitation, Laboratory, Lecture
Grade Roster Component	Recitation
Credit Available by Exam	Yes
Exam Type	Departmental Exams
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: 1250, 1250H, or 1260; and Math 1141 or 1151 or 1154 or above; or permission of instructor. Concur: Math 1152, 1158, 1161, 1172, 1181H, or 4181H.
Exclusions	Not open to students with credit for Physics 132 or 1251
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	40.0801
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors
General Education course:
Physical Science
The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students in natural sciences gain understanding of the principles, theories,and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and tech.

Content Topic List

- Coulomb's Laws
  Electric fields, force, and flux
  Gauss's Law
  Simple circuits, Ohm's Law, LC circuits, and capacitors
  Magnetic forces, fields, and torque

Sought Concurrence

No

Attachments

- syl-1231.pdf: Physics 1231 Syllabus
  (Syllabus. Owner: Gramila,Thomas J)
- assesment-plan-1231.pdf: General Ed Assessment
  (GEC Course Assessment Plan. Owner: Gramila,Thomas J)
- gen_ed_rationale_1231.pdf: General Ed Rationale
  (Other Supporting Documentation. Owner: Gramila,Thomas J)

Comments

- Submission is incomplete.Please read pages 61-64 in ASC Curriculum and Assessment Operations Manual https://asccas.osu.edu/sites/asccas.osu.edu/files/ASC_Curriculum_and_Assessment_Operations_Manual.pdf
  - Syllabus should have GE Natural Science-Physical Science goals and expected learning outcomes clearly identified.
  -It is not clear what the reference to Quantitative and Logical Skills is doing in syllabus. Is this another requested GE category?
  - There is no GE rationale document.
  - There is no GE assessment plan.
  - There is no explanation whether this is a BA-only or a BA/BS GE course. *(by Vankeerbergen,Bernadette Chantal on 10/06/2019 08:49 PM)*
- 9/30/19: Please change the effective term to Spring 2021. The Autumn 2020 deadline for new course proposals had been 07/01/19. *(by Haddad,Deborah Moore on 09/30/2019 01:24 PM)*
- This course is part of the new Engineering Technology major being implemented at the branch campuses. The course covers the electricity and magnetism portions of Physics 1251, but avoids the modern physics. This topic coverage has been discussed extensively with the committee developing this new major. *(by Gramila,Thomas J on 09/27/2019 05:39 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Gramila,Thomas J	09/27/2019 05:40 PM	Submitted for Approval
Approved	Perry,Robert James	09/30/2019 01:07 PM	Unit Approval
Revision Requested	Haddad,Deborah Moore	09/30/2019 01:24 PM	College Approval
Submitted	Perry,Robert James	09/30/2019 02:30 PM	Submitted for Approval
Approved	Perry,Robert James	09/30/2019 02:32 PM	Unit Approval
Revision Requested	Haddad,Deborah Moore	09/30/2019 03:03 PM	College Approval
Submitted	Perry,Robert James	09/30/2019 05:34 PM	Submitted for Approval
Approved	Perry,Robert James	09/30/2019 05:35 PM	Unit Approval
Revision Requested	Haddad,Deborah Moore	09/30/2019 05:41 PM	College Approval
Submitted	Gramila,Thomas J	09/30/2019 06:47 PM	Submitted for Approval
Approved	Perry,Robert James	10/01/2019 12:01 PM	Unit Approval
Approved	Haddad,Deborah Moore	10/01/2019 01:07 PM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	10/06/2019 08:49 PM	ASCCAO Approval
Submitted	Gramila,Thomas J	02/13/2020 02:57 PM	Submitted for Approval
Approved	Perry,Robert James	03/05/2020 05:16 PM	Unit Approval
Approved	Haddad,Deborah Moore	03/05/2020 06:21 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Oldroyd,Shelby Quinn Vankeerbergen,Bernadette Chantal	03/05/2020 06:21 PM	ASCCAO Approval

PHYSICS 1231 ASSIGNMENT SHEET SPRING 2021

Prof. Bill Putikka **Office:** 377 Ovalwood Hall

Phone: (614) 292-3882 **Email:** putikka.1@osu.edu

Office Hours: Tues. 2:00 - 3:00, Thurs. 2:00 - 3:00 and by appointment

TEXT: Serway & Jewett, *Physics for Scientists and Engineers with Modern Physics, 10th ed.*

LAB: *Laboratory Manual Physics 1251, 7th ed.*

Box web page box.osu.edu
Course web page: carmen.osu.edu
WebAssign web page: www.webassign.net/osu/student.html
Homework is due by midnight on the following Tuesday.

Grading:

Midterm	150
Quizzes (6/7)	120
Labs	30
Homework	70
Final	250
Total	620

Jan 12	Ch 23.1-3	Electric Charge	
		Lab: Electric Force/Coulomb's Law	
14	Ch 23.4-5	Electric Field	**QUIZ 1**

19	Ch 23.6-7	Electric Field	
		Lab: Electric Field	
21	Ch 24.1-2	Electric Flux	**QUIZ 2**

26	Ch 24.2-3	Gauss's Law	
		Lab: Electric Flux	
28	Ch 24.3-4	Gauss's Law	**QUIZ 3**
Feb 2	Ch 25.1-3	Electric Potential	
		Lab: Electric Potential	
4	Ch 25.4-8	Electric Potential	**QUIZ 4**
9	Ch 26.1-4	Capacitance	
		Lab: Electric Current	
11		**MIDTERM Ch 23-26**	**NO QUIZ**
16	Ch 26.5-7, Ch 27.1-4	Current and Resistance	
		Lab: Qualitative Circuits	
18	Ch 27.5-6, Ch 28.1-3	Circuits	**QUIZ 5**
23	Ch 28.4, Ch 29.1-4	Magnetic Forces	
		Lab: Quantitative Circuits	
25	Ch 29.5, Ch 30.1-2	Magnetic Fields	**QUIZ 6**
Mar 2	Ch 30.3-5, Ch 31.1-2	Magnetic Fields, Induction	
		Lab: Magnetic Torque/Magnetic Fields	
4	Ch 31.3-6, Ch 32.1-3	Induction	**QUIZ 7**

9	Ch 32.5-6	RLC Circuit	
		Lab: Magnetic Induction/Inductor Circuits	
11		**FINAL EXAM**	**NO QUIZ**

Physics 1231 is a Physical Science course in the Natural Science category of the GEC. The goals and objectives for this category are:

Goals/Rationale: Students in natural sciences gain understanding of the principles, theories and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and technology to address problems of the contemporary world.

Learning Objectives for Physical Science:

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

How the Learning Objectives are Met:

1. Student preconceptions and alternate conceptions of physical law are addressed head-on in P1231. This is a necessary component of any contemporary introduction to physics, and is addressed in all components of the course.
2. Students learn the scientific theories that have developed from the 1600s to the present day. They learn different modes of approaching the same phenomena, such as field and potential methods in electrostatics.
3. Students understand that P1231 introduces the basic physical laws that underlie all engineering applications. Examples of applications are provided in the textbook and in demonstrations in lectures.
4. Students understand that the social implications lie in the applications, and that in the case of physics the social implications are taken up more appropriately in the engineering courses that teach the applications. The reason for this is that physics does not go into details of how to build instruments or devices.

Disability Service Statement

Any student who needs an accommodation based on the impact of a disability should contact Disability Services, to privately discuss their specific needs. We do not reach out to students based on submission of a previous IEP, rather students must contact the office for an appointment. Please contact the office by phone at (419) 755-4304, by e-mail at mcgregor.40@osu.edu, or stop by the office in Ovalwood 279.

Academic Misconduct Statement

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee via the Associate Dean.

Drop/Withdrawal Statement

It is the students responsibility to know the deadlines for dropping a course or withdrawing from the University. Term drop & withdrawal deadlines can be found at: http://registrar.osu.edu/ (click on the current term under Important Dates and scroll down to ADD/DROP/WITHDRAW DEADLINES). If you receive financial aid, you should always talk with a financial aid specialist prior to adjusting your schedule. If you stop attending a course but do not drop it, you risk receiving a failing grade which could negatively affect your GPA and your financial aid status. You can call 419-755-4317 to set up an appointment with an academic advisor or a financial aid specialist in 104 Riedl Hall.

Retention

The Ohio State University-Mansfield is committed to the success of students. If you are having academic or personal difficulties, you can contact Darla Myers at 419-755-4036, Ovalwood 283, for referral resources.

Mental Health Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a students ability to participate in daily activities. The Ohio State University at Mansfield offers services to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via the New Directions Student Assistance Program (SAP) by visiting newdirectionsforlife.com/or calling 419-529-9941 (no cost to students). They see students on campus in Ovalwood Hall. Local crisis services are available by calling 419-522-4357. Ohio State also has an afterhours service available by calling 614-292-5766 and choosing option 2 after hours, which includes weekends and holidays.

Student Conduct

The code of student conduct is established to foster and protect the core missions of the university, to foster the scholarly and civic development of the university's students in a safe and secure learning environment, and to protect the people, properties and processes that support the university and its missions (http://studentaffairs.osu.edu/resource_csc.asp). Students who violate faculty expectations may be subject to the code of conduct. For mental health and other behavioral related concerns, contact Student Life at 419-755-4317 and ask for an appointment with Dr. Donna L Hight, Assistant Dean, Student Life and Success. As a responsible community member, do not allow others to act inappropriately and impact the community.

Student Assistance with Difficulties

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact Michelle McGregor, Coordinator, Student Support Services at 419-755-4304, for support. Furthermore, please notify the professor if you are comfortable in doing so. This will enable me to provide any resources that I may possess.

Discrimination

The Ohio State University at Mansfield is committed to providing a learning, working and living environment that promotes personal integrity, civility and mutual respect in an environment free of discrimination of any type. This includes students creating a hostile environment for other students. To file a complaint, contact Student Life at 419-755-4317 and ask for an appointment with the Assistant Dean, Student Life and Success or Human Resources at 419-755-4047 and ask for an appointment with the Chief Human Resources Officer, who will connect you with the appropriate Columbus Offices.

Title IX and Sexual Misconduct

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find more information and the appropriate resources at http://titleix.osu.edu/.

HOW TO REPORT

Reports of sexual misconduct can be made to one of the following individuals:

Donna L. Hight, Ph.D.
Assistant Dean, Student Life and Success
419-755-4317
hight.6@osu.edu

Sgt. Jeff Hoffer
Campus Police
419-755-4210
hoffer.30@osu.edu

Sarah Metzger

Campus Sexual Assault Advocate
419-565-2489
smetzger@thedvshelter.com

Notice of an incident to the officials listed above, other than the Campus Sexual Assault Advocate, is considered official notice to the university. You can expect reports received by these individuals to be investigated and properly resolved through administrative procedures. Information will be shared only as necessary with investigators, witnesses, and the accused individual. The Campus Sexual Assault Advocate and the New Directions Student Assistance Program (SAP) staff are considered confidential resources.

Introduction:

These learning objectives and how they are met match what is presented in the course syllabus. In addition, they are identical to those of Physics 1251, which is a long established General Education Physical Science course. We include here as well a short discussion of the lab portion of the course, as well as information related to the courses appropriateness for BA and/or BS students.

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Laboratory Information:

'What type(s) of experiences will students have in the laboratory component of the course?'

Students will work in small groups in weekly 2 hour lab sessions exploring various topics in electricity and magnetism. These include forces between electric charges, electon deflection behavior, fundamental circuit principles, such as ohms law and series and parallel circuits. Properties of magnetic fields are also explored. Experiments undertaken by students focus on measurments using provided apparatus that highlight fundamental behaviors, where configuartion of the apparatus is left to the student. Measurements taken are compared with theoretical predictions derived by the students for the various situations and phenomena. Pre-labs are used to prepare students for the theoretical work, and comparisons are completed in class.

BA/BS Degrees:

Physics 1231 is intended for both BA and BS students. It's topics and content closely match an existing BA/BS course: Physics 1251. In fact, it is our expectation that the lecture portions of both courses will be shared. Aspects of 1231 that justify it's suitability for BS students include:

A Calculus pre-requisite.

Pre-requisite of a BS degree approved course: Physics 1250.

Sophisticated scientific knowledge, including, for example, Gausses Law, which relates two and three dimensional electrical quantities, as well as various topics in Magnetism

Computer assisted data collection and analysis in the lab portion of the course.

The course parallels, but is a bit shorter than, the structure and topics of a course required for a physics major (again, Physics 1251) .

Learning Outcomes Assessment Plan for Physics 1231

The specific learning goal for natural science GEC courses is to foster an understanding of the principles, theories and methods of modern science, the relationship between science and technology, and the effects of science and technology on the environment. This has been expanded into four learning objectives (outcomes).

Objective 1 is that the students shall understand the basic facts, principles, theories and methods of modern science. As a direct measure, we wish for Physics 1231 to obtain student responses biennially on an assessment post-test to determine the normalized gain G [= (post% - pre%)/(1 – pre%)] in understanding material that could be attributed to this instruction. When scheduling permits, reconfirming the average pretest student response level will also be done. National assessment tests of Physics 1231 topics are not as well established as those used for Newtonian mechanics, such as the FCI test. One such test is the Conceptual Survey of Electricity and Magnetism (CSEM), developed to assess students' knowledge about topics in introductory electricity and magnetism. Early studies using the CSEM for courses comparable to Physics 1231 suggest (1) that students' pre-test scores will barely exceed random and (2) that gains near (above) G = 0.25 would characterize traditional (new interactive engagement) physics instruction. An average gain much below 0.2 would then suggest that improvements must be made, while any gain over 0.3 would likely signal a significant learning improvement. As an indirect measure, biennially we will survey a sample of students to determine their level of agreement with Physics 1231 having met this objective. As objective 1 is most strongly coupled to the course's primary objective, we would wish to have >80% of the respondents agree that this particular objective has been met. Results greater than 'B' (3.0/4) on our exit polling for the 'value of X as part of this course' would also be related to successful instruction.

Satisfying the ***GEC learning objectives 2 (students learn key events in the history of science), 3 (students provide examples of the inter-dependence of scientific and technological developments), and 4 (students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world)*** is to some degree ancillary to meeting objective 1. Each can be successfully addressed best in the context and support of the presentation of the physics topics associated with objective 1. As a direct measure, we wish to occasionally have questions reflecting consideration of these objectives represented on Physics 1231 final exams. Professors responsible for writing the exam for Physics 1231 will be asked to identify instances in which a question used on his/her final exam measures one or more of the learning objectives 2, 3 or 4. Based on a sampling of the students' responses to questions so identified with a given objective over the year, an annual average of the percent correct scores will be computed, which if equal to 70% (consistent with the minimum for C- grade in this course) or greater will signify support of having satisfactorily met the goal of that particular objective. As an indirect measure, biennially we will survey a sample of our students to determine their level of agreement with Physics 1231 having met each of these objectives. Realizing that a given course may not strongly meet all GEC objectives, we would wish that the average of the percent responses to the four learning objectives be >50%, indicating that these objectives as a set have been perceived to have been reasonably met.

Assessment Plan for GEC Course Physics 1231

Appendix

Items included:

1. Copy of local version of Conceptual Survey of Electricity and Magnetism as primary 'evaluation instrument'
2. Examples of Final Exam questions related to GEC objectives 2-4
3. Sample copy of indirect survey of students to assess fulfillment of all four GEC objectives

Conceptual Survey in Electricity and Magnetism (CSEM)

In any question referring to current, conventional current will be used (where conventional current is the flow of positive charges). In addition, all effects due to the earth's magnetic field will be so small that they will be ignored. Note that the term "particle" is meant to be an object without size or structure.

1. A hollow metal sphere is electrically neutral (no excess charge). A small amount of negative charge is suddenly placed at one point P on this metal sphere. If we check on this excess negative charge a few seconds later we will find one of the following possibilities:
   (a) All of the excess charge remains right around P.
   (b) The excess charge has distributed itself evenly over the outside surface of the sphere.
   (c) The excess charge is evenly distributed over the inside and outside surface.
   (d) Most of the charge is still at point P, but some will have spread over the sphere.
   (e) There will be no excess charge left.

2. A hollow sphere made out of electrically insulating material is electrically neutral (no excess charge). A small amount of negative charge is suddenly placed at one point P on the outside of this sphere. If we check on this excess negative charge a few seconds later we will find one of the following possibilities:
   (a) All of the excess charge remains right around P.
   (b) The excess charge has distributed itself evenly over the outside surface of the sphere.
   (c) The excess charge is evenly distributed over the inside and outside surface.
   (d) Most of the charge is still at point P, but some will have spread over the sphere.
   (e) There will be no excess charge left.

For questions 3 -5:
Two small objects each with a net charge of +Q exert a force of magnitude F on each other.

We replace one of the objects with another whose net charge is +4Q:

3. The original magnitude of the force on the +Q charge was F; what is the magnitude of the force on the +Q now?

   (a) 16F (b) 4F (c) F (d) F/4 (e) other

4. What is the magnitude of the force on the +4Q charge?

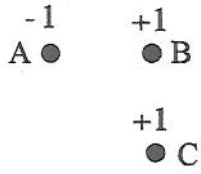
   (a) 16F (b) 4F (c) F (d) F/4 (e) other

Next we move the +Q and +4Q charges to be 3 times as far apart as they were:

5. Now what is the magnitude of the force on the +4Q?

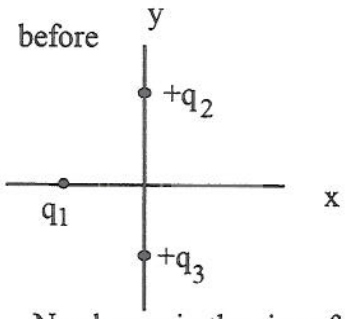
   (a) F/9 (b) F/3 (c) 4F/9 (d) 4F/3 (e) other

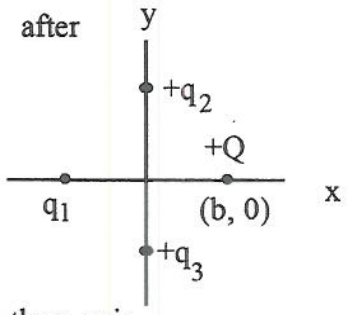
6. Which of the arrows is in the direction of the net force on charge B?



(a)  (b)  (c)  (d)  (e) none of these

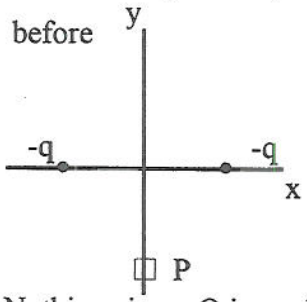
7. In the figure below, positive charges q_2 and q_3 exert on charge q_1 a net electric force that points along the +x axis. If a positive charge Q is added at (b,0), what now will happen to the force on q_1? (All charges are fixed at their locations.)

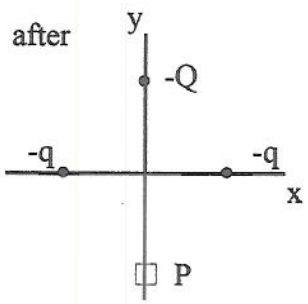




(a) No change in the size of the net force since Q is on the x-axis.
(b) The size of the net force will change but not the direction.
(c) The net force will decrease and the direction may change because of the interaction between Q and the positive charges q_2 and q_3.
(d) The net force will increase and the direction may change because of the interaction between Q and the positive charges q_2 and q_3.
(e) Cannot determine without knowing the magnitude of q_1 and/or Q.

8. In the figure below, the electric field at point P is directed upward along the y-axis. If a negative charge -Q is added at a point on the positive y-axis, what happens to the field at P? (All of the charges are fixed in position.)



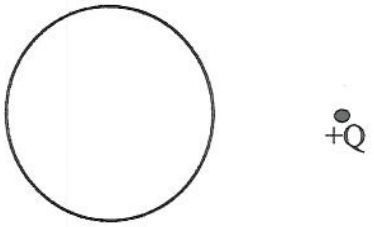


(a) Nothing since -Q is on the y-axis.
(b) Strength will increase because -Q is negative.
(c) Strength will decrease and direction may change because of the interactions between -Q and the two negative q's.
(d) Strength will increase and direction may change because of the interactions between -Q and the two negative q's.
(e) Cannot determine without knowing the forces -Q exerts on the two negative q's.

A positive charge is placed at rest at the center of a region of space in which there is a uniform, three-dimensional electric field. (A uniform field is one whose strength and direction are the same at all points within the *region*.)

9. What happens to the electric potential energy of the positive charge, after the charge is released from rest in the uniform electric field?
   (a) It will remain constant because the electric field is uniform.
   (b) It will remain constant because the charge remains at rest.
   (c) It will increase because the charge will move in the direction of the electric field.
   (d) It will decrease because the charge will move in the opposite direction of the electric field.
   (e) It will decrease because the charge will move in the direction of the electric field.

10. The figure below shows a hollow conducting metal sphere which was given initially an evenly distributed positive (+) charge on its surface. Then a positive charge +Q was brought up near the sphere as shown. What is the direction of the electric field at the center of the sphere after the positive charge +Q is brought up near the sphere?

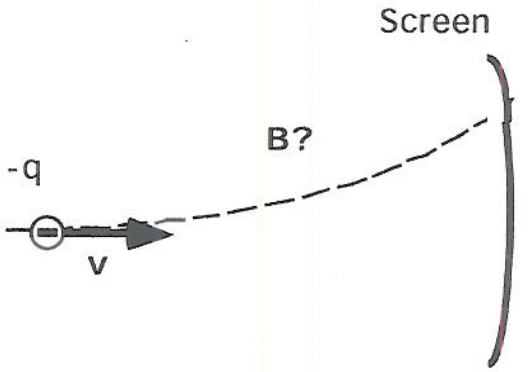


   (a) Left
   (b) Right
   (c) Up
   (d) Down
   (e) Zero field

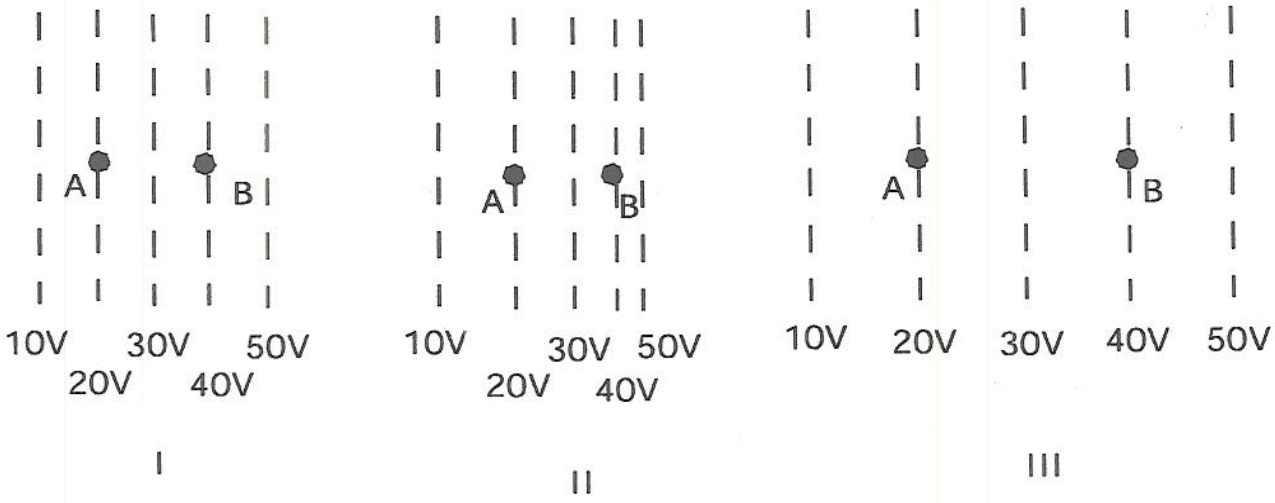
11. An electron is placed at a position on the x-axis where the electric potential is + 10 V. Which idea below best describes the future motion of the electron?
   (a) The electron will move left (-x) since it is negatively charged.
   (b) The electron will move right (+x) since it is negatively charged.
   (c) The electron will move left (-x) since the potential is positive.
   (d) The electron will move right (+x) since the potential is positive.
   (e) The motion cannot be predicted with the information given.

12. An electron moves horizontally toward a screen. The electron moves along the path that is shown because of a magnetic force caused by a magnetic field. In what direction does that magnetic field point?

   (a) Toward the top of the page
   (b) Toward the bottom of the page
   (c) Into the page
   (d) Out of the page
   (e) The magnetic field is in the direction of the curved path.



In the figures below, the dotted lines show the equipotential lines of electric fields. (A charge moving along a line of equal potential would have a constant electric potential energy.) A charged object is moved directly from point A to point B. The charge on the object is +1 μC.



13. How does the amount of work needed to move this charge compare for these three cases?
    (a) Most work required in I.
    (b) Most work required in II.
    (c) Most work required in III.
    (d) I and II require the same amount of work but less than III.
    (e) All three would require the same amount of work.

14. How does the magnitude of the electric field at B compare for these three cases?
    (a) I > III > II
    (b) I > II > III
    (c) III > I > II
    (d) II > I > III
    (e) I = II = III

15. What happens to a positive charge that is placed at rest in a uniform magnetic field? (A uniform field is one whose strength and direction are the same at all points.)

    (a) It moves with a constant velocity since the force has a constant magnitude.
    (b) It moves with a constant acceleration since the force has a constant magnitude.
    (c) It moves in a circle at a constant speed since the force is always perpendicular to the velocity.
    (d) It accelerates in a circle since the force is always perpendicular to the velocity.
    (e) It remains at rest since the force and the initial velocity are zero.

16. Wire 1 has a large current i flowing out of the page (⊙), as shown in the diagram. Wire 2 has a large current i flowing into the page (⊗). In what direction does the magnetic field point at position P?

(a) ↑ (b) ← (c) → (d) ↓

(e) none of the above.

17. The figures below represent positively charged particles moving in the same uniform magnetic field. The field is directed from left to right. All of the particles have the same charge and the same speed v. Rank these situations according to the magnitudes of the force exerted by the field on the moving charge, from greatest to least.

(a) I = II = III

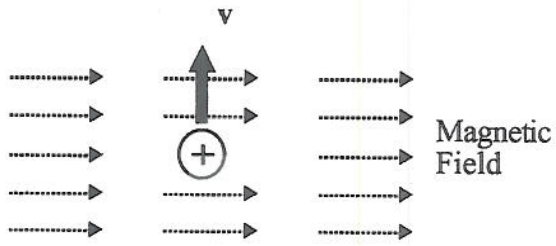
(b) III > I > II

(c) II > I > III

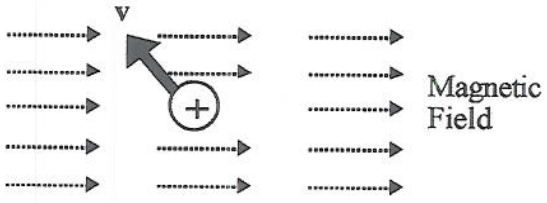
(d) I > II > III

(e) III > II > I

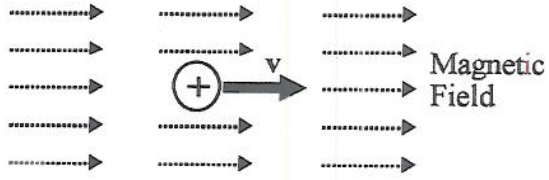
I



II



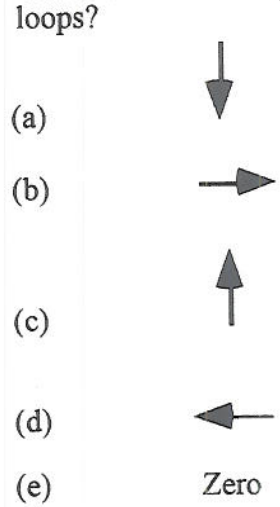
III



18. A positively-charged particle (+q) is at rest in the plane between two fixed bar magnets, as shown. The magnet on the left is three times as strong as the magnet on the right. Which choice below best represents the resultant **MAGNETIC** force exerted by the magnets on the charge?

(a) → (b) ↙ (c) ← (d) ↘ (e) Zero

19. Two identical loops of wire carry identical currents i. The loops are located as shown in the diagram. Which arrow best represents the direction of the magnetic field at the point P midway between the loops?



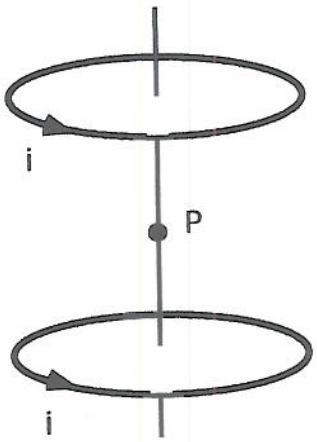
(a)

(b)

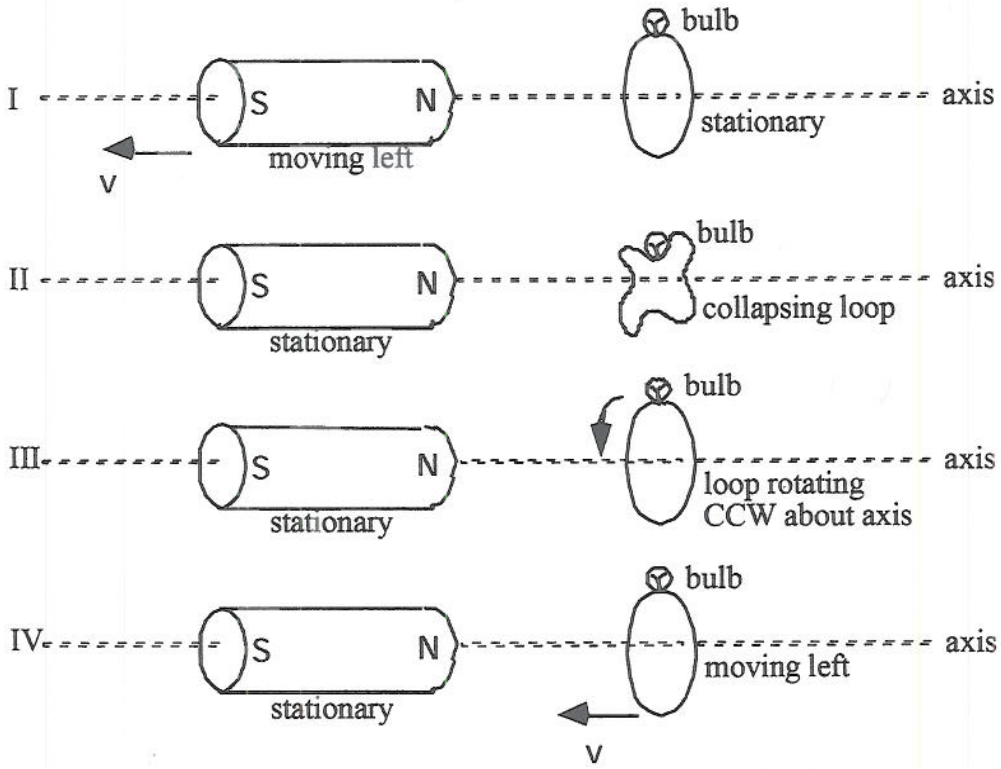
(c)

(d)

(e) Zero



The five separate figures below involve a cylindrical magnet and a tiny light bulb connected to the ends of a loop of copper wire. These figures are to be used in the following question. The plane of the wire loop is perpendicular to the reference axis. The states of motion of the magnet and of the loop of wire are indicated in the diagram. Speed will be represented by v and CCW represents counter clockwise.



20. In which of the above figures will the light bulb be glowing?

(a) I, III, IV (b) I, IV (c) I, II, IV (d) IV (e) None of these

Sample Physics 1231 Final Exam Questions
Related to GEC Learning Objectives 2-4

The following examples were the most challenging for the students per each GEC objective.

Objective #2 – 'Learn key events in the history of science'

The existences of a magnetic field surrounding a wire, and a voltage induced in wire due to changing magnetic fields were discovered by extraordinarily careful measurements by which two famous scientists (in order):

a) Joule, Coulomb
b) Snell, Faraday
c)* Ampere, Faraday
d) Franklin, Watt

Objective #3 -- 'Know examples of inter-dependence of scientific and technological developments"

The electric motor used in a fan is plugged into a 120 V socket and uses 8.0 A of current in normal operation when the back emf generated by the motor is 80 V. Find the resistance of the motor (in units of ohm).

a) 10
b) 15
c)* 5
d) 320
e) 0.2

Objective #4 -- 'Understand the potential of science and technology to address problems of the contemporary world'

An optical fiber used for telecommunications has a core made of crown glass (n_{glass} = 1.521) and a cladding made of quartz (n_{quartz} = 1.460). What is the critical angle for light emerging from the core into the cladding?

a) 48.6 deg
b) 16.3 deg
c) 41.4 deg
d)* 73.7 deg
e) 48.9 deg

Natural Science GEC course assessment of Physics 1231

While the introductory physics courses often fulfill specific requirements of various programs of study, they also can and do serve toward simultaneously satisfying the GEC Natural Science requirements. The department would appreciate your assessment of how well you think Physics 1231 advanced objectives that have been associated with Natural Science GEC courses. Please indicate your agreement with the following statements of the GEC learning objectives as related to your experience in Physics 1231. Thank you for your input.

1. Students understand the basic facts, principles, theories and methods of modern science.
O Strongly agree O Agree O Disagree O Strongly Disagree O N/A

2. Students learn key events in the history of science.
O Strongly agree O Agree O Disagree O Strongly Disagree O N/A

3. Students provide examples of the inter-dependence of scientific and technological developments.
O Strongly agree O Agree O Disagree O Strongly Disagree O N/A

4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.
O Strongly agree O Agree O Disagree O Strongly Disagree O N/A

SAMPLE