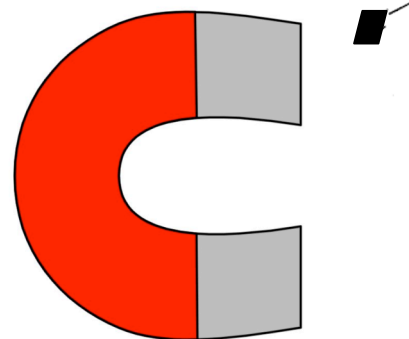


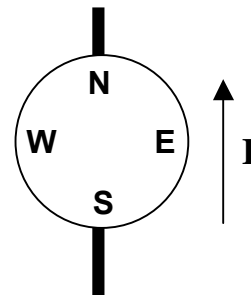
### Unit 3 Conceptual Questions

Please answer questions on Scantron form 882-ES. Otherwise you will receive a zero. Poorly erased responses will not be re-graded. Turn in two days before unit exam. You are encouraged to work together and discuss these questions!!!

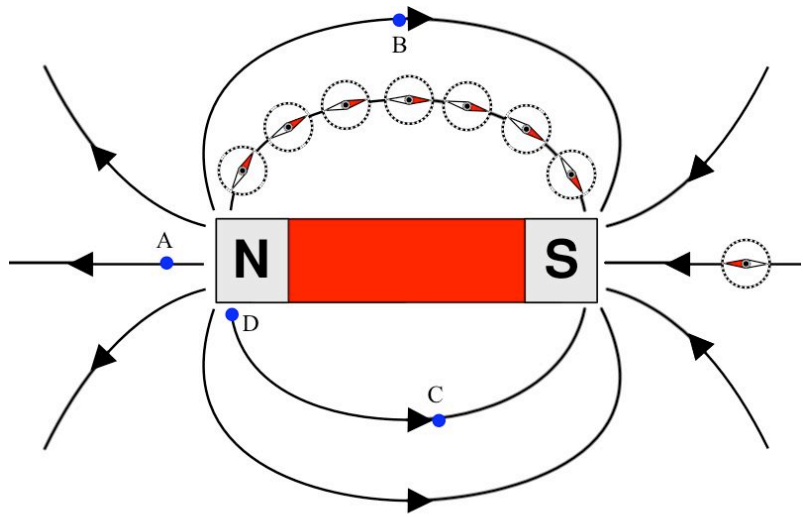
- A proton is moving to the right in a magnetic field that points toward the bottom of this page. As a result the direction of the force on the proton is directed
  - into the plane of the page
  - toward the top of the page
  - out of the plane of the page
  - to the left
  - not enough information provided
- Consider the proton in Problem 1. The work done by the magnetic field after the proton travels a certain distance to the right is
  - greater than zero
  - equal to zero
  - less than zero
- Compared to the huge force that attracts an iron object to a strong magnet, the force that the object exerts on the magnet is
  - fairly small
  - just as large



- Which of the following is not the correct unit for magnetic field?
  - tesla
  - gauss
  - weber
  - weber/m<sup>2</sup>
- A long straight wire conductor is placed **above** a compass. When the conventional current in the conductor is from south to north and large, the N pole of the compass:
  - remains undeflected
  - points to the south
  - points to the west.
  - points to the east.
  - points to the north.



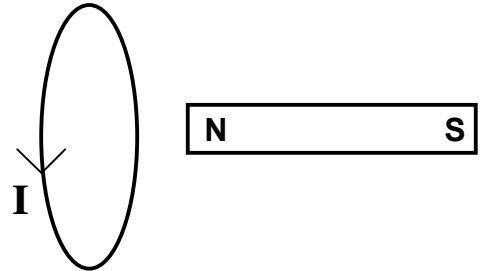
6. Consider the bar magnet shown below. Consider electrons at points A, B, C, and D is moving toward the top of this page with same speed  $v$ . Which electron experiences the largest magnetic force?



7. Suppose we want to determine the direction of the force on a wire in a magnetic field. Does it matter whether we specify conventional current or electron current when applying the right hand rule?
- yes
  - no
  - depends on the problem
8. Consider the uniform magnetic field directed from left to right. If a compass is placed in this field north pole of the compass will point
- to the left
  - to the right
  - toward the top of this page
  - toward the bottom of this page
9. Electrons and protons of the same momentum enter a uniform magnetic field that is perpendicular to their velocity vectors. If the mass of the electron and proton are  $m_e$  and  $m_p$ , respectively, what is the ratio of the radii of their path  $r_{\text{electron}}/r_{\text{proton}}$ ?
- $m_p/m_e$
  - $(m_p/m_e)^{1/2}$
  - $m_e/m_p$
  - $(m_e/m_p)^{1/2}$
  - 1
10. A particle of mass  $m$  and charge  $3.2 \times 10^{-19} \text{C}$  enters a region of crossed static and uniform electric and magnetic fields. The magnitude of the magnetic field and electric fields are  $0.25 \text{T}$  and  $2000 \text{N/C}$ , respectively. In traversing this region, the kinetic energy of the particle is found to increase from  $250 \text{eV}$  to  $400 \text{eV}$ . How much energy is supplied to the particle by the magnetic field?
- 0
  - $50 \text{eV}$
  - $100 \text{eV}$
  - $150 \text{eV}$
  - $400 \text{eV}$

11. A charged particle travels along positive x-direction with constant speed  $v$  through a region of space where both electric and magnetic fields exist. If  $\mathbf{E}$  and  $\mathbf{B}$  are respectively the magnitudes of the electric and magnetic fields and the electric field is directed along the negative y-direction, then
- the magnetic field must be along the positive z-direction.
  - the magnetic field must be along the negative z-direction.
  - the magnetic field must be along the positive y-direction.
  - the magnetic field must be along the negative z-direction.
  - the magnetic field must be along the positive z-direction.

12. A bar magnet is in the vicinity of a circular loop carrying current  $I$  as shown. What is the direction of the force on the wire?
- There is no force on the wire
  - It is directed toward the top of the page
  - It is directed toward the bottom of the page
  - It is directed to the left
  - It is directed to the right
  - Out of the plane of this page
  - Into the plane of this page



13. A permanent magnet can be used to pick up a string of nails, tacks, or paper clips even though these objects are not magnets themselves. How this is possible?
- These items are magnets and are attracted to the North pole of the permanent magnet.
  - These items are magnetized and become magnets in the vicinity of the permanent magnet.
  - None of the above.

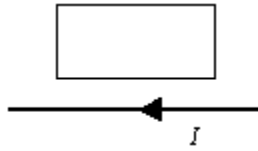
14. The current-carrying wire shown below has a current pointing out of the plane of the page (+z). In which direction is the magnetic field created by the current flowing in the wire pointing at position C
- towards the right side of the page (+x) increases
  - towards the left side of the page (-x)
  - towards the top of the page (+y)
  - towards the bottom of the page (-y)
  - none of the above



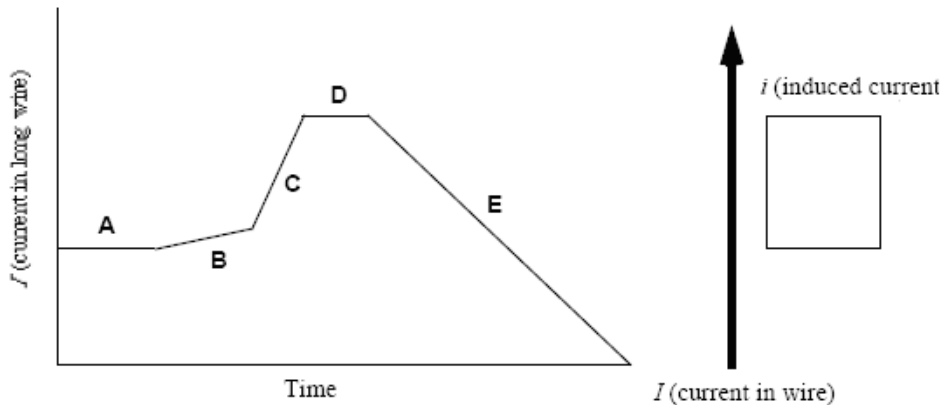
15. A current-carrying, rectangular coil of wire is placed in a magnetic field. The magnitude of the torque on the coil is not dependent upon which one of the following quantities?
- the magnitude of the current in the loop
  - the direction of the current in the loop
  - the length of the sides of the loop
  - the area of the loop
  - the orientation of the loop

16. What condition is necessary for an electric charge to have a magnetic field around it?
- it must be in a copper wire
  - it must be isolated from the opposite charge
  - it must be moving
  - it must be motionless
  - it must only be positive, a proton
17. For most magnetic materials, electron \_\_\_\_\_ is the main contributor to magnetism.
- electron spin
  - electron orbital motion
  - proton spin
  - proton orbital motion
18. Is it correct to say that every electron with its inherent spin is a tiny magnet?
- yes
  - no
19. Why are most materials not magnetic?
- they do not conduct electricity
  - they conduct electricity
  - they are not metals
  - the magnetic fields produced by the electron spin is canceled
  - they are insulators, meaning that electrons are not free to move around in the atomic lattice
20. Which is not a material that is commonly used to make a magnet?
- iron
  - cobalt
  - nickel
  - copper
21. What do you call a group of about a billion or so iron atoms that have their magnetic orientation coordinated?
- magnetic field
  - magnetic domain
  - magnetic flux
  - Faraday
22. A conducting loop of wire is placed in a uniform magnetic field that is normal to the plane of the loop. Which one of the following actions will not result in an induced current in the loop?
- Rotate the loop about an axis that is parallel to the field and passes through the center of the loop.
  - Increase the strength of the magnetic field.
  - Decrease the area of the loop.
  - Decrease the strength of the magnetic field.
  - Rotate the loop about an axis that is perpendicular to the field and passes through the center of the loop.

23. A long, straight wire is in the same plane as a rectangular, conducting loop. The wire carries a constant current  $I$  as shown in the figure. Which one of the following statements is true if the wire is suddenly moved toward the loop?

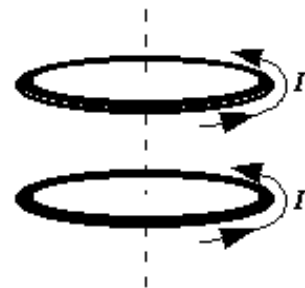


- There will be no induced emf and no induced current.
  - There will be an induced emf, but no induced current.
  - There will be an induced current that is clockwise around the loop.
  - There will be an induced current that is counterclockwise around the loop.
24. There is a long wire with a varying current,  $I$ , as indicated in the graph below. Near this wire is a square loop, also shown in the diagram below. Rank the magnitude of the induced current,  $i$ , in the square loop from greatest to least for the different time intervals.



25. Two conducting loops carry equal currents  $I$  in the same direction as shown in the figure. If the current in the upper loop suddenly drops to zero, what will happen to the current in the bottom loop according to Lenz's law?

- The current will decrease.
- The current will increase.
- The current will not change.
- The current will reverse its direction.



26. An airplane is flying east at 500 miles per hour. Is there an induced emf on the wings of the plane? What about the induced current?
- There will be no induced emf and no induced current.
  - There will be an induced emf, but no induced current.
  - There will be no induced emf, but a current is induced.
  - There will be an induced emf, and current.
27. Who were the two scientists that discovered electromagnetic induction?
- Faraday and Einstein
  - Faraday and Edison
  - Faraday and Henry
  - Henry and Edison
  - Henry and Einstein
28. Which of the following electromagnetic waves has the greatest wavelength?
- Microwave
  - Ultraviolet
  - Visible light
  - X-ray
29. Which of the following statements is correct?
- Light requires a medium to propagate.
  - Light is generated by a vibrating charge.
  - Light cannot travel through solids.
  - Light is a mechanical wave.
30. Light is a
- transverse wave.
  - longitudinal wave.
  - mechanical wave.
  - circular wave.