1. A wire placed in a constant magnetic field deflects upward when a current is passed through the wire. Reversing the direction of the current
A) causes exactly the same deflection in the wire.
B) causes no deflection in the wire.
C) deflects the wire downward.
D) causes upward deflection, but not as much.

2. Increasing the amount of current passing through the wire
A) causes exactly the same deflection in the wire.
B) causes no deflection in the wire.
C) deflects the wire in the opposite direction.
D) causes a greater deflection in the same direction.

3. Decreasing the amount of current passing through the wire
A) causes exactly the same deflection.
B) more deflection, same direction.
C) more deflection, opposite direction.
D) less deflection in the same direction.

4. Two identical magnets are pushed into two wire coils with a different number of loops.
A) The coil with more loops exerts less force on the magnet.
B) The coil with fewer loops exerts less force on the magnet.
C) The number of loops in the coils makes no difference.

5. You observe that passing a bar magnet through a 100–turn coil impresses 40 volts across the circuit. If you pass the magnet through the coil more quickly,
A) the voltage and current both decrease.
B) the voltage and current both increase.
C) same voltage, more current.
D) same voltage, less current.

6. If you pass the magnet through the coil more slowly,
A) the voltage increases.
B) the voltage decreases.
C) same voltage, less current.
D) same voltage, more current.

7. Using the same magnet and speed through a 50–turn coil, what voltage would you expect?
A) 20 V  B) 30 V  C) 40 V  D) 50 V  E) 80 V

8. Using the same magnet and speed through a 200–turn coil, what voltage would you expect?
A) 20 V  B) 40 V  C) 60 V  D) 80 V  E) 100 V

9. Replacing the magnet with a stronger one, you pass it through the 100–turn coil. You would expect
A) a stronger magnet to impress a greater voltage.
B) a stronger magnet to impress a smaller voltage.
C) a stronger magnet to impress exactly the same voltage as the weaker one.
D) a stronger magnet to impress less voltage when moved at increasing speed.

10. Replacing the original magnet with a weaker one, you pass it through the 100–turn coil. You would expect
A) a greater voltage.
B) a smaller voltage.
C) exactly the same voltage as the stronger one.
D) less voltage when moved at increasing speed.

11. Keeping the magnet stationary, instead you rotate the loop of wire.
A) This has no effect. No current flows through the wire.
B) This will be equally effective at generating current through the loop.

12. With a stationary magnet, you rotate the loop of wire faster than before.
A) So what? No current before, still no current now.
B) The faster the loop moves, the more current you will generate through it.
C) Increasing the speed will decrease the amount of current in the loop.
D) The current will increase or decrease; depends on whether you rotate clockwise or counterclockwise.
13. If you don't even have a magnet, you can still generate a current through your loop: get another loop of wire, bring it close, and vary the current through it. This makes a varying magnetic field that will impress a voltage across the original loop!
   A) No. No. This is so wrong, you can't even begin to count the ways.
   B) Oh yeah. This works just fine.

14. When you push a magnet through a coil of copper wire, you notice that the galvanometer needle moves to the right. If you pull the same magnet back through the loop of wire in the other direction, the needle
   A) moves to the right again. The galvanometer needle only moves one way.
   B) moves right, but it's because the direction of the current has not changed.
   C) does not move. Current only flows through the loop if the magnet moves one way, not the other.
   D) moves left, because the needle has to alternate the direction it moves: right, left, right, left.
   E) moves left. Changing the direction of motion induced the current to flow in the opposite direction.

15. What is the difference between an ammeter, voltmeter, and galvanometer?
   A) They are unrelated instruments.
   B) They are, in fact, the same instrument, just calibrated to measure different quantities.
   C) They are related, but only by the fact that they can be used to measure things about circuits.
   D) An ammeter is like a "pump" to move electrical energy, but a voltmeter is more like a "bucket" to store it.
   E) Ammeters convert electrical to mechanical energy, voltmeters convert mechanical to electrical energy. A galvanometer can do either.

16. The principles of the ac generator were developed by
   A) Thomas Edison, who used the first ac generator to electrocute Nikola Tesla.
   B) Alexander Graham Bell, who used the first ac generator to make a telephone to call Nikola Tesla.
   C) Henry Ford, who used the generator to power the first car, which he drove to Nikola Teslas house.
   D) Nikola Tesla!

17. Magnetic flux is
   A) the changing drift velocity of electrons as they move through a magnetic field.
   B) the changing force on a charged particle as it moves through a changing magnetic field.
   C) the change in current that results when a magnet is moved parallel to a long straight wire.
   D) the changing number of field lines lassoed by a loop of wire as one or the other is moved.

18. To increase the magnetic flux through a loop of wire, you could
   A) make the loop smaller.
   B) make the magnetic field weaker.
   C) decrease the number of loops of wire making up the coil.
   D) spin the coil so that the plane of the loop is perpendicular to the magnetic field lines.
   E) do nothing. Leave everything perfectly still. Anything you touch or change will decrease the flux.

19. As the wire loop of an ac generator is rotated, the magnetic flux
   A) remains constant, and depends on the strength of the magnet used.
   B) remains zero at all times, but the current moves in alternating directions.
   C) changes continuously, and the direction of the current changes automatically.
   D) changes continuously, but the direction of the induced current remains constant.

20. An electrical motor
   A) converts electrical energy to mechanical.
   B) converts mechanical energy to electrical.
   C) converts chemical energy into mechanical.
   D) produces more energy than it consumes.

21. A generator
   A) converts electrical energy to mechanical.
   B) converts mechanical energy to electrical.
   C) converts chemical energy into mechanical.
   D) produces more energy than it consumes.
22. Maxwell's equations: what's the point?
   A) No point, really. Just some weird looking equations that nobody really needs or understands.
   B) These equations are significant because they summarized ideas about electricity and magnetism that no one had ever thought of before. For example, Maxwell's equations prompted Coulomb to investigate the electrostatic force and write his own equation.
   C) When Maxwell wrote his equations in the 1860s, they were a new way of looking at ideas that had been previously stated. For example, the equations for electric and magnetic forces were well known, but he approached the problems using the concept of the field, which was a new idea.
   D) Maxwell's equations, written in 1867, led directly to the invention of the television in 1868. The invention of the television in 1868 led directly to the invention of the TV dinner in 1869, followed immediately by the microwave oven in 1870.

23. A step-down transformer will
   A) increase the secondary voltage so it is greater than the primary voltage.
   B) decrease the secondary voltage so it is lower than the primary voltage.

24. A step-up transformer will
   A) increase the secondary voltage so it is greater than the primary voltage.
   B) decrease the secondary voltage so it is lower than the primary voltage.

25. The number of secondary windings in a step-up transformer is
   A) less than the number of primary windings.
   B) equal to the number of primary windings.
   C) greater than the number of primary windings.

26. The number of secondary windings in a step-down transformer is
   A) less than the number of primary windings.
   B) equal to the number of primary windings.
   C) greater than the number of primary windings.

27. A model train requires 9V to operate. The primary coil of its transformer has 280 windings. If the primary is connected to a 120-V household circuit, how many secondary windings are there?
   A) 2.33 turns  
   B) 3.86 turns  
   C) 13.3 turns  
   D) 21 turns