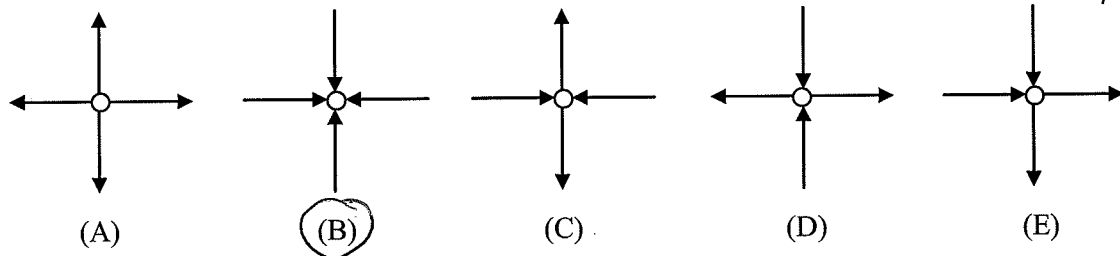


Physics 1114
Midterm #3 – Spring 2014
Version A

Multiple choice (6 points each for questions 2-19)

- 1) Which exam version do you have?
 - A) A
 - B) B
 - C) C
 - D) D
- 2) What discussion section are you in?
 - A) Section 11: 8:30-9:20 AM Physical Science Center 359 (Tang)
 - B) Section 12: 10:30-11:20 AM Nielsen Hall Room 251 (Tang)
 - C) Section 13: 11:30-12:20 PM Adams Hall Room 101 (Savoy)
 - D) Section 14: 12:30-1:20 PM Physical Science Center 359 (Savoy)
- 3) A negatively charged object is moved from a place where the electric potential is defined to be 0 V to a place where the electric potential is 100 V. Which of the following is true?
 - A) Neither the electric potential nor the electric potential energy changed.
 - B) The electric potential increased and the electric potential energy increased.
 - ☒ C) The electric potential increased but the electric potential energy decreased.
 - D) The electric potential decreased and the electric potential energy decreased.
 - E) The electric potential decreased but the electric potential energy increased.
- 4) Which diagram shows the proper electric field lines for a negatively charged object?

Electric potential ↑
+++++
↑
0 -----
since $q < 0$
potential E ↓



- 5) 1.6 A of current flows from a single battery that is connected to three resistors of 15 Ω , 20 Ω , and 25 Ω in series. What is the voltage of the battery?
 - A) 10 V
 - B) 32 V
 - C) 38 V
 - D) 47 V
 - ☒ E) 96 V

$R_s = 15\Omega + 20\Omega + 25\Omega = 60\Omega$
 $E = IR = 1.6A \cdot 60\Omega = 96V$

- 6) Two resistors with different values of resistance are connected in parallel to a battery. Which of the following is true?

(A) The voltage across the resistors is the same but the current through the resistors is not the same.
 B) The voltage across the resistors is the same and the current through the resistors is the same.
 C) The voltage across the resistors is not the same but the current through the resistors is the same.
 D) The voltage across the resistors is not the same and the current through the resistors is not the same.
 E) None of the above.

Voltage across
always same
in parallel
resistors

$$I = \frac{E}{R}$$

since R different
I different

- 7) If 5.7×10^{14} electrons in a wire pass a point in 0.75 s, what current does this correspond to?

A) 6.8×10^{-5} A
 B) 9.1×10^{-5} A
 (C) 1.2×10^{-4} A
 D) 7.6×10^{14} A
 E) 4.8×10^{33} A

$$I = \frac{q}{t} = \frac{5.7 \times 10^{14} e \cdot 1.6 \times 10^{-19} C/e}{0.75 s}$$

$$I = 1.2 \times 10^{-4} A$$

- 8) A parallel plate capacitor has plates separated by 1.4 cm and a potential difference between the plates of 250 V. What is the electric field between the plates?

A) 3.5 V/m
 B) 180 V/m
 C) 350 V/m
 (D) 18,000 V/m
 E) 35,000 V/m

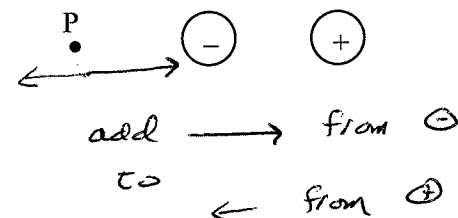
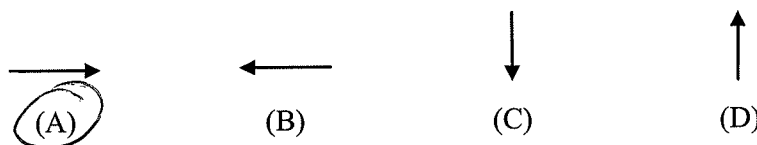
$$d = .014 m$$

$$V = 250 V$$

$$V = E d$$

$$E = \frac{V}{d} = \frac{250 V}{.014 m} = 17857 \sim 18,000$$

- 9) Two objects with equal but opposite charge are placed as shown in the figure. Which direction is the electric field produced by these objects at the point marked P to the left of both objects?



← smaller magnitude
since farther away

(E) None of the above. The electric field there is zero.

- 10) When resistors are connected in series

A) The same power is dissipated in each one
 B) The potential difference across each is the same
 (C) The current flowing in each is the same
 D) More than one of the above is true
 E) None of the above answers are true.

current always the same
in resistors in series

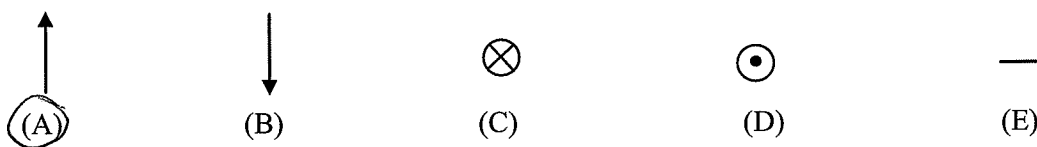
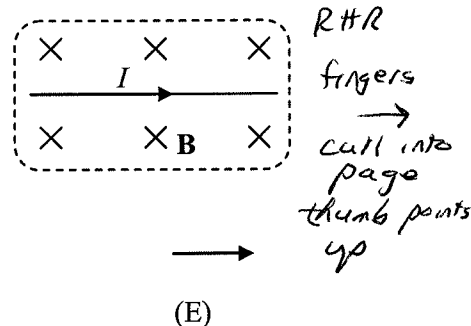
- 11) Three resistors of $12\ \Omega$, $12\ \Omega$ and $6\ \Omega$ are connected in parallel. A 12-V battery is connected to the combination. What is the total current coming out of the battery?

A) 1 A
B) 2 A
C) 3 A
D) 4 A
E) 6 A

$$\frac{1}{R_p} = \frac{1}{12} + \frac{1}{12} + \frac{1}{6} = \frac{4}{12}\ \Omega^{-1} \quad R_p = \frac{12}{4} = 3\ \Omega$$

$$I = \frac{E}{R} = \frac{12\text{V}}{3\ \Omega} = 4\text{ A}$$

- 12) A long straight wire has a current I flowing to the right as shown in the figure. When this wire is placed in a region of space with a magnetic field \mathbf{B} going into the page as shown, which direction is the force on the wire?

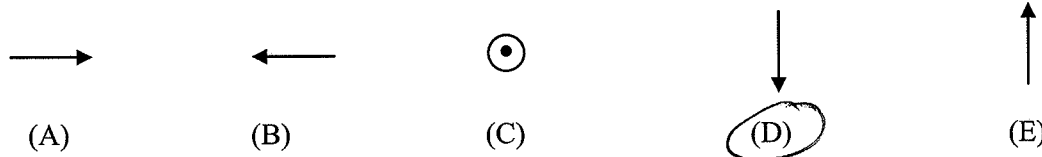
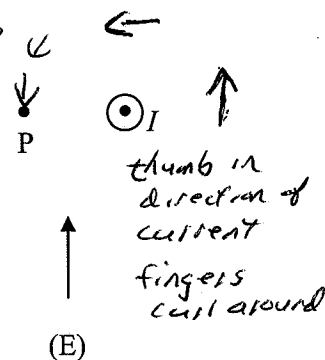


- 13) Which of the following particles will feel a magnetic force?

$$F = qv \perp B$$

A) A charged particle stationary in a magnetic field. $v=0 \quad F=0$
B) A charged particle moving north in a magnetic field pointing north. $v \parallel B$
C) A charged particle moving east in a magnetic field pointing north.
D) A neutral particle moving east in a magnetic field pointing north. $q=0$
E) A neutral particle moving north in a magnetic field pointing north. $q=0$

- 14) A long wire has a current I flowing out of the page as shown in the figure to the right. What direction is the magnetic field produced from this wire at the point labeled P?



- 15) A heater is rated to dissipate 1440 W when connected to a 120 V source, the current drawn by the heater is

A) 0.083 A
B) 3.2 A
C) 10 A
D) 12 A
E) 130 A

$$P = IV$$

$$I = \frac{P}{V} = 12\text{ A}$$

16) You obtain a 100 W light bulb and a 50 W light bulb. You place them in series across normal household voltage. Which statement is correct?

- A) Both bulbs glow at the same reduced brightness
- B) Both bulbs glow at the same increased brightness
- C) The 100W bulb glows brighter than the 50 W bulb
- ☒ D) The 50 W bulb glows more brightly than the 100 W bulb
- E) Cannot be determined with the given information

17) Two long parallel wires are placed a distance r from each other. One wire carries a current of I_1 and the other wire carries a current of I_2 and the force/unit length is measured. If I_1 is doubled and r is doubled and I_2 remains the same, by what factor does the force/unit length change?

- A) $\frac{1}{4}$
- B) $\frac{1}{2}$
- ☒ C) 1
- D) 2
- E) 4

$$\frac{F}{L} = \frac{k' I_1 I_2}{r} \quad \begin{array}{l} I_2 \text{ doubles} \\ r \text{ doubles} \end{array}$$

$$\frac{F}{L} = \frac{k' 2I_1 I_2}{2r} = \frac{k' I_1 I_2}{r}$$

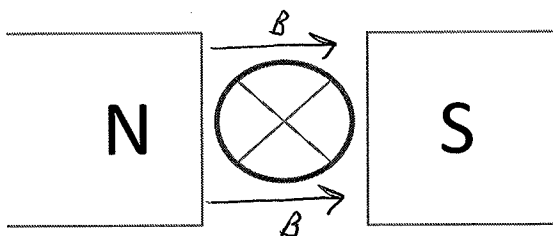
18) A coil of wire with 50 turns has a uniform magnetic field of 0.4 T passing through the coil perpendicular to its plane. The coil encloses an area of 0.03 m^2 . What is the flux through the coil?

- A) 0 Tm^2
- B) 0.012 Tm^2
- C) 0.2 Tm^2
- ☒ D) 0.6 Tm^2
- E) $.12 \text{ Tm}^2$

$$\Phi = NBA = 50 \cdot 0.4 \cdot 0.03 \text{ m}^2 = .6 \text{ Tm}^2$$

19) A long straight wire is placed between the poles of a magnet as shown. When a current is flowing into the page as shown, the direction of the magnetic force on the wire will be:

- A) Toward the left
- B) Toward the right
- C) Toward the top of the page
- ☒ D) Toward the bottom of the page
- E) Out of the page



Fingers point into page
curl to right
thumb points down