Question 1

Figure 29-26 shows cross sections of two long straight wires; the left-hand wire carries current $i_1$ directly out of the page. The net magnetic field due to the two currents is to be zero at point $P$.

(a) Should the direction of current $i_2$ in the right-hand wire be directly into or out of the page?

(b) Should $i_2$ be greater than, less than, or equal to $i_1$?

Question 2

A surveyor is using a magnetic compass 7.1 m below a power line in which there is a steady current of 120 A. What is the magnetic field in microteslas at the site of the compass due to the power line?

The number of significant digits is set to 2; the tolerance is +/-2%
Question 3

In the figure, point $P_1$ is at distance $R = 12.0$ cm on the perpendicular bisector of a straight wire of length $L = 19.9$ cm carrying current $i = 64.7$ mA. (Note that the wire is not long.) What is the magnitude of the magnetic field at $P_1$ due to $i$ (in T)?

![Diagram of a straight wire with a point $P_1$ on the perpendicular bisector]

Number | Units
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The number of significant digits is set to 3; the tolerance is +/-2%

Question 4

A solenoid 1.62 m long and 2.25 cm in diameter carries a current of 21.5 A. The magnetic field inside the solenoid is 27.2 mT. Find the length of the wire forming the solenoid.

Number | Units
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The number of significant digits is set to 3; the tolerance is +/-2%

Question 5

A long solenoid has 140 turns/cm and carries current $i$. An electron moves within the solenoid in a circle of radius 2.38 cm perpendicular to the solenoid axis. The speed of the electron is $0.0430c$ ($c =$ speed of light, equal to $2.998 \times 10^8$ m/s). Find the current $i$ (in A) in the solenoid.

Number | Units
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The number of significant digits is set to 3; the tolerance is +/-2%

Question 6

In the figure, a closed loop carries current $i = 254$ mA. The loop consists of two radial straight wires and two concentric circular arcs of radii 2.83 m and 6.58 m. The angle $\theta$
is 1.29 rad. What is the magnitude of the net magnetic field (in T) at the center of curvature P?

Number | Units
--- | ---

*1

The number of significant digits is set to 3; the tolerance is +/-2%

**Question 7**

If the circular conductor in Fig. 30-21 undergoes thermal expansion while it is in a uniform magnetic field, a current is induced clockwise around it. Is the magnetic field directed into or out of the page?

- Out of
- Into

**Question 8**

In Fig. 30-23, a long straight wire with current $i$ passes (without touching) three rectangular wire loops with edge lengths $L$, $1.5L$, and $2L$. The loops are widely spaced (so as not to affect one another). Loops 1 and 3 are symmetric about the long wire.
Rank the loops according to the size of the current induced in them if current $i$ is constant, greatest first. If multiple loops rank equally, use the same rank for each, then exclude the intermediate ranking (i.e. if objects A, B, and C must be ranked, and A and B must both be ranked first, the ranking would be A:1, B:1, C:3). If all loops rank equally, rank each as '1'.

1. Greatest
2. Second greatest
3. Third greatest

Rank the loops according to the size of the current induced in them if current $i$ is increasing, greatest first. If multiple loops rank equally, use the same rank for each, then exclude the intermediate ranking (i.e. if objects A, B, and C must be ranked, and A and B must both be ranked first, the ranking would be A:1, B:1, C:3). If all loops rank equally, rank each as '1'.

1. Greatest
2. Second greatest
3. Third greatest

Question 9

An elastic conducting material is stretched into a circular loop of 17.7 cm radius. It is placed with its plane perpendicular to a uniform 0.922 T magnetic field. When released, the radius of the loop starts to shrink at an instantaneous rate of 84.1 cm/s. What emf is induced in volts in the loop at that instant?

\[ *1 \text{ V} \]

*The number of significant digits is set to 3; the tolerance is +/-2%*
Question 10

One hundred turns of (insulated) copper wire are wrapped around a wooden cylindrical core of cross-sectional area $2.76 \times 10^{-3} \text{ m}^2$. The two ends of the wire are connected to a resistor. The total resistance in the circuit is $15.3 \, \Omega$. If an externally applied uniform longitudinal magnetic field in the core changes from 1.37 T in one direction to 1.37 T in the opposite direction, how much charge (in C) flows through a point in the circuit during the change?

\[ *1 \text{ C} \]

*The number of significant digits is set to 3; the tolerance is +/-2%*

Question 11

A 10 H inductor carries a current of 2.7 A. At what rate must the current be changed to produce a 88 V emf in the inductor?

\[
\begin{array}{|c|c|}
\hline
\text{Number} & *1 \text{ Units} \\
\hline
\end{array}
\]

*The number of significant digits is set to 2; the tolerance is +/-2%*