**Practice for 20.1 - Right Hand Rules**

**1.** These are vector cross product questions. The "X" in the middle means cross product. Your right hand **index finger** goes in the direction of the **first vector**, your **middle finger** in the direction of the **second vector**, and your **thumb** is the **resultant vector** or answer. (Whilst you are making the Physics gang sign)

"x" = into the page

"." = out of the page

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| **(down the page)**Xx | **(up the page)**X**.** | **(out of the page)**X | **(left)**X**.** |
| **(right)**Xx | **(down the page)**X**.** | **(up the page)**Xx | **(up the page)**X**.** |
| **(into the page)**X | **(right)**Xx | **(into the page)**X | **(up the page)**X**.** |
| **(out of the page)**X | **(down the page)**X**.** | **(left)**X**.** | **(into the page)**X |
| **(out of the page)**X | **(left)**X**.** | **(left)**X**.** | **(into the page)**X |

**2.** These are for the magnetic field around a wire. You wrap the fingers of your right hand around the wire with your **thumb** in the direction of the **current**. Your **fingers** wrap in the direction that the **magnetic field (B)** encircles the wire. So in these, where it says "B?" I want to know the direction of the B field there on that side of the wire. (into (x) or out of (.) the page) Where I give you the B field, I want to know which way the current would go to effect those fields.

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| **(into the page)**B?I | **(into the page)**IB? | **(current flows →)**B x x x x x x xB . . . . . . .I? | **(left side into the page, right side, out of the page)** B?B? |
| **(into the page)**B?I | **(out of the page)**B?I | **(current flows →)**B x x x x x x xB . . . . . . .I? | **(left side into, right out of page)** B?B? |
| **(into the page)**IB? | **(out of the page)**B?I | **(current flows ←)**B . . . . . . .B x x x x x x xI? | **(below the wire into the page, above, out of)** IB?B? |
| **(out of the page)**B?I | **(into the page)**B?I | **(current flows ↑)**B .....B xxxxxI? | **(above the wire into, below the wire out of the page)** B?B? |
| **(out of the page)**IB? | **(out of the page)**IB? | **(current flows ↓)**B .....B xxxxxI? | **(right side into, left side, out of the page)** IB?B? |

**3.** These are for predicting the location of the North Pole of an electromagnet or loop of wire. You wrap the **fingers** of your right hand in the **direction of the current** in the loop or solenoid, and your **thumb** is the **North Pole**.

"x" = into the page

"." = out of the page

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| **Which way does the north pole point?(.)**I | **Which way does the north pole point? (x)**I | **Which way does the north pole point? (←)****(Current flows up on Front of coil)** | **Which way does the current flow on the front side of this coil? (←)**NS |
| **Which way does the north pole point? (.)**I | **Which way does the north pole point? (x)**I | **Which way does the north pole point? (↑)****(Current flow L to R on Front of coil)** | **Which way does the current flow on the front side of this coil? (↓)**NS |
| **Which way does the north pole point? (x)**I | **Which way does the north pole point? (.)**I | **Which way does the north pole point? (↑)****(Current flow L to R on Front of coil)** | **Which way does the current flow on the front side of this coil? (↑)**SN |
| **Which way does the north pole point? (x)**I | **Which way does the north pole point? (.)**I | **Which way does the north pole point? (→)****(Current flows down on Front of coil)** | **Which way does the current flow on the front side of this coil? (→)**SN |
| **Which way does the north pole point? (x)**I | **Which way does the north pole point? (.)**I | **Which way does the north pole point? (↓)****(Current flow R to L on Front of coil)** | **Which way does the current flow on the front side of this coil? (↑)**NS |

**4.** This is the right hand rule for the force on a wire. Your **index finger** goes in the direction of the **current**, your **middle finger** goes in the direction of the **B field**, and your **thumb** is in the direction of the **force on the wire**. (Assuming you are making the Physics gang sign)

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| **F ? (←)**B:x x x x x x xx x x x x x xx x x x x x xx x x x x x xI | **F ? (.)**B:I | **B ? (That causes the force)**F = **.** (out of the page)I**(↓)** | **I ? (↓)** FB:. . . . . . .. . . . . . .. . . . . . .. . . . . . . |
| **F ? (→)**B:. . . . . . .. . . . . . .. . . . . . .. . . . . . .I | **F ? (x)**B:I | **B ? (That causes the force)**IF = **.** (out of the page)**(←)** | **I ? (.)**BF |
| **F ? (x)**IB: | **F ? (.)**B:I | **B ? (That causes the force)**FI**(.)** | **I ? (x)**BF |
| **F ? (.)**B:I | **F ? (↑)**B:. . . . . . .. . . . . . .. . . . . . .. . . . . . .I | **B ? (That causes the force)**IF**(.)** | **I ? (↓)**B:x x x x x x xx x x x x x xx x x x x x xx x x x x x xF |
| **F ? (.)**B:I | **F ? (↑)**IB:x x x x x x xx x x x x x xx x x x x x xx x x x x x x | **B ? (That causes the force)**FI**(.)** | **I ? ( ←)**FB:. . . . . . .. . . . . . .. . . . . . .. . . . . . . |

**5.** This is the right hand rule for particles. Your **index** **finger** goes in the **direction the charge is moving**, your **middle** **finger** goes in the direction of the **B field**, and your **thumb** is in the direction of the **force** on the particle. **Remember that the force will be opposite this for a negative (-) charge.**

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| **Which way is the force on the moving particle? (↑)**B:x x x x x x xx x x x x x xx x x x x x xx x x x x x x | **Which way is the force on the moving particle? (.)**B | **Which way must a proton move to experience a northerly force in a vertically upward magnetic field? (w)**NW ES | **An electron moving south experiences a force to the west. B is what way?**NW ES**(vertically downward or x)** |
| **Which way is the force on the moving particle? (←)**B:. . . . . . .. . . . . . .. . . . . . .. . . . . . . | **Which way is the force on the moving particle? (↓)**B:. . . . . . .. . . . . . .. . . . . . .. . . . . . . | **Which way must a proton move to experience a vertically downward force in an easterly magnetic field? (n)**NW ES | **An electron moving east experiences a force to the north. B is what way?** NW ES**(vertically upward or .)** |
| **Which way is the force on the moving particle? (x)**B: | **Which way is the force on the moving particle? (→)**B:. . . . . . .. . . . . . .. . . . . . .. . . . . . . | **Which way must a proton move to experience a southerly force in a vertically downward magnetic field? (w)**NW ES | **An electron moving south experiences a force vertically downward. B is what way? (e)**NW ES |
| **Which way is the force on the moving particle? (.)**B: | **Which way is the force on the moving particle? (x)**B | **Which way must a proton move to experience a easterly force in a northerly magnetic field? (vertically downward or x)** NW ES | **An electron moving vertically upward experiences a force to the north. B is what way? (w)**NW ES |
| **Which way is the force on the moving particle? (↑)**B:. . . . . . .. . . . . . .. . . . . . .. . . . . . . | **Which way is the force on the moving particle?(→)**B:x x x x x x xx x x x x x xx x x x x x xx x x x x x x | **Which way must a proton move to experience a vertically upward force in a northerly magnetic field? (e)**NW ES | **An electron moving east experiences a force to the vertically downward. B is what way? (n)**NW ES |