1. Which of the following does not create a magnetic field?
   A) The orbital motion of electrons.
   B) Electrons spinning.
   C) An electric current through a wire.
   D) The gravitational attraction between protons and electrons.
   E) All of the above are related, therefore all create magnetic fields.

2. Which of the following is most responsible for creating the magnetic field of a typical refrigerator magnet?
   A) The orbital motion of electrons.
   B) Gravitational attraction between protons and electrons.
   C) Electrons spinning.
   D) Convection currents as the denser metal sinks.

3. Every magnet has
   A) two poles, either a pair of North poles or a pair of South poles.
   B) two poles, one negative and one positive.
   C) a pair of poles, one North and one South.
   D) at least 50% iron in its composition.

4. The magnetic force
   A) causes like poles to repel each other.
   B) causes like poles to attract each other.

5. The magnetic field lines of a bar magnet
   A) are all straight, directly away from the north pole of the magnet.
   B) criss-cross each other randomly, without any discernible pattern.
   C) curve from the north to the south pole of the magnet.
   D) cannot be seen, so they do not exist and cannot be mapped.

6. A friend hands you a rectangular piece of metal, and claims that it has a single magnetic pole, located at the exact center of the object.
   A) Not possible; if it only had one pole, that pole would have to be located on one end.
   B) Not possible; magnetic poles always occur in pairs.
   C) Possible; magnetic monopoles are actually quite common.
   D) Winner of the 2005 Nobel Prize for Physics: you! Well, your friend, unless you nonchalantly tell him that the metal is worthless, offer him a dollar for it, then publish your amazing findings in a reputable peer-reviewed journal.

7. Which would be the least suitable material for making a compass needle?

8. Which would be the most suitable material for making a compass needle?

9. A magnetic domain is a region
   A) within a substance where there are no electrons, so there is no magnetic field.
   B) within a substance where electron spins are in alignment, creating a magnetic field.
   C) of space in which you can feel a magnetic force, even when you are not touching a magnet.
   D) of space where solar particles are deflected by the earth's magnetic field.

10. Which of the following is not true with respect to magnetic domains?
    A) Most materials are not magnetic because the domains are randomly aligned.
    B) Increasing the alignment of magnetic domains in a piece of iron increases its magnetic field.
    C) The more random the domains are, the stronger the magnet will be.

11. Most materials are not magnetic because
    A) the domains are randomly aligned.
    B) they have no domains to be either aligned or not aligned.
    C) the domains are in perfect alignment.
    D) they have no electrons.
12. Can a magnet attract a piece of iron that is not magnetized? Why or why not?
   A) No; iron does not have a good structure for magnetism.
   B) No; non-magnetic material will not show attractive or repulsive forces to a magnet.
   C) Yes; all metals are attracted to magnets.
   D) Yes; the domains in the iron are induced into alignment and one pole is attracted to the magnet.

13. You have an unmagnetized piece of iron.
   A) Dropping it repeatedly will cause the domains to line up, magnetizing the object.
   B) Stroking it with a permanent magnet will align the domains and magnetize it.
   C) Passing a current through it will randomize the domains and magnetize it.

14. You have a magnetized piece of iron.
   A) Passing a current through it will randomize the domains and de-magnetize it.
   B) Stroking it with a permanent magnet will align the domains and de-magnetize it.
   C) Dropping it repeatedly will cause the domains to randomize, de-magnetizing the iron.

15. What happens if you break a bar magnet into four pieces?
   A) You have four complete magnets, each one having a north and a south pole.
   B) You have four magnets: two with only south poles and two with only north poles.
   C) One magnet has a south pole, one has a north pole, and two pieces are unmagnetized metal.
   D) Nothing happens because it is impossible to break a magnet in half, much less into four pieces.

16. When a current is passed through a long straight wire,
   A) a magnetic field is generated. The field lines form circles around the wire.
   B) a magnetic field is generated. The field lines are radial, pointing away from the wire.
   C) no magnetic field is generated. There is no connection between electricity and magnetism.
   D) no magnetic field is generated; moving electrons de-magnetize the wire by destroying domain alignment.

17. What limits the strength of an electromagnet?
   A) Nothing; you can make electromagnets infinitely strong.
   B) The amount of current you use: the strength decreases with increasing amount of current.
   C) The resistance of the wire: the greater the resistance, the stronger the electromagnet will be.
   D) The iron core: once all the domains are aligned, you cannot make the magnet any stronger.

18. An electron moves through a uniform magnetic field. The force on the electron is
   A) perpendicular to the magnetic field and parallel to the electron's velocity.
   B) perpendicular to both the magnetic field and the electron's velocity.
   C) parallel to both the magnetic field and then electron's velocity.
   D) parallel to magnetic field and perpendicular to electron's velocity.

19. What is the difference between an ammeter, voltmeter, and galvanometer?
   A) They are unrelated instruments.
   B) They are related, but only by the fact that they can be used to measure things about circuits.
   C) They are, in fact, the same instrument, just calibrated to measure different quantities.

20. You are making a simple galvanometer to use as a voltmeter. You can select either a thin or thick wire to make the coil.
    A) Pick thick! The lower resistance means a more accurate reading of the current.
    B) Pick thin! The higher resistance will draw the least current when the voltmeter is wired in parallel.
    C) It doesn't matter which wire you select; the number of coils determines the resistance of the wire.

21. You are making a simple galvanometer to use as an ammeter. You can select either a thin or thick wire to make the coil.
    A) Pick thick! The lower resistance means a more accurate reading of the current.
    B) Pick thick! The higher resistance means more voltage for a given current.
    C) Pick thin! The lower resistance means you can use more coils in the same amount of space.
    D) Pick thin! The higher resistance will have the least impact when the ammeter is wired in series.

22. 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.
23. The Earth’s magnetic field is generated
   A) by the gravitational deflection of charged particles from the sun.
   B) by the alignment of the domains within the iron core of the planet.
   C) by convection currents deep within the molten outer core of the planet.
   D) by the energy beams of the aliens who have secret bases on the far side of the moon.

24. How stable is the earth’s magnetic field?
   A) It seems stable to us, but there is evidence that the field has reversed polarity many times.
   B) The field is rapidly and constantly changing; this is what causes the aurora borealis to have such beautiful colors.
   C) Extremely stable; there is geologic evidence that the field orientation and strength have remained unchanged for literally billions of years.

25. Help! My pigeon has a magnet up his nose!
   A) Now you are just being dramatic. There is no magnet, and you probably don't even have a pigeon.
   B) Ok, it isn't exactly a bar magnet wedged up his nostril (beak–stril?). But pigeons do have the ability to navigate using the earth’s magnetic field.
   C) Pigeons do not naturally have any sense of magnetic fields. They may or may not have magnets up their noses, but if they do, it’s the result of a cruel practical joke, not any naturally occurring phenomenon.