Wire is above the magnet.
The force on the wire is:

1. Up  
2. Down  
3. Right  
4. Left  
5. Into Page  
6. Out of Page  
7. Don’t Know
Prediction 1

(6) Out of the page

Magnetic field is up
Current is to the right

\[ I \hat{d}\mathbf{l} \times \mathbf{B} \text{ is right} \times \text{up} \]

is out of the page
Experiment 6: Prediction 2

Wire is in front of magnet. The force on the wire is

1. Up          2. Down
3. Right       4. Left
5. Into Page   6. Out of Page
7. Don’t Know
Prediction 2

(5) Into the page

The magnetic field is down and the current is to the right, so that $I \, d\vec{l} \times \vec{B}$ is into the page.
Wire is behind the magnet. The force on the wire is

1. Up  2. Down  
3. Right  4. Left  
5. Into Page  6. Out of Page  
7. Don’t Know
Prediction 3

(5) Into the page

The magnetic field is still down and the current is still to the right, so that $I \, d\vec{l} \times \vec{B}$ is again into the page
Experiment 6: Prediction 4

Force on the coil of wire is

1. Up 2. Down
3. Right 4. Left
5. Into Page 6. Out of Page
7. Don’t Know
Prediction 4
(2) Down
Look where current is into/out of page – force is in plane of the page.
IMPORTANT: Field lines are not straight up!
The force on the coil of wire is
1. Up    2. Down
3. Right  4. Left
5. Into Page  6. Out of Page
7. Don’t Know
Prediction 5
(1) Up

Reverse the current, reverse the force.
Bent Wire

The magnetic field at point P

1. points towards the +x direction
2. points towards the +y direction
3. points towards the +z direction
4. points towards the -x direction
5. points towards the -y direction
6. points towards the -z direction
7. points nowhere because it is zero
Bent Wire

(6) B is in the $-z$ direction

The vertical line segment contributes nothing to the field at P (it is parallel to the displacement).

The horizontal segment makes a field into the page.
Curved Wire

The magnetic field at P is equal to the field of:
1. a semicircle
2. a semicircle plus the field of a long straight wire
3. a semicircle loop minus the field of a long straight wire
4. none of the above
Curved Wire

(2) Semicircle + long, straight wire

All of the wire makes B into the page. The two straight parts, if put together, would make an infinite wire. The semicircle is added to this to get the complete field
Two Particles

Two positive charges are mounted on tracks that force them to move at constant velocities. The magnetic force on the charge $q_1$ due to $q_2$ points in the direction of:

1. $+x$
2. $+y$
3. $+z$
4. $-x$
5. $-y$
6. $-z$
7. Nothing (zero force)
8. Points in some other direction
Two Particles

(2) The force is up (+y direction)

$q_2$ generates a B field out of the page (+z) at $q_1$.

$$\vec{v} \times \vec{B} = -\hat{i} \times \hat{k} = \hat{j}$$

So the force is in the +y direction.