SECTION 2 *Questions 11–20*

Questions 11–14

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

11 The next event at the hotel will be a

A trade fair.
B wedding.
C party.

12 The number of guests will be

A less than 50.
B from 50 to 100.
C more than 100.

13 Guests will start arriving at

A 7.15.
B 7.30.
C 7.45.

14 The entertainment will be a

A live band.
B comedian.
C magician.

Questions 15–17

Who will be responsible for the following jobs as the guests arrive?

*Choose **THREE** answers from the box and write the correct letter, **A–E**, next to Questions 15–17.*

A	Susan
B	Ahmed
C	Gary
D	Olav
E	Monica

15 offer drinks to guests .....

16 take guests' coats and hats .....

17 show guests where to go .....

Questions 18–20

Complete the sentences below.

*Write **NO MORE THAN THREE WORDS** for each answer.*

General instructions

In order to get the guests to move to the restaurant the hotel manager will **18** ..... .

Seating plans will be placed on each table and also in the **19** ..... .

There will be a total of three **20** ..... .

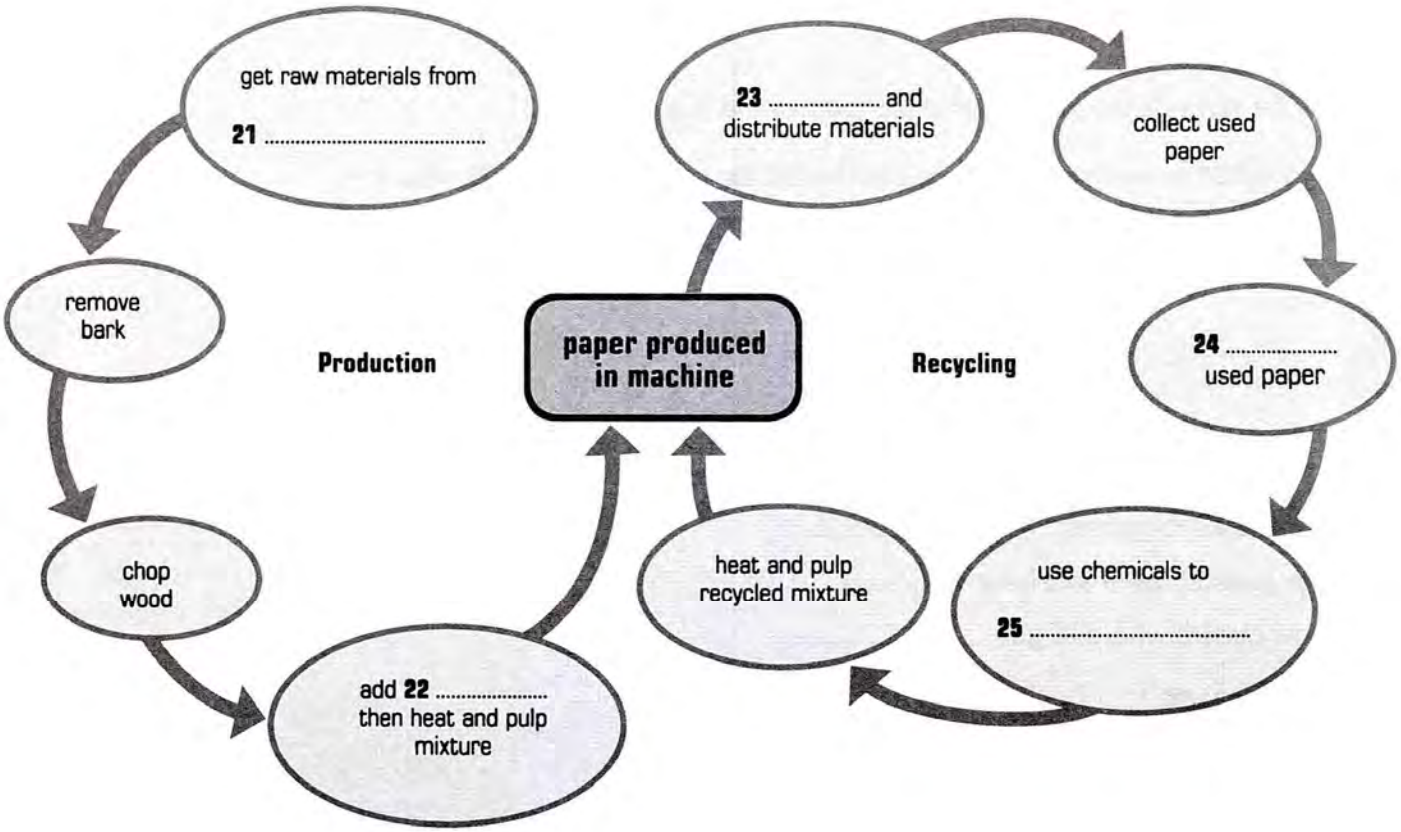
SECTION 3 *Questions 21–30*

Questions 21–25

Complete the flow-chart below.

*Write **NO MORE THAN TWO WORDS** for each answer.*

Paper Production and Recycling



Questions 26–30

Answer the questions below.

Write ***NO MORE THAN TWO WORDS*** *for each answer.*

26 What part of the assignment is Alan going to start working on? .....

27 Where will Melanie get more information on used paper collection? .....

28 What will they add to the assignment to make it more interesting? .....

29 What do they agree to complete by the end of the month? .....

30 Who will they ask to review their work? .....

SECTION 4 *Questions 31–40*

Questions 31–38

Complete the notes below.

*Write **ONE WORD AND/OR A NUMBER** for each answer.*

HAIR

Facts about hair

- main purposes – warmth and **31** .....
- main component *keratin* – makes fingernails **32** .....
- full head of hair can support a large weight – equal to two **33** .....
- average number of strands of hair – **34** ..... for an adult
- large amount of money spent on **35** ..... for hair in the UK

Structure of hair

Three main parts:

a) bulb – like a **36** ..... over end of hair follicle

b) root – contains glands that supply **37** ..... to hair strand

c) shaft – not **38** .....

Questions 39–40

Complete the summary below.

*Write **ONE WORD ONLY** for each answer.*

Health and Hair

Changes in diet will take longer to affect your hair than your **39** .....
Vitamins C, D and E are all important for healthy hair and **40** .....
are one of the best sources of Vitamin C.

READING

READING PASSAGE 1

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

SECRETS OF THE SWARM

Insects, birds and fish tend to be the creatures that humans feel furthest from. Unlike many mammals they do not engage in human-like behaviour. The way they swarm or flock together does not usually get good press coverage either: marching like worker ants might be a common simile for city commuters, but it's a damning, not positive, image. Yet a new school of scientific theory suggests that these swarms might have a lot to teach us.

American author Peter Miller explains, 'I used to think that individual ants knew where they were going, and what they were supposed to do when they got there. But Deborah Gordon, a biologist at Stanford University, showed me that nothing an ant does makes any sense except in terms of the whole colony. Which makes you wonder if, as individuals, we don't serve a similar function for the companies where we work or the communities where we live.' Ants are not intelligent by themselves. Yet as a colony, they make wise decisions. And as Gordon discovered during her research, there's no one ant making decisions or giving orders.

Take food collecting, for example. No ant decides, 'There's lots of food around today; lots of ants should go out to collect it.' Instead, some forager ants go out, and as soon as they find food, they pick it up and come back to the nest. At the entrance, they brush past reserve foragers, sending a 'go out' signal. The faster the foragers come back, the more food there is and the faster other foragers go out, until gradually the amount of food being brought back diminishes. An organic calculation has been made to answer the question, 'How many foragers does the colony need today?' And if something goes wrong – a hungry lizard prowling around for an ant snack, for instance – then a rush of ants returning without food sends waiting reserves a 'Don't go out' signal.

But could such decentralised control work in a human organisation? Miller visited a Texas gas company that has successfully applied formulas based on ant colony behaviour to 'optimise its factories and route its trucks'. He explains, 'If ant colonies had worked out a reliable way to identify the best routes between their nest and food sources, the company managers figured, why not take advantage of that knowledge?' So they came up with a computer model, based on the self-organising principles of an ant colony. Data is fed into the model about deliveries needing to be made the next day, as well as things like weather conditions, and it produces a simulation determining the best route for the delivery lorries to take.

Miller explains that he first really understood the impact that swarm behaviour could have on humans when he read a study of honeybees by Tom Seeley, a biologist at Cornell University. The honeybees choose as a group which new nest to move to. First, scouts fly off to investigate multiple sites. When they return they do a 'waggle dance' for their spot, and other scouts will then fly off and investigate it. Many bees go out, but none tries to compare all sites. Each reports back on just one. The more they liked their nest, the more vigorous and

lengthy their waggle dance and the more bees will choose to visit it. Gradually the volume of bees builds up towards one site; it's a system that ensures that support for the best site snowballs and the decision is made in the most democratic way.

Humans, too, can make clever decisions through diversity of knowledge and a little friendly competition. 'The best example of shared decision-making that I witnessed during my research was a town meeting I attended in Vermont, where citizens met face-to-face to debate their annual budget,' explains Miller. 'For group decision-making to work well, you need a way to sort through the various options they propose; and you need a mechanism to narrow down these options.' Citizens in Vermont control their municipal affairs by putting forward proposals, or backing up others' suggestions, until a consensus is reached through a vote. As with the bees, the broad sampling of options before a decision is made will usually result in a compromise acceptable to all. The 'wisdom of the crowd' makes clever decisions for the good of the group – and leaves citizens feeling represented and respected.

The Internet is also an area where we are increasingly exhibiting swarm behaviour, without any physical contact. Miller compares a wiki website, for example, to a termite mound. Indirect collaboration is the key principle behind information-sharing web sites, just as it underlies the complex constructions that termites build. Termites do not have an architect's blueprint or a grand construction scheme. They simply sense changes in their environment, as for example when the mound's wall has been damaged, altering the circulation of air. They go to the site of the change and drop a grain of soil. When the next termite finds that grain, they drop theirs too. Slowly, without any kind of direct decision-making, a new wall is built. A termite mound, in this way, is rather like a wiki website. Rather than meeting up and talking about what we want to post online, we just add to what someone – maybe a stranger on the other side of the world – already wrote. This indirect knowledge and skill-sharing is now finding its way into the corridors of power.

Questions 1–6

Do the following statements agree with the information in the text?

In boxes 1–6 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 Commuters are often compared favourably with worker ants.

2 Some ants within a colony have leadership roles.

3 Forager ants tell each other how far away the food source is.

4 Forager ants are able to react quickly to a dangerous situation.

5 Termite mounds can be damaged by the wind.

6 Termites repair their mounds without directly communicating with each other.

Questions 7–9

*Complete each sentence with the correct ending, **A–F**, below.*

*Write the correct letter, **A–F**, in boxes 7–9 on your answer sheet.*

7 Managers working for a Texas gas company

8 Citizens in an annual Vermont meeting

9 Some Internet users

A provide support for each other's ideas in order to reach the best outcome.

B use detailed comments to create large and complicated systems.

C use decision-making strategies based on insect communities to improve their service.

D communicate with each other to decide who the leader will be.

E contribute independently to the ideas of others they do not know.

F repair structures they have built without directly communicating with each other.

Questions 10–13

Complete the flow-chart below.

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

Write your answers in boxes 10–13 on your answer sheet.

How honeybees choose a new nest

Honeybee **10** ..... explore possible nest sites

↓

they perform what is known as a **11** ..... on their return

↓

other bees go out and report back

↓

enthusiasm and **12** ..... increase for one particular site

↓

a final choice is reached using a **13** ..... process

READING PASSAGE 2

*You should spend about 20 minutes on **Questions 14–26**, which are based on Reading Passage 2 on the following pages.*

Questions 14–18

The text on the following pages has five paragraphs, **A–E**.

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

*Write the correct number, **i–viii**, in boxes 14–18 on your answer sheet.*

List of Headings

- **i** A joint business project
- **ii** Other engineering achievements
- **iii** Examining the overall benefits
- **iv** A building like no other
- **v** Some benefits of traditional methods
- **vi** A change of direction
- **vii** Examples of similar global brands
- **viii** From factory to building site

14 Paragraph A

15 Paragraph B

16 Paragraph C

17 Paragraph D

18 Paragraph E

High Speed, High Rise

A Chinese entrepreneur has figured out a way to manufacture 30-story, earthquake-proof skyscrapers that snap together in just 15 days.

A Zhang Yue is founder and chairman of Broad Sustainable Building (otherwise known as 'Broad') who, on 1 January, 2012, released a time-lapse video of its 30-story achievement. It shows construction workers buzzing around like gnats while a clock in the corner of the screen marks the time. In just 360 hours, a 100-metre-tall tower called the T30 rises from an empty site to overlook Hunan's Xiang River. At the end of the video, the camera spirals around the building overhead as the Broad logo appears on the screen: a lowercase b that wraps around itself in an imitation of the @ symbol. The company is in the process of franchising its technology to partners in India, Brazil, and Russia. What it is selling is the world's first standardized skyscraper and with it, Zhang aims to turn Broad into the McDonald's of the sustainable building industry. When asked why he decided to start a construction company, Zhang replies, 'It's not a construction company. It's a structural revolution.'

B So far, Broad has built 16 structures in China, plus another in Cancun. They are fabricated at two factories in Hunan, roughly an hour's drive from Broad Town, the sprawling headquarters. The floors and ceilings of the skyscrapers are built in sections, each measuring 15.6 by 3.9 meters with a depth of 45 centimeters. Pipes and ducts for electricity, water and waste are threaded through each floor module while it is still in the factory. The client's choice of flooring is also pre-installed on top. Standardized truckloads carry two modules each to the site with the necessary columns, bolts and tools to connect them stacked on top of each other. Once they arrive at the location, each section is lifted by crane directly to the top of the building, which is assembled like toy Lego bricks. Workers use the materials on the module to quickly connect the pipes and wires. The unique column design has diagonal bracing at each end and tabs that bolt into the floors above and below. In the final step, heavily insulated exterior walls and windows are slotted in by crane. The result is far from pretty but the method is surprisingly safe – and phenomenally fast.

C Zhang attributes his success to his creativity and to his outsider perspective on technology. He started out as an art student in the 1980s, but in 1988, Zhang left the art world to found Broad. The company started out as a maker of non-pressurized boilers. His senior vice-president, Juliet Jiang, says, 'He made his fortune on boilers. He could have kept doing this business, but ... he saw the need for nonelectric air-conditioning.' Towards the end of the decade, China's economy was expanding past the capacity of the nation's electricity grid, she explains. Power shortages were becoming a serious obstacle to growth. Large air-conditioning (AC) units fueled by natural gas could help companies ease their electricity load, reduce overheads, and enjoy more reliable climate control into the bargain. Today, Broad has units operating in more than 70 countries, in some of the largest buildings and airports on the planet.

D For two decades, Zhang's AC business boomed. But a couple of events conspired to change his course. The first was that Zhang became an environmentalist. The second was the earthquake that hit China's Sichuan Province in 2008, causing the collapse of poorly constructed buildings. Initially, he says, he tried to convince developers to refit existing buildings to make them both more stable and more sustainable, but he had little success. So Zhang drafted his own engineers and started researching how to build cheap, environmentally friendly structures that could also withstand an earthquake. Within six months of starting his research, Zhang had given up on traditional methods. He was frustrated by the cost of hiring designers and specialists for each new structure. The best way to cut costs, he decided, was to take building to the factory. But to create a factory-built skyscraper, Broad had to abandon the principles by which skyscrapers are typically designed. The whole load-bearing structure had to be different. To reduce the overall weight of the building, it used less concrete in the floors; that in turn enabled it to cut down on structural steel.

E Around the world, prefabricated and modular buildings are gaining in popularity. But modular and prefabricated buildings elsewhere are, for the most part, low-rise. Broad is alone in applying these methods to skyscrapers. For Zhang, the environmental savings alone justify the effort. According to Broad's numbers, a traditional high-rise will produce about 3,000 tons of construction waste, while a Broad building will produce only 25 tons. Traditional buildings also require 5,000 tons of water onsite to build, while Broad buildings use none. The building process is also less dangerous. Elevator systems – the base, rails, and machine room – can be installed at the factory, eliminating the risk of injury. And instead of shipping an elevator car to the site in pieces, Broad orders a finished car and drops it into the shaft by crane. In the future, elevator manufacturers are hoping to preinstall the doors, completely eliminating any chance that a worker might fall. 'Traditional construction is chaotic,' he says. 'We took construction and moved it into the factory.' According to Zhang, his buildings will help solve the many problems of the construction industry and what's more, they will be quicker and cheaper to build.