READING PASSAGE 1

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

Biomimetic Design

What has fins like a whale, skin like a lizard, and eyes like a moth? The future of engineering. Andrew Parker, an evolutionary biologist, knelt in the baking red sand of the Australian outback just south of Alice Springs and eased the right hind leg of a thorny devil into a dish of water.

A

"Its back is completely drenched!" Sure enough, after 30 seconds, water from the dish had picked up the lizard's leg and was glistening all over its prickly hide. In a few seconds more the water reached its mouth, and the lizard began to smack its jaws with evident satisfaction. It was, in essence, drinking through its foot. Given more time, the thorny devil can perform this same conjuring trick on a patch of damp sand – a vital competitive advantage in the desert. Parker had come here to discover precisely how it does this, not from purely biological interest, but with a concrete purpose in mind: to make a thorny-devil-inspired device that will help people collect lifesaving water in the desert. "The water's spreading out incredibly fast!" he said, as drops from his eyedropper fell onto the lizard's back and vanished, like magic. "Its skin is far more hydrophobic than I thought. There may well be hidden capillaries, channeling the water into the mouth."

B

Parker's work is only a small part of an increasingly vigorous, global biomimetics movement. Engineers in Bath, England, and West Chester, Pennsylvania, are pondering the bumps on the leading edges of humpback whale flukes to learn how to make airplane wings for more agile flight. In Berlin, Germany, the fingerlike primary feathers of raptors are inspiring engineers to develop wings that change shape aloft to reduce drag and increase fuel efficiency. Architects in Zimbabwe are studying how termites regulate temperature, humidity, and airflow in their mounds in order to build more comfortable buildings, while Japanese medical researchers are reducing the pain of an injection by using hypodermic needles edged with tiny serrations, like those on a mosquito's proboscis, minimizing nerve stimulation.

C

Ronald Fearing, a professor of electrical engineering at the University of California, Berkeley, has taken on one of the biggest challenges of all: to create a miniature robotic fly that is swift, small, and maneuverable enough for use in surveillance or search-and-rescue operations. Fearing made his own, one of which he held up with tweezers for me to see, a gossamer wand some 11 millimeters long and not much thicker than a cat's whisker. Fearing has been forced to manufacture many of the

LIVEWORKSHEETS

other minute components of his fly in the same way, using a micromachining laser and a rapid prototyping system that allows him to design his minuscule parts in a computer, automatically cut and cure them overnight, and assemble them by hand the next day under a microscope.

D

With the micro laser he cuts the fly's wings out of a two-micron polyester sheet so delicate that it crumples if you breathe on it and must be reinforced with carbon-fiber spars. The wings on his current model flap at 275 times per second – faster than the insect's own wings – and make the blowfly's signature buzz. "Carbon fiber outperforms fly chitin," he said, with a trace of self-satisfaction. He pointed out a protective plastic box on the lab bench, which contained the fly-bot itself, a delicate, origami-like framework of black carbon-fiber struts and hairlike wires that, not surprisingly, looks nothing like a real fly. A month later it achieved liftoff in a controlled flight on a boom. Fearing expects the fly-bot to hover in two or three years, and eventually to bank and dive with flylike virtuosity.

E

Stanford University roboticist Mark Cutkosky designed a gecko-insured climber that he christened Stickybot. In reality, gecko feet aren't sticky – they're dry and smooth to the touch – and owe their remarkable adhesion to some two billion spatula-tipped filaments per square centimeter on their toe pads, each filament only a hundred nanometers thick. These filaments are so small, in fact, that they interact at the molecular level with the surface on which the gecko walks, tapping into the low-level van der Waals forces generated by molecules' fleeting positive and negative charges, which pull any two adjacent objects together. To make the toe pads for Stickybot, Cutkosky and doctoral student Sangbae Kim, the robot's lead designer, produced a urethane fabric with tiny bristles that end in 30-micrometer points. Though not as flexible or adherent as the gecko itself, they hold the 500-gram robot on a vertical surface.

F

Cutkosky endowed his robot with seven-segmented toes that drag and release just like the lizard's, and a gecko-like stride that snugs it to the wall. He also crafted Stickybot's legs and feet with a process he calls shape deposition manufacturing (SDM), which combines a range of metals, polymers, and fabrics to create the same smooth gradation from stiff to flexible that is present in the lizard's limbs and absent in most man-made materials. SDM also allows him to embed actuators, sensors, and other specialized structures that make Stickybot climb better. Then he noticed in a paper on gecko anatomy that the lizard had to branch tendons to distribute its weight evenly across the entire surface of its toes. Eureka. "When I saw that, I thought, wow, that's great!" He subsequently embedded a branching polyester cloth "tendon" in his robot's limbs to distribute its load in the same way.

G

LIVEWORKSHEETS

Stickybot now walks up vertical surfaces of glass, plastic, and glazed ceramic tile, though it will be some time before it can keep up with a gecko. For the moment it can walk only on smooth surfaces, at a mere four centimeters per second, a fraction of the speed of its biological role model. The dry adhesive on Stickybot's toes isn't self-cleaning like the lizard's either, so it rapidly clogs with dirt. "There are a lot of things about the gecko that we simply had to ignore," Cutkosky says. Still, a number of real-world applications are in the offing. The Department of Defense's Defense Advanced Research Projects Agency (DARPA), which funds the project, has it in mind for surveillance: an automaton that could slink up a building and perch there for hours or days, monitoring the terrain below. Cutkosky hypothesizes a range of civilian uses. "I'm trying to get robots to go places where they've never gone before," he told me. "I would like to see Stickybot have a real-world function, whether it's a toy or another application. Sure, it would be great if it eventually has a lifesaving or humanitarian role..."

H

For all the power of the biomimetics paradigm, and the brilliant people who practice it, bio-inspiration has led to surprisingly few mass-produced products and arguably only one household word – Velcro, which was invented in 1948 by Swiss chemist George de Mestral, by copying the way cockleburs clung to his dog's coat. In addition to Cutkosky's lab, five other high-powered research teams are currently trying to mimic gecko adhesion, and so far none has come close to matching the lizard's strong, directional, self-cleaning grip. Likewise, scientists have yet to meaningfully re-create the abalone nanostructure that accounts for the strength of its shell, and several well-funded biotech companies have gone bankrupt trying to make artificial spider silk.

Questions 1-7

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

*In boxes **1-7** 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

1 Andrew Parker failed to make effective water device which can be used in desert.

2 Skin of lizard is easy to get wet when it contacts water.

3 Scientists apply inspiration from nature into many artificial engineering.

4 Tiny and thin hair under gecko's feet allows it to stick to the surface of object.

5 When gecko climbs downward, its feet release a certain kind of chemical to make them adhesive.

LIVEWORKSHEETS

6 Famous cases stimulate a large number of successful products of biomimetics in real life.

7 Velcro is well-known for its bionics design.

Questions 8-10

Filling the blanks below.

Write **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the passage for each question of robot below.

Ronald Fearing was required to fabricate tiny components for his robotic fly **8**..... by specialized techniques.

The robotic fly's main structure outside is made of **9** ..... and long and thin wires which make it unlike fly at all.

Cutkosky applied an artificial material in Stickybot's **10** ..... as a tendon to split pressure like lizard's does.

Questions 11-13

Fill the blanks below.

Write **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the passage for each answer about facts of stickybot.

11 Stickybot's feet doesn't have ..... function which makes it only be able to walk on smooth surface.

12 DARPA is planning to use stickybot for .....

13 Cutkosky assumes that stickybot finally has potential in ..... or other human-related activities.

READING PASSAGE 2

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

The evolutional mystery: *Crocodile survives*

A

Crocodiles have been around for 200 million years, but they're certainly not primitive. The early forms of crocodiles are known as Crocodilian. Since they spent most of their life beneath water, accordingly their body adapted to aquatic lifestyle. Due to the changes formed within their body shape and tendency to adapt according to the climate they were able to survive when most of the reptiles of their period are just a part of history. In their tenure on Earth, they've endured the impacts of meteors, planetary refrigeration, extreme upheavals of the Earth's tectonic surface and profound climate change. They were around for the rise and fall of the dinosaurs, and even 65 million years of supposed mammalian dominance

LIVEWORKSHEETS

has failed to loosen their grip on the environments they inhabit. Today's crocodiles and alligators are little changed from their prehistoric ancestors, a telling clue that these reptiles were (and remain) extremely well adapted to their environment.

B

The first crocodile-like ancestors appeared about 230 million years ago, with many of the features that make crocs such successful stealth hunters already in place: streamlined body, long tail, protective armour and long jaws. They have long head and a long tail that helps them to change their direction in water while moving. They have four legs which are short and are webbed. Never underestimate their ability to move on ground. When they move they can move at such a speed that won't give you a second chance to make a mistake by going close to them especially when hungry. They can lift their whole body within seconds from ground. The fastest way by which most species can move is a sort of "belly run", where the body moves like a snake, members huddled to the side paddling away frenetically while the tail whips back and forth. When "belly running" Crocodiles can reach speeds up to 10 or 11 km/h (about 7mph), and often faster if they are sliding down muddy banks. Other form of movement is their "high walk", where the body is elevated above the ground.

C

Crocodilians have no lips. When submerged in their classic 'sit and wait' position, their mouths fill with water. The nostrils on the tip of the elongated snout lead into canals that run through bone to open behind the valve – allowing the crocodilian to breathe through its nostrils even though its mouth is under water. When the animal is totally submerged, another valve seals the nostrils, so the crocodilian can open its mouth to catch prey with no fear of drowning. The thin skin on the crocodilian head and face is covered with tiny, pigmented domes, forming a network of neural pressure receptors that can detect barely perceptible vibrations in the water. This enables a crocodile lying in silent darkness to suddenly throw its head sideways and grasp with deadly accuracy small prey moving close by.

D

Like other reptiles, crocodiles are endothermic animals (cold-blooded, or whose body temperature varies with the temperature of the surrounding environment) and, therefore, need to sunbathe, to raise the temperature of the body. On the contrary, if it is too hot, they prefer being in water or in the shade. Being a cold-blooded species, the crocodilian heart is unique in having an actively controlled valve that can redirect, at will, blood flow away from the lungs and recirculate it around the body, taking oxygen to where it's needed most. In addition, their metabolism is a very slow one, so, they can survive for long periods without feeding. Crocodiles are capable of slowing their metabolism even further allowing

LIVEWORKSHEETS

them to survive for a full year without feeding. Compared to mammals and birds, crocodilians have slow metabolisms that burn much less fuel, and are ideally suited to relatively unstable environments that would defeat mammals with their high food demands.

E

Crocodiles use a very effective technique to catch the prey. The prey remains almost unaware of the fact that there can be any crocodile beneath water. It is due to the fact that when the crocodile sees its prey it moves under water without making any noise and significant movement. It keeps only its eyes above water surface. When it feels it has reached sufficiently close to the target it whistles out of water with wide open jaws. 80 percent of their attempts are successful. They have very powerful jaws. Once the prey trapped in its jaws they swallow it. Their power can be judged from the fact they can kill the wild zebras which come to watery areas in search of water. They do not chew their food. They normally feed on small animals, big fish, birds and even human flesh. As like some water creatures that interact by making sounds crocodiles also use many sounds to communicate with other crocodiles. They exist where conditions have remained the same and they are free of human interference. The crocodile is successful because it switches its feeding methods. It hunts fish, grabs birds at the surface, hides among the water edge vegetation to wait for a gazelle to come by, and when there is a chance for an ambush, the crocodile lunges forward, knocks the animal with its powerful tail and then drags it to water where it quickly drowns. Another way is to wait motionless for an animal to come to the water's edge and grabs it by its nose where it is held to drown.

F

In many places inhabited by crocodilians, the hot season brings drought that dries up their hunting grounds and takes away the means to regulate their body temperature. They allowed reptiles to dominate the terrestrial environment. Furthermore, many crocs protect themselves from this by digging burrows and entombing themselves in mud, waiting for months without access to food or water, until the rains arrive. To do this, they sink into a quiescent state called aestivation.

G

Most of (At least nine species of) crocodilian are thought to aestivate during dry periods. Kennett and Christian's six-year study of Australian freshwater crocodiles – ***Crocodylus johnstoni (the King Crocodiles).*** The crocodiles spent almost four months a year underground without access to water. Doubly labeled water was used to measure field metabolic rates and water flux, and plasma (and cloacal fluid samples were taken at approximately monthly intervals during some years to monitor the effects of aestivation with respect to the accumulation of nitrogenous wastes and

LIVEWORKSHEETS

electrolyte concentrations. Double found that the crocodiles' metabolic engines tick over, producing waste and using up water and fat reserves. Waste products are stored in the urine, which gets increasingly concentrated as the months pass. However, the concentration of waste products in the blood changes very little, allowing the crocodiles to function normally. Furthermore, though the animals lost water and body mass (just over one-tenth of their initial mass) while underground, the losses were proportional: on emergence, the aestivating crocodiles were not dehydrated and exhibited no other detrimental effects such as a decreased growth rate. Kennett and Christian believe this ability of individuals to sit out the bad times and endure long periods of enforced starvation must surely be key to the survival of the crocodilian line through time.

Questions 14-20

Reading passage 2 has seven paragraphs, **A-G**.
Choose the correct heading for paragraphs **A-G** from the list below.
*Write the correct number, **i-xi**, in boxes **14-20** on your answer sheet.*

List of Headings

i The competitors with the dinosaur
ii A historical event for the Supreme survivors
iii What makes the crocodile the fastest running animal on land
iv Regulated body temperature by the surrounding environment
v Underwater aid in body structure offered to a successful predator
vi The perfectly designed body for a great land roamer
vii Slow metabolisms which makes crocodile a unique reptile
viii The favorable features in the impact of a drought
ix Shifting Eating habits and food intake
x A project on a special mechanism
xi A unique findings has been achieved recently

14 Paragraph **A**
15 Paragraph **B**
16 Paragraph **C**
17 Paragraph **D**
18 Paragraph **E**
19 Paragraph **F**
20 Paragraph **G**

Questions 21-26

Complete the summary and write the correct answer (**NO MORE THAN TWO WORDS OR A NUMBER**) in boxes **21-26** on your answer sheet.

LIVEWORKSHEETS

In many places inhabited by crocodilians, most types of the crocodile have evolved a successful scheme to survive in the drought brought by a **21**..... According to Kennett and Christian's six-year study of Australian freshwater crocodiles' aestivation, they found Aestivating crocodiles spent around **22**..... a year without access to **23**..... The absolute size of body water pools declined proportionately with **24**.....; thus there is no sign of **25**..... and other health-damaging impact in the crocodiles even after an aestivation period. This super capacity helps crocodiles endure the tough drought without slowing their speed of **26**..... significantly.

READING PASSAGE 3

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

Grimm's Fairy Tales

The Brothers Grimm, Jacob and Wilhelm, named their story collection Children's and Household Tales and published the first of its seven editions in Germany in 1812. The table of contents reads like an A-list of fairy-tale celebrities: Cinderella, Sleeping Beauty, Snow White, Little Red Riding Hood, Rapunzel, Rumpelstiltskin, Hansel and Gretel, the Frog King. Drawn mostly from oral narratives, the 210 stories in die Grimm's' collection represent an anthology of fairy tales, animal fables, rustic farces, and religious allegories that remain unrivalled to this day.

Such lasting fame would have shocked the humble Grimms. During their lifetimes the collection sold modestly in Germany, at first only a few hundred copies a year. The early editions were not even aimed at children. The brothers initially refused to consider illustrations, and scholarly footnotes took up almost as much space as the tales themselves. Jacob and Wilhelm viewed themselves as patriotic folklorists, not as entertainers of children. They began their work at a time when Germany had been overrun by the French under Napoleon, who was intent on suppressing local culture. As young, workaholic scholars, single and sharing a cramped flat, the Brothers Grimm undertook the fairy-tale collection with the goal of serving the endangered oral tradition of Germany.

For much of the 19th century teachers, parents, and religious figures, particularly in the United States, deplored the Grimms' collection for its raw, uncivilized content. Offended adults objected to the gruesome punishments inflicted on the stories' villains. In the original "Snow White" the evil stepmother is forced to dance in red-hot iron shoes until she falls down dead. Even today some protective parents shy from the Grimms' tales because of their reputation for violence.

LIVEWORKSHEETS

Despite its sometimes rocky reception, Children's and Household Tales gradually took root with the public. The brothers had not foreseen that the appearance of their work would coincide with a great flowering of children's literature in Europe. English publishers led the way, issuing high-quality picture books such as Jack and the Beanstalk and handsome folktale collections, all to satisfy a newly literate audience seeking virtuous material for the nursery. Once the Brothers Grimm sighted this new public, they set about refining and softening their tales, which had originated centuries earlier as earthy peasant fare. In the Grimms' hands, cruel mothers became nasty stepmothers, unmarried lovers were made chaste, and the incestuous father was recast as the devil.

In the 20th century the Grimms' fairy tales have come to rule the bookshelves of children's bedrooms. The stories read like dreams come true: handsome lads and beautiful damsels, armed with magic, triumph over giants and witches and wild beasts. They outwit mean, selfish adults. Inevitably the boy and girl fall in love and live happily ever after. And parents keep reading because they approve of the finger-wagging lessons inserted into the stories: keep your promises, don't talk to strangers, work hard, obey your parents. According to the Grimms, the collection served as "a manual of manners".

Altogether some 40 persons delivered tales to the Grimms. Many of the storytellers came to the Grimms' house in Kassel. The brothers particularly welcomed the visits of Dorothea Viehmann, a widow who walked to town to sell produce from her garden. An innkeeper daughter, Viehmann had grown up listening to stories from travellers on the road to Frankfurt. Among her treasure was "Aschenputtel" - Cinderella. Marie Hassenpflug was a 20-year-old friend of their sister, Charlotte, from a well-bred, French-speaking family. Marie's wonderful stories blended motifs from the oral tradition and from Perrault's influential 1697 book, Tales of My Mother Goose, which contained elaborate versions of "Little Red Riding Hood", "Snow White", and "Sleeping Beauty", among others. Many of these had been adapted from earlier Italian tales.

Given that the origins of many of the Grimm fairy tales reach throughout Europe and into the Middle East and Orient, the question must be asked: How German are the Grimm tales? Very, says scholar Heinz Rolleke. Love of the underdog, rustic simplicity, creative energy—these are Teutonic traits. The coarse texture of life during medieval times in Germany, when many of the tales entered the oral tradition, also coloured the narratives. Throughout Europe, children were often neglected and abandoned, like Hansel and Gretel. Accused witches were burned at the stake, like the evil mother-in-law in "The Six Swans". "The cruelty in the stories was not the Grimm's fantasy", Rolleke points out" It reflected the law-and-order system of the old times".

LIVEWORKSHEETS

The editorial fingerprints left by the Grimms betray the specific values of 19th-century Christian, bourgeois German society. But that has not stopped the tales from being embraced by almost every culture and nationality in the world. What accounts for this widespread, enduring popularity? Bernhard Lauer points to the "universal style" of the writing, you have no concrete descriptions of the land, or the clothes, or the forest, or the castles. It makes the stories timeless and placeless," The tales allow us to express 'our utopian longings'," says Jack Zipes of the University of Minnesota, whose 1987 translation of the complete fairy tales captures the rustic vigour of the original text. They show a striving for happiness that none of us knows but that we sense is possible. We can identify with the heroes of the tales and become in our mind the masters and mistresses of our own destinies."

Fairy tales provide a workout for the unconscious, psychoanalysts maintain. Bruno Bettelheim famously promoted the therapeutic of the Grimms' stories, calling fairy tales the "great comforters. By confronting fears and phobias, symbolized by witches, heartless stepmothers, and hungry wolves, children find they can master their anxieties. Bettelheim's theory continues to be hotly debated. But most young readers aren't interested in exercising their unconsciousness. The Grimm tales, in fact, please in an infinite number of ways, something about them seems to mirror whatever moods or interests we bring to our reading of them. The flexibility of interpretation suits them for almost any time and any culture.

Questions 27-32

Do the following statements agree with the information given in Reading Passage 1?

*In boxes **27-32** on your answer sheet, write*

YES if the statement is true

NO if the statement is false

NOT GIVEN if the information is not given in the passage

27 The Grimm brothers believed they would achieve international fame.

28 The Grimm brothers were forced to work in secret.

29 Some parents today still think Grimm fairy tales are not suitable for children.

30 The first edition of Grimm's fairy tales sold more widely in England than in Germany.

31 Adults like reading Grimm's fairy tales for reasons different from those of children.

32 The Grimm brothers based the story "Cinderella" on the life of Dorothea Viehmann

LIVEWORKSHEETS

Questions 33-35

Choose the correct letter, **A**, **B**, **C** or **D**.

*Write your answers in boxes **33-35** on your answer sheet.*

33 In paragraph 4, what changes happened at that time in Europe?

A Literacy levels of the population increased.

B The development of printing technology made it easier to publish.

C Schools were open to children.

D People were fond of collecting superb picture books.

34 What changes did the Grimm Brothers make in later editions?

A They made the stories shorter.

B They used more oral language.

C The content of the tales became less violent.

D They found other origins of the tales.

35 What did Marie Hassenpflug contribute to the Grimm's Fairy tales?

A She wrote stories.

B She discussed the stories with them.

C She translated a popular book for the brothers using her talent for languages.

D She told the oral stories that were based on traditional Italian stories.

Questions 36-40

Complete the following summary of the paragraphs of Reading Passage

Using **NO MORE THAN TWO WORDS** from the Reading Passage for each answer.

*Write your answers in boxes **36-40** on your answer sheet.*

36 Heinz Rolleke said the Grimm's tales are "German" because the tales

37 Heinz Rolleke said the abandoned children in tales

38 Bernhard Lauer said the writing style of the Grimm brothers is universal because they

39 Jack Zipes said the pursuit of happiness in the tales means they

40 Bruno Bettelheim said the therapeutic value of the tales means that the fairy tales

A reflect what life was like at that time

B help children deal with their problems

C demonstrate the outdated system

D tell of the simplicity of life in the German countryside

E encourage people to believe that they can do anything

F recognize the heroes in the real life

G contribute to the belief in nature power

H avoid details about characters' social settings.

LIVEWORKSHEETS