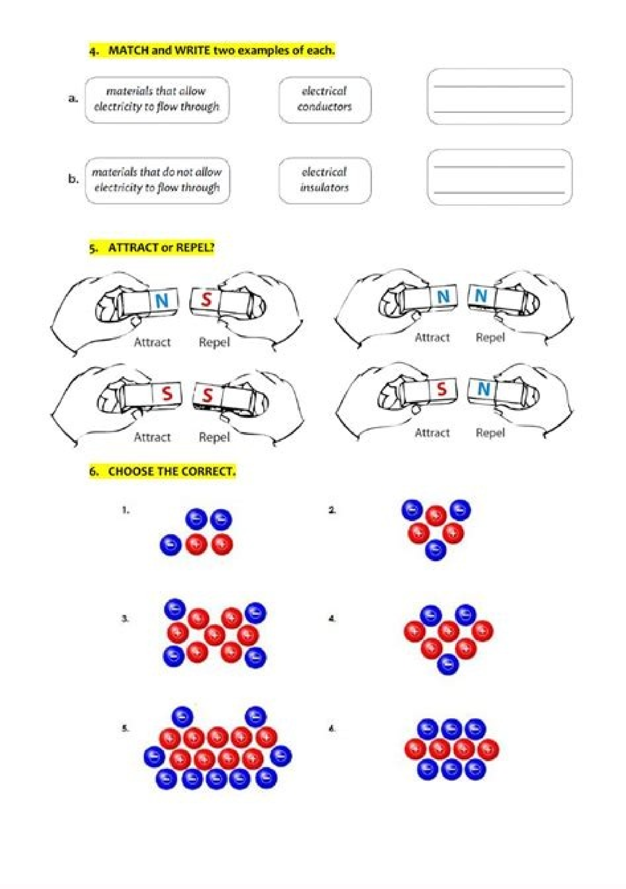
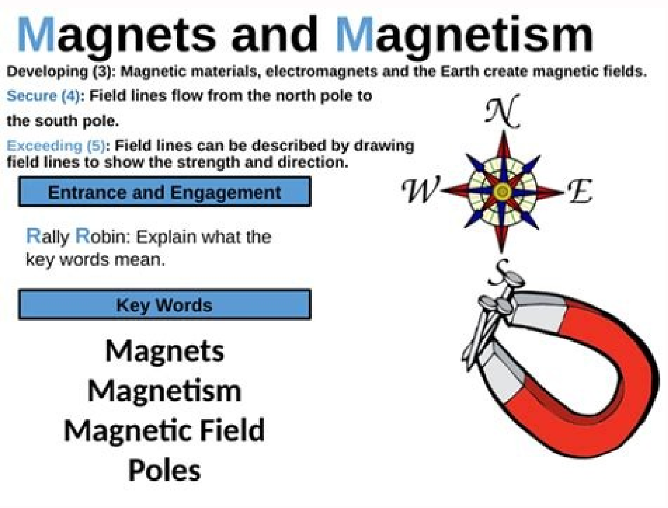
Electricity and magnetism review answers





A Level Physics — Electric Fields — Answers

1. (a) Electric field strength at a point in an electric field is defined as the force which would be exerted on a unit positive charge placed at that point. ✓ [1]

(b) $F = \frac{Q_1 Q_2}{4\pi\varepsilon_0 r^2} = \frac{(20\times10^{-6})(20\times10^{-6})}{4\pi(8.85\times10^{-12})(0.25)^2}$ ✓ = 57.5N ✓ [2]

(c) (i) the force would be attractive rather than repulsive ✓ [1]

(ii) there would be a very slight reduction in the size of the force ✓ (because the permittivity of air is slightly higher than that of free space). (no change acceptable) [1]

(iii) there would be a large reduction in the force ✓(because the permittivity of paraffin is many times higher than that of free space). [1]

Total 6 marks

2. (a) electric potential at a point in a field is the work done in bringing a unit positive charge from infinity to that point. ✓ [1]

(b) $E = V/x = (2.5\times10^3)/(4.3\times10^{-3})$ ✓ $= 5.81\times10^5 Vm^{-1}$ ✓ [2]

(c) This is Milikan's experiment. Oil drops are charged by friction and inserted between the metal plates which are connected to a DC voltage. ✓

By altering the sign and the value ✓of the applied voltage it is possible to suspend an individual drop between the plates ✓.

The weight of the drop is balanced by the upward electrical force exerted on it. The weight of the drop, mg, can be found by a subsidiary experiment, and the value of the applied voltage, V, and the distance between the plates, d, can be measured directly. ✓

Using the equation:
weight = electric field strength × charge
we get mg = Vq/d
so q = mgd/V ✓
allowing the value of q to be found.

This experiment is repeated a large number of times and the calculated values of q are compared. It is found that these are always exact multiples of a unit basic charge, e. ✓ [6]

Total 9 marks

Page 1

Disk 1	Disk 2
1) Color Changing Milk	13) Floating Eggs
2) Egg in a Bottle	14) Keep Paper Dry Underwater
3) Exploring Air Pressure	15) Dry Ice Bubbles
4) Build a Lemon Battery	16) Balloon in a Candle Flame
5) Inverted Cup of Water	17) Ocean in a Bottle
6) Candle Suction Power	18) Build a Motor with Lights
7) Amazing Magnetic Force	19) Simple Lava Lamp
8) Lift an Ice Cube with String	20) Invisible Ink
9) Unburnable Money	21) Density Tower
10) Matchstick Speedboat	22) Soda Can Fizz
11) Reversing an Image with Water	23) Build a Motor #2

2.

(a) The table below describes the conditions of the molecules of a substance in each of the three states of matter, solid, liquid and gas.

In the right-hand column, write the state of the substance that is described in the left-hand column.

condition of the molecules	state in which the substance exists
The molecules are a great distance apart, moving very rapidly, with negligible interaction. The substance occupies all the space available.	
The molecules are only able to vibrate rapidly about fixed positions. The substance does not need a container to maintain its shape.	
The molecules move about amongst each other, with attractive forces between them. The substance does not necessarily fill its container.	

[2]

(b) **(i)** What is the state of matter just before a substance boils?

....[1]

(ii) Describe what happens to the molecules during boiling.

....

....[2]

(iii) State two differences between boiling and evaporating.

1. ....

2. ....[2]

(c) **(i)** What is the state of matter just before a substance melts?

....[1]

(ii) Aluminium melts at 660 °C. At what temperature does it freeze?

....[1]

[Total: 9]

3.

Fig. 10.1 shows a series circuit.

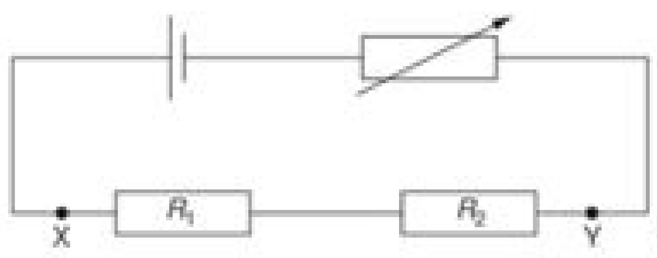


Fig. 10.1

Electricity and magnetism review worksheet answers.

Free-Photos/Pixabay In short, magnetic energy is the energy that operates within a magnetic field. A magnetic field is invisible to the naked eye, but that means the effects of magnetic energy are not felt. Magnetic energy is easy to see when two magnets are placed next to each other, whether connected or not. Learn more about magnetic energy, how it was discovered and what types of magnets exist. How was Magnetic Energy discovered? Magnetic energy was discovered by Scottish physicist James Clerk Maxwell, when he studied the nature of magnetism and electricity. What he discovered was the opposite of what was thought then that magnetism and electricity had no relation. Instead, he discovered that the electric current was associated with magnetic fields and that the opposite was also true: that magnetic fields had an electric current. This was not only the discovery of magnetic energy, but the precursor of the study of electromagnetic energy. What is a magnet? A magnet is any kind of material from which a magnetic field occurs. A magnet has two poles, called North Pole and South Pole. At each end is where the magnetic energy is stronger. However, it is about opposite poles. Only magnets can be connected through opposite poles. For example, you can connect a North Pole to a South Pole or a South Pole to a North Pole, but if you try to connect two North Pole or two South Pole, the magnets repel each other. This is magnetic energy similarly as when two magnets attract. In addition, you can't break a magnet in half to get the poles connected. The South Pole and the North Pole, with respect to each magnetic field, are unmovable. What are some uses of magnets? Everyone is familiar with the magnets hanging in the fridge or as part of the children's toys, like when twoWooden connect with magnets. However, magnets have many other uses in the world. Magnets help electrical eligid Run. Imagine when you turn off your power and your need for a generator "What do you think causes these independent units to run? The magnets inside the generator near the coils cause electricity, which runs the generator. In addition, the magnets run on wind turbines. The wind powers the turbine, but what the wind does is rotate the magnet to power the turbine. Magnetic fields can also create electric current to run on top of a wire. What kind of magnets are there? There are three types of magnets available: permanent magnets, temporary magnets and electromagnetic magnets. Electromagnets have the most complex science of the three, and are used to power televisions, computers, motors and other electrical equipment. What are permanent and temporary magnets? Permanent and temporary magnets are the most common types of magnets that you speak in contact with everyday life, particularly permanent magnets. A permanent magnet is any type of magnet that never loses its magnetic energy. That means that, once it is magnetized, it will always be magnetized. Even if you lose some magnetism over time, like using a refrigerator magnet year after year, you still get magnetized. A temporal magnet is very different and is often the subject of fair science experiments. A temporary magnet is very easily magnetized by some kind of external force, but loses its magnetism quickly. For example, if you take a paper clip on a strong magnet, that paper clip will turn into a magnet itself easily for a few seconds. This is also known as a "soft" magnet. More from reference.com Thank you for your participation! Electricity and magnetism are separate but interconnected phenomena associated with electromagnetic force. Together, they form the basis for electromagnetism, a discipline of key physics. Electricity and magnetism are two related phenomena by electromagnetic force. Together, they form electromagnetism. An electric charge in motion generates a magnetic field. A magnetic field induces. induces.charge motion, producing an electric current. In an electromagnetic wave, the electric field and the magnetic field are perpendicular to each other. Except for the behavior due to the force of gravity, almost every occurrence in daily life comes from the electromagnetic force. It is responsible for the interactions between atoms and the flow between matter and energy. The other fundamental forces are the weak and strong nuclear force, which govern radioactive decay and the formation of atomic nuclei. Since electricity and magnetism are incredibly important, it's a good idea to start with a basic understanding of what they are and how they work. Electricity is the phenomenon associated with fixed or mobile electric charges. The source of the electric charge could be an elemental particle, an electron (which has a negative charge), a proton (which has a positive charge), an ion, or any larger body that has a positive and negative charge imbalance. Positive and negative charges attract (e.g., protons attract electrons), while charges repel each other (e.g., protons repel other protons and electrons repel other electrons). Family examples of electricity include lightning, the electric current of an output or battery, and static electricity. Common SI electricity units include the ampere (A) for current, coulomb (C) for electric charge, volt (V) for potential difference, ohm (Î©) for resistance, and watt (W) for energy. A stationary point charge has an electric field, but if the charge is in motion, it also generates a magnetic field. Magnetism is defined as the physical phenomenon produced by the mobile electric charge. In addition, a magnetic field can induce charged particles to move, producing an electric current. An electromagnetic wave (like light) has a component and magnetic. The two components of the wave travel in the same direction, but are oriented in a straight angle (90 degrees) each other. As as Magnetism produces attraction and repulsion between objects. While electricity is based on positive and negative charges, there are no known magnetic monopolies. Any particle or magnetic object has a "north" and "south" pole, with instructions based on the orientation of the Earth's magnetic field. Just as the poles of a magnet repel each other (for example, the North repels the North), while the opposite poles attract each other (pull the North and South). Familiar examples of magnetism include the compass needle's reaction to the magnetic field, the attraction and repulsion of bar magnets, and the surrounding electromagnetic field. However, each mobile electric charge has a magnetic field, so the electrons orbiting the atoms produce a magnetic field; There is a magnetic field associated with power lines; and disks and speakers rely on magnetic fields to function. The KEY SI units of magnetism include the Tesla (T) for magnetic flux density, Weber (WB) for magnetic flux, amperes per meter (A/M) for magnetic field resistance, and Henry (H) for inductance. The word Electromagnetism comes from a combination of the Greek works Elektron, which means "ambar" and magnetis lithos, which means "Magnesian stone", which is a magnetic iron ore. The ancient Greeks were familiar with electricity and magnetism, but considered them two separate phenomena. The relationship known as Electromagnetism was not described until James Clerk Maxwell published a treatise on electricity and magnetism in 1873. Maxwell's work included twenty famous equations, which have since been condensed into four partial differential equations. The basic concepts represented by the equations are as follows: Like electric charges repel, and unlike electric charges. The force of attraction Repulsion is inversely proportional to the square of distance between them. The magnetic poles always exist as north-south pairs. Like the poles repel and attract, unlike the electrical current in a cable it generates a magnetic field around the cable. cable. The direction of the magnetic field (in the sense of the clock needles or to the left) depends on the direction of the current. This is the "Right Hand Ball", where the magnetic field address follows the fingers of your right hand if your thumb is pointing in the current direction. Staying on a cable loop or getting away from a magnetic field induces a current on the cable. The direction of the current depends on the direction of the movement. Maxwell's theory contradicted Newtonian mechanics, but the experiments demonstrated Maxwell's equations. The conflict was finally resolved by Einstein's theory of special relativity. Hunt, Bruce J. (2005). The Maxwellians. Cornell: Cornell University Test. PP 165- 166. ISBN 978-0-8014-8234-2. International Union of Pure and Applied Chemistry (1993). 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