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ПРОФЕССИОНАЛЬНО-ОРИЕНТИРОВАННЫЙ АНГЛИЙСКИЙ ЯЗЫК

Методические указания для студентов специальности

5В074600 – Космическая техника и технологии

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Данные методические указания предназначены для применения на практических занятиях для студентов третьего курса для развития навыков чтения и перевода текстов. Тексты взяты из оригинальной литературы. В каждом разделе имеются упражнения для работы с текстом.

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Text 1

The Shock of the Truth

A. Throughout history, there have been instances in which people have been unwilling to accept new theories, despite startling evidence. This was certainly the case when Copernicus published his theory - that the earth was not the center of the universe.

B. Until the early 16th century, western thinkers believed the theory put forward by Ptolemy, an Egyptian living in Alexandria in about 150 A.D. His theory, which was formulated by gathering and organizing the thoughts of the earlier thinkers, proposed that the universe was a closed space bounded by a spherical envelope beyond which there was nothing. The earth, according to Ptolemy, was a fixed and immobile mass, located at the center of the universe. The sun and the stars, revolved around it.

C. The theory appealed to human nature. Someone making casual observations as they looked into the sky might come to a similar conclusion. It also fed the human ego. Humans could believe that they were at the center of God's universe, and the sun and stars were created for their benefit.

D. Ptolemy's theory was of course, incorrect, but at the time nobody contested it. European astronomers were more inclined to save face. Instead of proposing new ideas, they attempted to patch up and refine Ptolemy's flawed model. Students were taught using a book called The Sphere which had been written two hundred years previously. In short, astronomy failed to advance.

E. In 1530, however, Nikolaj Kopernik, more commonly known as Copernicus, made an assertion which shook the world. He proposed that the earth turned on its axis once per day, and travelled around the sun once per year. Even when he made his discovery, he was reluctant to make it public, knowing how much his shocking revelations would disturb the church. However, George Rheticus, a German mathematics professor who had become Copernicus's student, convinced Copernicus to publish his ideas, even though Copernicus, a perfectionist, was never satisfied that his observations were complete.

F. Copernicus's ideas went against all the political and religious beliefs of the time. Humans, it was believed, were made in God's image, and were superior to all creatures. The natural world had been created for humans to exploit. Copernicus's theories contradicted the ideas of all the powerful churchmen of the time. Even the famous playwright William Shakespeare feared the new theory, pronouncing that it would destroy social order and bring chaos to the world. However, Copernicus never had to suffer at the hands of those who disagreed with his theories. He died just after the work was published in 1543.

G. However, the scientists who followed in Copernicus's footsteps bore the brunt of the church's anger. Two other Italian scientists of the time, Galileo and Bruno, agreed wholeheartedly with the Copernican theory. Bruno even dared to say that space was endless and contained many other suns, each with its own planets.

For this, Bruno was sentenced to death by burning in 1600. Galileo, famous for his construction of the telescope, was forced to deny his belief in the Copernican theories. He escaped capital punishment, but was imprisoned for the rest of his life.

H. In time however, Copernicus's work became more accepted. Subsequent scientists and mathematicians such as Brahe, Kepler and Newton took Copernicus's work as a starting point and used it to glean further truths about the laws of celestial mechanics.

I. The most important aspect of Copernicus' work is that it forever changed the place of man in the cosmos. With Copernicus' work, man could no longer take that premier position which the theologians had immodestly assigned him. This was the first, but certainly not the last time in which man would have to accept his position as a mere part of the universe, not at the center of it.

1. The text has nine paragraphs, A-I. Which paragraph contains the following information?

a) The public's reaction to the new theory.
b) An ancient belief about the position of the earth.
c) Copernicus's legacy to the future of science.
d) How academics built on Copernican ideas.
e) An idea which is attractive to humans.
f) Out-dated teaching and defective research.
g) Scientists suffer for their beliefs.

Text 2

A. In April 2002 an event took place which demonstrated one of the many applications of information theory. The space probe, Voyager I, launched in 1977, had sent back spectacular images of Jupiter and Saturn and then soared out of the Solar System on a one-way mission to the stars. After 25 years of exposure to the freezing temperatures of deep space, the probe was beginning to show its age, Sensors and circuits were on the brink of failing and NASA experts realized that they had to do something or lose contact with their probe forever. The solution was to get a message to Voyager I to instruct it to use spares to change the failing parts. With the probe 12 billion kilometers from Earth, this was not an easy task. By means of a radio dish belonging to NASA’s Deep Space Network, the message was sent out into the depths of space. Even travelling at the speed of light, it took over II hours to reach its target, far beyond the orbit of Pluto. Yet, incredibly, the little probe managed to hear the faint call from its home planet, and successfully made the switchover

B. It was the I0ngest·distance repair job in history, and a triumph for the NASA engineers. But it also highlighted the astonishing power of the techniques developed by American communications engineer Claude Shannon, who had died just a year earlier. Born in 1916 in Petoskey, Michigart Shannon showed an early talent for maths and for building gadgets, and made breakthroughs in the foundations of computer technology when still a student. While at Bell laboratories, Shannon developed information theory, but shunned the resulting acclaim. In the 1940s he singlehandedly created an entire science of communication which has since inveigled its way into a host of applications, from DVDs to satellite communication to bar codes - any area, in short, where data has to be conveyed rapidly yet accurately.

C. This all seems light years away from the down to-earth uses Shannon originally had for his work, which began when he was a 22-year—old graduate engineering student at the prestigious Massachusetts Institute of Technology in 1939. He set out with an apparently simple aim: to pin down the precise meaning of the concept of 'information'. The most basic form of information, Shannon argued, is whether something is true or false - which can be captured in the binary unit, or 'bit', of the form 1 or 0. Having identified this fundamental unit, Shannon set about defining otherwise vague ideas about information and how to transmit it from place to place in the process he discovered something surprising: it is always possible to guarantee information will get through random interference - 'noise' — intact.

D. Noise usually means unwanted sounds which interfere with genuine information. Information theory generalizes this idea via theorems that capture the effects of noise with mathematical precision. In particular, Shannon showed that noise sets a limit on the rate at which information can pass along communication channels while remaining error-free. This rate depends on the relative strengths of the signal and noise travelling down the communication channel, and on its capacity (its' bandwidth'). The resulting limit, given in units of bits per second, is the absolute maximum rate of error-free communication given signal strength and noise level. The trick, Shannon showed, is to find ways of packaging up - 'coding' - information to cope with the ravages of noise, while staying within the information carrying capacity 'bandwidth' - of the communication system being used.

E. Over the years scientists have devised many such coding methods, and they have proved crucial in many technological feats. The Voyager spacecraft transmitted data using codes which added one extra bit for every single bit of information; the result was an error rate of just one bit in 10,000 — and stunningly clear pictures of the planets. Other codes have become part of everyday life - such as the Universal Product Code, or bar code, which uses a simple error-detecting system that ensures supermarket check-out lasers can read the price even on. say, a crumpled bag of crisps. As recently as 1993, engineers made a major breakthrough by discovering so-called turbo codes - which come very close to Shannon's ultimate limit for the maximum rate that data can be transmitted reliably, and now play a key role in the mobile videophone revolution.

F. Shannon also laid the foundations of more efficient ways of storing information, by stripping out superfluous ('redundant') bits from data which contributed little real information. As mobile phone text messages like 'l CN C U' show, it is often possible to leave out a lot of data without losing much meaning, As with error correction, however, there's a limit beyond which messages become too ambiguous. Shannon showed how to calculate this limit, opening the way to the design of compression methods that cram maximum information into the minimum space.

1. Reading Passage 56 has six paragraphs, A-F. Which paragraph contains the following information? Write the correct letter A-E in boxes 1 - 6 on your answer sheet.

1) an explanation of the factors affecting the transmission of information
2) an example of how unnecessary information can be omitted
3) a reference to Shannon`s attitude to fame
4) details of a machine capable of interpreting incomplete information
5) a detailed account of an incident involving information theory
6) a reference to what Shannon initially intended to achieve in his research

2. Complete the notes below. Choose no more than two words from the passage for each answer Write your answers in boxes 7-11 on your answer sheet.

The Voyager l Space Probe

The probe transmitted pictures of both ____ and ____ (7) , then left the ____ (8). The freezing temperatures were found to have a negative effect on parts of the space probe. Scientists feared that both the____ and ____ (9) were about to stop working. The only hope was to tell the probe to replace them with ____ (10) - but distance made communication with the probe difficult. A ____ (11) was used to transmit the message at the speed of light.
The message was picked up by the probe and the switchover took place.

3. Do the following statements agree with the information given in Reading Passage 37 in boxes 38-40 on your answer sheet. Write

- true if the statement agrees with the information;
- false if the statement contradicts the information;
- not given if there is no information on this.

12) The concept of describing something as true or false was the starting point for Shannon in his attempts to send messages over distances.

13) The amount of information that can be sent in a given time period is determined with reference to the signal strength and noise level.

14) Products have now been developed which can convey more information than Shannon had anticipated as possible.

Text 3

Venus in Transmit

June 2004 saw the first passage., known as a 'transit` of the planet Venus across the face of the Sun in 122 years. Transits have helped shape our view of the whole Universe, as Heather Cooper and Nigel Henbest explain.

A. On 8 June 2004, more than half the population of the world were treated to a rare astronomical event. For over six hours, the planet Venus steadily inched its way over the surface of the Sun. This “transit` of Venus was the first since 6 December l882. On that occasion, the American astronomer Professor Simon Newcomb led a party to South Africa to observe the event. They were based at a girls' school, where - if is alleged – the combined forces of three schoolmistresses outperformed the professionals with the accuracy of their observations.

B. For centuries, transits of Venus have drawn explorers and astronomers alike to the four corners of the globe. And you can put it all down to the extraordinary polymath Edmond Halley. In November 1677, Halley observed a transit of the innermost planet Mercury, from the desolate island of St Helena in the South Pacific. .He realized that from different latitudes, the passage of the planet across the Suns disc would appear to differ. By timing the transit from two widely-separated locations, teams of astronomers could calculate the parallax angle - the apparent difference in position of an astronomical body due to a difference in the observers position. Calculating this angle would allow astronomers to measure what was then the ultimate goal; the distance of the Earth from the Sun. This distance is known as the 'astronomical unit` or AU.

C. Halley was aware that the AU was one of the most fundamental of all astronomical measurements. Johannes Kepler, in the early 17*h century, had shown that the distances of the planets from the Sun governed their orbital speeds, which were easily measurable. But no-one had found a way to calculate accurate distances to the planets from the Earth. The goal was to measure the AU; then, knowing the orbital speeds of all the other planets round the Sun, the scale of the Solar System would fall into place. However, Halley realized that Mercury was so far away that its parallax angle would be very difficult to determine. As Venus was closer to the Earth, its parallax angle would be larger and Halley worked out that by using Venus it would be possible to measure the Sun`s distance to 1 part in 500. But there was as problem: transits of Venus, unlike those of Mercury; are rare occurring in pairs roughly eight years apart every hundred or so years. Nevertheless, he accurately predicted that Venus would cross the face of the Sun in both 1761 and 1769 - though he didn`t survive to see either.

D. Inspired by Halley's suggestion of a way to pin down the scale of the Solar System, teams of British and French astronomers set out on expeditions to places as diverse as India and Siberia. But things weren’t helped by Britain and France being at war. The person who deserves most sympathy is the French astronomer Guillaume Le Gentil. He was thwarted by the fact that the British were besieging his observation site at Pondicherry in India. Fleeing on a French warship crossing the Indian Ocean, Le Gentil saw a wonderful transit - but the ship`s pitching and rolling ruled out any attempt at making accurate observations. Undaunted, he remained south of the equator, keeping himself busy by studying the islands of Mauritius and Madagascar before setting off to observe the next transit in the Philippines. Ironically after travelling nearly 50,000 kilometres, his view was clouded out at the last moment, a very dispiriting experience.

E. While the early transit timings were as precise as instruments would allow the measurements were dogged by the 'black drop' effect. When Venus begins to cross the Sun's disc, it looks smeared not circular - which makes it difficult to establish timings. This is due to diffraction of light. The second problem is that Venus exhibits a halo of light when it is seen just outside the Sun's disc. While this showed astronomers that Venus was surrounded by a thick layer of gases refracting sunlight around it, both effects made it impossible to obtain accurate timings.

F. But astronomers labored hard to analyze the results of these expeditions to observe Venus transits. Jonathan Franz Encke, Director of the Belin Observatory, finally determined a value for the AU based on all these parallax measurements: 153340,000 km. Reasonably accurate for the time, that is quite close to today's value of 149,597,870 km, determined by radar, which has now superseded transits and all other methods in accuracy. The AU is a cosmic measuring rod, and the basis of how we scale the Universe today the parallax principle can be extended to measure the distances to the stars. If we look at a star in January - when Earth is at one point in its orbit - it will seem to be in a different position from where it appears six months later. Knowing the width of Earth`s orbit, the parallax shift lets astronomers calculate the distance.

G. June 2004's transit of Venus was thus more of an astronomical spectacle than a scientifically important event. But such transits have paved the way for what might prove to be one of the most vital breakthroughs in the cosmos - detecting Earth-sized planets orbiting other stars

1. Reading Passage has seven paragraphs, A-G. Which paragraph contains the following information?

1) examples of different ways in which the parallax principle has been applied

2) a description of an event which prevented a transit observation

3) a statement about potential future discoveries leading on from transit observations

4) a description of physical states connected with Venus which early astronomical instruments failed to overcome

2. Look at the following statements (Questions 5-8) and the list of people below. Match each statement with the correct person, A, B, C or D.

5) He calculated the distance of the Sun from the Earth based on observations of Venus with a fair degree of accuracy.

6) He understood that the distance of the Sun from the Earth could be worked out by comparing observations of a transit.
7) He realized that the time taken by a planet to go round the Sun depends on its distance from the Sun.
8) He witnessed a Venus transit but was unable to make any calculations.

List of People
a) Edmond Halley
b) Johannes Kepler
c) Guillaume Le Gentil
d) Johann Franz Encke

3. Do the following statements agree with the information given in Reading Passage 2?
true it the statement agrees with the information
false if the statement contradicts the information
not given if there is no information on this

9) Halley observed one transit of the planet Venus.
10) Le Gentil managed to observe a second Venus transit.
11) The shape of Venus appears distorted when it starts to pass in front of the Sun.
12) Early astronomers suspected that the atmosphere on Venus was toxic.
13) The parallax principle allows astronomers to work out how far away distant stars are from the Earth.

Text 4

The Earth

A. The Earth is the third planet from the Sun and it is the only planet known to have life on it. The Earth formed around 4.5 billion years ago. It is one of four rocky planets on the inside of the Solar System. The other three are Mercury, Venus, and Mars.
B. The large mass of the Sun makes the Earth move around it, just as the mass of the Earth makes the Moon move around it. The Earth also turns round in space, so different parts face the Sun at different times. The Earth goes around the Sun once (one "year") for every 365¼ times it turns all the way around (one "day").
C. The Moon goes around the Earth about every 27⅓ days, and reflects light from the Sun. As the Earth goes round the Sun at the same time, the changing light of the Moon takes about 29½ days to go from dark to bright to dark again. That is where the idea of "month" came from. However, now most months have 30 or 31 days so they fit into one year.

D. The Earth is the only planet in our Solar System that has a large amount of liquid water. About 71% of the surface of the Earth is covered by oceans. Because of this, it is sometimes called the "Blue Planet".

E. Because of its water, the Earth is home to millions of species of plants and animals. The things that live on Earth have changed its surface greatly. For example, early cyanobacteria changed the air and gave it oxygen. The living part of the Earth's surface is called the "biosphere".

F. The Earth is part of the eight planets and many thousands of small bodies that move around the Sun as its Solar System. The Solar System is moving through the Orion Arm of the Milky Way Galaxy now, and will be for about the next 10,000 years.

G. The Earth is generally 150,000,000 kilometers or 93,000,000 miles away from the Sun (this distance is named an "Astronomical Unit"). The Earth moves along its way at an average speed of about 30 km or 19 mi a second. The Earth turns all the way around about 365¼ times in the time it takes for the Earth to go all the way around the Sun. To make up this extra bit of a day every year, an additional day is used every four years. This is named a "leap year".

H. The Moon goes around the Earth at an average distance of 400,000 kilometers (250,000 mi). It is locked to Earth, so that it always has the same half facing the Earth; the other half is called the "dark side of the Moon". It takes about 27⅓ days for the Moon to go all the way around the Earth but, because the Earth is moving around the Sun at the same time, it takes about 29½ days for the Moon to go from dark to bright to dark again. This is where the word "month" came from, even though most months now have 30 or 31 days.

1. Reading Passage 1 has eight paragraphs A-H. Which paragraph contains the following information?

1) Earth's natural satellite.
2) Distance between Earth and Sun.
3) General information about Earth.
4) The Solar System.
5) Length of most moths.
6) Another name for Earth.
7) The living part of the Earth's surface.
8) The movements of Earth around the Sun.

2. Complete the sentences below. Choose no more than three words from the text for each answer

9) Apart from Earth, other rocky planets in our Solar Systems are Venus, Mars and ____.

10) Moon ____ from the Sun on Earth.

11) There are millions of ____ of plants and animals that inhabit Earth.

12) Now the Solar System is travelling through ____.

13) The dark side of the Moon is the side, which ____ faces Earth.

Text 5

Galaxies are the *major* building blocks of the universe. A galaxy is a giant family of many millions of stars, and it is held together by its own gravitational field. Most of the material universe is organized into galaxies of stars, together with gas and dust.

There are three main types of galaxy; spiral, elliptical, and irregular. The Milky Way is a spiral galaxy: a flattish disc of stars with two spiral arms emerging from *its* central nucleus. About one-quarter of all galaxies have this shape. Spiral galaxies are well supplied with the interstellar gas in which new stars form ; as the rotating spiral pattern sweeps around the galaxy it compresses gas and dust, triggering the formation of bright young stars in its arms. The elliptical galaxies have *a symmetrical* elliptical or spheroidal shape with no *obvious* structure. Most of their member stars are very old and since ellipticals are devoid of interstellar gas, no new stars are forming in them. The biggest and brightest galaxies in the universe are ellipticals with masses of about 1013 times that of the Sun; these giants may frequently be sources of strong radio emission, in which case they are called radio galaxies. About two-thirds of all galaxies are elliptical. Irregular galaxies comprise about one-tenth of all galaxies and they come in many subclasses.

Measurement in space is quite different from measurement on Earth. Some terrestrial distances can be expressed as intervals of time : the time to fly from one continent to another or the time it takes to drive to work, for example. By comparison with these familiar yardsticks, the distances to the galaxies are incomprehensibly large, but *they* too are made more manageable by using a time calibration, in this case the distance that light travels in one year. On such a scale the nearest giant spiral galaxy, the Andromeda galaxy, is two million light years away. The most distant luminous objects seen by telescopes are probably ten thousand million light years away. Their light was already halfway here before the Earth even formed. The light from the nearby Virgo galaxy set out when reptiles still dominated the animal world.

1) The world "major" in line 1 is closest in meaning to
a) Intense
b) Principal
c) Huge
d) Unique
2) What does the second paragraph mainly discuss?
a) The Milky Way
b) Major categories of galaxies
c) How elliptical galaxies are formed
d) Difference between irregular and spiral galaxies

3) The word "which" in line 5 refers to

a) Dust
b) Gas
c) Pattern
d) Galaxy

4) According to the passage, new stars are formed in spiral galaxies due to

a) an explosion of gas
b) the compression of gas and dust
c) the combining of old stars
d) strong radio emissions

5) The word "symmetrical" the second paragraph is closest in meaning to

a) proportionally balanced
b) commonly seen
c) typical large
d) steadily growing

6) The word "obvious" in line 8 is closest in meaning to

a) Discovered
b) Apparent
c) Understood
d) simplistic

7)According to the passage, which of the following is NOT true of elliptical galaxies?

a) They are the largest galaxies.
b) They mostly contain old stars.
c) They contain a high amount of interstellar gas.
d) They have a spherical shape

8) Which of the following characteristics of radio galaxies is mentioned in the passage?

a) They are a type of elliptical galaxy.
b) They are usually too small to be seen with a telescope
c) They are closely related to irregular galaxies.
d) They are not as bright as spiral galaxies.

9) What percentage of galaxies is irregular?

a) 10%
b) 25%
c) 50%
d) 75%

10) The word "they" the third paragraph refers to

a) intervals
b) yardsticks
c) distances
d) galaxies

11) Why does the author mention the Virgo galaxy and the Andromeda galaxy in the third paragraph?

a) To describe the effect that distance has on visibility
b) To compare the ages of two relatively young galaxies
c) To emphasize the vast distances of the galaxies from Earth
d) To explain why certain galaxies cannot be seen by a telescope

Text 6

Planets in Our Solar System

The Sun is the hub of a huge rotating system consisting of nine planets, their satellites, and numerous small bodies, including asteroids, comets, and meteoroids. An estimated 99.85 percent of the mass of our solar system is contained within the Sun, while the planets collectively make up most of the remaining 0.15 percent. The planets, in order of their distance from the Sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. Under the control of the Sun's gravitational force, each planet maintains an elliptical orbit and all of them travel in the same direction.

The planets in our solar system fall into two groups: the terrestrial (Earth-like) planets (Mercury, Venus, Earth, and Mars) and the Jovian (Jupiter-like) planets (Jupiter, Saturn, Uranus, and Neptune). Pluto is not included in either category, because its great distance from Earth and its small size make this planet's true nature a mystery.

The most obvious difference between the terrestrial and the Jovian planets is their size. The largest terrestrial planet, Earth has a diameter only one quarter as great as the diameter of the smallest Jovian planet, Neptune, and its mass is only one seventeenth as great. Hence, the Jovian planets are often called giants. Also, because of their relative locations, the four Jovian planets are known as the outer planets, while the terrestrial planets are known as the inner planets. There appears to be a correlation between the positions of these planets and their sizes.

Other dimensions along which the two groups differ markedly are density and composition. The densities of the terrestrial planets average about 5 times the density of water, whereas the Jovian planets have densities that average only 1.5 times the density of water. One of the outer planets, Saturn, has a density of only 0.7 that of water, which means that Saturn would float in water. Variations in the composition of the planets are largely responsible for the density differences. The substances that make up both groups of planets are divided into three groups-gases, rocks, and ices-based on their melting points. The terrestrial planets are mostly rocks: dense rocky and metallic material, with minor amounts of gases. The Jovian planets, on the other hand, contain a large percentage of the gases hydrogen and helium, with varying amounts of ices: mostly water, ammonia, and methane ices.

The Jovian planets have very thick atmospheres consisting of varying amounts of hydrogen, helium, methane, and ammonia. By comparison, the terrestrial planets have meager atmospheres at best. A planet's ability to retain an atmosphere depends on its temperature and mass. Simply stated, a gas molecule can "evaporate" from a planet if it reaches a speed known as the escape velocity. For Earth, this velocity is 11 kilometers per second. Any material, including a rocket, must reach this speed before it can leave Earth and go into space. The Jovian planets, because of their greater masses and thus higher surface gravities, have higher escape velocities (21-60 kilometers per second) than the terrestrial planets. Consequently, it is more difficult for gases to "evaporate" from them. Also, because the molecular motion of a gas depends on temperature, at the low temperatures of the Jovian planets even the lightest gases are unlikely to acquire the speed needed to escape. On the other hand, a comparatively warm body with a small surface gravity, like Earth's moon, is unable to hold even the heaviest gas and thus lacks an atmosphere. The slightly larger terrestrial planets Earth, Venus, and Mars retain some heavy gases like carbon dioxide, but even their atmospheres make up only an infinitesimally small portion of their total mass.

The orderly nature of our solar system leads most astronomers to conclude that the planets formed at essentially the same time and from the same material as the Sun. It is hypothesized that the primordial cloud of dust and gas from which all the planets are thought to have condensed had a composition somewhat similar to that of Jupiter. However, unlike Jupiter, the terrestrial planets today are nearly void of light gases and ices. The explanation may be that the terrestrial planets were once much larger and richer in these materials but eventually lost them because of these bodies' relative closeness to the Sun, which meant that their temperatures were relatively high.

1) According to the passage, each of the following statements comparing terrestrial planets with Jovian planets is true except:

a) Terrestrial planets are closer to the Sun than Jovian planets
b) Terrestrial planets have smaller diameters than Jovian planets
c) Terrestrial planets have smaller masses than Jovian planets
c) Terrestrial planets travel in a different direction than Jovian planets do

2) The word markedly in the passage is closest in meaning to

a) essentially
b) typically
c) consistently
d) noticeably

3) Paragraph 4 mentions which of the following as a reason why terrestrial planets are dense?

a) They are made up of three groups of substances
b) They are composed mainly of rocky and metallic materials
c) They contain more ice than Jovian planets
d) They contain relatively small amounts of water

4) Paragraph 4 supports each of the following statements about Saturn EXCEPT:

a) It is less dense than any of the terrestrial planets

b) It contains no rocky material

c) It contains ices

d) It contains a large percentage of gases

5) The word meager in the passage is closest in meaning to

a) over time

b) long ago

c) simply

d) certainly

6) According to paragraph 5, which of the following statements is true of both Jovian and terrestrial planets?

a) The thicker the atmosphere, the smaller the planet's mass

b) The more varied the gases in the atmosphere, the higher the temperature

c) The higher the surface gravity, the higher the escape velocity

d) The less the atmosphere contributes to the total mass, the lower the temperature

7) According to paragraph 5, what is a major reason that Jovian planets have much thicker atmospheres than terrestrial planets do?

a) Jovian planets have lower surface gravities

b) Jovian planets have lower temperatures

c) Jovian planets have lower escape velocities

d) Jovian planets' gas molecules have higher average speeds

8) Paragraph 5 supports which of the following statements about the ability of planets to retain gases?

a) More-massive planets are less able to retain gases than less-massive ones

b) Planets are more likely to retain heavy gases than light gases

c) Jovian planets are unlikely to retain the lightest gases

d) Only terrestrial planets have been able to retain carbon dioxide

9) In calling the cloud of gas and dust from which the Sun and all the planets are thought to have condensed "primordial,' the author means that the cloud was

a) immense in size

b) composed of similar particles

c) present at the very beginning of our solar system's formation

d) created from a great variety of different materials

10) The word eventually in the passage is closest in meaning to

a) over time

b) long ago

c) simply

d) certainly

11) According to paragraph 6, what is a possible explanation for the lack of light gases and ices on terrestrial planets?

a) The location of terrestrial planets caused them to lose some of the materials they once contained

b) Terrestrial planets were formed much later than Jovian planets

c) The composition of terrestrial planets was different from that of Jupiter

d) Terrestrial planets were formed out of different material than the Sun was

12) Look at the four squares A that indicate where the following sentence could be added to the passage.

This explains their relatively low densities.

Where would the sentence best fit?

a) A

b) B

c) C

d) D

13. Directions: From the seven answer choices below, select the two phrases that correctly characterize the terrestrial planets and the three phrases that correctly characterize the Jovian planets. Drag each phrase you select into the appropriate column of the table. Two of the phrases will NOT be used. This question is worth 3 points.

Terrestrial planets	*Jovian planets*

Answer Choices:

1) Have relatively small sizes.
2) Are grouped in the same category as Pluto.
3) Contain relatively high proportions of ices.
4) Have relatively high temperatures.
5) Have densities that are generally lower than the density of water.
6) Have relatively high escape velocities.
7) Have a composition closer to that of the cloud from which they condensed terrestrial.

Text 7

Comets, meteors and asteroids come from space. Comets appear as shining lights and cannot be seen without a telescope. Meteors look like thin streaks of light in the night sky. They can be seen by the naked eye. Asteroids are chunks of rock that circle the Sun. They measure about 3 miles across.

A comet in the outer parts of the Solar System is too small to be seen from Earth. It looks like a large, dirty snowball. It has an icy core, covered by a layer of black dust. The nucleus is mainly water and gases, frozen and mixed together with bits of rock and metal.

The ice melts when the comet gets closer to the Sun. It changes into a gas. Dust particles spread out around the nucleus in a cloud called a coma. The Sun causes them to glow. The coma of an average comet is sixty thousand miles across, but very thin. Radiation and the solar wind drive the gases of the coma away. They form a straight tail. The tail can grow to ninety million miles long.

The orbits of most comets are oval-shaped. Short-period comets take less than two hundred years to travel around the sun. Halley's Comet returns every 76 years. The comet with the shortest period is Encke's comet. It orbits the Sun every 3.3 years. Most comets get brighter when they get closer to the Sun. Bright comets are visible in the sky only once or twice in a century, but for a long period of time.

Meteors flash in the sky every night. They are sometimes called falling or shooting stars. Meteors begin as meteoroids pushing through the Earth's atmosphere. Friction made by rubbing against air particles makes them look red hot. Then they are called meteors. They last for only a few seconds. Meteors come much closer to the Earth than comets.

Earth might pass through an old comet orbit and bump into particles from its nucleus. This event is called a meteor shower. Perhaps more than a dozen meteors might be visible in an hour. If many more meteors are together, this event is called a meteor storm.

Asteroids are the largest of the space rocks. Most of them go around the Sun between the orbits of Mars and Jupiter. The region they are located is called the Asteroid Zone. There are more than three thousand known asteroids. Most are only a few miles across. Ceres is the largest. It is six hundred miles across.

Sometimes asteroids spin out of their zone to follow different orbits. More than twenty-five asteroids share the same orbit as Jupiter. They are called Trojan asteroids. Apollo asteroids come across Earth's orbit and approach the Sun like a comet.

In summary, comets, meteors, and asteroids are three types of space travelers which can be seen by humans. Comets are shiny patches in the sky from time to time. Asteroids are chunks of rock which circle the Sun. Both can be viewed only by using a telescope. Meteors are thin streaks of light every night. These can be seen without a telescope.

1) *Which of the following is an asteroid?*
a) A shooting star
b) A big chunk of space rock
c) A small comet
d) A small meteor
2) *Which of the following has an icy core?*
a) An asteroid
b) The Earth
c) The Moon
d) A comet
3) *Which of the following statements is true?*
a) Asteroids can be seen by the human eye
b) A coma is the trail a meteor leaves behind

c) The orbits of most comets are oval-shaped
d) Meteors appear only every few months

4) How often does Halley's Comet return?

a) 76 years
b) 25 years
c) 50 years
d) 2 years

5) Which of the following statements is not true?

a) Most comets get brighter as they get near the Sun
b) The comet with the shortest period is Encke's comet
c) Asteroids go around the Sun between the orbits of Mars and Jupiter
d) A meteor shower happens when meteors hit Earth

6) Which of the following best describes a Trojan asteroid?

a) Very small asteroids
b) Asteroids which share Jupiter's orbit
c) Asteroids which share Earth's orbit
d) The largest asteroids

Text 8

A. The primary reason for the search is basic curiosity - the same curiosity about the natural world that drives all pure science. We want to know whether we are alone in the Universe. We want to know whether life evolves naturally if given the right conditions, or whether there is something very special about the Earth to have fostered the variety of life forms that we see around us on the planet. The simple detection of a radio signal will be sufficient to answer this most basic of all questions. In this sense, SETI is another cog in the machinery of pure science which is continually pushing out the horizon of our knowledge. However, there are other reasons for being interested in whether life exists elsewhere. For example, we have had civilization on Earth for perhaps only a few thousand years, and the threats of nuclear war and pollution over the last few decades have told us that our survival may be tenuous. Will we last another two thousand years or will we wipe ourselves out? Since the lifetime of a planet like ours is several billion years, we can expect that if other civilizations do survive in our galaxy, their ages will range from zero to several billion years. Thus any other civilization that we hear from is likely to be far older on average than ourselves. The mere existence of such a civilization will tell of that long term survival is possible, and gives us some cause for optimism. It is even possible that the older civilization may pass on the benefits of their experience in dealing with threats to survival such as nuclear war and global pollution, and other threats that we haven't yet discovered.

B. In discussing whether we are alone, most SETI scientists adopt two ground rules. First UFOs (Unidentified Flying Objects) are generally ignored since most scientists don`t consider the evidence for them to be strong enough to bear serious consideration (although it is also important to keep an open mind in casa any really convincing evidence emerges in the future). Second, we make a very conservative assumption that we are looking for a life form that is pretty well like us, since if it differs radically from us we may well not recognize it as e life form, quite apart from whatever we are able to communicate with it. In other words, the life form we are looking for may well have two green heads and seven fingers, but it will nevertheless resemble us in that it should communicate with its fellows. Be interested in the Universe, Live on a planet orbiting a star like our Sun, and perhaps most restrictively have chemistry, like us, based on carbon and water.

C. Even when we make these assumptions our understanding of other life forms is still severely limited. We do not even know for example, how many stars have planets, and we certainly do not know how likely it is that life will arise naturally, given the right conditions. However, when we look at the 100 billion stars in our galaxy (the Milky Way), and 100 billion galaxies. In the observable Universe, It seems inconceivable that at least one of these planets does not have a life form on it; in fact, the best educated guess we can make using the little that we do know about the conditions for carbon-based life, leads us to estimate that perhaps one in 100,000 stars might have a life-bearing planet orbiting it. That means that our nearest neighbors are perhaps 1000 light years away which is almost next door in astronomical terms.

D. An alien civilization could choose many different ways of sending information across the galaxy, but many of these either require too much energy or else are severely attenuated while traversing the vast distances across the galaxy. It bums out that for a given amount of transmitted power: radio waves in the frequency range 1000 to 3000 MHz travel the greatest distance and so all searches to date have concentrated on looking for radio waves in this frequency range. So far there have been a number of searches by various groups around the world, including Australian searches using the radio telescope at Parkes, New South Wales. Until now there have not been any detection from the few hundred stars which have been searched. The scale of the searches has been increased dramatically since 1992, when the US Congress voted NASA $10 million per year for ten years to conduct a thorough search for extra-terrestrial life. Much of the money in this project is being spent on developing the special hardware needed to search many frequencies et once. The project has two parts. One part is a targeted search using the world's largest radio telescopes. The American-operated telescope in Arecibo Puerto Rico and the French telescope in Nancy in France. This part of the project is searching the nearest 1000 likely stars with high sensibility for signals in the frequency range 1000 to 3000 MHz. The other part of the project is an undirected search which is monitoring all of space with a lower using the smaller antennas of NASA`s Deep Space Network.

E. There is considerable debate over how we should react if we detect a signal from an alien civilization. Everybody agrees that we should not reply immediately. Quite apart from the impracticality of sending e reply over such large distances at short notice, it raises a host of ethical questions that would have to be addressed by the global community before any reply could be sent. Would the human race face the culture shock if faced with a superior and much older civilization? Luckily, there is no urgency about this. The stars being searched are hundreds of light years away so it takes hundreds of years for their signal to reach us, and a further few hundred years for our reply to reach them. It's not important, then, if there`s a delay of a few years, or decades, while the human race debates the question of whether to reply and perhaps carefully drafts a reply.

1. You should spend about 20 minutes on Questions 1-14, which are based on Reading Passage 2 on the following pages. Reading Passage 2 has five paragraphs, A-E.

Choose the correct heading for paragraphs B-E from the headings below.

List of Headings

I Seeking the transmission of radio signals from planets
II Appropriate responses to signals from other civilizations
III Vast distances to Earth's closest neighbors
IV Assumptions underlying the search for extra-terrestrial intelligence
V Reasons for the search for extra-terrestrial intelligence
VI Knowledge of extra-terrestrial life forms
VII Likelihood of lite on other planets

Example	*Answer*
1) Paragraph A	v
2) Paragraph B	
3) Paragraph C	
4) Paragraph D	
5) Paragraph E	

2. Answer the Questions Below. Choose no more than two words from the passage for each answer

6) What is the life expectancy of Earth?

7) What kind of signals from other intelligent civilizations are SETI scientists searching for?

8) How many stars are the world's most powerful radio telescopes searching?

3.Do the following statements agree with the views of the writer in Reading Passage 2?

- *true* if the statement agrees with the information.
- *false* if the statement contradicts the information.
- *not given* if there is no information on this more than once.

9) Alien civilizations may be able to help the human race to overcome serious problems

10) SETI scientists are trying to find a life form that resembles humans in many ways.

11) The Americans and Australians have cc-operated on joint research projects.

12) So far SETI scientists have picked up radio signals from several stars.

13) The NASA project attracted criticism from some members of Congress.

14) If a signal from outer space is received, it will be important to respond promptly.

Text 9

The Discovery of Uranus

Someone once put forward an attractive though unlikely theory. Throughout the Earth's annual revolution around the sun there is one point of space always hidden from our eyes. This point is the opposite part of the Earth's orbit, which is always hidden by the sun. Could there be another planet there, essentially similar to our own, but always invisible?

If a space probe today sent back evidence that such a world existed it would cause not much more sensation than Sir William Herschel's discovery of a new planet, Uranus, in 1781. Herschel was an extraordinary man — no other astronomer has ever covered so vast a field of work — and his career deserves study. He was born in Hanover in Germany in 1738, left the German army in 1757, and arrived in England the same year with no money but quite exceptional music ability. He played the violin and oboe and at one time was organist in the Octagon Chapel in the city of Bath. Herschel's was an active mind, and deep inside he was conscious that music was not his destiny; he therefore read widely in science and the arts, but not until 1772 did he come across a book on astronomy. He was then 34, middle-aged by the standards of the time, but without hesitation he embarked on his new career, financing it by his professional work as a musician. He spent years mastering the art of telescope construction, and even by present-day standards his instruments are comparable with the best.

Serious observation began 1774. He set himself the astonishing task of 'reviewing the heavens', in other words, pointing his telescope to every accessible part of the sky and recording what he saw. The first review was made in 1775; the second, and most momentous, in 1780-81. It was during the latter part of this that he discovered Uranus. Afterwards, supported by the royal grant in recognition of his work, he was able to devote himself entirely to astronomy. His final achievements spread from the sun and moon to remote galaxies (of which he discovered hundreds), and papers flooded from his pen until his death in 1822. Among these there was one sent to the Royal Society in 1781, entitled An Account of a Comet. In his own words:

On Tuesday the 13th of March, between ten and eleven in the evening, while I was examining the small stars in the neighbourhood of H Geminorum, I perceived one that appeared visibly larger than the rest; being struck with its uncommon magnitude, I compared it to H Geminorum and the small star in the quartile between Auriga and Gemini, and finding it to be much larger than either of them, suspected it to be a comet.

Herschel's care was the hallmark of a great observer; he was not prepared to jump any conclusions. Also, to be fair, the discovery of a new planet was the last thought in anybody's mind. But further observation by other astronomers besides Herschel revealed two curious facts. For comet, it showed a remarkably sharp disc; furthermore, it was moving so slowly that it was thought to be a great distance from the sun, and comets are only normally visible in the immediate vicinity of the sun. As its orbit came to be worked out the truth dawned that it was a new planet far beyond Saturn's realm, and that the 'reviewer of the heavens' had stumbled across an unprecedented prize. Herschel wanted to call it georgium sidus (Star of George) in honour of his royal patron King George III of Great Britain. The planet was later for a time called Herschel in honour of its discoverer. The name Uranus, which was first proposed by the German astronomer Johann Elert Bode, was in use by the late 19th century.

Uranus is a giant in construction, but not so much in size; its diameter compares unfavourably with that of Jupiter and Saturn, though on the terrestrial scale it is still colossal. Uranus' atmosphere consists largely of hydrogen and helium, with a trace of methane. Through a telescope the planet appears as a small bluish-green disc with a faint green periphery. In 1977, while recording the occultation 1 of a star behind the planet, the American astronomer James L. Elliot discovered the presence of five rings encircling the equator of Uranus. Four more rings were discovered in January 1986 during the exploratory flight of Voyager 2 2 , In addition to its rings, Uranus has 15 satellites ('moons'), the last 10 discovered by Voyager 2 on the same flight; all revolve about its equator and move with the planet in an east—west direction. The two largest moons, Titania and Oberon, were discovered by Herschel in 1787. The next two, Umbriel and Ariel, were found in 1851 by the British astronomer William Lassell. Miranda, thought before 1986 to be the innermost moon, was discovered in 1948 by the American astronomer Gerard Peter Kuiper.

Glossary:

Occultation: in astronomy, when one object passes in front of another and hides the second from view, especially, for example, when the moon comes between an observer and a star or planet.

Voyager 2: an unmanned spacecraft sent on a voyage past Saturn, Uranus and Jupiter in 1986; during which it sent back information about these planets to scientists on earth.

1. Complete the table below. Write a date for each answer.

Event	Date
Example William Herschel was born	*Answer* 1738
Herschel began investigating astronomy	____ (1)
Discovery of the planet Uranus	____ (2)
Discovery of the moons Titania and Oberon	____ (3)
First discovery of Uranus' rings	____ (4)
Discovery of the last 10 moons of Uranus	____ (5)

2. Do the following statements reflect the claims of the writer of the Reading Passage?

YES	if the statement reflects the claims of the writer.
NO	if the statement contradicts the writer.
NOT GIVEN	if it is impossible to say what the writer thinks about this.

Example	*Answer*
Herschel was multi-talented	YES

6) It is improbable that there is a planet hidden behind the sun.
7) Herschel knew immediately that he had found a new planet.
8) Herschel collaborated with other astronomers of his time.
9) Herschel's newly-discovered object was considered to be too far from the sun to be a comet.
10) Herschel's discovery was the most important find of the last three hundred years.

3. Complete each of the following statements (Questions 11-14) with a name from the Reading Passage.

The suggested names of the new planet started with ____ (11), then ____ (12), before finally settling on Uranus. The first five rings around Uranus were discovered by ____ (13). From 1948 until 1986, the moon ____ (14). was believed to be the moon closest to the surface of Uranus.

Text 10

Information Theory- the Big Data

Information theory lies at the heart of everything - from DVD players and the genetic code of DNA to the physics of the universe at its most fundamental. it has been central to the development of the science of communication, which enables data to be sent electronically and has therefore had a major impact on our lives.

A. In April 2002 an event took place which demonstrated one of the many applications of information theory. The space probe, Voyager I, launched in 1977, had sent back spectacular images of Jupiter and Saturn and then soared out of the Solar System on a one-way mission to the stars. After 25 years of exposure to the freezing temperatures of deep space, the probe was beginning to show its age, Sensors and circuits were on the brink of failing and NASA experts realized that they had to do something or lose contact with their probe forever. The solution was to get a message to Voyager I to instruct it to use spares to change the failing parts. With the probe 12 billion kilometers from Earth, this was not an easy task. By means of a radio dish belonging to NASA's Deep Space Network, the message was sent out into the depths of space. Even travelling at the speed of light, it took over II hours to reach its target, far beyond the orbit of Pluto. Yet, incredibly, the little probe managed to hear the faint call from its home planet, and successfully made the switchover.

B. It was the I0ngest·distance repair job in history, and a triumph for the NASA engineers. But it also highlighted the astonishing power of the techniques developed by American communications engineer Claude Shannon, who had died just a year earlier. Born in 1916 in Petoskey, Michigart Shannon showed an early talent for maths and for building gadgets, and made breakthroughs in the foundations of computer technology when still a student. While at Bell laboratories, Shannon developed information theory, but shunned the resulting acclaim. In the 1940s he singlehandedly created an entire science of communication which has since inveigled its way into a host of applications, from DVDs to satellite communication to bar codes - any area, in short, where data has to be conveyed rapidly yet accurately.

C. This all seems light years away from the down to-earth uses Shannon originally had for his work, which began when he was a 22-year—old graduate engineering student at the prestigious Massachusetts Institute of Technology in 1939. He set out with an apparently simple aim: to pin down the precise meaning of the concept of 'information'. The most basic form of information, Shannon argued, is whether something is true or false - which can be captured in the binary unit, or 'bit', of the form 1 or 0. Having identified this fundamental unit, Shannon set about defining otherwise vague ideas about information and how to transmit it from place to place. In the process he discovered something surprising: it is always possible to guarantee information will get through random interference - 'noise' — intact.

D. Noise usually means unwanted sounds which interfere with genuine information. Information theory generalizes this idea via theorems that capture the effects of noise with mathematical precision. In particular, Shannon showed that noise sets a limit on the rate at which information can pass along communication channels while remaining error-free. This rate depends on the relative strengths of the signal and noise travelling down the communication channel, and on its capacity (its' bandwidth'). The resulting limit, given in units of bits per second, is the absolute maximum rate of error-free communication given signal strength and noise level. The trick, Shannon showed, is to find ways of packaging up - 'coding' - information to cope with the ravages of noise, while staying within the information carrying capacity 'bandwidth' - of the communication system being used.

E. Over the years scientists have devised many such coding methods, and they have proved crucial in many technological feats. The Voyager spacecraft transmitted data using codes which added one extra bit for every single bit of information; the result was an error rate of just one bit in 10,000 — and stunningly clear pictures of the planets. Other codes have become part of everyday life - such as the Universal Product Code, or bar code, which uses a simple error-detecting system that ensures supermarket check-out lasers, can read the price even on. say, a crumpled bag of crisps. As recently as 1993, engineers made a major breakthrough by discovering so-called turbo codes - which come very close to Shannon's ultimate limit for the maximum rate that data can be transmitted reliably, and now play a key role in the mobile videophone revolution.

F. Shannon also laid the foundations of more efficient ways of storing information, by stripping out superfluous ('redundant') bits from data which contributed little real information. As mobile phone text messages like 'l CN C U' show, it is often possible to leave out a lot of data without losing much meaning, As with error correction, however, there's a limit beyond which messages become too ambiguous. Shannon showed how to calculate this limit, opening the way to the design of compression methods that cram maximum information into the minimum space.

1.Reading Passage has six paragraphs, A-F. Which paragraph contains the following information?

1) an explanation of the factors affecting the transmission of information
2) an example of how unnecessary information can be omitted
3) a reference to Shannon`s attitude to fame
4) details of a machine capable of interpreting incomplete information
5) a detailed account of an incident involving information theory
6) a reference to what Shannon initially intended to achieve in his research

2.Complete the notes below. Choose no more than two words from the passage for each answer

The Voyager l Space Probe

The probe transmitted pictures of both ____ and ____ (7), then left the ____ (8). The freezing temperatures were found to have a negative effect on parts of the space probe. Scientists feared that both the ____ and ____ (9) were about to stop working. The only hope was to tell the probe to replace them with ____ (10) - but distance made communication with the probe difficult. A ____ (11) was used to transmit the message at the speed of light.

The message was picked up by the probe and the switchover took place.

3. Do the following statements agree with the information given in Reading Passage?

TRUE if the statement agrees with the information.

FALSE if the statement contradicts the information.

NOT GIVEN if there is no information on this.

12) The concept of describing something as true or false was the starting point for Shannon in his attempts to send messages over distances.

13) The amount of information that can be sent in a given time period is determined with reference to the signal strength and noise level.

14) Products have now been developed which can convey more information than Shannon had anticipated as possible.

Text 11

For 150 years scientists have tried to determine the solar constant, the amount of solar energy that reaches the Earth. Yet, even in the most cloud-free regions of the planet, the solar constant cannot be measured precisely. Gas molecules and dust particles in the atmosphere absorb and scatter sunlight and prevent some wavelengths of the light from ever reaching the ground.

With the advent of satellites, however, scientists have finally been able to measure the Sun's output without being impeded by the Earth's atmosphere. Solar Max, a satellite from the National Aeronautics and Space Administration (NASA), has been measuring the Sun's output since February 1980. Although a malfunction in the satellite's control system limited its observation for a few years, the satellite was repaired in orbit by astronauts from the space shuttle in 1984. Max's observations indicate that the solar constant is not really constant after all.

The satellite's instruments have detected frequent, small variations in the Sun's energy output, generally amounting to no more than 0.05 percent of the Sun's mean energy output and lasting from a few days to a few weeks. Scientists believe these fluctuations coincide with the appearance and disappearance of large groups of sunspots on the Sun's disk. Sunspots are relatively dark regions on the Sun's surface that have strong magnetic fields and a temperature about 2,000 degrees Fahrenheit cooler than the rest of the Sun's surface. Particularly large fluctuations in the solar constant have coincided with sightings of large sunspot groups. In 1980, for example, Solar Max's instruments registered a 0.3 percent drop in the solar energy reaching the Earth. At that time a sunspot group covered about 0.6 percent of the solar disk, an area 20 times larger than the Earth's surface.

Long-term variations in the solar constant are more difficult to determine. Although Solar Max's data have indicated a slow and steady decline in the Sun's output, some scientists have thought that the satellite's aging detectors might have become less sensitive over the years, thus falsely indicating a drop in the solar constant. This possibility was dismissed, however, by comparing Solar Max's observations with data from a similar instrument operating on NASA's Nimbus 7 weather satellite since 1978.

1) What does this passage mainly discuss?
a) The launching of a weather satellite
b) The components of the Earth's atmosphere
c) The measurement of variations in the solar constant
d) The interaction of sunlight and air Pollution
2) Why does the author mention "gas" and "dust" in line 3?
a) They magnify the solar constant
b) They are found in varying concentrations
c) Scientific equipment is ruined by gas and dust
d) They interfere with accurate measurement of the solar constant
3) Why is it not possible to measure the solar constant accurately without a satellite?
a) The Earth is too far from the Sun
b) Some areas on Earth receive more solar energy than others
c) There is not enough sunlight during the day
d) The Earth's atmosphere interferes with the sunlight
4) The word "scatter" in line 4 is closest in meaning to
a) emit
b) capture
c) transform
d) disperse
5) The word "its" in line 10 refers to the
a) orbit
b) atmosphere
c) satellite
d) malfunction
6) The word "detected" in line 13 is closest in meaning to
a) estimated
b) disregarded
c) registered
d) predicted
7) According to the passage, scientists believe variations in the solar constant are related to

a) sunspot activity
b) unusual weather patterns
c) increased levels of dust
d) fluctuations in the Earth's Temperature

8) The word "decline" in line 25 is closest in meaning to
a) fall
b) reversal
c) release
d) fluctuation

9) Why did scientists think that Solar Max might be giving unreliable information?
a) Solar Max did not work for the first few years
b) The space shuttle could not fix Solar Max's instruments
c) Solar Max's instruments were getting old
d) Nimbus 7 interfered with Solar Max's Detectors

10) The phrase "This possibility" in line 27 refers to the likelihood that the
a) solar constant has declined
b) Nimbus 7 satellite is older than Solar Max
c) solar constant cannot be measured
d) instruments are providing inaccurate Data

11) The attempt to describe the solar constant can best be described as
a) an ongoing research effort
b) an issue that has been resolved
c)a question that can never be answered
d) historically interesting, but irrelevant to contemporary concerns

Text 12

Reaching the stars

A. Our nearest star, Proxima Centauri, is 4.2 light years away – more than 200,000 times the distance from the Earth to the Sun. Such vast distances would seem to put the stars well beyond the reach of human explorers. Suppose we had been able to ride aboard NASA’s Voyager 1, the fastest interstellar space probe yet built. Voyager 1 is now heading out of the solar system at about 17 kilometers per second. At this rate it would take 74,000 years to reach Proxima Centauri.

B .What would it take for humans to reach the stars within a lifetime? For a start, we would need a spacecraft that can travel at close to the speed of light. There has been no shortage of proposals: vehicles propelled by repeated blasts from hydrogen bombs, or from the destruction of matter and antimatter. Others resemble huge sailing ships with giant reflective sails, pushed along by lasers. All of these ambitious schemes have their disadvantages, and it is doubtful they could really go the distance.

C. Now there are two radical new possibilities on the table that might just enable us, or at least or descendants, to reach the stars. One physicist has outlined his design for a spacecraft powered by dark matter, which is apparently abundant, even if we cannot see it. And two mathematicians have proposed a craft powered by an artificial black hole.

D. Nobody disputes that building a ship powered by black holes or dark matter would be extremely difficult. Yet, remarkably, there seems to be nothing in our present understanding of physics to prevent us from making either of them. Most astronomers are convinced of the existence of dark matter because of the way its gravity pulls on the stars and galaxies we see with our telescopes. Such observations suggest that dark matter outweighs the universe's visible matter by a factor of about six. So a dark matter starship could pick up its fuel on the way and would therefore not need to carry any.

E. It is speculated that dark matter particles could be made to collide, thus annihilating each other and converting their mass to energy. One kilogram of dark matter could release 10 billion times more energy than 1 kilogram of dynamite. Even less certain is the detail of how dark matter rocket might work. The matter could be collected and compressed, which would increase its annihilation rate, and the quicker it would scoop up its fuel and accelerate. It is thought that such a rocket might be able to come close to the speed of light within a few days.

F. Another possibility concerns the construction of a rocket using a black hole as fuel. Very small black holes emit far more radiation than large, stellar-mass black holes, according to the equations describing black holes. A black hole weighing about a million tones would make a perfect energy source, it has been calculated, it is small enough to generate enough radiation to power a spaceship, yet large enough to survive without radiating all its mass during a typical stellar journey of about 100 years in duration.

G. recently, one possibility is to hunt for a pre-existing black hole, but theorists have been skeptical and prefer an alternative proposal of making one. To create a black hole one would need to concentrate a tremendous amount of energy into a tiny volume of, say, 20 cubic meters. Solar energy would be collected in solar panels, each 250 kilometers across, orbiting just a few million kilometers away from the Sun and soaking up sunlight for about a year. The resulting million-ton black hole would be about the size of an atomic nucleus. The next step would be to maneuver it into the focal range of a parabolic mirror attached to the back of the crew quarters of a starship. The resulting gamma ray photons would be the starship's exhaust and would push it forwards. A black-hole starship could accelerate to close to the speed of light in a few decades, it is thought, and once you were travelling at this speed in your starship, time would slow down for you, so you would age more slowly than your friends and family back on Earth.

1. This reading passage has seven paragraphs A-G. Choose the correct heading for each paragraph from the list of heading below. Write the correct number, i – ix, in paregraphs 1-7

List of headings

I More attractive ideas for long-range space travel.
II An ideal size of a possible source of power.
III Stars too far to reach with present-day technology.
IV A plentiful supply of power in space?
V Unlikely suggestions for interstellar travel.
VI the ageing process for space travelers.
VII dangers of using dark matter as fuel.
VIII A man-made power source.
IX Energy generated and speed reached using dark matter.

1) Paragraph A.
2) Paragraph B.
3) Paragraph C.
4) Paragraph D.
5) Paragraph E.
6) Paragraph F.
7) Paragraph G.

2. 8-9 Choose two letters, A-F. Which two proposals to power superships might allow people to travel to the stars within a human lifespan?

a) hydrogen bomb
b) laser-driven sails
c) black holes
d) dark matter
e) solar energy

3. Question 1-3. Choose no more than one word from the passage for each answer.

One theory proposes a collision of dark matter ____ (10), which would be mutually destroyed, thus resulting in a transformation of their physical components into ____ (11). Such a procedure would be capable of producing vastly greater force than using a conventional explosive. Acquisition and compression of the matter would speed up its ____ (12), and the vehicle might approach light speed in a very short time.

Text 13

Movements of planets

People have pondered the movements of stars and planets for as long as humans have been on this Earth. Long ago it was noticed that some of the lights in the sky seemed permanent in relation to each other and these were known as the "fixed stars", whereas other lights moved about much more freely and were called "the wanderers." We now know the latter as the planets and we also know that the stars are by no means fixed but move in predictable patterns. That both stars and planets circled the sky over 24 hours was thought to be because they revolved around the Earth.

One early theory described the "music of the spheres". It was believed that the stars and planets were fixed on glass-like spheres that were centred on the Earth and created heavenly music as they moved, this latter belief possibly originating from the humming in the ears at high altitude. The Greek astronomer, mathematician and geographer Ptolemy was one of the first to suggest a pattern to these movements and in his Ptolemaic system the Sun, the Moon and the planets each had a sphere that moved independently of the others and the stars were all fixed on the outermost sphere. This system was thus able to account for the differing movements then observed.

By the 16th century, more accurate measuring instruments were available, and using these, even before the telescope was developed, a Polish monk, Nicolaus Copernicus, spent much of his life making far more exact observations of the heavens. He tried to explain the mathematics behind the planets' movements but found that the circular movement of a sphere could not explain why, for example, Mars apparently stopped and went backwards for a short time. He discovered that the planets' movements could be far more easily predicted if not the Earth but the Sun was placed in the centre of the system, and the planets circled the Sun rather than the Earth. The problem with this explanation was that many people believed that man was the centre of the universe, and so not everyone accepted it. Copernicus avoided this difficulty by suggesting the theory merely as a method of more accurately working out the dates of important celebration days. The theory got strong support in the 17th century, when the eminent Italian mathematician and astronomer Galileo Galilei taught the Copernican system to his students.

The telescope was invented in the Netherlands in the early 17th century and this allowed far more accurate measurements of planetary motion to be taken. The German astronomer Johannes Kepler used it to discover that the Copernican observations were not quite correct and so could not be used to predict the orbits of the planets. Copernicus had assumed that the planets moved in a circular path around the Sun, but Kepler found that they did not; they moved in ellipses. He then developed his three laws of planetary motion, which gave a more eccentric Danish astronomer Tycho Brahe had been appointed as the court astronomer to the Holy Roman Emperor and had made a large number of important observations that Kepler needed for his theories. However, although Kepler's three laws explained *how*the planets moved, they did not explain *why*. This was left to Isaac Newton in the 18th century.

Isaac Newton's invention of the reflecting telescope is often seen as a defining moment in the study of astronomy, but in fact he only enhanced it; the original telescope was invented in 1608 by the Dutchman Lippershey who used a convex lens in a tube focusing light into an eyepiece. The first telescopes were seen as an important military invention to detect the distant approach of enemy soldiers before. Galileo used one to observe the night sky. Newton discovered that a concave mirror reflecting light onto a flat secondary mirror gave an enhanced image, which allowed a much more accurate view of the heavens. Furthermore, mirrors were easier to manufacture than lenses and could be made larger, thus increasing the ability of astronomers to chart the movements of the stars and planets. Yet it was Newton's discovery of the laws of gravity that explained why the planets move the way they do. It also enabled two astronomers in the 20^{th} century to predict the existence, before it was seen in telescopes, of another small, outer asteroid, Pluto (at first classified as a planet), by observing slight variations in the orbit of Uranus.

1. Look at the following statements and list of people below. Match each statement with the correct person, A-F.

List of people

a) Ptolemy.
b) Nicolaus Copernicus.
c) Galileo Galilei.
d) Johannes Kepler.
e) Isaac Newton.

1) An alternation in the design led to an improvement in a scientific instrument.

2)The planets took an egg-shaped route.

3) the science at the time did not accord with what was observed in the sky.

4) The planets revolved around a different object than was previously thought.

5) A revolutionary theory provided reasons for the manner in which the planets travelled.

6) the use of a telescope provided evidence that amended what an earlier observer had found.

2. Complete the sentences below. Choose no more than three words from the passage for each answer.

7) Early observers used the term ____ to refer to feature that appeared to be motionless in the sky.

8) Objects that appeared to be mobile are now refers to as ____.

9) According to an early way of thinking, ____ was made by the motion of celestial bodies.

10) Ptolemy believed that each planet moved within its own ____.

Text 14

Worlds to explore

Read there comments about space exploration and discuss how far you agree with each opinion:

1)Space exploration is ridiculously expensive, considering how little we get for the money wasted on it.

2)It's stimulating to think about what exists beyond, but what are the chances of getting something useful out of space exploration?

3)We've got our priorities wrong. It's about time science turned its eye back to this planet and set about doing something about poverty, disease and pollution. Once we've sorted out our own problems, let the exploration continue.

Why do we explore space?

Why should mankind explore space? Why should money, time and effort be spent exploring, investigating and researching something with so few apparent benefits? Why should resources be spent on space rather than on conditions and people on Earth? There are questions that, understandably, are very often asked.

Perhaps the best answer lies in our genetic makeup as human beings. What drove our distant ancestors to move from the trees into the plants, and on onto all possible areas and environments?

It appears that we are driven to entire the success and continuation of not just our own genes, but of the species as a whole. The wider the distribution of the species, the better is chance of survival. Perhaps the best reason for exploring space is this genetic predisposition to expand wherever possible.

Nearly every successful civilization has explored, because by doing so, any dangers is surrounding area can be identified and prepared for. There might be enemies in neighboring cultures, physical features of the area, a change in the area which might affect food supplies, or any number of factors. They all pose a real danger, and all can be made less threatening if certain preparations are made/ without knowledge, we may be completely destroyed by the danger. With knowledge, we can lessen its effects.

Exploration also allows minerals and other potential resources to be located. Additional resources are always beneficial when used wisely, and can increase our chances of survival. Even if we have no immediate need of them, they will perhaps be useful later.

Resources may be more than physical assets. Knowledge or techniques acquired through exploration, or preparing to explore, filter from the developers into society at large. The techniques may have medical applications which can improve the length or quality of our lives. Techniques may be social allowing members of society better to understand those within or outside the culture. Better understanding may lead to more efficient use of resources, or a reduction in competition for resources. We have already benefited from other spin-offs, including improvements in earthquake prediction – which has saved many lives – in satellites used weather forecasting and in communications systems. Even non-stick saucepans and mirrored sunglasses are by-products of technological developments in the space industry!

While many resources are spent on what seems a small return, the exploration of space allows creative, brave and intelligent members of our species to focus on what may serve to save us. While space may hold many wonders and explanations of how the universe was formed or how it works, it also holds dangers. The chances of a large comet or asteroid hitting the Earth are small, but it could happen in time. Such strikers in the past may account for the extinction of dinosaurs and other species.

Human technology is the point where it might be able to detect the possibility of this happening, and enable us to minimize the damage, or prevent it completely, allowing us as a species to avoid extinction. The danger exists, but knowledge can help human beings to survive. Without the ability to reach out across space, the chance to save ourselves might not exist.

In certain circumstances, life on Earth may become impossible: over-population or epidemics, for instance, might eventually force us to find other places to live. While earth is the only planet known to sustain life, surely the adaptive ability of human would allow us to inhabit other planets and moons. It is true that the lifestyle would be different, but human life and cultures have adapted in the past and surely could in the future.

The more a culture expands, the less chance there is that it will become extinct. Space allows us to expand and succeed: for the sake of everyone on the Earth, now and in the future, space exploration is essential.

1. This passage is adapted from a web page of the Astronomical Data Center, which used to be a branch of the American Space Agency, NASA. Skim through it, and choose the best sentences A, B, C or D to summarize it.

a) Space exploration can encourage collaboration on earth.

b) Space exploration is justified by the gains we have already made from it.

c) Space exploration may help us to avoid potential problems on earth.

d) Space exploration provides better value for money than most people realize.

2. choose 3 letters A-F. Which three of the following reasons for exploring space are mentions by the writer?

a) It is natural for us to do so.

b) We may find new sources of food.

c) It will help us to prevent earthquakes.

d) It has side-effects that improve the quality of our lives.

e) it may enable us to find alternative homes.
f) We will discover whether other planets are inhabited.
3. Complete the summary of the text

Reason for exploring space

One reason for exploring space is that we have a <u>genetic </u>(0) tendency to ensure the ____ (1) of the species into neighboring regions. Exploration will allow us to make suitable ____ (2) for dealing with any ____ (3) that we might face, and we may be able to find physical resources such as ____ (4), for present or future use. It is possible that new knowledge and techniques will provide social or ____ (5) benefits. Further, exploration might one day enable us to prevent impact by a ____ or ____ (6), making the ____ (7) of the human race less likely. It will make it possible for us to live on other ____ and ____ (8), should the need arise.

Text 15

Too close for comfort

The night of 13 April 2029 will be pretty special, because of what will probably be the closest near miss by a dangerous asteroid for over a millennium. It will be exceptionally close, with later estimates putting the asteroid's proximity at around 25, 600 kilometers from earth's surface. If you are in Europe, Africa or Central Asia on the night passes, asteroid 2004 MN4 will appear as a fairly bright star moving slowly across the sky.

MN4 was discovered in June 2004 and led to a few hail-beating days for astronomers later that year, when NASA's webpage on asteroid impact hazards gave this object the highest ever odds of hitting the Earth, more than 1 in 50 (although this later proved to be a false alarm). At around 300 meters across, the asteroid is capable of devastating a large city, making it one of this century's most serious dangers.

When an asteroid comes very close to a planet, gravity very slightly changes its orbit and speeds it up. This phenomenon has been the basis for many of the unmanned space missions over the last few decades, with a few 'gravity – assist fly-bys included on the flight plan to speed probes on their way to outer space. However, until recently, no one had thought the implications for asteroids.

Even though we know that MN4 will miss as in 2029, it has a greater chance of hitting Earth later in the century, with various impact dates currently being predicted. There possible impacts are considered dangerous enough to be given a 1 on the Torino scale. This scale is an attempt to quantify the likelihood of potential impacts, with a rating of 0 indicating harmless and 10 signifying a certain impact, capable of causing a global catastrophe. In December 2004, MN4 was briefly given a rating of 4, albeit due to inaccurate calculations.

NM4 will be coming fairly close to Earth again soon, providing an opportunity for fresh observations. If there still show the possibility of future impacts, it might be a good idea to do something about it/ the first thing would be to try to pin down MN4's exact position, and the best way to do that would apparently be to fix something such as a radio transponder to it. Such a project would incidentally give us a much better idea of the internal structure of asteroids. At the moment, we don't really know whether they are mostly solid, riddled, with cracks or holes, or made up of lots of loose material.

The Hollywood-style assumption that hitting an asteroid with missiles is the only way of avoiding global catastrophe might in fact just lead to multiple. Earth impacts, caused by its shattered remains. Instead, it may be preferable to simply push the troublestone asteroid gently aside. Strange as it may sound, one way to do this might spray the whole asteroid with white paint! The outcome of this would be to increase reflectance, and in so doing, alter the gravitation effects of solar radiation, leading the asteroid to drift gradually off course, and further away from earth.

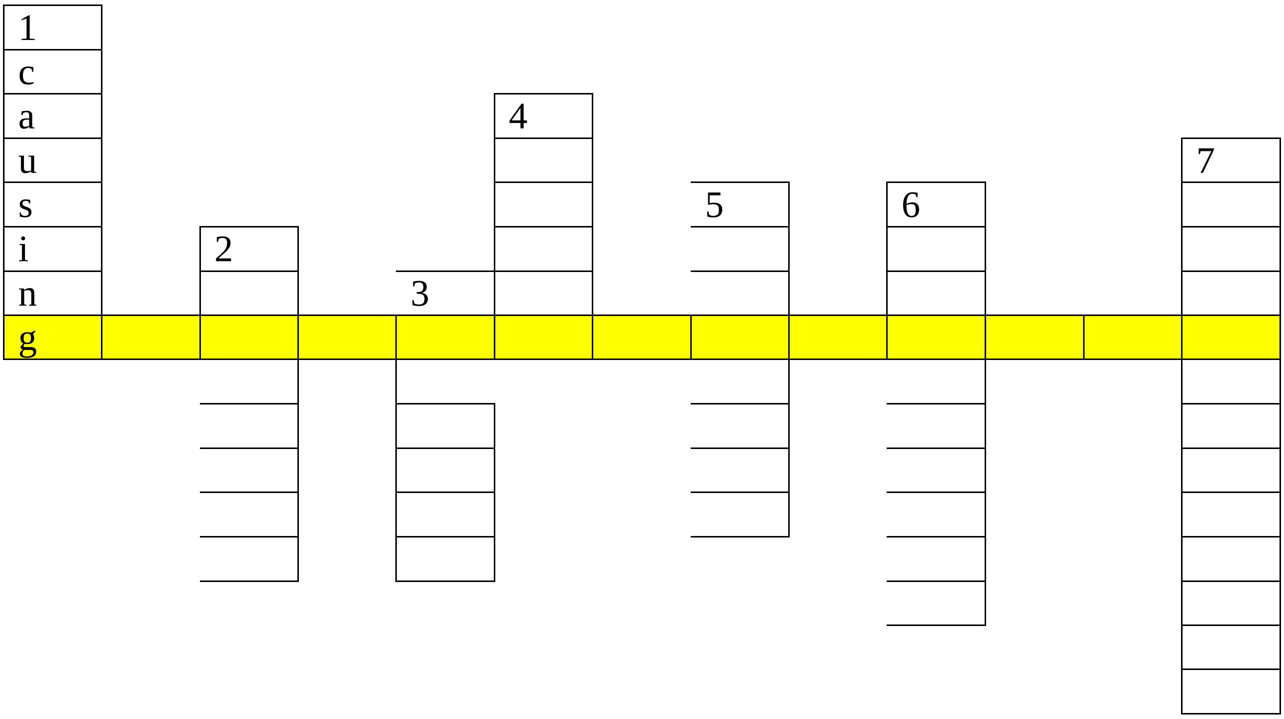
There may be no cinematic attraction in watching paint dry, but this option could just be the perfect solution. Only time will tell.

1. Complete the summary with words from the box. You will not need all words.

Action	collision	controversy	core	data	destruction	device	effect	
eradication	force	hypothesis	incidents	nature	research	result	risk	
suggestion	termination							

We will narrow escape a _____ (1) between asteroid MN4 and the Earth in 2029, and the chances of further catastrophic incidents are likely to increase during the century. If it ever does hit the Earth, the ____ (2) caused by MN4 could affect an entire city, which is why astronomers are keen to conduct ____ (3) on the asteroid in the very near future. One ____ (4) which has already been made is to attach a radio ____ (5) to the asteroid, which would give scientists a lot of valuable ____ (6) on the precise ____ (7) of the asteroid's _____ (8). As far as a future catastrophe, the ____ (9) of detonation explosives on the asteroid is perceived to be unacceptable. This course of ____ (10) might indeed have the opposite ____ (11) to the one intended, triggering several simultaneous Earth impacts. A more promising idea is to promote a slight ____ (12) in the asteroid's course by coating it with white paint. As a ____ (13), MN4 would reflect more of the sun's rays, and this would alter the ____ (14) of gravity upon it, causing the asteroid to move away from its dangerous path.

2. Scan the text to find words meaning the same 2-7 below. Use them to complete the word puzzle. What word from the text is revealed horizontally?



1) leading to;
2) dangers;
3) collision or force of one object hitting another;
4) path through which an object moves around planets;
5) result;
6) nearness;
7) likely effects of an action.

Answers:
Text 1

1) F
2) B
3) I
4) H
5) C
6) D
7) G

Text 2

1) D
2) F
3) B
4) E
5) A
6) C
7) Jupiter Saturn
8) Solar System
9) sensors circuits
10) spares
11) radio dish
12) TRUE
13) TRUE
14) FALSE

Text 3

1) F
2) D
3) G
4) E
5) D
6) A
7) B
8) C
9) FALSE
10) FALSE
11) TRUE
12) NOT GIVEN
13) TRUE

Text 4

1) H
2) G
3) A
4) F
5) C

6) D
7) E
8) B
9) Mercury
10) Reflects light
11) Species
12) The Orion Arm
13) Never

Text 5

a) B
b) B
c) B
d) B
e) A
f) B
g) C
h) A
i) A
j) C
k) C

Text 6

1) D
2) D
3) B
4) B
5) B
6) C
7) B
8) B
9) C
10) A
11) A
12) B
13) *Terrestrial planets 1,4*

Jovian planets 3,6,7

Text 7

1) B
2) D
3) C
4) A
5) D
6) B

Text 8

1) Iv
2) Vii
3) I
4) Ii
5) several billion years
6) radio (waves/signals)
7) 1000 (stars)
8) YES
9) 22.YES
10) NOT GIVEN
11) NO
12) NOT GIVEN
13) NO

Text 9

1) 1772
2) 1781
3) 1787
4) 1977
5)1986
6) YES
7) NO
8) NOT GIVEN
9) YES
10) NOT GIVEN
11) georgium sidus
12) Herschel
13) James L. Elliot
14) Miranda

Text 10

1) D
2) F
3) B
4) E
5) A
6) C
7) Jupiter Saturn
8) Solar System
9) sensors circuits
10) spares
11) radio dish
12) TRUE
13) TRUE

14) FALSE

Text 11

1) C
2) D
3) D
4) D
5) C
6) C
7) A
8) A
9) C
10) D
11) A

Text 12

1) iii
2) v
3) i
4) iv
5) ix
6) ii
7) viii
8) C
9) D
10) particles
11) energy
12) annihilation

Text 13

1) E
2) D
3) B
4) B
5) E
6) D
7) fixed stars
8) the planets
9) heavenly music
10) sphere
11) convex lens
12) eyepiece

Text 14

1) C
2) A, D, E
3)

1) distribution
2) preparations
3) danger
4) minerals
5) medical
6) comet, asteroid
7) extinction
8) planets, moons

Text 15

1) collision
2) destruction
3) research
4) suggestion
5) device
6) data
7) nature
8) core
9) risk
10) action
11) effect
12) shift
13) result
14) force

2)

1) causing
2) hazards
3) impact
4) orbit
5) outcome
6) proximity
7) implications

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