

ÜDS

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1. The most mysterious, perhaps, of all substances in the sea is iodine. In sea water it is one of the least common of the non-metals, difficult to detect and resisting exact analysis. ----. Sponges, corals and certain seaweeds, in particular, accumulate vast quantities of it.

- A) The ocean is the earth's greatest storehouse of minerals.
- B) In the human body, iodine functions as a regulator of the basal metabolism.
- C) Yet it is found in almost every marine plant and animal.
- D) The plants and animals of the sea are very much better chemists than men.
- E) Iodine deficiency in the body causes certain metabolic disorders.

2. Bridges are among the most important, and often the most spectacular, of all civil engineering works. ----. Without them it would be impossible to imagine how traffic in Istanbul could circulate. Moreover, they are the symbolic link of two continents.

- A) A further aspect of civil engineering is the choice of a suitable site
- B) The bridges across the Bosphorus are a case in point
- C) One of the major problems posed by long bridges is that of maintenance.
- D) The construction of bridges requires a number of engineering skills
- E) Historically there has always been a dream to construct a bridge across the Bosphorus

3. When scientist are trying to understand a particular set of phenomena, they often make use of a model: A model, in the scientist's sense, is a kind of analogy or mental image of the phenomena in terms of something we are familiar with. ----. We cannot see waves of light as if it were made up of waves because experiments indicate that light behaves in many respects as water waves do.

- A) Other natural laws have been discovered over centuries
- B) The atomic model of matter has gone through many refinements
- C) Models often lead to import theories
- D) One example is the wave model of light
- E) This is the obvious difference between a theory and a model.

4. Evaporation can be described as the process by which a liquid is changed into vapour by heat. ----.The higher the temperature, the quicker the process. Obviously, evaporation is a fundamental process in nature.

- A) Desalination depends upon the process of evaporation
- B) Whenever a liquid is exposed to heat, evaporation takes place.
- C) The average annual temperature in the arctic region is far below that in the Mediterranean
- D) The human body can easily adapt to humid climate
- E) Some plants are more affected by evaporation than others

5. ----. He was one of the earliest to argue that the interior of the earth was not solid but that it consisted of a condensed though highly heated fluid or gas. He also argued that on its exterior the earth had a relatively thin shell of matter.

- A) The great achievements of Benjamin Franklin in natural science should not blind us to the fact that he was a great statesman
- B) When Benjamin Franklin was a young man, he moved from Boston to Philadelphia where he spent the rest of his life studying political science
- C) In the eighteen century, Benjamin Franklin made remarkable contributions to the field of electricity
- D) Benjamin Franklin played an important parting the early development of American political thought
- E) Benjamin Franklin had many original and penetrating ideas on geology

6. Scientists are only just beginning to explore the seabed. Remote-controlled submarines are bringing up sediment from an apparently lifeless sea floor. ----. Indeed, so many new species are being identified that the deep seabed may turn out to support a greater bio-diversity than the rainforests.

- A) There are trenches in the seabed that are 11 km deep
- B) But under the microscope this sediment teems with life
- C) By means of echo-sounding much can be learned about the surface of the seabed
- D) Sedimentation is a slow process of creating land masses
- E) There, ocean-floor magma vents support an ecology independent of sunlight

7. The science of how fire spreads is simple enough.----. This means that in a typical house fire, the flames and fumes move upwards until they meet an obstruction, such as a ceiling, where they mushroom out laterally until they reach a wall.

- A) The opening of a door or window requires great caution as it may cause a violent outbreak of flames
- B) Today fire - fighters begin their basic training with physics
- C) One of the most skilled techniques employed by fire-fighters is ventilation
- D) Ventilation helps to reduce the risk of explosions resulting from the build-up of hot gases
- E) Once air is heated, it becomes lighter, rises and seeks to escape through any openings that may be available

8. The power loom was invented by Dr Edmund Cartwright in the early 19 century. However, many improvements were necessary before it came into common use. Gradually its range was extended to include all fibres and types of cloth. ----. At the same time, speed and precision were increased.

- A) Recently, the craft of hand-loom weaving has gained in popularity
- B) The running speeds of looms vary according to various factors, including width and type of cloth
- C) In fact, by about 1850, it had superseded the hand loom almost entirely
- D) The warp threads are kept taut by iron weights
- E) Since about 1900, automatic looms have been progressively introduced

9. Some years ago, measurement on ice cores showed that the concentration of carbon dioxide in the atmosphere was lower during ice ages than it is today. ----. Some researchers have sought an explanation by suggesting that the whole-ocean reservoir of algal nutrients was larger during glacial times than it is now. Others by proposing that the biological pump was more efficient then.

- A) So far no one has ever tried to solve this puzzle
- B) As yet there is no broadly accepted explanation for this difference
- C) The reason for this was soon obvious
- D) There have been large cyclic variations in climate and glaciation during the past two million years
- E) The experiment focuses on the open ocean surrounding Antarctica

10. Concrete is strong in compression but it is relatively weak in tension. That means it is strong when pushed together, but continuous flat slab will not stretch well and might crumble. ----. Steel is generally used for this purpose as it improves the elasticity of concrete.

- A) To overcome this weakness and control cracking, concrete has to be reinforced
- B) The base materials of concrete are sand, cement and aggregate
- C) Different percentages of the base ingredients are used depending on the strength required
- D) Signs of corrosion and cracking sometimes appear soon after constructing
- E) Nevertheless, concrete is not as popular a building material as previously

11. The object of the air traffic control officers is to achieve the highest densities in all parts of the controlled air space that is consistent with safety and the elimination of collision risk _____. The amounts of the separation are partly dependent upon the means available for determining accurately the position and course of the various aircraft.

- A) For purposes of air traffic control, air space is divided and then subdivided
- B) Military aviation originally held itself outside any air traffic control but for a long time now this has not been practicable
- C) They, therefore, direct the captains of aircraft so as to maintain adequate vertical and horizontal separation between aircraft
- D) As these are within controlled air space a pilot intending to fly along them must file a flight plan.
- E) The "flight progress strip" gives an indication of what is happening to any aircraft in the area

12. The Wankel engine has many advantages over the reciprocating piston engine. Fewer moving parts are necessary because it produces a rotary movement without using a connecting rod and a crankshaft. _____. In addition, it has no valves and it is smaller and lighter than conventional engines of the same power.

- A) Though there are advantages, there are also disadvantages
- B) Because of this rotary, movement it has no vibration
- C) A fresh charge is then induced into the cylinder
- D) The Wankel piston is triangular with curved sides
- E) Fuel enters the cylinder through the inlet port

13. Thermal insulation is concerned with the problem of reducing the transfer of heat from one place to another and depends upon the thermal resistance of the insulating medium. _____. However, this is not very satisfactory in an ordinary air space because radiation is also involved in the transfer of heat.

- A) Since air is a very poor conductor, an air gap, narrow enough to minimize convection, may be used for insulation
- B) Thermal conductivity is a term that is only strictly applicable to homogeneous materials
- C) In general, the lighter the material per unit volume, the greater its insulating value per unit thickness
- D) The vertical air spaces used in insulating buildings are actually only about one third as thick
- E) The optimum thickness must also be chosen to avoid condensation of moisture inside the walls

14. Germination is the initiation of growth in a newly formed plant-structure, or the resumption of growth after a period of rest, as in fungus and bacterial spores, but exemplified most vividly in seeds. _____. Growth is stopped and respiration is extremely slow. At germination, development is resumed and there is a spectacular acceleration of function.

- A) The essential point about germination is the sudden change from a resting state to one of intense activity
- B) The development of the new plant starts at fertilization
- C) Before full physiological activity can be resumed, the dehydrated tissues must become fully turgid with water
- D) As the embryo swells it ruptures the seed coat
- E) In the resting condition, the life processes are slowed down to a minimum

15. Improved efficiency of the use of fuel is a theme to which more attention has been given as the cost of fuel has increased. _____. The processing of raw fuel into the form in which it is to be used is another.

- A) The efficient and economical use of fuels is indeed one of the chief aspects of the work of the fuel technologist
- B) Each type of fuel and each process naturally has its own problems
- C) There is a staff to advise on methods of increasing the efficiency of the use of fuel in industry
- D) It is well known that the probable resources of coal are very extensive
- E) Fuel technology is now a recognized and even an essential profession

16. Space research is the scientific study of the universe by means of vehicles in space. ----. Unlike other scientific disciplines, space research is thus distinguished by technical means not by field of study.

- A) The long life of satellites makes possible the observation of occasional phenomena such as the effects of solar flares
- B) Geophysics and astrophysics are also subjects for space research but are not completely comprehended in it
- C) This is why space vehicles can make direct studies of phenomena of interest above the dense atmosphere
- D) Experiments involving the artificial creation of new condition in space have also been conducted
- E) Space, in this connection, means regions beyond the earth which cannot be reached by airborne vehicles such as balloons or aeroplanes

17. Food industrialists hail biotechnology as a miracle, but there are many people who feel distinctly uneasy about this new development. ----. They wonder what unknown changes take place when the genes of living things are manipulated and what the long-term consequences might be.

- A) One of the most exiting and fearful areas in genetic research today is the cloning of animals
- B) These people feel that tampering with genetics may change organisms in ways not yet fully understood, even by the scientists who developed the techniques.
- C) Indeed it is now possible to select desirable traits from a number of species and insert them into the genetic material of crops and animals.
- D) Biotechnology means the use of biological systems or organisms to create or modify products.
- E) Biotechnology promises to produce greater crops yields, leaner meats and better nutrient composition.

18. The drag of an airship is made up of two parts ---. The latter include an often important increase of the former due to disturbance of flow, and may approach 50 % of the former.

- A) The maximum cross-sectional area is about oneseventh of the "wetted surface"
- B) Hulls are usually given a fineness ratio of about 6, which means the length is six times the maximum diameter.
- C) There is the drag of the bare hull and the effective drag of all appendages
- D) As a result, model experiment is quite unsuitable
- E) One stroke horse-power for each 100 lb gross weight may be expected to give speed of about 75 miles per hour

19. When an aircraft collides with a bird, the result can be a potentially catastrophic damage. ----. This is why a team at Britain's Defence Evaluation and Research Agency plants to use crystals that glow when fractured to warn of such unseen damage.

- A) In this instance, the impact damage resulted in 60 per cent of the material's compressive strength being lost
- B) This makes visual inspections for damage unreliable
- C) Getting an aircraft back into the air quickly can be vital
- D) But, if planes are made of carbon composites, one cannot see the damage.
- E) Ultrasound and X- ray techniques have both been used, but these are slow and costly

20. Dust devils, which look like miniature tornadoes, form when sunlight warms air just above the ground ---. Once it has started spinning, it can draw in more air, forming a whirlwind that picks up dust from the ground.

- A) This is why there is always a dusty haze to be seen around Mars
- B) Dust devils often develop in dry areas on Earth too
- C) A few much larger ones have been spotted on Mars
- D) These small whirlwinds load the Martian atmosphere with dust
- E) Small breezes can then give a twist the rising warm air.

21. The world's ten most important coral reef hotspots have been identified. The sites, which are all over the world, have one thing in common: ----. The findings contradict a longheld contention that marine species are unlikely to become extinct because of their vast geographic ranges in the oceans.

- A) they are all rich in marine species found only in small areas and therefore highly vulnerable to extinction
- B) habitat destruction leads to loss of biodiversity
- C) most of the world's coral reefs are under threat from human activities, in particular from pollution
- D) the advantages of an integrated land and sea conservation strategy are suggested by at least eight of them
- E) the ten hotspots account for a tiny 0,017 per cent of the oceans, but 34 per cent of restricted range coral reef species

22. The training for tourists travelling into space is tough; the journey itself is even tougher. ---- . Moreover, the G-forces push their organs and blood to the back of their body. Eight minutes later they should be 805 km above Earth, travelling at speeds of more than 40,234 km/h.

- A) Besides the vigorous training programme, there are stringent medical and fitness tests
- B) The view and the experience, however, more than compensate for any unpleasantness
- C) After ignition the force of acceleration drags on the tourists with the weight of eight men
- D) Would-be travellers to space have also to complete a 22-month training programme
- E) The G-force exercises are perhaps the most demanding part of the training

23. One important aim of this "Scientific Opportunities" organisation is to create a more welcoming environment for creative, inventive thinkers. ----; but they are tools that aren't used nearly enough. Too many young people become bored with science and maths education, and they learn far too little about what the great inventors have done to create the world we live in.

- A) Other skills are naturally required if the job is to be done properly
- B) No cause is more important than cultivating the potential of the human mind
- C) Every trade has its own tools and special equipment
- D) Invention and creativity are humanity's most powerful tools for making the world a better place
- E) This is its long-standing mission and to achieve it every available tool is being used

24. There is very little similarity between the chemical composition of river water and that of sea water. The various elements are present in entirely different proportions. ----. An important reason for the difference is that immense amounts of calcium salts are constantly being withdrawn from sea water by marine animals for the making of shells and skeletons.

- A) The ocean is the earth's greatest storehouse of minerals
- B) The rivers bring in four times as much calcium as chloride, for example; yet in the ocean the proportions are reversed; there is 46 times as much chloride as calcium
- C) Although the earth is constantly shifting her component materials from place to place, the heaviest movements are always from land to sea, not from sea to land
- D) The annual flow of water seaward is believed to be about 5,500 cubic miles, and this inflow of river water gives the ocean several billion tonnes of salts
- E) In a single cubic mile of sea water there are, on the average, 166 million tons of dissolved salts

25. Acid rain not only kills fish, it also erodes buildings. Airborne urban pollution, including SO₂, nitric acid and carbon particles (soot) is deposited on the wet surfaces of stonework to form unsightly black crusts. ---- . Porous stones and sandstone are especially vulnerable.

- A) To make matters worse, the features of many of these statues have also been eroded away
- B) Air pollution was much worse in Western cities 30 years ago than it is today
- C) The crust is essentially soot, mixed with gypsum - the soft mineral calcium sulphate which forms when stone reacts with sulphuric acid
- D) Another problem that used to be associated with acid rain was lead poisoning, but plastic pipe work has more or less eliminated this risk
- E) Rural sources of acidity from industrial sites have similarly been increasing at an alarming rate

26. Some people believe that solar power stations on the moon could provide enough electricity to power the Earth by the year 2050. ----. This would be sent to Earth-based receivers using a microwave beam, and converted back into electricity.

- A) There would be no need to ship raw materials to the moon because they are already present in the moon's dusty surface
- B) As the population of Earth increases, more and more power is required
- C) The moon has no weather, so a lunar power station there would not be affected by clouds or rain
- D) To achieve this, large banks of solar panels would be built on the moon to collect sunlight and turn it into electricity
- E) In fact, just one per cent of the solar power received by the moon would meet man's needs

27. A volcano in Papua New Guinea is threatening to erupt and put thousands of lives at risk. ----. Fifteen thousand people have already been evacuated, and scientists fear the worst may be yet to come.

- A) As a precaution, the Papuan government is considering increasing food supplies to the area
- B) For almost 500 years now there has been virtually no action
- C) The mission is proving to be one of the team's most difficult so far
- D) In fact, some areas are only accessible by helicopter
- E) For two months now it has been slowly pumping out lava, and occasionally rocks and ash

28. On the whole, only one-third of the oil in an oil field can be brought to the surface. Some is forced out by gas pressure when a well is drilled, and engineers can sometimes pump water to drive out more. ----. And although plastics can be used to block stringers or even to increase the viscosity of the water, they are very expensive. It has been suggested that the problem can be solved effectively with the help of tiny bacteria that form biofilms to block fissures.

- A) When oil companies want to squeeze more crude oil out of an oil well, they usually turn to experts in physics, chemistry or engineering
- B) But if the water escapes through layers of permeable rock called stringers, this strategy will fail
- C) When an oil well shows signs of running dry, it is time to call in experts to stop it leaking away
- D) Biofilms grow on every surface where there are bacteria
- E) Biofilms can make oil wells up to 20 per cent more productive

29. The simplest way to measure gravity is with a gravimeter, basically an extremely sensitive weighing device comprising a mass hanging on a spring. ----. But gravimeters are sensitive to movement, so it takes time to set up the equipment, and this makes surveys expensive.

- A) Gravity surveys are also used to detect ore bodies of minerals
- B) It is simple to use and get results quickly
- C) The stronger the gravity field, the further the spring extends
- D) However, magnetic storms can interfere with the measurements
- E) Small variations in the Earth's gravitational pull show up well in such cases

30. Smoke is a mixture of gases and particles. It is usually the product of a combustion process and, in this case, its composition depends on the fuel and the technology used. The main gas involved in smoke processes is carbon dioxide. ----.

- A) But other gases such as carbon monoxide, nitrogen oxides, hydrocarbons and sulphur dioxide might also be present
- B) The warm air is higher than the cold air so there is little vertical turbulence to carry smoke upwards
- C) Smoke rises because it is part of a stream of hot gases that are normally warmer than the surrounding air
- D) The vertical and straight nature of the smoke plume depends very much on the wind conditions
- E) Wood smoke is often seen in a layer above houses where it is burnt and sometimes it subsequently descends to street level

31. The so-called "One Time System" is the name of a cipher proven to be unbreakable. In this system, the text of messages is turned into numbers, and then random numbers are added. The security of the system rests on the fact that it is impossible to work out what random numbers were used to encrypt the message, as they do not follow any predictable pattern. ---- .

- A) Moreover, computers can provide reasonable imitations of randomness, which is more than humans can do
- B) Consequently, the creation of randomness is extremely difficult in an age of very advanced computers
- C) As its name suggests, however, the "One Time System" demands that the random number sequence is used only once for each message
- D) The ability of randomness thus to produce meaningless clusters is all too familiar to scientists
- E) Many calculators and computers have so-called random number generators, but all of them use fixed mathematical formulas

32. Oxygen gas has a very interesting property: it absorbs ultraviolet light. On absorbing ultraviolet light, an oxygen molecule breaks down into two oxygen atoms. ----. Oxygen in this form is called ozone, which is a blue gas with a sharp odour.

- A) The ozone layer rests about 48 kilometers above the surface of the Earth
- B) The ozone layer in the atmosphere absorbs almost all the ultraviolet radiation that could destroy life on Earth
- C) The formation of the ozone layer had a tremendous effect on the spread of living organisms on Earth
- D) Oxygen atoms produced in this way combine to give a new kind of gas that has molecules made of three atoms of oxygen
- E) The presence of oxygen in the atmosphere has also made possible the development of respiration

33. In World War II, the demands for bombs of increasing size and disruptive power were incessant. So a great deal of research was carried out. ----. Blast bombs were produced of up to a 12,000 pound capacity.

- A) Fortunately, these gas-filled bombs were never used
- B) Blast effect in particular was studied when the effectiveness of the landmines dropped by the Luftwaffe on Britain was observed
- C) Most Royal Air Force high-explosive bombs were filled with a combination of pistol and separate detonator
- D) Usually some form of safety device, actuated on the release of the bomb, is felt to be necessary
- E) A bomb weighing 3,000 pounds was developed during World War I, but it was never used

34. In the modern mass-production furniture factory, machines and processes reproduce the parts once laboriously turned out by hand. ---- . Endless conveyors maintain a constant feed of parts along the production lines.

- A) Well-organized factories operate "flow-line" production
- B) This particular factory is designed to meet the demands of high-speed production
- C) All waste is continuously sucked away from each machine and conveyed through pipes to storage bins for disposal
- D) It is particularly significant that solid wood is rarely used except for legs and frames
- E) With mass-production better quality goods are produced at lower costs

35. "Liquid metal" is an alloy developed by the researchers at the California Institute of Technology. ---- . Its properties allow for more sophisticated designs, while helping to keep manufacturing costs down. Once cast, the alloy is non-corrosive, more than twice as strong as titanium and four times as elastic.

- A) However, some firms have already blended titanium and carbon fiber to produce stronger and lighter alloys
- B) Its elasticity is one of the qualities that makes it ideal for sports equipment
- C) The US army is already developing liquid metal weapons that are far more effective than conventional ones
- D) It is also likely to prove useful in the manufacture of sporting products
- E) It has a different atomic structure from other metals and is pourable, like plastic, during the production process

36. The health of the wildlife around us can be seen as an indicator of how we are managing the world's resources. There is much concern about the fact that some species are disappearing. — . For instance, some species once thought to be extinct have been rediscovered as scientists have gone deeper into the surviving wild areas.

- A) Their aim is to help poor, local communities to protect their food sources and local wildlife at the same time
- B) An increasing number of today's conservation projects involve sustainable development programmes
- C) Habitat restoration and captive breeding programmes have already brought several species back from the brink of extinction
- D) Although certain species are indeed endangered, the overall picture is not as gloomy as is sometimes suggested
- E) In Britain, with the restoration of river habitats and a reduction in pollution, the otter is another genus that has made an impressive recovery

37. The emergence of the World Wide Web has been the most important technological development of the last decade as regards the spread of information. —. As such, the web is the biggest advance in information technology since the invention of the printing press in 1450.

- A) To start with, the web was simply a handy aid for academics
- B) It was conceived as a means of giving everyone access to information anywhere and at any time
- C) A British scientist, Berners-Lee, was the visionary behind the web
- D) These early browsers only worked on academic computers
- E) With the launch of the Mosaic web browser, the numbers of people using the web grew at a phenomenal rate

38. Future computer chips may not have wires, but miniature radio transmitters and receivers. —. Here a team of scientists has demonstrated a wireless communication system built on a chip. The discovery could lead to earthquake detectors and listening devices for the military. Also it could usher in a new generation of faster computers.

- A) That's the promise of research at the University of Florida
- B) This has been hailed as the most radical advance in information technology
- C) The result will be a worldwide network of computers
- D) So the network of information can be accessed by anyone
- E) Indeed, it soon became obvious that they offered many advantages over existing systems

39. Water filters are particularly useful if you live in a hard water area. Hard water contains a greater concentration of calcium than soft water. —. It also means that you won't get many suds from your soap. As well as softening the water, a filter removes other chemicals to improve its look and taste.

- A) There are many other chemicals which pollute water
- B) Today a water filter is a common sight in many kitchens
- C) Indeed, there's more to the household water filter than meets the eye
- D) A water filter is equipped with a cartridge which contains ion exchange resin and activated carbon
- E) In fact, it is this that causes lime scale in kettles, irons and other electrical appliances

40. Otto Lehmann observed that liquid crystals are remarkably sensitive. —. Further, they can register the minutest fluctuations in temperature by a change in colour.

- A) Liquid crystals in thermometers, thermographs, computers, TVs and solid-state devices were too far in the future for him to imagine
- B) Lehmann dedicated 25 years of work to studying these strange chemicals
- C) In his last book he suggested many applications, mostly in power generation and transformation, but none of them proved practical
- D) They respond to heat, light, sound, mechanical pressure, electromagnetic fields and radiation and even some chemical vapours
- E) Many of them wrote off liquid crystals as chemical impurities with no scientific or practical merit

41. When nuclear power was first proposed in the 1940s, it seemed like a gift from heaven, for it seemed to offer a cheap, clean and inexhaustible source of electricity. ----. These new advantages include the fact that nuclear power generates no greenhouse gases and it does not come from countries of doubtful stability. But, in the popular imagination, it is still associated with a host of problems.

- A) The question of waste disposal, however, is another problem that has yet to be solved
- B) Indeed, no new American nuclear plant has been ordered in nearly 25 years
- C) Scientific research and political developments have since brought new advantages to the fore
- D) Fear of terrorist bombing is the latest source of anxiety
- E) As was expected, the cost of nuclear fuel proved to be very low

42. Governments are beginning to realize just how hard it is going to be to meet the goals they set themselves at various conferences in Johannesburg and at a world water forum in Kyoto. —. The problems they face spring from neither a lack of money nor a scarcity of water. The real problem is that a huge amount of water is wasted in subsidized irrigation by farmers.

- A) However, there are claims that the wars of the future could be fought over water, not oil
- B) As for farmers, proper pricing of water would create new incentives to conserve supplies
- C) Actually, chronic underpricing of water does not help the poor
- D) The main goal is to cut by half, by 2015, the number of people without clean water
- E) There are certain cheaper and better ways of storing water and providing protection against floods

43. In 1992, the United States declared that it would no longer carry out nuclear weapons tests. ----. The reality was rather different, however, for by the early 1990s, the power of supercomputers had reached such a point that for the first time, weapons could be designed, tested and maintained in secrecy.

- A) Supercomputers are now the workhouses of scientists tackling big questions
- B) On the face of it, this was a historic move by the world's only remaining superpower
- C) The first-ever atomic bomb was tested in the New Mexico desert in 1945
- D) In fact, the talks with the Russians on limiting nuclear weapons had started back in the 1960s
- E) National Laboratories in New Mexico took delivery of the world's first teraflop supercomputer capable of over a million million operations a second

44. The problem of the Moon's origin has perplexed astronomers for a great many years. All of the numerous theories proposed have been found to have shortcomings. —. It is then supposed that the debris from the collision went into orbit around the Earth and formed the Moon. This is called "the giant impact theory".

- A) To solve the problem, further explorations of the Moon's surface have to be carried out
- B) Some astronomers in the past believed that the Moon had simply been thrown off from a rapidly rotating Earth
- C) In the nineteenth century, it was proposed that the Earth and the Moon had been born together from the same material surrounding the youthful Sun
- D) According to some astronomers, the Moon was once a completely independent body, but was captured by the Earth and is now a satellite of Earth
- E) According to one theory, the Moon was created following a collision between the Earth and an unknown planetary body perhaps the size of Mars

45. Pouring water into the sea sounds like a harmless scheme. But as regards Florida Bay, it is proving highly controversial. —. If increased salinity is the main problem there, the bay's ecology will benefit from the project. If, however, nitrogen is the problem, increasing the flow of fresh water could make matters worse.

- A) This has had a damaging effect upon the animals that depend on the reef including nearly 600 species of fish
- B) Moreover, economic problems are also at stake, not merely ecological ones
- C) What is causing such an ecological change is a matter of much debate
- D) This is because researchers are divided over whether it will help or hinder the plants and animals that live in the bay
- E) But the bay's once crystal-clear waters often resemble a dense fog

46. Antoine Lavoisier was one of the first chemists to try to explain what makes a substance acidic. In 1777, he proposed that oxygen was an essential element in acids. But in 1808, Humphry Davy showed that hydrogen chloride, which dissolves in water to give hydrochloric acid, contains only hydrogen and chlorine. ----.

- A) Acids react with active metals such as magnesium and zinc to release hydrogen
- B) The Swedish chemist Svante Arrhenius defined acids and bases in terms of the effect these substances have on water
- C) Then chemists realized that hydrogen, not oxygen, must be the essential constituent of acids
- D) Acids and bases were first recognized by simple properties such as taste
- E) The stronger acids are those that lose their protons more easily

47. The aim is to transform scientific discoveries into commercially viable products and translate academic expertise into industrial strength. ----. However, over the next 10 years 75 new centres will be set up involving the creation of several thousand new jobs.

- A) Without financial support the scheme can never take off
- B) So far no definite plans have been formulated
- C) This aspect of the scheme has been widely criticized
- D) The universities themselves, came up with the idea
- E) But this will not happen overnight

48. Satellites are an essential part of modern life. They give access to dozens of extra television channels and let people talk on the phone right across the world. However, it is worth bearing in mind that they also have a covert, even a disturbing use as well, which is why they were invented in the first place. ----.

- A) Satellite spying, in fact, has a history that is just as fascinating as the technology itself
- B) A tiny Proba satellite measures just 60x60x80 cm
- C) To get a better idea of exactly where the Earth observation satellites are, the Web includes a "Sky View" programme
- D) Therefore, this gave rise to many a spacerelated theory
- E) On the contrary, a digital method of image capture was required to bypass this weak link and beam photos directly back to Earth

49. Ultimately we should be sending people to Mars because they can do things that robots cannot do. ----. It cannot realize that something is interesting and start to investigate.

- A) We need to learn much more about the Martian environment
- B) A robot is programmed with a specific set of instructions, and cannot go beyond them
- C) One day it may be worth sending people to Mars, but that day has not yet come
- D) Human exploration goes beyond scientific motives
- E) People can solve more difficult problems than robots can

50. Clay is a natural mixture of very small crystals of certain silicate sheet minerals. These minerals form by the weathering of granite. ----. The resulting wet platelike crystals adhere to one another to give a plastic mass.

- A) During the elevated temperatures of the firing, complex irreversible changes occurred
- B) Fired clay is a major medium for producing objects of art
- C) When a pure liquid substance freezes, it usually forms a crystalline solid
- D) Clay minerals easily absorb water
- E) The word "ceramics" comes from a Greek word for pottery

51. For decades, earthquake experts had hopes of being able to predict the time and place of the world's next disastrous shock. ----. So complex indeed, that they concluded that the planet's largest tremors are isolated, random and utterly unpredictable.

- A) By the early 1990s, however, scientists began to realize that the behaviour of quake-prone faults was extremely complex
- B) The stress-triggering hypothesis continues to gain credibility, and offers hope of being able to predict quakes accurately
- C) Faults are unexpectedly responsive to subtle stresses they acquire as neighbouring faults shake
- D) Once more, there is hope that more accurate warnings will be forthcoming
- E) Historical records confirm that about one-third of the world's recorded tremors cluster in time and space

52. The author of the book is an assistant professor of physics and an amateur icehockey player. ----. He supports his idea with reference to thermodynamics, molecular physics, fluid dynamics and the physics of collisions, and presents his material clearly and convincingly.

- A) It's an informative study and certainly original
- B) He claims that ice-hockey involves more physics than any other sport
- C) He wonders whether shooting, like skating, makes use of a great deal of mechanics
- D) Air drag and ice friction are fully discussed
- E) There is no advice on how to avoid collisions

53. Cappadocia's extraordinary landscape is partly the result of erosion by water, wind and changes in temperature. ----. In winter, extreme temperature changes cause the rocks to expand and contract and eventually to disintegrate.

- A) Volcanic activity in central Anatolia is a product of the region's position
- B) Around 30 million years ago, erupting volcanoes blanketed the region with ash
- C) The region is famous for its bewitching natural formations
- D) Over time, this tuff was worn away, creating distinctive formations
- E) Rainfall and rivers wear down the tuff and, like the wind, carry away loose materials

54. Polish is made of wax. ----. And, each of them has its own melting point. The low-melting-point wax makes it easier to apply the polish, whereas the high-melting-point wax helps the polish to stay in place.

- A) But, unlike candles, which are also made of wax, it is a blend of different waxes
- B) Nobody seems to have done any systematic research into the chemical components of wax
- C) On a microscopic level, the surface you are polishing is rough, and when you apply the polish, it looks dull at first
- D) This is the same basic concept as that of a steamroller on hot tarmac
- E) Any oil in the boot has to be burned off and then layers of polish and beeswax are applied with a very soft cloth

55. Scientists generally agree that there are 35 to 40 species of seahorse in the world. Though they resemble miniature horses, they actually belong to the fish family "syngnathidae". They are monogamous. ----. This unique trait has led people to believe, for some strange reason, that seahorses have curative powers, and 20 million seahorses are exported annually for use in traditional Chinese medicines.

- A) The Victorians named seahorses "hippocampus", which means "horse caterpillar"
- B) Intriguingly, they are the only animal in which the male becomes pregnant and gives birth to live young
- C) Consequently, fishermen have reported a minimum 50 per cent decline in wild stocks of seahorses in the past five years
- D) Their genetic structure has not yet been identified
- E) The distribution of spiny and short-snouted seahorses is thought to extend from Britain across the Mediterranean to the Black Sea

56. Fragile ecosystems like the Arctic could face many more years of contamination from PCBs (polychlorinated biphenyls), despite international treaties banning their use. ----. An estimated 1.3 million tonnes of PCBs were made between the 1930s and 1990s around the world for use in the manufacture of pesticides, lubricants, and plastics. But an investigation to determine the fate of these PCBs has failed to locate most of them.

- A) On the other hand, PCBs may be carried by wind to cold countries where they condense out in the cold air
- B) Indeed, soils in temperate lands have captured most of the PCBs so far released into the environment
- C) On the contrary, PCBs could pose a threat to polar bears for years to come
- D) That is the conclusion of a study into the fate of PCBs manufactured worldwide during much of the 20th century
- E) As a result, urban air contains more PCBs than rural air

57. The Kavli Foundation's approach differs from the increasingly utilitarian focus of most funded research. ----. Kavli opposes this practice for he believes you have to be willing to fund science without knowledge of the benefits.

- A) To obtain funding from any source, scientists must usually frame their ideas in the context of studies already completed and short-term impact
- B) Knowledge about materials and processes in the universe could open up benefits that we can't even imagine
- C) In fact, the foundation pays for nondirected research in its three main areas of interest: astrophysics, nanoscience and neuroscience
- D) It is unrealistic of such agencies to expect these programmes to deliver useful tools and applications rapidly
- E) The foundation has chosen disciplines that are already acknowledged as "growth" areas in science

58. Traditionally, the study of planet formation has proved frustrating, as astronomers have never been sure whether their theories apply to other planetary systems. ----. Now, however, the observations of debris discs around stars of different masses and ages are helping to place our solar system in context.

- A) Some discs look like gigantic versions of the rings of Saturn
- B) Most of the discs, however, could not be seen directly
- C) What the recent images show is wonderfully unexpected
- D) This is because the solar system is the only known example of a planetary system
- E) The dust particles probably result from collisions among asteroids

59. Isaac Newton presented the earliest scientific definition of mass in 1687 in his landmark work *Principium*: “The quantity of matter is the measure of the same arising from its density and bulk conjointly.” That very basic definition was good enough for Newton and other scientists for more than 200 years. ----. In recent years, however, the why of mass has become a research topic in physics.

- A) The laws of gravity predict that gravity acts on mass and energy
- B) Most people think they know what mass is, but actually they understand only a very small part of what it entails
- C) Fundamental particles have an intrinsic mass known as their rest mass
- D) Energy and mass are related, as described by Einstein’s famous equation, $E=mc^2$
- E) They understood that science should proceed first by describing how things work and later by understanding why

60. Can coal ever become a friend of the environment? Coal-fired power stations supply half the electricity used in many industrial countries. ----. This, of course, is the most worrisome of the so-called “greenhouse gases.”

- A) New ones will have to comply with the Clean Air Act
- B) They are, however, responsible for 80% of the power industry’s emissions of carbon dioxide
- C) Energy engineers are already talking about “clean coal” technology
- D) Clean coal means different things to different people
- E) Coal treatment and refining processes are rightly getting a lot of attention as well

61. Engineers are problem solvers. ----. A child playing with building blocks who learns how to construct a taller structure is doing engineering. A secretary who stabilizes a wobbly desk by inserting a piece of cardboard under the short leg has engineered a solution to the problem.

- A) Certainly, engineers benefit from scientific theory
- B) Early in human history, there were no formal schools to teach engineering
- C) This approach resulted in some remarkable accomplishments
- D) In a sense, all humans are engineers
- E) Sometimes a solution is required before the theory can catch up to the practice

62. Gecko lizards can run up a wall or across a ceiling with ease because of their remarkable toes. But gecko toes aren’t sticky in the usual way, like duct tape or Post-it notes. ----.

- A) In spite of this, the ability of geckos to stick to surfaces has attracted scientific scrutiny since the time of Aristotle
- B) Instead, gecko toes have a combination of structures that act together as a smarter adhesive
- C) Hence, it is not surprising that scientists are trying to create artificial, geckolike adhesives
- D) The theory that gecko toe pads act as suction cups has since been disproven
- E) A gecko can stop itself by re-attaching its toes to passing leaves or branches

63. ----. The dimension of length may be described by units of metres, feet, inches, and so forth. Thus, dimension is an abstract idea, whereas unit is more specific.

- A) The metre is currently defined by the distance light traverses in a given length of time
- B) Any measuring system must establish base units from which all other units are derived
- C) For units of measure to be useful, they must be standardized so that business transactions are unambiguous
- D) The metre was first defined in 1793 by dividing the “quadrant of meridian” into 10 million parts
- E) The distinction between dimension and unit is best understood by example

64. If you have ever burned your finger on a metal pot while waiting for the water in it to boil, you know that water heats up much more slowly than metal. In fact, because of hydrogen bonding, water has a better ability to resist temperature change than most other substances. ----.

- A) Because of this property, Earth’s giant water supply moderates temperatures, keeping them within limits that permit life
- B) Temperature and heat are related, but different
- C) Another way water moderates temperatures is by evaporative cooling
- D) At 66% of your body weight, water helps moderate your internal temperature
- E) Water must absorb an unusually large amount of heat in order to vaporize because its hydrogen bonds tend to hold the molecules in place

65. Replication is not the only way to improve accuracy in scientific experimentation. ----. Blocking is a method of experimental design that reduces the effects of chance errors; modelling, on the other hand, is much less familiar to practicing scientists.

- A) Accordingly, most scientists try to develop new and more reliable methods
- B) Scientific data always contain a mixture of *signal* and *noise*; the scientist's job is to find the signal
- C) Two other strategies, called *blocking* and *modelling*, can provide at least one replication's worth of accuracy at almost no cost
- D) Replication is one of the finest ideas in the history of science, but it faces a severe law of diminishing returns
- E) Scientists prefer an average of two replicates to a single unreplicated observation because the former is likely to be more accurate

66. Hippopotamuses can be irritable and aggressive when it comes to defending their territory and their young. ----. They have trampled or gored people who came too near, dragged them into lakes, tipped over their boats, and bitten off their heads.

- A) Hippos are led by dominant males, which can weigh 6,000 pounds or more
- B) Agricultural irrigation systems and other developments have depleted the hippos' wetland, river and lake habitats
- C) Although hippos occasionally fight with crocodiles, a growing number of their attacks are on humans
- D) A decade ago there were about 160,000 hippos in Africa, but the population has dwindled to between 125,000 and 148,000 today
- E) In countries beset by civil unrest, where people are hungry and desperate, hippos are hunted for their meat

67. The historian G. Sarton said that the development of mathematics is unknown to the general public. ----. Cayley's seminal investigations of matrix algebra were crucial for the development of linear algebra. The terms *matrix*, *determinant* and *Jacobian*, familiar to most science students, were invented by Sylvester.

- A) Cayley was a Trinity College fellow at Cambridge for a few years until he married
- B) It isn't clear when they met, but by 1847 they were corresponding to share thoughts about mathematics
- C) Each had triumphed on the University of Cambridge's fearsome Tripos examinations
- D) Certainly very few have ever heard of A. Cayley or J.J. Sylvester, two of the most prolific mathematicians of the Victorian era
- E) J.J. Sylvester was not only a mathematician but also an enthusiastic poet who called himself the "mathematical Adam"

68. ----? The answer to that question can range from days to months to decades on the one extreme and from centuries to millenia, and possibly even longer depending on such diverse and interrelated factors as design, construction and maintenance.

- A) How old is the world-famous Brooklyn Bridge
- B) Can a bridge possibly be designed to last a century
- C) How long did London's Millennium Bridge stay open
- D) The Tacoma Narrows Bridge lasted only four months before it fell to the wind, didn't it
- E) How long can a bridge last

69. Detecting a virus on any nanosize particle usually means fixing it to a substrate or attaching a fluorescent probe to it, neither of which is practical for detecting particles in real time. ----. The system splits a laser beam in two, sending one half to a sample. When the light hits a small particle, it is reflected back and recombined with the reserved half of the laser beam, producing a detectable interference pattern only when a moving particle is present.

- A) The method works because it relies on the light's amplitude rather than its intensity
- B) The investigators have so far detected single particles as small as seven nanometres across
- C) Now physicists have assembled a simple system for doing just that
- D) A substrate is a substance that reacts when it comes into contact with a particular enzyme
- E) Amplitude is the square root of intensity

70. Why do young chameleons prefer to stay close to the ground? In a recent study published in *Behavioral Ecology and Sociobiology*, biologists argue that cannibalism in the common chameleon has resulted in a habitat shift. ----. Juvenile chameleons tend to stay in low grasses, whereas adults make better use of their anatomical gifts by living primarily in trees.

- A) That is, as individuals develop, their choice of habitat changes
- B) With its prehensile tail and strong, opposing toes, the common chameleon is a natural climber
- C) Young chameleons showed little change in behaviour when with other juveniles
- D) The biologists placed a one-way mirror between an adult and a juvenile, so that the adult could see the juvenile but not the other way round
- E) Whether an attack was likely when there was close contact between the generations was also tested

71. Engineers are hired by clients (and employers) specifically for their specialized expertise. ----. Therefore, engineers have ethical obligations to their clients, because the client often cannot assess the quality of the engineer's technical advice. These obligations are part of engineering ethics, the set of behavioural standards that all engineers are expected to follow.

- A) Civil engineering is generally considered the oldest engineering discipline
- B) Successful teamwork results in accomplishments larger than those that can be produced by individual team members
- C) Generally, the client knows less about the subject than the engineer
- D) Biochemical engineers combine biological processes with traditional chemical engineering to produce foods and pharmaceuticals and to treat wastes
- E) An engineer does not need to have a licence to practise engineering, but those who do may have more career opportunities

72. An athlete's body must be heavier for its height than a nonathlete's body because the athlete's bones and muscles are denser. ----. However, this is not true. Weight standards that may be appropriate for others are inappropriate for athletes. Therefore, measures such as fatfold tests yield more useful information about body composition.

- A) When athletes consult standard weight-for-height tables and see that they are on the heavy side, they may mistakenly believe that they are too fat
- B) The increasing incidence of abnormal eating habits among athletes, especially young women, is causing concern
- C) Athletes are particularly likely to develop eating disorders
- D) They fail to realize that the loss of lean tissue that accompanies energy restriction actually impairs their physical performance
- E) Male athletes, especially wrestlers and gymnasts, are affected by these disorders as well, but research shows that females have a greater tendency

73. Thanks to their status as one of the world's top predators, great whites are among the best known sharks on Earth, yet essentially nothing is known about their mating habits. That could soon change, as researchers have discovered a remote spot in the North Pacific Ocean that may be a mating ground for great whites, according to a recent study. ----. But, as scientists have explained, the theory that the area is a feeding ground for great whites may be incorrect.

- A) It's not an area that a shark would logically go to from California to find something to eat
- B) At first, scientists nicknamed the region, 1,553 miles west of the Baja Peninsula, the "great white café" because they suspected sharks could be going there to feed
- C) The sharks migrate long distances seasonally from the coast of California to Hawaii and to the offshore area
- D) On average, the sharks dive every 10 minutes, 325 metres down, perhaps to sniff for mates, whose scent could be detected at a certain level of depth
- E) Sharks gather at marine mammal habitats in California during autumn and winter months, feeding on the abundant elephant seals and other prey before migrating to the offshore waters

74. The dark side of nanotechnology is the nightmare possibility that "nano-robots" could be programmed to turn everything on Earth into more nano-robots. ----. Some researchers, however, say that while they also have some worries about nanotechnology, they don't want it banned because its benefits outweigh its risks.

- A) R. Smalley discovered the three-dimensional nanoscale carbon cages called fullerenes
- B) E. Drexler says he invented the word "nanotechnology"
- C) The inventors of nanotechnology were awarded a Nobel Prize
- D) In 1990, a team of scientists found they could use a scanning tunnelling microscope to drag individual atoms of xenon over the surface of a crystal of nickel
- E) There are other fears, such as nanoscale particles creating unforeseen toxic hazards

75. Seismologists have struggled for years to find a reliable earthquake predictor. Could balls of light in the sky preceding quakes hold the key? The US Federal Emergency Management Agency (FEMA) has begun asking that very question. ----. Thus, they have funded NASA to study earthquake lights using weather satellites and the MODIS research satellite during the past few years.

- A) In 1999, floating balls of light in the sky were broadcast on Turkish television, reportedly filmed the night before the earthquake in İzmit
- B) In 1968, the first photographs of "earthquake lights" were taken by Yutaka Yasui of the Kakioka Magnetic Observatory
- C) The main problem facing FEMA is that earthquake lights still don't have an accepted scientific explanation
- D) Most earthquakes occur at plate boundaries, where one plate slides beneath another hundreds of kilometres below the Earth's surface
- E) Mainstream geologists had dismissed these earlier claims as coincidental

76. Carbon nanotubes have been hailed as a semiconducting wonder ingredient that will make materials stronger. ----. Moreover, their ability to act as filters might one day be exploited to build artificial livers.

- A) In the molecules of a polar liquid, some atoms are slightly positively charged while others carry a balancing negative charge
- B) Some experts in nanotube chemistry have published extensively
- C) Accordingly, it is possible to make nanotubes generate electricity
- D) Thus, their importance has been greatly overrated
- E) In addition, they will help miniaturize electronics systems

77. Locomotion can be considered to be a flow of mass from one location to another. ----. They seek and find paths and rhythms that allow them to move their mass the greatest distance per expenditure of useful energy while minimizing thermodynamic imperfections such as friction.

- A) All of these designs allow for the maximum transfer of material with the least amount of resistance
- B) A flow is an equilibrium of areas with high and low resistivities
- C) Animals move on the surface of Earth in the same way as rivers, winds and oceanic currents
- D) A river basin configures and reconfigures itself so that the water is discharged with the least resistance through the mouth of the river
- E) One of the basic goals of any design – whether it’s an animal or a machine – is to get maximum output for minimum energy

78. Only a few large meteorites have struck the earth. The largest we know about fell in Arizona and made what is now called Meteor Crater, a hole about a mile across and 600 feet deep. ----. Other big meteorites fell in ancient times, in Texas, in Argentina, in northern Siberia and in Greenland.

- A) When a meteor reaches the earth, it is called a meteorite
- B) This big meteorite may have fallen as much as twenty-five thousand years ago
- C) The amazing thing about these meteor showers is that they come year after year
- D) Most meteors are small, probably a few inches in diameter
- E) The most remarkable meteor shower was seen in Connecticut on the night of November 12, 1833

79. Although a soccer ball can be put together in many ways, there is one design so ubiquitous that it has become iconic. This standard soccer ball is glued together from 32 polygons, 12 of them five-sided and 20 six-sided, arranged in such a way that every pentagon (five-sided) is surrounded by hexagons (six-sided). ----. This colour scheme was introduced for the World Cup in 1970 to enhance the visibility of the ball on television, although the design itself is older.

- A) 12 pentagons and 20 hexagons form a figure known to mathematicians as a “truncated icosahedron”
- B) To a mathematician, the iconic black and white soccer ball is an intriguing puzzle
- C) A number of questions can be tackled about the arrangement of pentagons and hexagons using the language of mathematics
- D) The usual way to colour such a ball is to paint the pentagons black and the hexagons white
- E) Every soccer ball contains at least 12 pentagons, but may well contain more

80. This year researchers from some 60 nations are participating in the International Polar Year, an intensive burst of interdisciplinary research focusing on the polar regions. ----. For instance, water from the melting ice sheet is flowing into the North Atlantic much faster than scientists had previously thought possible.

- A) Greenland, especially, has become a kind of barometer for the rest of the world because of its sensitivity to climate changes
- B) Climatologists have found that the best places to study global warming are the coldest regions on Earth
- C) Thus far, the data the researchers have seen has been alarming
- D) A glacier that accelerates with a warming atmosphere is within the realm of scientific expectation
- E) Arctic climatologist Konrad Steffen has spent 18 consecutive springs on the Greenland ice cap, personally building and installing the weather stations

