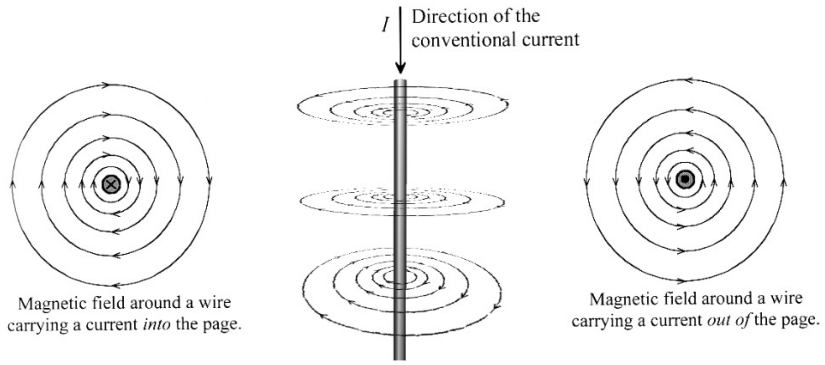
Magnetic Fields Assignment ***SOLUTIONS***

1.

various options are given and not exclusive

a)



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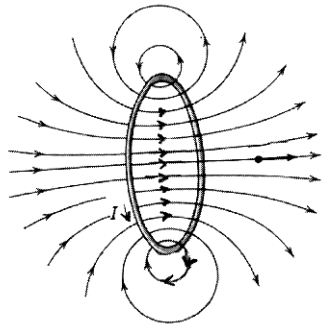
b)



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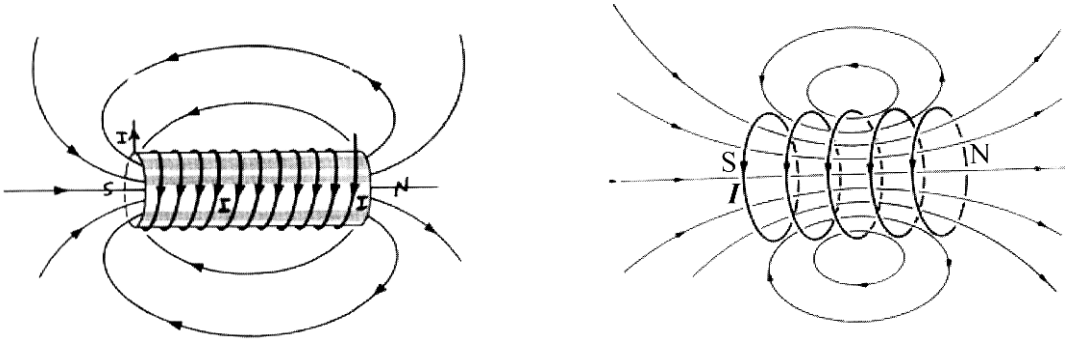
c)



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2.

a) out of the page

b) to the left

c) towards the top of the page

d) into the page

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3.

a) Force is proportional to sinθ, where θ is the angle between direction of the current and the direction of the magnetic field.

If θ is 0° (parallel) or 180° (antiparallel), sinθ = 0 so F = 0.

/2

b) $F = I\Delta l B \sin\theta$

$= 0.951 \times 20.1 \times 10^{-2} \times 4.99 \times 1$

$= 0.954\text{N}$ (3 s.f.)

/2

c) $B = \dfrac{F}{I\Delta l \sin\theta}$

$= \dfrac{0.954}{0.951 \times 20.1 \times 10^{-2} \times \sin(25.0°)}$

$= 11.8\text{ T}$ (3 s.f.)

/2

d) $\theta = \sin^{-1}\left(\dfrac{F}{I\Delta l B}\right)$

$= \sin^{-1}\left(\dfrac{0.954 \times 2}{0.951 \times 20.1 \times 10^{-2} \times 11.8}\right)$

$= 57.7°$ (3 s.f.)

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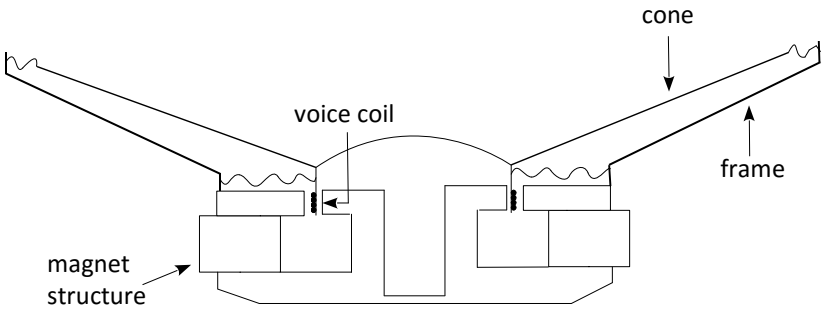
4.

a)



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b)

Since the "voice coil" runs between two magnet poles, it will experience a force when current flows through it.

The input voltage to the coil (and therefore current since Ohm's law I = V/R applies and resistance is constant) alternates with the signal, so that according the right hand rule the force on the coil (and therefore the cone) is either out of the speaker or into the speaker at any moment.

This continual in-out motion produces compressions and rarefactions in the air, which is sound.

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TOTAL /26