12. Magnetism and Electromagnetism

Starter Quiz · 课前小测

AP Physics 2 Name: _____ Score: _____

1. Two north poles are brought together. They:

   ☐ attract

   ☐ repel

   ☐ do nothing

   ☐ merge into one pole

2. A 2 C charge moves at 3 $\frac{\text{m}}{\text{s}}$ across a 4 T field (right angles). What force does it feel, in N?

   _____ N

3. A 0.5 m wire carries 4 A across a 2 T field. What force does it feel, in N?

   _____ N

4. A 100-turn coil has its flux change by 0.02 Wb in 0.5 s. What is the size of the induced EMF, in V?

   _____ V

5. Outside a magnet, field lines point:

   ☐ from south to north

   ☐ from north to south

   ☐ randomly

   ☐ straight up

6. The magnetic force on a moving charge is directed:

   ☐ along the velocity

   ☐ along the field

   ☐ perpendicular to both velocity and field

   ☐ opposite the velocity

7. The force on a current-carrying wire in a magnetic field is:

   ☐ $F = qvB$

   ☐ $F = BIL$

   ☐ $F = IR$

   ☐ $F = ma$ only

8. What is needed to induce a voltage in a coil?

   ☐ a steady magnetic field

   ☐ a changing magnetic flux

   ☐ a stationary magnet inside it

   ☐ a large resistance

9. You can cut a bar magnet to obtain a single, isolated north pole.

   ☐ True ☐ False

10. A stationary charge in a magnetic field feels no magnetic force.

    ☐ True ☐ False

AP Physics 2

1. **repel**

   Like poles repel, just as like charges do.

2. **24 N**

   $F = qvB = 2 \times 3 \times 4 = 24$ N.

3. **4 N**

   $F = BIL = 2 \times 4 \times 0.5 = 4$ N.

4. **4 V**

   $|\varepsilon| = N\Delta\Phi/\Delta t = 100 \times 0.02/0.5 = 4$ V.

5. **from north to south**

   Outside a magnet, field lines run from the north pole to the south pole.

6. **perpendicular to both velocity and field**

   The force is perpendicular to both the velocity and the field.

7. $F = BIL$

   $F = BIL$ — the motor-effect force on a current.

8. **a changing magnetic flux**

   Only a changing flux induces an EMF; a steady field does nothing.

9. **False**

   Poles always come in pairs; each piece of a cut magnet has both N and S.

10. **True**

    The magnetic force needs motion: $F = qvB$ is zero when $v = 0$.