NAME (Please Print)_____

Part 1.
*Please c*ircle the correct answer, to the nearest number for the quantitative questions. *Each Question worth's 1 point.*

1. A proton, moving west, enters a magnetic field of a certain strength. Because of this magnetic field the proton curves upward. What is the direction of this magnetic field?

(A) towards the west (B) towards the west (C) towards the south
(D) towards the north (E) downward

2. A charged particle moving with a certain velocity along the **+*x*-axis** enters a magnetic field pointing toward the **+*z*-axis**. Determine the required direction of an electric field that will allow the charged particle to continue to move along the **+*x*-axis**.

(A) along the -*y*-axis (B) along the -*x*-axis (C) along the +*x*-axis
(D) along the -*z*-axis (E) along the +*y*-axis

3. Two long, parallel wires carry currents of different magnitudes. If the amount of current in each wire is doubled, what happens to the magnitude of the force between the wires?

(A) It is doubled. (B) It is tripled. (C) It is quadrupled.
(D) It stays the same. (E) It is reduced by a factor of 2.

4. A proton moving with a velocity of **4.0×10^4 m/s** along the **+*y*-axis** enters a magnetic field of **0.20 T** directed towards the **-*x*-axis**. What is the magnitude force acting on the proton?

(A) 8.0×10^{-15} N (B) 1.3×10^{-15} N (C) 3.9×10^{-15} N
(D) 2.6×10^{-15} N (E) 0 N

5. A **2.0 m** long wire is carrying a current of **2.0 A**. The wire is placed at an angle of **60°** with respect to a magnetic field. If the wire experiences a force of **0.2 N**, what is the strength of the magnetic field?

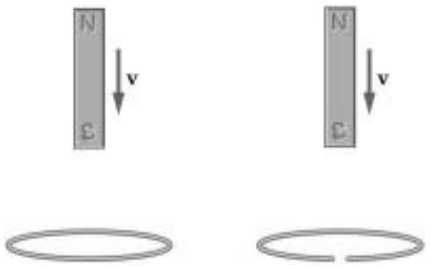
(A) 0.06 T (B) 0.04 T (C) 0.05 T (D) 0.03 T (E) 0.02 T

6. The magnetic field at a point **P**, a certain distance from a long wire carrying a current of **2.0 A**, is **1.2×10^{-6} T**. How far is **P** from the center of the wire?

(A) 11 cm (B) 22 cm (C) 44 cm (D) 33 cm (E) 55 cm

7. The two identical bar magnets in the Figure below are dropped from rest along a vertical line passing through the center of the rings, as shown. The two rings are identical in every respect except that the ring on the right has a small break in it.

Calling $\mathbf{a_L}$ and $\mathbf{a_R}$ the magnitude of the downward accelerations of the magnets on the left and right, respectively, you observe that



(A) $a_L = a_R$. (B) $a_L > a_R$. (C) $a_L < a_R$. (D) $a_L = (½)\, a_R$.
(E) It is not possible to predict the outcome of this experiment with the data given.

8. The number of turns in the coil of a generator is reduced by a factor of **2** and at the same time it is rotated twice as fast keeping other factors constant. What happens to the value of the maximum induced **emf**?

(A) It is reduced by a factor of 2. (B) It is reduced by a factor of 4.
(C) It is doubled (D) It is quadrupled. (E) It stays the same.

9. Which one of the following is the correct unit for the time constant of an *RL* circuit?

(A) H/Ω (B) (V·s)/(A·Ω) (C) s
(D) all of the above (E) none of the above

10. A conducting loop in the form of a circle is placed perpendicular to a magnetic field of **0.50 T**. If the area of the loop increases at a rate of $\mathbf{3.0 \times 10^{-3}\ m^2/s}$, what is the induced **emf** in the loop?

(A) 4.3 mV (B) 0 mV (C) 1.7 mV (D) 5.5 mV (E) 1.5 mV

11. A coil with a self-inductance of **6.0 H** has a constant current of **2.0 A** flowing through it for **2.0 seconds**. What is the **emf** induced in this coil?

(A) 6 V (B) 12 V (C) 4 V (D) 8 V (E) 0V.

Part 2 . Please show your work in the space provided.

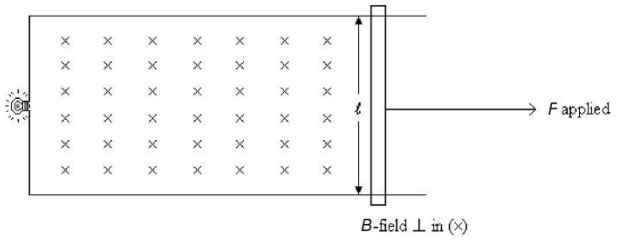
1. A proton moving eastward with a velocity of **5.0×10^3 m/s** enters a magnetic field of **0.20 T** pointing northward. What is the magnitude and direction of the force that acts on the proton? ***(3 points)***

1.6×10^{-16} N upwards

Answer (Magnitude)_____
Answer (Direction)_____

12. A conducting rod with a length of **27.0 cm** is placed on a **U-shaped** metal wire that includes a light bulb with a resistance of **60.0 Ω** as shown in the Figure below. A constant magnetic field with a strength of **0.600 T** is applied perpendicular into the paper. An applied force moves the rod to the right with a constant speed of **6.00 m/s**. What is the power consumed by the light bulb?

(3 points)



15.7 mW

Answer _____

Good Luck