PHSC001 Course
Chapter6 (Basic magnetism) Worksheet Solutions

Part1: Multiple choices

1. A magnetic field in a region can be detected by
A. A magnet
B. A compass
C. Iron filing
D. All of the above

2. The alignment of a freely suspended magnet by a string in specific direction in the absence of any magnet nearby shows
A. The magnetic field of the magnet itself
B. The magnetic field of the sun
C. The magnetic field of the earth
D. All of the above

3. The deflection of a compass needle close a wire carrying current shows
A. The magnetic field of the sun
B. The magnetic field of the wire
C. The direction of wind
D. The electric field

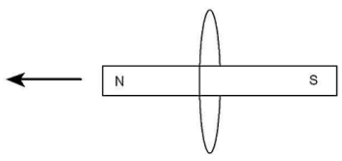
4. Which of the following statements is not correct statement of the similarities between charges and magnets?
A. There are attractive and repulsive forces between like and unlike charges and magnetic poles
B. Both magnetic poles and charges develop fields
C. Both exert non push or pull force
D. Both electrical charges and magnetic poles can be separated (isolated)

5. Bt which process a magnetic field can be produced
A. By the motion of separated magnetic poles
B. By the motion of electrons within atoms
C. By the motions of protons and neutrons within the atomic nucleus
D. By rubbing iron by a piece of cloth

6. Which of the following will strengthen the magnetic field in a solenoid
A. By increasing the thickness of the iron core
B. By increasing the thickness of the wire
C. By reducing the number of loops
D. By increasing the number of loops

7. What energy conversion is achieved by the electric generator?
A. Mechanical energy to electrical energy
B. Electrical energy to mechanical energy
C. Electrical energy to solar energy
D. Mechanical energy to nuclear energy

8. If you constantly push the bar magnet through the loop as shown below, then
A. constant current would flow in the loop
B. A changing current would flow in the loop
C. The magnet demagnetized
D. None of the above is correct



9. If you stopped the magnet (questions 8) midway through the loop, then
A. The current gradually dropped to zero
B. The current immediately dropped to zero
C. The magnet demagnetized
D. None of the above is correct

10. Which of the following would not be part of a generator?
A. Electromagnet
B. Permanent magnet
C. Wires
D. Battery

Part 2: True/False. If the answer is False then correct it

1. A compass is a magnet
A. True
B. False

2. The magnetic force is exerted by the north pole of a magnet only.
A. True
B. False (the magnetic force is excreted by the magnetic field not the pole)

3. The magnetic force increases when the distance from a magnet increases
A. True
B. False (the magnetic force decreases when the distance from a magnet increases)

4. Before current from a power lines enter your house, it must be pass through a step-up transformer.
A. True
B. False (step-down to decrease it from about 5000 V into 120/110 V)

5. Generally, the strength of the solenoid magnetic field depends on both the current and number of turns
A. True
B. False

6. When a current pass through a wire an electric field generates around the wire.
A. True
B. False (magnetic field is generated not electric field)

7. A constant magnetic field induces electric current.
A. True
B. False (A changed magnetic field (not constant) generates (induces) electric current)

Part 3: Challenge questions

1. Explain why the needle of a compass points in a certain direction.
(The needle is a magnet and it is affected by the magnetic field of some magnet in the neighborhood like another magnet or the earth)

2. Discuss one major difference between electric field lines and magnetic lines.
(Electric field lines are curves and magnetic field lines are loops)

3. Explain how you could identify the polarity of unknown magnet.
(Bring it close to an identified magnet)

4. Explain what will happen if you spread iron filing near a magnet.
(It will attract by the magnet because it is made of iron (magnetic material) the attraction is very strong close to the poles

5. Suppose you have been given two physically identical magnets, then how can you determine which one is more powerful than the other?
(The strong magnet has a strong magnetic field, which its effect on the compass is large)

6. If you stack two physically identical magnets together, does their magnetic force increases? Explain
(A magnetic field is strong when the number of magnetic lines is large and they are close to each other. Stacking two magnets with the same poles on the same side make them repel each other. Stacking such that opposite poles on either side will lower the number of lines outside or this will decrease the magnetic field.)

7. You have been given two coils (solenoids), one with 10 turns and 20 turns for the other. Which will have a stronger magnetic field if same current passes through each?
(the 20 turns solenoid)

8. If we put a lighted candle between the poles of U-shaped magnet, its flame is repelled by the field. Explain why.
(the flame material is diamagnetic material)

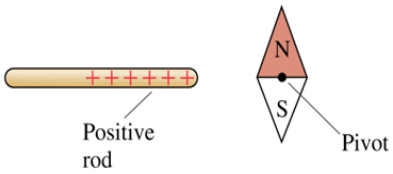
9. You have been given a physically identical U-shaped and horseshoe magnets, which has the strongest magnetic field? Explain
(the horse shoe is stronger because the poles are closer than the those of the U-shaped)

10. Though the protons and neutrons move in a similar fashion like electrons within the atom, but they do not contribute to the atomic magnetism. Explain why.
(the neutron does not have a charge and therefore it does not produce magnetism. The proton does have a charge but its magnetism is very small that can be ignored because it is much heavier than the electron)

11. How can you determine for sure whether a piece of steel is magnetized? How would you determine its polarity if magnetized?
(bring it close or attach it to a permanent magnet. It will attract other pieces of steel (paper clip). After it is magnetized bring it close to a magnet and see if it is attracted or repelled)

12. Which is more fundamental, electricity or magnetism? Remember that magnetism is a property of charge in motion.
(Electricity is)

13. What is your justification that the theory of magnetic domain is true?
Explain what will happen when a positively charged rod is brought close to a compass
(a magnetic domain is a group of magnetic atoms pointing in some direction. A permanent magnet has most of the magnetic domains pointing in one direction (lined up) and it can loses its magnetism if these magnetic domains are no longer in one direction. For example, by exposing the permanent magnet to too much of heat will destroy its magnetism)

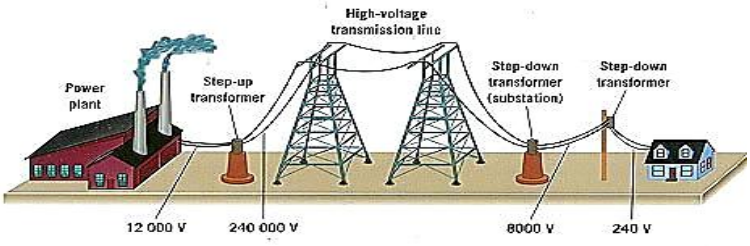


14. Why do you think that a human is considered as a diamagnetic material? Can a human be elevated? Scientists were successful to elevate a live frog. Suggest a proposal.
(About ¾ of human is water and water is diamagnetic. A human can be elevated if very strong magnetic field is used. The magnetic force must overcome the gravitational force)

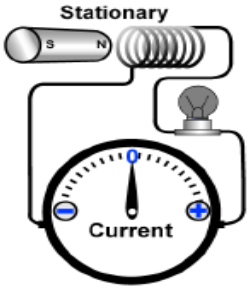
Part 4: learning from looking at sketches and diagrams

In few lines, explain in writing what these diagrams are demonstrating to you

1. **(A power station is generating electricity using a generator working on the electromagnetic induction principle. Electricity is transferred through cables to a consumer. Because the company send the electrical energy as a high voltage, a step-down transformer is used to lower the voltage from 8000V into 240V)**



2. **(When the magnet of the loop is not moving, then there will be no induced current. The meter shows zero value indicating that there is no current in the circuit.)**



3. **(A magnet attracts magnetic materials like the iron filing. The magnetic field is very strong at the poles.)**

4. **(By changing a magnetic field an induced electric current in the loop is produced. The magnetic field changes when its magnetic lines are changed. In and out motion changes the direction of the current.)**