

READING PASSAGE 1

You should spend about 20 minutes on **Questions 1 —13** which are based on Reading Passage 1 below.

William Gilbert and Magnetism

The accredited father of the science of electricity and magnetism was the English scientist, William Gilbert, who was a physician and man of learning at the court of Elizabeth. Prior to him, all that was known of electricity and magnetism was what the ancients knew, that the lodestone possessed magnetic properties and that amber and jet, when rubbed, would attract bits of paper or other substances of small specific gravity. William Gilbert's great treatise *De Magnete, Magneticisque Corporibus or On the Magnet*, printed in Latin in 1600, containing the fruits of his researches and experiments for many years, indeed provided the basis for a new science.

William Gilbert was born in Colchester, Suffolk, on May 24, 1544. He studied medicine at St. John's College, Cambridge, graduating in 1573. He was prominent in the College of Physicians and became its president in 1599. The following year he was appointed physician to Queen Elizabeth I, and a few months before his death on Dec. 10, 1603, physician to James I. The ancient Greeks knew about lodestones, strange minerals with the power to attract iron. Some were found near the city of Magnesia in Asia Minor (now Turkey), and that city lent its name to all things magnetic. The early Chinese also knew about lodestones and about iron magnetized by them. Around the year 1000 they discovered that when a lodestone or an iron magnet was placed on a float in a bowl of water, it always pointed south. From this developed the magnetic compass, which quickly spread to the Arabs and from them to Europe.

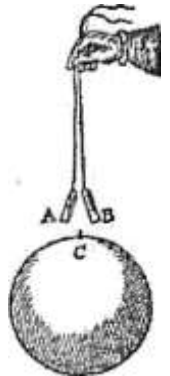
Britain was a major seafaring nation in 1588 when the Spanish ! Armada was defeated, opening the way to British settlement of America. British ships depended on the magnetic compass, yet no one understood why it worked. Did the pole star attract it, as Columbus once speculated; or was there a magnetic mountain at the pole, as described in *Odyssey*, which ships should never approach, because the sailors thought its pull would yank out all their iron nails and fittings? Did the smell of garlic interfere with the action of the compass, which is why helmsmen were forbidden to eat it near a ship's compass? For nearly 20 years William Gilbert conducted ingenious experiments to understand magnetism.

"William Gilbert was fascinated by magnets," as Dr. David P. Stern of NASA notes. Given two magnets, Gilbert knew that magnetic poles can attract or repel, depending on polarity. In addition, however, ordinary iron is always attracted to a magnet. Gilbert guessed, correctly, that near a permanent magnet iron became a temporary magnet, of a polarity suitable for attraction. That is, the end of an iron bar stuck to an S pole of a magnet (south-seeking pole) temporarily becomes an N-pole. Because magnetic poles always come in matched pairs, the other end of the bar temporarily becomes an S-pole, and can in its turn attract more iron. Gilbert confirmed his guess of temporary ("induced") magnetism by an original experiment. Using strings, he hung two parallel iron bars above the pole of a *terrella*, a model earth he designed for this experiment, and noted that they repelled each other. Under the influence of the *terrella*, each became a temporary magnet with the same polarities, and the temporary poles of each bar repelled those of the other one. In 1600 Gilbert published *De Magnete* in Latin. Very quickly it became the standard work throughout Europe on electrical and magnetic phenomena. In this work he describes many of his experiments with his model earth *terrella*. From his experiments, he concluded that the Earth was itself magnetic and that this was the reason compasses pointed north. In his book, he also studied static electricity using amber, Gilbert strongly argued that electricity and magnetism was not the same thing. For evidence, he (incorrectly) pointed out that electrical attraction disappeared with heat, magnetic attraction did not. By keeping clarity, Gilbert's strong distinction advanced science for nearly 250 years. It took James Clerk Maxwell to show electromagnetism is, in fact, two sides of the same coin.

De Magnete is not only a comprehensive review of what was known about the nature of magnetism, Gilbert added much knowledge through his own experiments. He likened the polarity of the magnet to the polarity of the Earth and built an entire magnetic philosophy on this analogy. In Gilbert's animistic explanation, magnetism was the soul of the Earth and a perfectly spherical lodestone, when aligned with the Earth's poles, would spin on its axis, just as the Earth spins on its axis in 24 hours. He speculated that the moon might also be a magnet caused to orbit by its magnetic attraction to the Earth. This was perhaps the first proposal that a force might cause a heavenly orbit.

Gilbert did not, however, express an opinion as to whether this rotating Earth was at the center of the universe or in orbit around the Sun. In traditional cosmology the Earth was fixed and it was the sphere of the fixed stars, carrying the other heavens with it, which rotated in 24 hours. Since the Copernican cosmology needed a new physics to undergird it, Copernicans such as Johannes Kepler and Galileo were very interested in Gilbert's magnetic researches. Galileo's efforts to make a truly powerful armed lodestone for his patrons probably date from his reading of Gilbert's book.

The first major scientific work produced in England, Gilbert's *De Magnete* reflected a new attitude toward scientific investigation. Until then, scientific experiments were not in fashion: instead, books relied on quotes of ancient authorities and that is where the myth about garlic interfering with the compass started. Unlike most medieval thinkers, Gilbert was willing to rely on sense experience and his own observations and experiments rather than the authoritative opinion or deductive philosophy of others. In the treatise he not only collected and reviewed critically older knowledge on the behavior of the magnet and electrified bodies but described his own researches, which he had been conducting for 17 years. It was because of this scientific attitude, together with his contribution to our knowledge of magnetism, that a unit of magneto motive force, also known as magnetic potential, was named the Gilbert in his honor.



Questions 1-8

Do the following statements agree with the information given in Reading Passage 1? In boxes 1 -8 on your answer sheet write

TRUE if the statement is true
FALSE if the statement is false
NOT GIVEN if the information is not given in the passage.

1. It was Gilbert who first discovered some substances with magnetic properties.
2. Arabs invented the magnetic compass in which an iron magnet always pointed south.
3. Gilbert explained the phenomenon of the magnetic compass in his book De Magnete.
4. Gilbert's mistaken notion about the distinction between electricity and magnetism held back the development of science.
5. Gilbert speculated that the moon orbited the Earth by magnetic force.
6. Copernicans such as Galileo favored traditional cosmology which held that the earth was the center of the universe.
7. Gilbert's magnetic theories contradicted traditional cosmology.
8. As a scientist, Gilbert set himself apart by favoring an intuitive approach and experiments rather than deductive reason.

Questions 9-13

Choose the appropriate letters **A-D** and write them in boxes **9-13** on your answer sheet.

- 9 In the Odyssey, why could ships not approach the mountain at the pole?
A People believed that they would get lost if garlic hampered the action of the compass.
B People believed that the pole star would distract ships away.
C People believed that the magnetism would wreck the ship.
D People believed that [the magnetic mountain would make the compass out of work.
- 10 By contacting two metal bars, one magnetized, the other neutral, he was able to pass on a charge to the neutral bar. He called this.....
A induced magnetism, B permanent magnetism.
C terrestrial magnetism. D polar magnetism.
- 11 In De Magnete, Gilbert..... discussed electricity, magnetism and heat.
A emphatically B scientifically
C wrongly D passionately
- 12 James Clerk Maxwell demonstrated that.....
A electricity and magnetism was the same thing.
B electrical and magnetic attraction disappeared with heat.
C there was some relationship between electricity and magnetism.
D electromagnetism has two opposite sides.
- 13 Gilbert's De Magnete, a collection of his theories and experiments and reflections on others' work is commonly known as
A an essay. B a treatise.
C a volume. D a contribution.

READING PASSAGE 2

You should spend about 20 minutes on **Questions 14-26** which are based on Reading Passage 2 below.

The History and Evolution of Banana Hybrids

Bananas are the world's favorite fruit and many nations depend on banana trees to supply its citizens with this delicious food product to save them from famines. Bananas are available on markets year round and are rich in vitamins, minerals, and fiber, containing only small hollow seed that are infertile. Ornamental bananas, 'Musa ensata' and 'Musa nana' are inedible but in high demand for landscaping.

India is the world's largest producer of bananas and Alexander the Great found them growing there in 327 BC, when he conquered India. Soldiers of Alexander the Great returned to Greece and Persia with bulbs from banana plants, 'Musa accuminata', where they were distributed and planted. Antonius Musa, the personal physician of Augustus Caesar, imported the first banana trees, 'Musa accuminata', to Rome from Africa in 63 BC. Later, slaves from Portugal brought bananas to Europe from Africa in the early 1400s. Even though the banana is believed to have originated in India (Eastern Asia), it was established in Africa and Europe as a staple food product many centuries ago and came into North America through Spanish missionaries. Those first bananas that people knew in antiquity were not sweet like the bananas we know today, but were cooking bananas or plantain bananas with a starchy taste and composition. The bright yellow bananas that we know today were discovered as a mutation from the plantain banana by a Jamaican, Jean Francois Poujot, in the year 1836. He found this hybrid mutation growing in his banana tree plantation with a sweet flavor and a yellow color—instead of green or red, and not requiring cooking like the plantain banana. The rapid establishment of this new exotic fruit was welcomed worldwide, and it was massively grown for world markets.

Each banana comes from a flower maturing into groups of 10-20 bananas called 'hands' that circle the stalk, which collectively is

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called a 'bunch'. The bananas can require one year to mature after flowering in the field, and then the mother banana plant dies. The plant is restored the following season by offshoots from the mother plant. An original cluster of banana trees can grow continuously for 100 years, but are generally replaced in banana tree plantations after 25 years. Bananas ripen best and develop more sweetness, if the bunch is removed from the tree, allowing the fruit to ripen off the tree in a shady place to slowly ripen. The banana tree can grow up to 30 feet tall, and the trunk of the tree grows to a width at the base of over 1 foot. The trunk of the banana plant is made sheaths and stems with new growth emerging from the center of the trunk. The size of bananas can range from a fruit the size of a football to one as small as a child's finger. Some bananas taste sweet; some starchy and some ornamental bananas are loaded with large seeds and are considered inedible. The color of ripe bananas can range from green, orange, brown, yellow, or variegated with white stripes.

Bananas are the world's best selling fruit, outselling both apples and citrus; each American is estimated to eat 25 pounds of fruit every year. The 'Cavendish' banana is the most popular banana in the United States and over 400 cultivars of bananas are available on world markets. The leaves of banana trees are used as wrappers for steaming other foods inside, and the banana flower is also edible.

Bananas are also the largest exported fruit in the world, registering sales of 12 billion dollars a year for Chiquita and Dole. These bananas are imported into the United States from companies and plantations growing banana trees in India, South America and Africa. Many third world countries

depend on the production of bananas to feed them as a major food staple, where they eat bananas 3 meals a day. Bananas are rich in sugars such as sucrose, glucose, and fructose, as well as fiber and special minerals containing potassium, phosphorous, magnesium and iron. Bananas contain tryptophan, a body protein that is converted to serotonin, a mood enhancer. They also are high in Vitamin A, Vitamin B6, Vitamin B12, and Vitamin C. Doctors claim that eating bananas can cut the risk of sudden stroke by 40%, as published in the New England Journal of Medicine.

Most banana trees available today are grown from 'mother' bulbs by taking offsets that form shoots. Those can be replanted to multiply and increase a banana tree plantation. These banana sprouts that form at the base of the 'mother' bulb can be shipped around the world to many countries, being almost genetically identical to the original banana plant parent of 10,000 years ago that mutated and stopped making seed and became the first naturally evolved hybrid.

No pollinated sex means no annoying seeds, which may be good news for hungry consumers but also means that there's little or no genetic variation—and hence little or no resistance to the banana's many natural enemies. Devoid of sex, the poor cloned banana is a sitting target for any pest. Recently, an evil-sounding beast called the Black Sigatoka fungus has been throwing those livelihoods into jeopardy. Black Sigatoka, along with the weevils, worms and viruses that also routinely attack bananas, is a particularly disturbing menace in the tropics, where the cooking banana and starchy plantain provide up to a quarter of the daily intake of essential calories.

Finding a way of introducing a little spice—and therefore genetic variety—into the reproductive life of the banana (and its cousin the plantain) is therefore a pressing problem. That's why a project to do just that has now begun. Announced recently, it involves scientists from 11 countries forming a consortium to decode the banana's genome within the next five years. As with the human genome project, the information will reveal much about the genes that make a banana what it is, and more importantly what it might be with a little extra help. This information—and any resulting advances in genetic modification—will be of profound importance, not just to banana boffins, but to a large proportion of humanity.

Questions 14-21

Do the following statements agree with the views of the writer in Reading Passage 2? In boxes **14-21** write

- | | |
|------------------|---|
| YES | if the statement agrees with the views of the writer |
| NO | if the statement contradicts the views of the writer |
| NOT GIVEN | if it is impossible to say what the writer thinks about this. |

14. Ornamental bananas are valued as a delicacy.
15. Augustus Caesar brought bananas from Greece to Rome via Africa.
16. Third World countries grow bananas as a major food source.
17. After maturing for one year bananas are at their peak.
18. The banana genome project aims at changing the genetic code of bananas.
19. Bananas are the No. 1 fruit crop in the world in terms of consumption.
20. Without pollinated sex, the cloned banana is vulnerable to pests.
21. Doctors believe that eating bananas can heal some diseases.

Questions 22-26 Complete the sentences below with words taken from the passage. Use **ONLY ONE WORD**.

22. The bright yellow bananas we eat today were a.....from the plantain banana.
23.is a key factor in curing mood depression.
24. The benefit to cloned fruit is that it has no
25. Some ornamental bananas are full of large seeds, making them.....
26. The bananas of antiquity required..... before eating.

READING PASSAGE 3

You should spend about 20 minutes on **Questions 27 - 40** which are based on Reading Passage 3 below.

Questions 27-32

Reading Passage 2 has 7 paragraphs A- G.

From the list of headings below choose the 6 most suitable headings for paragraphs **A, B, C, D, E** and **F**.

Write the appropriate numbers (**i-x**).

NB There are more headings than paragraphs, so you will not use them all.

List of Headings

- i Toys challenging the early conceptions
- ii Parental love never changes
- iii Toy representing Medieval art
- iv The first archaeological evidence
- v Various sources of medieval toys
- vi Development of toy industry and trade
- vii Written evidence of toys
- viii Window to the Middle Ages childhood
- ix Tangible proof of toys
- x Exceptionally rare toys

Example	Answer
Paragraph	G
27. Paragraph A	
28. Paragraph B	
29. Paragraph C	
30. Paragraph D	
31. Paragraph E	

Medieval Toys and Childhood

A. This toy knight comes from a rich harvest of archaeological finds, made in the mud banks of the River Thames in London during the last 30 years. It was manufactured in about 1300. and illustrates several facets of medieval childhood. Then as now, children liked playing with toys. Then as now, they had a culture of their own, encompassing slang, toys, and games. Then as now, adults cared for children and encouraged their play. An adult made this toy and another adult bought it for a child, or gave a child money to buy it. The toy knight was made from a mould, and produced in large numbers. It probably circulated among the families of merchants, shopkeepers, and craft workers, as well as those of the nobility and gentry. The finds also include toys that girls might have liked: little cups, plates, and jugs, some sturdy enough to heat up water by a fireside. There is even a self-assembly kit: a cupboard cut out of a sheet of soft metal, instead of the plastic that would be used today. Toys give us a positive view of medieval childhood.



B. Medieval toys might be home-made by adults with time on their hands, fashioned by the children themselves, or bought from wandering peddlers or merchants at fairs—even ordered specially from the most prestigious makers. Some of the dolls appear to have been given to children once their usefulness as fashion models was past. Naturally, the types and magnificence of the toys varied with the status of the recipient.

C. Many of the dolls sold in England came from abroad, chiefly from Germany and Holland, although very fancy dolls were sold in the Palais du Justice, alongside other expensive luxuries. However, the industry was slow to develop into a guild, hampered partly by its own rules—toys had to be finished by the appropriate masters, and thus could not be made all in one workshop, for instance. There was also the hindrance that toy making was for a long time considered an addition to a 'real' trade, and to a great extent left to the local craftsmen in their spare time, rather than quickly becoming an industry of its own, as was the case in many other fields. However dolls among other toys appear to have been traded on a small but constant and gradually increasing level throughout the Middle Ages and Renaissance. Döckemacher ('doll-makers') are recorded in Nuremberg from 1413, and their very existence indicates the rising importance of the toy trade on both the local and the international scene.

D. Written sources for the existence of toys, and to some extent of their type and manufacture, are fairly plentiful, from legal records, to poetry describing the age of innocence, and sermons on the immature behavior of the socialites of the day. Most pictorial sources are generally later, but one drawing survives from around 1200, which shows two youths playing with a pair of foot soldiers. The warriors appear to be on strings, enabling them to be pulled back and forth in semblance of battle. Boys are often shown in illustrations playing with such warrior dolls, and various jousting figures survive which show the perfection of articulated armour and fine horse-trap pings which could be achieved in a boy's plaything. In portraiture of the sixteenth century, noble girls are often pictured holding exquisitely dressed dolls, possibly bought new for the sitting as they seem fresh from the box and neither grubby nor worn down with use. These dolls are likely to be accurately painted rather than idealized, as the sitters themselves often were, so it must be assumed that such dolls were indeed artistically finished, beautifully attired and painted with the most delicate of features. In contrast, the seventeenth-century painting of a peasant family, by Adriane van Ostade, offers proof that children of more humble origins also played with dolls.

- E.** Archaeological evidence is more widely available than might at first be thought. Naturally, more survives, the closer we get to modern times, and the material of which dolls were made doubtless influences our picture of their history. From Viking settlements in the far north a few dolls have been separated from the multitude of figures identified by the experts as idols and funerary figures. Some heads and limbs have been found, which may once have had cloth bodies, although it is unclear whether these were designed as toys or votive offerings. Although no surviving pieces have thus far been uncovered, wealthy Anglo-Saxon children in England may have entertained themselves with carved alabaster dolls, a substance which had been used for doll-making since the Roman occupation, while poorer children of this age would have owned wooden or cloth dolls.
- F.** Dating from as early as the 13th century, items unearthed from the mudbanks of the River Thames include tiny cannons and guns, metal figurines, and miniaturized household objects such as stools, jugs, cauldrons, and even frying pans complete with little fish. Made mainly from pewter (a tin-lead alloy), these medieval toys are exceptionally rare and have helped transform perceptions of childhood during the Middle Ages, says Hazel Forsyth, curator of post-medieval collections at the Museum of London. "In the 1960s French historian Philippe Aries claimed that there wasn't really such a thing as childhood in the Middle Ages and that parents didn't form emotional attachments with their offspring, regarding them as economic providers or producers for the household," Forsyth said. Aries pioneered ways of looking beyond kings, politics, and war to everyday medieval life. He argued that parents invested little emotional capital in their children because they had lots of offspring, many of them died in infancy, and that surviving children were sent to work at the ages of six or seven.
- G.** Aries's views had a lot of currency. And for very many years, people took it for granted. It has only been recently, with discovery of ancient childhood items by contemporary treasure hunters, that we've challenged this received wisdom. "Surprise, surprise, human nature doesn't change," Forsyth said, "some parents from the Middle Ages were very devoted to their children and gave them every luxury and pleasure they could afford."

Questions 33-36

Do the following statements agree with the information given in Reading Passage 3?
boxes **33-36** on your answer sheet write

- TRUE** if the statement is true
FALSE if the statement is false
NOT GIVEN if the information is not given in the passage.

- 33.** In the past boys have played with soldier dolls and girls with feminine, fashionably dressed miniatures.
34. The establishment of the toy trade grew together with the formal establishment of a toymaker's guild.
35. England was the largest doll market during the Middle Ages.
36. Paintings show young boys playing with dolls that having moving pieces.

Questions 37-40 Complete the summary below.

Choose your answers from the box and write them in boxes **37-40** on your answer sheet.

NB There are more words than spaces so you will not use them all.

French historian Philippe Aries claimed that there wasn't37..... in the Middle Ages. Aries also asserted that people at that time had so many38..... that they could not invest much effort in everyone. Although many people39..... these views, the discovery of Medieval Toys cast much doubt on them. Hazel Forsyth believed that40..... didn't change and in the Middle Ages parents spent vast money to buy luxury toys for their children.

Providers	opposed	a toy	producers
descendants	a child	human nature	advocated
currency	a thing	wisdom	