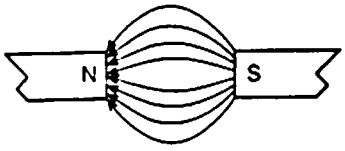
Physics

Name _____

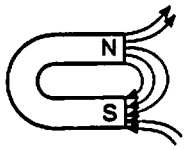
Review

Electromagnetism

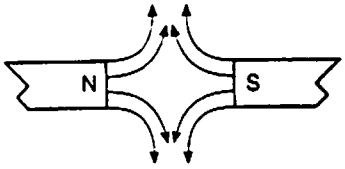
1 Which diagram correctly shows a magnetic field configuration?



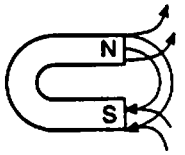
(1)



(3)

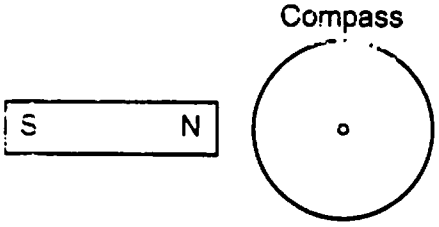


(2)



(4)

2 The diagram below shows a compass placed near the north pole, *N*, of a bar magnet.



Which diagram best represents the position of the needle of the compass as it responds to the magnetic field of the bar magnet?

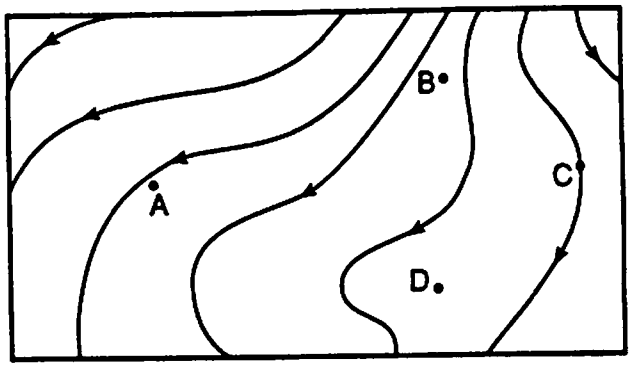
(1)

(3)

(2)

(4)

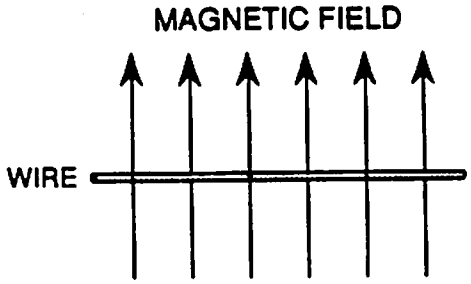
3 The diagram below represents lines of magnetic flux within a region of space.



The magnetic field strength is greatest at point

(1) *A*
(2) *B*
(3) *C*
(4) *D*

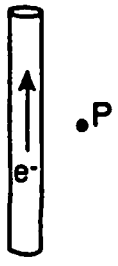
4 The diagram below shows a current-carrying wire located in a magnetic field which is directed toward the top of the page. The electromagnetic force on the wire is directed out of the page.



In the wire, the electron flow is directed toward the

1 left
2 right
3 top of the page
4 bottom of the page

5 Electrons are flowing in a conductor as shown in the diagram at the right. What is the direction of the magnetic field at point *P*?



1 toward the top of the page
2 toward the bottom of the page
3 into the page
4 out of the page

6 An electromagnet would have the greatest strength if its wire were wrapped around a core made of

1 wood
2 iron
3 aluminum
4 copper

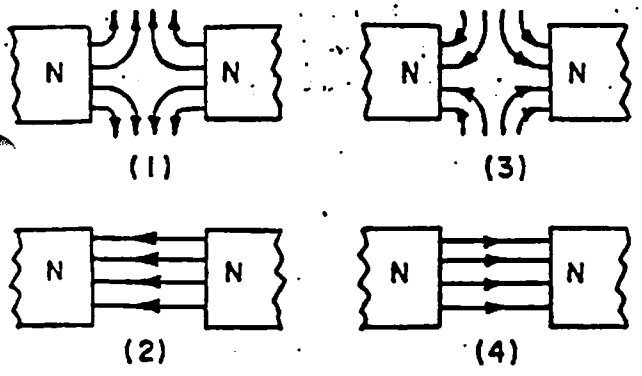
7 An electron moving in a uniform magnetic field experiences the maximum magnetic force when the angle between the direction of the electron's motion and the direction of the magnetic field is

(1) 0°
(2) 45°
(3) 90°
(4) 180°

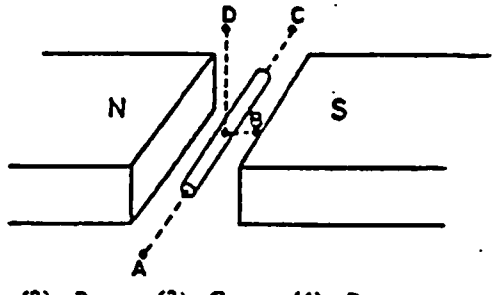
8 An accelerating particle that does *not* generate electromagnetic waves could be

1 a neutron
2 a proton
3 an electron
4 an alpha particle

9 Which diagram best represents a magnetic field between two magnetic poles?



10 The diagram below shows a copper wire located between the poles of a magnet. Maximum electric potential will be induced in the wire when it is moved at a constant speed toward which point?



(1) *A* (2) *B* (3) *C* (4) *D*

11 The charge-to-mass ratio of an electron is

(1) 9.1×10^{-31} C/kg
(2) 1.6×10^{-19} C/kg
(3) 5.7×10^{-12} C/kg
(4) 1.8×10^{11} C/kg

12 A potential difference of 10. volts is induced in a wire as it is moved at a constant speed of 5.0 meters per second perpendicular to a magnetic field having a flux density of 4.0 newtons per ampere-meter. What is the length of the wire in the field?

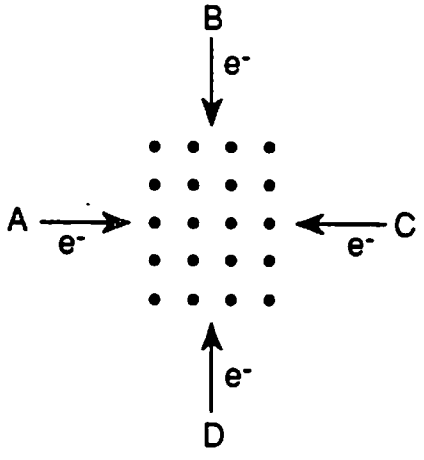
(1) 0.50 m
(2) 2.0 m
(3) 8.0 m
(4) 200 m

13 The primary coil of an operating transformer has 200 turns and the secondary coil has 40 turns. This transformer is being used to

1 decrease voltage and decrease current
2 decrease voltage and increase current
3 increase voltage and decrease current
4 increase voltage and increase current

Base your answers to questions 14 and 15 on the information and diagram below.

Four electron beams, *A*, *B*, *C*, and *D*, are projected into a magnetic field directed out of the page.



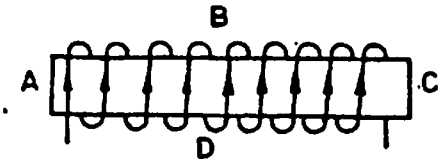
14 Which beam of electrons will initially be deflected toward the top of the page by the magnetic field?

(1) *A*
(2) *B*
(3) *C*
(4) *D*

15 If the speed of the electrons in beam *B* is doubled and the magnetic field strength is halved, the magnitude of the deflecting force on the electrons will be

1 unchanged
2 doubled
3 halved
4 quadrupled

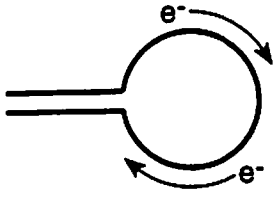
16 The arrows in the diagram below indicate the direction of the electron flow.



The south pole of the electromagnet is located closest to point

(1) *A*
(2) *B*
(3) *C*
(4) *D*

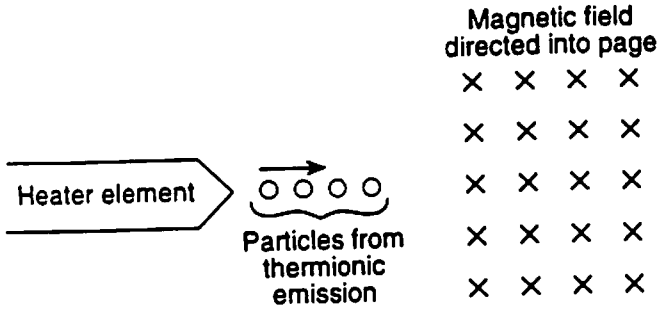
17 The diagram below shows an electron current in a wire loop.



What is the direction of the magnetic field at the center of the loop?

1 out of the page
2 into the page
3 clockwise
4 counterclockwise

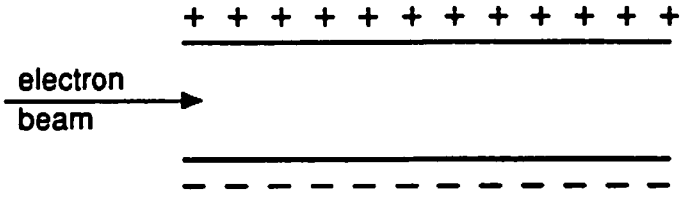
18 The diagram below shows particles produced by thermionic emission at the end of a heater element about to enter a magnetic field directed into the page.



Upon entering the magnetic field, the particles will be deflected

1 toward the top of the page
2 toward the bottom of the page
3 into the page
4 out of the page

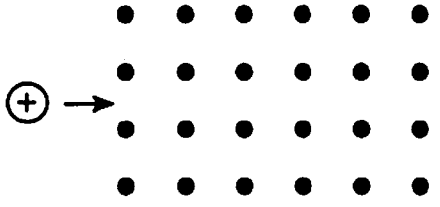
19 The diagram below represents an electron beam entering the region between two oppositely charged parallel plates.



In which direction will the beam of electrons be deflected?

1 out of the page
2 into the page
3 toward the top of the page
4 toward the bottom of the page

20 A proton having a velocity of 1.5×10^6 meters per second to the right is projected into a magnetic field having a flux density of 3.0 teslas directed out of the page, as shown in the diagram below.



What is the magnitude of the magnetic force on the proton?

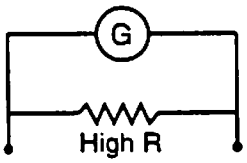
(1) 4.1×10^{-24} N
(2) 7.2×10^{-13} N
(3) 4.5×10^{6} N
(4) 7.2×10^{6} N

21 A straight conductor 1.0 meter long is moved at a constant speed of 10. meters per second perpendicular to a magnetic field. If the flux density of the field is 5.0×10^{-3} tesla, what is the magnitude of the electromotive force induced in the conductor?

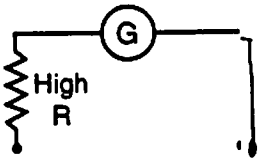
(1) 0.0 V
(2) 2.0×10^{3} V
(3) 5.0×10^{-2} V
(4) 5.0×10^{-4} V

Em #4

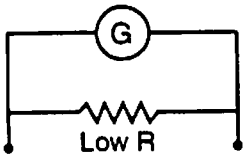
22 Which diagram best represents how galvanometer G can be modified to make it a voltmeter? [In the diagrams, R represents resistance.]



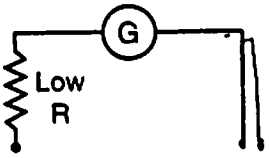
(1)



(3)



(2)



(4)

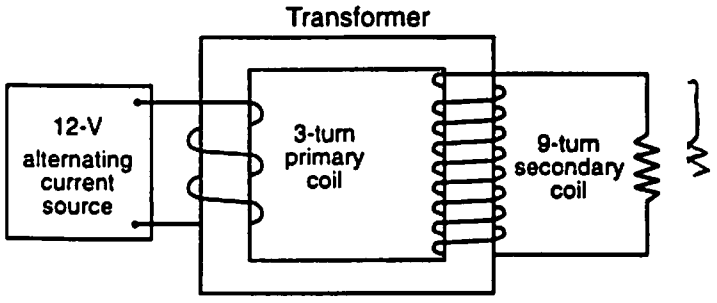
23 A motor is to rotational mechanical energy as a generator is to

1 chemical potential energy
2 induced electrical energy
3 thermal internal energy
4 elastic potential energy

24 A split-ring commutator is used to

1 reduce the voltage in a transformer
2 reduce the resistance of the shunt in an ammeter
3 make the light waves coherent in a laser
4 keep the torque acting in the same direction in a motor

25 The 100% efficient transformer in the diagram below has three turns in its primary coil and nine turns in its secondary coil. When a 12-volt alternating current source is connected to the primary coil, 3.0 amperes flows in the primary coil.



What potential difference and current are induced in the secondary coil?

(1) 36 V and 1.0 A
(2) 36 V and 9.0 A
(3) 4.0 V and 1.0 A
(4) 4.0 V and 9.0 A

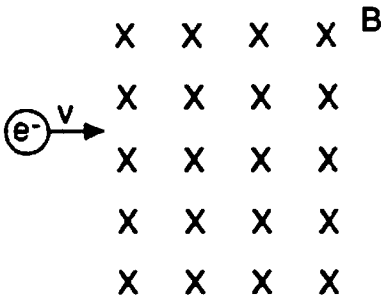
26 A beam of particles is produced in a cathode-ray tube. The beam may be deflected by a magnetic field because each particle in the beam

1 possesses a charge
2 is at rest
3 has a rest mass greater than 9.1×10^{-31} kilogram
4 has a speed of 3.0×10^{8} meters per second

27 Which device does *not* operate by means of torque exerted on a current-carrying loop of wire in a magnetic field?

1 ammeter
2 electric motor
3 transformer
4 voltmeter

Base your answers to questions 28 and 29 on the diagram below which represents an electron about to enter uniform magnetic field B. The velocity of the electron (v) is 6.0×10^{7} meters per second to the right. The flux density of the magnetic field is 4.0×10^{-2} tesla, directed into the page.



28 When the electron first enters the magnetic field, the electron experiences a magnetic force directed toward the

1 top of the page
2 bottom of the page
3 left of the page
4 right of the page

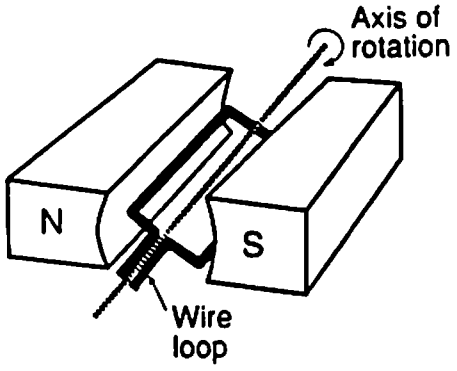
29 The magnitude of the magnetic force acting on the electron in the field is approximately

(1) 2.4×10^{-11} N
(2) 3.8×10^{-13} N
(3) 1.6×10^{-18} N
(4) 2.2×10^{-24} N

30 As a charged particle moves through a magnetic field, the particle is deflected. The magnitude of the magnetic force acting on the particle is directly proportional to the

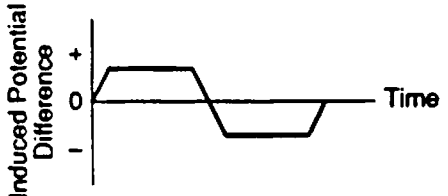
1 mass of the particle
2 electric charge on the particle
3 polarity of the magnetic field
4 work done on the charge by the magnetic field

Base your answers to questions 31 through 33 on the diagram below which shows a loop of wire being rotated at a constant rate about an axis in a uniform magnetic field.

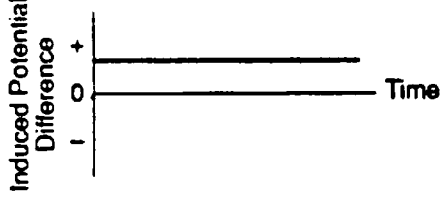


31 Which graph best represents the relationship between induced potential difference across the ends of the loop and time, for one complete rotation?

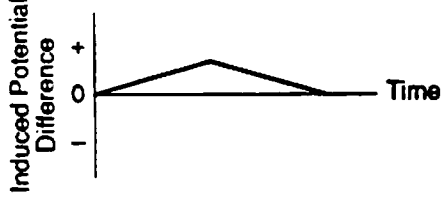
(1)



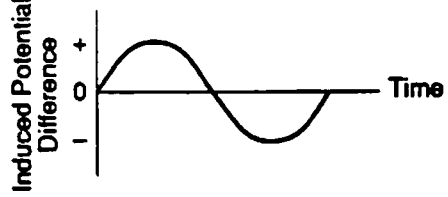
(2)



(3)



(4)



32 Which procedure would enable a current to flow in the loop, due to the induced potential difference?

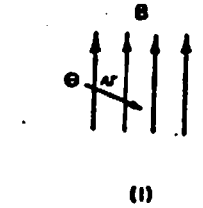
1 turning the loop in the opposite direction at the same rate of rotation
2 increasing the distance between the ends of the loop
3 connecting the ends of the loop to each other with an insulating material
4 connecting the ends of the loop to each other with a conducting material

Note that question 33 has only three choices.

33 As the speed of rotation of the wire loop is increased, the maximum electromotive force induced in the loop

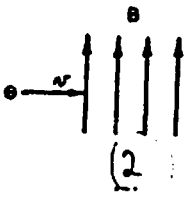
1 decreases
2 increases
3 remains the same

34 An electron traveling at a speed (v) in the plane of this paper enters a uniform magnetic field. Which diagram best represents the condition under which the electron will experience the greatest magnetic force as it enters the magnetic field?



(1)

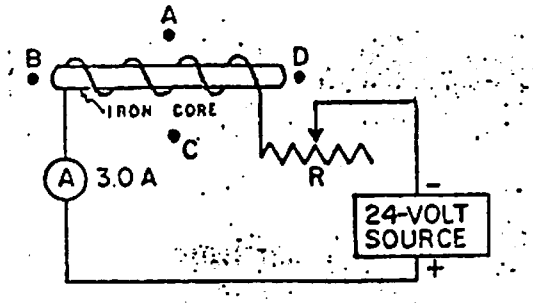
(3)



(2)

(4)

Base your answers to questions 35 through 38 on the circuit diagram below which represents a solenoid in series with a variable resistor and a voltage source.



35 The resistance of the circuit is
(1) 72 Ω
(2) 24 Ω
(3) 12 Ω
(4) 8.0 Ω

36 The direction of the magnetic field inside the iron core is toward point
(1) *A*
(2) *B*
(3) *C*
(4) *D*

Note that questions 37 and 38 have only three choices.

37 If the resistance of the variable resistor is decreased, the magnetic field strength of the solenoid will
1 decrease
2 increase
3 remain the same

38 If the iron core is removed from the solenoid, the magnetic field strength of the solenoid will
1 decrease
2 increase
3 remain the same

39 Electromagnetic radiations are produced by
1 an accelerating alpha particle
2 an accelerating neutron
3 a proton at a constant velocity
4 an electron at a constant velocity

40 The transformer on a power pole steps down the voltage from 10,800 volts to 120. volts. If the secondary coil contains 360 turns, how many turns are on the primary coil?
(1) 30
(2) 90
(3) 3600
(4) 32,400

41 When a 12-volt potential difference is applied to the primary coil of a transformer, an 8.0-volt potential difference is induced in the secondary coil. If the primary coil has 24 turns, how many turns does the secondary coil have? [Assume 100% efficiency.]
(1) 36
(2) 16
(3) 3
(4) 4