READING PASSAGE 1

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

Becoming an expert

What is the nature of exercise and what is the process by which one moves from being a novice, to a journeyman, and eventually to becoming an expert?

Expertise is commitment coupled with creativity. It takes a considerable amount of time and regular exposure to a large number of cases to become an expert.

An individual enters a field of study as a novice. The novice needs to learn the guiding principles and rules of a given task in order to understand that task. Concurrently, the novice needs to be exposed to specific cases, or instances, that test the boundaries of such rules. Generally, a novice will find a mentor to direct them through the process of acquiring new knowledge.

In time, and with much practice, the novice begins to distinguish patterns of behavior within cases and, thus becomes a journeyman. With more practice and exposure to increasingly complex cases, the journeyman finds patterns not only within cases but also between cases. The journeyman still maintains regular contact with a mentor to solve specific problems and learn more complex strategies.

When a journeyman starts to make and test hypotheses about future behavior based on past experiences, they begin the next transition. Once they creatively generate knowledge, rather than simply matching superficial patterns, they become an expert. At this point, they are confident in their knowledge and no longer need a mentor as a guide they become responsible for their own knowledge. Once they make predictions based on patterns and tests those predictions against actual behavior, they are generating new knowledge.

This process is rather like an apprenticeship model. An apprenticeship may seem like a restrictive 18th-century model of education, but it is still a standard method of training for many complex tasks. Academic doctoral programs are based on an apprenticeship model, as are fields like law, music, engineering, and medicine. Graduate students enter such fields of study, find mentors, and begin the long process of becoming independent experts and generating new knowledge in their respective domains.

Experts have a deeper understanding of their domains than novices have, and utilize higher-order principles to solve problems. A novice, for example, might group objects together by color or size, whereas an expert would group the same objects according to their function or utility. Experts comprehend the meaning of data and weigh variables with different criteria within their domains better than novices. Experts recognize variables that have the largest influence on a particular problem and focus their attention on those variables.

Experts have better domain-specific short-term and long-term memory than novices have. Moreover, experts perform tasks in their domains faster than novices and commit problems differently than novices. Experts spend more time thinking about a problem to fully understand it at the beginning of a task than do novices, who immediately seek to find a solution. Experts use their knowledge of previous cases as context for creating mental models to solve given problems.

Better at self-monitoring than novices, experts are more aware of instances where they have committed errors or failed to understand a problem. Experts check the solutions more often than novices and recognize when they are missing information knowledge and apply their domain's principles and rules to solve problems that fall necessary for solving a problem. Experts are aware of the limits of their domain knowledge and apply their domain's principles and rules to solve problems outside of their experience base.

The contradiction of Expertise

The strengths of expertise can also be weaknesses. Although one would expect experts to be good forecasters, they are not particularly good at making predictions about the future. The performance of experts has been tested against predictions derived from pure statistical analysis of past events to determine if they are better than these models. With more than 200 experiments in different domains, it is clear that the answer is no.

Theorists and researchers differ when trying to explain why experts are less accurate forecasters than statistical models. Some have argued that experts, like all humans, are inconsistent when using mental models to make predictions. That is, the model an expert uses for predicting something in one month, is different from the model used for predicting the same thing in a following, month, although identical data set are used in both instances.

A number of other researchers point to human bias to explain unreliable expert predictions. During the last 30 years, researchers have categorized, experimented with, and theorized about the different aspects of forecasting. Despite such efforts, the literature shows little consensus regarding the causes or manifestations of human bias.

The very method by which one becomes an expert explains why experts are much better at describing, explaining, performing tasks, and problem-solving within their domains than are novices, but with a few exceptions are worse at forecasting than tables based on historical, statistical models.

Questions 1-5

Complete the notes below.

Choose ***NO MORE THAN THREE WORDS*** *from the passage for each answer.*

Write your answers in boxes 1-5 on your answer sheet.

Novices: have to learn the key **1………………** and rules of tasks before performing them

- Usually require the help of a **2………………**

Journeyman: - recognize different **3………………**

incases that become more and more **4………………**

Experts: - are able to make and **5………………** predictions

- can base predictions on experience and on what they know in order to create new knowledge

Questions 6-10

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

In boxes 6-10 on your answer sheet, write

TRUE *if the statement agrees with the information*

FALSE *if the statement contradicts the information*

NOT GIVEN *there is no information on this*

6. Novices and experts use the same system to classify objects.
7. Novices are often required to work on tasks that build memory skills.
8. Novices perform tasks more slowly than experts.
9. Novices begin task by looking for an answer straight away.
10. Experts review their work more efficiently than novices.

Questions 11-13

Complete the summary below.

*Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

Write your answers in boxes 11-13 on your answer sheet.

The contradiction of expertise researchers

Researchers have conducted a large number of **11**…………………. in different areas which show that statistical models provide more accurate predictions than experts. Some theorists think this may be because experts can apply different mental models to the same data sets on different occasions.

Others suggest that forms of **12………………….** may also influence experts, although there is not a great deal of **13………………….** about why or how this happens.

READING PASSAGE 2

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

The fascinating world of attine ants

Nicholas Wade examines leaf-cutter ants and their amazing agriculture

A. Leaf-cutting ants and their fungus (fungus an organism such as a mushroom which obtains its food from decaying material) 'farm' are a marvel of nature and perhaps the best-known example of symbiosis- the mutual dependence of two species. ants cultivate a mushroom – like fungus in 'farms'. Both the ants and their so-called 'agriculture have been extensively studied over the years, but recent research has uncovered intriguing new findings. Ants invented agriculture 50 million years before people did, and the leaf-cutters, members of the large attine ant family, practice the most sophisticated example of it. They grow their fungus in underground chambers that can reach the size of a football. A single leaf-cutter nest may contain a thousand such chambers, embedded in an underground metropolis up to 18 feet deep, and support a society of more than a million ants.

B. These ant communities are the dominant plant-eaters of the Neotropics, the region comprising South and Central America, Mexico and the Caribbean. Biologists believe 15 percent of the leaf production of tropical forests disappears down the nests of leaf-cutter ants. In the nest, the leaves are shredded and added to the fungus, which digests the leaves and is in turn eaten by the ants. The attine ants' achievement is remarkable because it allows them to consume, courtesy of their mushroom's digestive powers, the harvest of tropical forests whose leaves are laden with poisonous chemicals.

C. There are more than 200 known species of the attine ant tribe, divided into 12 groups, or genera. The leaf-cutters usefresh vegetation; the other groups, known as the lower attines because their nests are smaller and their techniques more primitive, feed their gardens with similar leaves which have fallen on the ground and insects that lie on the forest floor. Lower attine ants are all a siilar size. However, leaf-cutter worker ants come in made-to-fit sizes – large ants to saw off leaves, medium ones to shred them, and miniature workers to seed them with fungus and clean off alien growths.

D. In 1994, biologists from the United States Department of Agriculture analyzed the DNA of ant funguses. They found the leaf-cutters' fungus was descended from a single pure strain, propagated for at least 23 million years. However, the funguses grown by lower attine ants fell into four different groups, as if the ants had domesticated wild funguses at least four times in evolutionary history. What could be driving these two patterns of fungus gardening, the pure clone cultivation of the leaf-cutters and multiple varieties of the lower attines?

E. The answer has been suggested by Cameron Currie of University of Toronto, it. The pure strain of fungus grown by the leaf-cutters, it seemed to him, resembled the single crops grown by humans to the exclusion of all others, such as potato growing. These 'monocultures, which lack the genetic diversity to respond to changing environmental threats, are particularly vulnerable to parasites – organisms which live and feed on their host, often causing harm. Currie felt there had to be a parasite in the ant-fungus system. But a century of ant research did not provide any evidence for his idea. Textbooks describe how leaf-cutter ants scrupulously weed their gardens of all foreign organisms. “People kept telling me, the ants keep their gardens free of parasites, “ said Currie. Nevertheless, after three years of sifting through attine ant gardens, Currie discovered several alien organisms, particularly a family of parasitic molds called ‘Escovopsis’.

F. Escovopsis is a deadly disease that can devastate a fungus garden in a couple of days. It blooms like a white cloud which envelops the whole garden. Other ants won’t go near it and the ants associated with the garden just starve to death. Evidently, the ants usually manage to keep Escovopsis and other parasites under control. Nevertheless, with any lapse in control Escovopsis will quickly burst forth. Although new leaf-cutter gardens start off free of Escovopsis, within two years some 60 percent become infected.

G. The discovery of Escovopsis’s role brings a new level of understanding to the evolution of the attine ants. In the last decade, evolutionary biologists have been increasingly aware of the role of parasites as driving forces in evolution. With Curries’s work, there is now a possible reason for the different varieties of fungus in the lower attine mushroom gardens- to stay one step ahead of the relentless Escovopsis. Interestingly, the leaf-cutters had in general fewer alien molds in their gardens than the lower attines, yet more Escovopsis infections. Clearly, the price they pay for cultivating a pure variety of fungus is a higher risk from Escovopsis.

H. So how do attine ants keep this parasite under control? People have known for a hundred years that ants have a whitish growth on their body surface. It was thought to be wax but, after examining it under a microscope, Currie discovered a specialized patch on the ants’ bodies that harbors a particular kind of bacterium, one well known to the pharmaceutical industry and the source of half the antibiotics used in medicine. This bacterium is potent poisoner of Escovopsis inhibiting its growth and suppressing spore formation. Astoundingly, the leaf-cutter ants are accomplishing feats beyond the power of humans: they are growing a monocultural crop year after year without disaster, and they are using an antibiotic apparently so wisely that, unlike people, they are not provoking antibiotic resistance in the target disease-producing organism.

Questions 14 - 19

Reading passage 2 has eight paragraphs, A-H.

Which section contains the following information?

Write the correct letter, A-H, in boxes 14-19 on your answer sheet.

14. two things at which leaf-cutter ants have succeeded but humans have failed.

15. a comparison between the nests of leaf-cutter and lower attine ants.

16. an assessment of the impact leaf-cutter ants have on their environment.

17. the effect Escovopsis has on ant communities.

18. the advantage for lower attine ants of growing a range of funguses.

19. the discovery of the age of the attine ant funguses.

Questions 20 - 24

Classify the following features as belonging to based on Passage 2.

Write the correct letter A, B or C in boxes 20-24 on your answer sheet.

NB You may use any letter more than once.

List of features

A Leaf-cutting ants

B Lower attines

C Both leaf-cutting ants and lower attine ants

List of statements

20. the use of dead vegetation to cultivate their fungus.

21. very small ants that keep the fungus free of foreign organisms.

22. the ability to safely eat harmful plants.

23. the cultivation of a single fungus.

24. a nest with a very large number of rooms for growing fungus.

Questions 25 - 26

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

Write the correct letter in boxes 25 and 26 on your answer sheet.

25. What does the writer say about Cameron Currie's research?

A. No previous work had been done in this area.

B. Earlier studies did not support his theory.

C. Textbooks on this subject lacked specific detail.

D. Currie's initial theory had proven to be incorrect.

26. Using a microscope Currie was the first to discover that the body of attine ants

A. has a white covering.

B. is covered in wax.

C. is poisonous to humans.

D. has a substance useful to humans.

Questions 27 - 33

*Reading Passage 3 has seven paragraphs **A-G**.*

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number, i-ix, in boxes 27-33 on your answer sheet.

List of heading

i methods used to investigate termite mound formation

ii challenging our assumptions about the nature of life

iii reconsidering the termite's reputation

iv principal functions of the termite mound

v distribution of termite mounds in sub-Saharan Africa

vi some potential benefits of understanding termite architecture

vii the astonishing physical dimensions of the termite mound

viii termite mounds under threat from global climate change

ix a mutually beneficial relationship

27. Paragraph **A**

28. Paragraph **B**

29. Paragraph **C**

30. Paragraph **D**

31. Paragraph **E**

32. Paragraph **F**

33. Paragraph **G**

READING PASSAGE 3

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

Termite Mounds

Could the vast towers of mud constructed by insects in sub-Saharan Africa hold the key to our energy-efficient building of the future?

A. To most of us, termites are destructive insects which can cause damage on a devastating scale. But according to Dr Rupert Soar of Loughborough University's School of Mechanical and Manufacturing Engineering, these pests may serve a useful purpose for us after all. His multi-disciplinary team of British and American engineers and biologists have set out to investigate the giant mounds built by termites in Namibia, in sub-Saharan Africa, as part of the most extensive study of these structures ever taken.

B. Termite mounds are impressive for their size alone; typically they are three metres high, and some as tall as eight metres by found. They also reach far into the earth, where the insects 'mine' their building materials, carefully selecting each grain of sand they use. The termite's nest is contained in the central cavity of the mound, safely protected from the harsh environment outside. The mound itself is formed of an intricate lattice of tunnels, which spilt into smaller and smaller tunnels, much like a person's blood vessels.

C. This complex system of tunnels draws in air from the outside, capturing wind energy to drive it through the mound. It also serves to expel spent respiratory gases from the nest to prevent the termites from suffocating, so ensuring them a continuous provision of fresh, breathable air. So detailed is the design that the nest stays within three degrees of a constant temperature, despite variations on the outside of up to 50° C, from blistering heat in the daytime to below freezing on the coldest nights. The mound also automatically regulates moisture in the air, by means of best its underground 'cellar', and evaporation from the top of the mound. Some colonies even had 'chimneys' at a height of 20m to control moisture less in the hottest regions of sub-Saharan Africa.

D. Furthermore, the termites have evolved in such a way as to outsource some of their biological functions. Part of their digestive process in camera out by a fungus, which they 'farm' inside the mound. This fungus, which is found nowhere else on earth, thrives in the constant and optimum environment of the mound. The termites feed the fungus with slightly chewed wood pulp, which the fungus then breaks down into a digestible sugary food to provide the insects with energy, and cellulose which they use for building. And, although the termites must generate waste, none ever leaves the structure, indicating that there is also some kind of internal waste-recycling system.

E. Scientists are so excited by the mounds that they have labelled them a ‘super organism’ because, in Soar’s word. “They dance on the edge of what we would perceive to cool down, or if you’re too cold you need to thrive: that’s called homeostasis. What the termites have done is to move homeostatic function away from their body, into the structure in which they live. ‘As more information comes to light about the unique features of termite mounds, we may ultimately need to redefine our understanding of what constitutes a ‘living’ organism.

F. To reveal the structure of the mounds, Soar’s team begins by filling and covering their plaster of Paris, a chalky white paste based on the mineral gypsum, which becomes rock-solid when dry. The researcher's hen carves the plaster of Paris into half-millimatre-thick slices, and photograph them sequentially. Once the pictures are digitally scanned, computer technology is able to recreate complex three-dimensional images of the mounds. These models have enabled the team to map termite architecture at a level of detail never before attained.

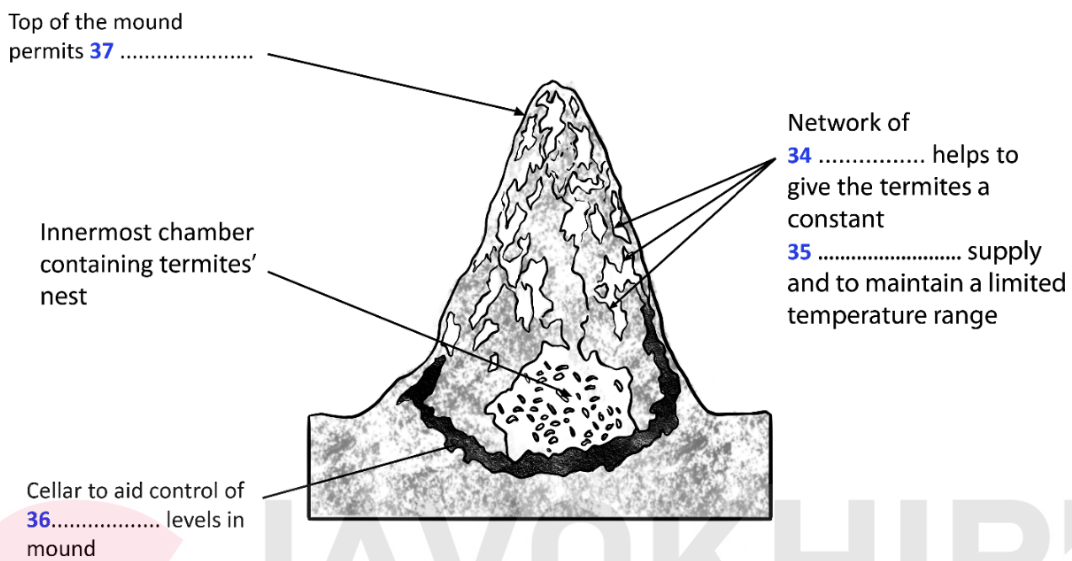
G. Soar hopes that the models will explain how termite mounds create a self-regulating living environment which manages to respond to changing internal and external conditions without drawing on any outside source of power. If they do, the findings could be invaluable in informing future architectural design, and could inspire buildings that are self-sufficient, environmentally, and cheap to run. ‘As we approach a world of climate change, we need temperatures to rise, he explains, there will not be enough fuel to drive air conditioners around the world. It is hoped, says Soar, ‘ that the findings will provide clues that aid the ultimate development of new kinds of human habitats, suitable for a variety of arid, hostile environments not only on the earth but maybe one day on the moon and beyond.’

Questions 34 - 37

Label the diagram below.

Choose ***ONE WORD ONLY*** *from the passage for each answer.*

Write your answers in boxes 34-37 on your answer sheet.



Questions 38 - 40

Do the following statements agree with the claims of the writer in Reading Passage 3?

In boxes 38-40 on your sheet, write

YES if the statement agrees with the claims of the writer

NO if the statement contradicts with the claims of the writer

NOT GIVEN if it is impossible to say what the writer thinks about this

38. The termite mound appears to process its refuse material internally.

39. Dr Soar's reconstruction involves scanning a single photograph of a complete mound into acomputer.

40. New information about termite architecture could help people deal with future energy crises.