Name: _____ Class: _____ Date: _____

INTEGRATION QUESTIONS

Electric current and electrical power

1. A machine needs a charge of 1800 C to run for 3 minutes. What is the current intensity required to make it run?

$3\ min = 180\ s$

$I = \frac{q}{\Delta t} = \frac{1800\ C}{180\ s} = 10\ A$

The current intensity required to make the machine run for 3 minutes is 10 A.

2. An electric stove requires a potential difference of 220 V. What charge is necessary for it to provide 450 000 J of energy?

$q = \frac{E}{U} = \frac{450000\ J}{220\ V} = 2045\ C$

For the stove to provide 450 000 J of energy with a potential difference of 220 V, a charge of 2045 C is needed.

3. A tool runs on a current of 20 A and a potential difference of 120 V.

a) What is the tool's electrical resistance?

$R = \frac{U}{I} = \frac{120\ V}{20\ A} = 6\ \Omega$

The tool's electrical resistance is 6 Ω.

b) What is the tool's electrical power?

$P_e = UI = 120\ V \times 20\ A = 2400\ W$

The tool's electrical power is 2400 W.

4. A radio receiver needs a current of 6 A to work. What charge is needed to make it work for 10 minutes?

$10\ min = 600\ s$

$q = I \times \Delta t = 6\ A \times 600\ s = 3600\ C$

A charge of 3600 C is needed to make the radio receiver work for 10 minutes.

Name: _____ Class: _____ Date: _____

5. What amount of energy can a 350 C charge provide in a 120 V circuit?

ST

$E = U \times q = 120\ V \times 350\ C = 42000\ J$

A 350 C charge with a potential difference of 120 V can provide 42 000 J of energy.

6. A toaster has an electrical power of 970 W. If it is used for two and a half minutes, what amount of energy does that represent?

2,5 min = 150 s

$E = P_e \times \Delta t = 970\ W \times 150\ s = 145500\ J$

ST

The toaster uses 145 500 J of energy in two and a half minutes.

7. An electricity bill shows that 1320 kWh was consumed over a 70-day period. Calculate the electrical power used in this period.

ST

70 j = 1680 h

$P_e = \frac{E}{\Delta t} = \frac{1320\ kWh}{1680\ h} = 0{,}79\ kW = 790\ W$

The electrical power used in 70 days was 790 W.

8. What amount of electrical energy will a 900 W coffee maker have consumed after six minutes of use?

ST

6 min = 360 s

$E = P_e \Delta t = 900\ W \times 360\ s = 324000\ J$

The coffee maker will have consumed 324 000 J after six minutes of use.

9. An element in a circuit requires a potential difference of 120 V and offers a resistance of 10 Ω.

a) What is the intensity of the current flowing through the element?

ST

$I = \frac{U}{R} = \frac{120\ V}{10\ \Omega} = 12A$

The current intensity is 10 A.

b) What is the element's electrical power?

$P = UI = 120\ V \times 12A = 1440W$

The element's electrical power is ~~1200~~ 1440 W.

Name: _____ Class: _____ Date: _____

INTEGRATION QUESTIONS

Magnetism and electromagnetism

1. True or false? If a statement is false, correct it.

   a) Opposite magnetic poles repel each other.

   False. Opposite magnetic poles attract each other. It is poles of the same sign that repel each other.

   b) Magnetic force can act over a distance.

   True.

   c) A charged comb can generate a magnetic field.

   False. To generate a magnetic field, there must be magnetic charges in motion.

   d) A magnetic field produced by an electric current can be switched on and off at will.

   True.

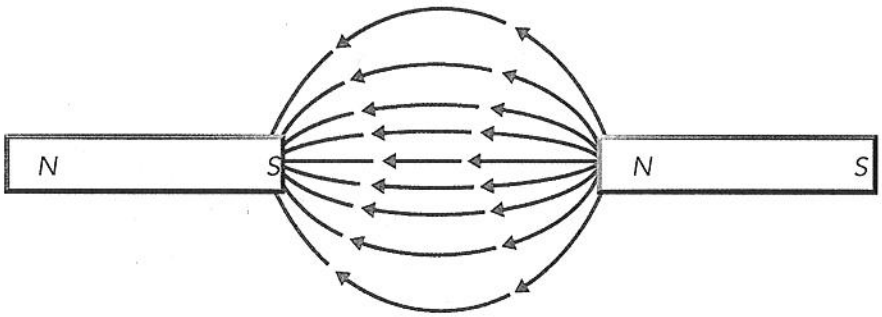
   e) An electromagnet is a cylindrical coil of live wire.

   False. This is the definition of a solenoid.

2. If you allowed a bar magnet to move freely, by suspending it from a thread, for instance, how would it behave?

   Its north pole would naturally seek the Earth's geographic North Pole.

3. Name the poles of the magnets in the following illustration.



Name: _____ Group: _____ Date: _____

Support activities – Second Year of Secondary Cycle Two

ST
STUDENT BOOK: Chapter 5, pages 163–168
RELATED HANDOUT: Concept review 23

ACTIVITY 23 ANSWER KEY

Magnetism and electromagnetism

1. Complete the following sentences, using the words or groups of words in the box below. You may not need some words, and you may use others more than once.

• adding	• dynamic	• magnetic field lines	• permanent
• aligned	• electromagnet(s)	• magnetism	• powerful
• artificial	• electromagnetism	• magnetized	• right-hand rule
• attract each other	• entering into	• mechanical	• rolled
• attraction	• ferromagnetic	• more powerful	• sharp blow
• circular	• ferromagnetic core	• motion	• solenoid
• cobalt	• fingers	• natural	• south-seeking
• coming out of	• geographic North Pole	• nickel	• steel
• conserve	• increasing	• not aligned	• stopping
• direction	• like	• opposite	• temporary
• distance	• magnetic field	• ore	• thumb
• domains			

a) *Magnetism* describes all the phenomena caused by magnets. Magnets are objects that can attract other objects containing iron, *nickel* or cobalt. Around 600 BCE, the Greeks discovered an *ore* called magnetite, which is a *natural* magnet with this property.

b) Certain metals have magnetic properties, which can be explained by their composition: they contain a set of regions called "*domains*," and each of these regions acts like a tiny magnet. The directions of these domains are *not aligned* if the metal is not magnetized. If the metal is *magnetized*, its domains will be well *aligned*. The greater the number of aligned domains, the *more powerful* the magnet.

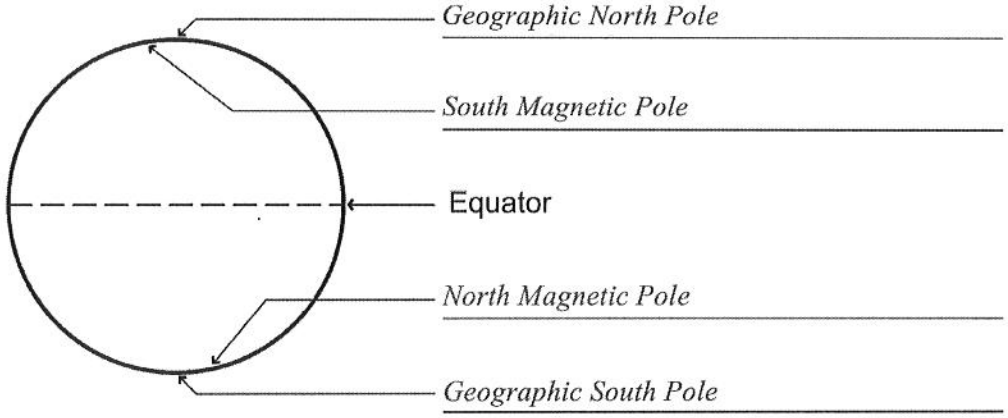
c) Each magnet has a north-seeking and a *south-seeking* pole. By convention, the north pole of a magnet corresponds to the end that naturally turns toward the magnetic pole that is located close to the Earth's *geographic North Pole*.

d) Magnets interact with one another through forces of _attraction_ and repulsion. In other words, opposite magnetic poles _attract each other_, and _like_ magnetic poles repel each other. These forces can act across a _distance_. In a diagram of a magnetic field, they are represented by _magnetic field lines_. By convention, the lines are drawn _coming out of_ the north pole and _entering into_ the south pole of a magnet.

e) Electricity can be used to make magnets. The interaction between magnetism and electricity is called "_electromagnetism_." An electric current can generate a magnetic field, and the _opposite_ is also true. Only _dynamic_ electricity can generate a magnetic field because the electrical charges must be in _motion_.

f) Using the _right-hand rule_, we can determine the direction of the magnetic field lines of a live wire. The _thumb_ points in the direction of the current, from the positive terminal toward the negative terminal. The _fingers_ wrapped around the wire show the direction of the magnetic field lines. These lines are _circular_.

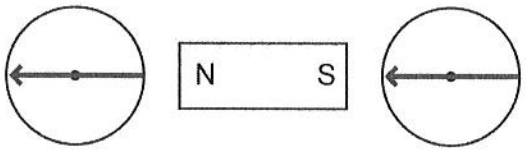
2. The figure below represents the Earth, which is a large magnet. Complete the figure with the following terms.
   - geographic North Pole
   - North Magnetic Pole
   - geographic South Pole
   - South Magnetic Pole



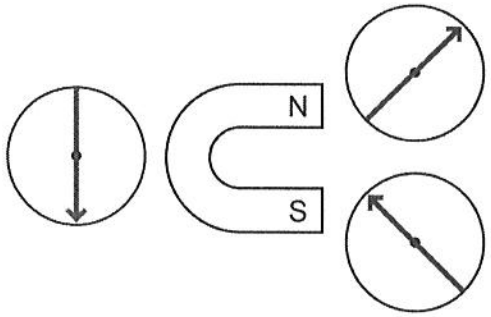
Name: _____ Group: _____ Date: _____

3. The circles below represent compasses. In each situation, draw the needles of the compasses, using an arrow to show the direction they point.

a)

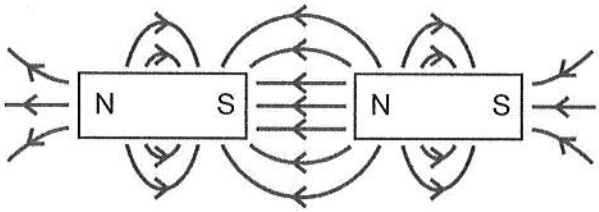


b)



4. Draw the magnetic field of each of the magnets below.

a)



b)