

READING

READING PASSAGE 1

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

Questions 1–8

Reading Passage 1 has eight paragraphs, **A–H**.

Choose the correct heading for paragraphs **A–H** from the list of headings below.

Write the correct number, **i–xi**, in boxes 1–8 on your answer sheet.

List of Headings

- i** Availability to the public
- ii** Use as a digestive aid
- iii** Risks of application to the skin
- iv** Edible sources of salicylic acid
- v** Early popularity in Europe
- vi** Unwanted side effects of swallowing aspirin
- vii** Discovery and development
- viii** Appropriate and inappropriate long-term uses
- ix** External uses of salicylic acid
- x** Benefits for plant life
- xi** A remedy for sick children

- 1** Paragraph **A**
- 2** Paragraph **B**
- 3** Paragraph **C**
- 4** Paragraph **D**
- 5** Paragraph **E**
- 6** Paragraph **F**
- 7** Paragraph **G**
- 8** Paragraph **H**

Salicylic acid

This natural powdery substance has helped to ease the troubles of human life for centuries.

A The benefits of salicylic acid were first documented in the 5th Century BC, when the Greek physician Hippocrates noted how powder derived from the bark of the white willow tree (*Salix alba*) was capable of reducing fevers and relieving pain. Surviving evidence suggests that early civilisations across the Middle East and in North America also used willow bark for these purposes. It was not until 1826, however, that the active component of willow bark was finally distilled and given a name – *salicin* – by Johann Andreas Buchner, a German pharmacologist at the University of Munich. A few years later, the process of isolation was perfected and the Italian chemist Raffaele Piria completed the development of salicylic acid through a chemical conversion. By the end of the nineteenth century, the German company Bayer was successfully marketing the drug as tablets under the Aspirin trademark, and it quickly became a staple in the medicine chest of households in the Western world.

B Although salicylic acid is still used most widely in over-the-counter painkiller tablets, over the years its applications have broadened considerably. In the field of dermatology, for instance, salicylic acid in the form of skin cream is lauded for its function as an exfoliator, brightening and enhancing the complexion. Because it softens and dissolves keratin, a kind of ‘glue’ in the skin’s structure, salicylic acid is able to treat many conditions in which the skin has suffered from an excessive accumulation or clogging of skin cells. These conditions include acne, dermatitis, psoriasis and folliculitis, all of which have proved remarkably resistant to other treatments. As a further benefit, salicylic acid also has anti-inflammatory properties and, as a result, can soothe troubled skin where other medicines often tend to exacerbate the problem.

C Although it has a reputation as a ‘gentle’ chemical compared to harsher alternatives, in high concentrations and in some circumstances salicylic acid creams can prove harmful, and very occasionally, even fatal. Highly concentrated salicylic acid, particularly concentrations used for wart, corn or callus removal, can cause chemical burns if applied to skin for long periods of time. Hyperpigmentation – a blotchy discolouration of skin tone – may also result in users who have darker skin and those who follow application with excessive exposure to ultraviolet light. Most over-the-counter facial lotions are limited to a relatively mild 2–3% concentration for this reason.

D Salicylic acid also has a number of other less widely known uses. Due to its antimicrobial properties, it is used in the formation of bismuth subsalicylate, the active ingredient in a number of popular remedies for upset stomachs and other intestinal

problems. Some evidence suggests that salicylic acid destroys *E. coli* bacteria and consequently reduces symptoms of diarrhoea and gastrointestinal distress in many sufferers. Long-term use, however, is discouraged because an accumulation of bismuth subsalicylate in the body is toxic.

E Salicylic acid in the form of aspirin tablets is commonly used to reduce fever, aches and pains and inflammation but when ingested, it can cause gastrointestinal ulcers, stomach irritation or bleeding and other undesirable side effects – an issue for many users of aspirin over the years. Children seem to be particularly sensitive, with epidemiological research demonstrating a connection between aspirin use in children suffering from a viral illness and a damaging, and potentially fatal, condition known as Reye’s syndrome. As a result, the Food and Drug Administration has recommended parents avoid the use of aspirin for all feverish children and teenagers.

F Salicylic acid has many uses for humans and other animals, but several species of flora, too, rely on its benefits. It seems to protect against fungicidal and bacterial infections by acting as a signal for pathogenic invasion. It also acts as a kind of therapeutic agent by playing a role in plant responses to abiotic, or external, stresses, such as in situations of drought, excessive cold or heat and heavy metal toxicity.

G It is a naturally occurring substance in most fruits, including berries, dates, raisins, kiwifruit, olives and tomatoes. A few vegetables and also mushrooms and almonds have a strong salicylic acid content. Some herbs and spices, such as turmeric and curcumin, possess so much of the substance that, according to the Rowett Research Institute, a very spicy curry contains more salicylic acid than a dose of aspirin!

H Some physicians recommend aspirin as a continuous medication in low dosages to provide a defence against heart attacks, strokes and blood clot formation in some patients. Early results from studies show it may even be effective in warding off certain types of cancer. However, it is not suggested that healthy people should start taking daily aspirin as a prophylactic measure, as there are positive lifestyle changes that can be made instead: quitting smoking, consuming little or no alcohol, and maintaining a normal weight by eating a wholesome diet and getting regular exercise. These adjustments to lifestyle may not be effortless but in the long run are extremely beneficial. If symptoms of withdrawal (from nicotine or caffeine, for example) are painful, you could take a couple of aspirin to overcome the temporary discomfort.

Questions 9–12

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

Write the correct letter, **A–G**, in boxes 9–12 on your answer sheet.

- 9** Salicylic acid is used on the skin because it...
- 10** Some users of salicylic cream have problems because it...
- 11** Aspirin is used for stomach problems because it...
- 12** Young people should not take Aspirin because it...

- | |
|---|
| <p>A can cause high temperatures and sore muscles</p> <p>B is usually sold in high concentrations</p> <p>C kills germs inside the body</p> <p>D may result in a serious disease or even death</p> <p>E reduces the sticky effects of blocked up cells</p> <p>F resists the progress of many diseases</p> <p>G changes the colour of the skin</p> |
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Question 13

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

Write the correct letter in box 13 on your answer sheet.

What is the writer's overall purpose in writing this article?

- A** to outline uses and effects of salicylic acid in various contexts
- B** to examine the key properties of salicylic acid and how it functions
- C** to show the benefits of salicylic acid compared to other treatments
- D** to warn against the dangers of misusing salicylic acid

READING PASSAGE 2

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

Ada Lovelace

The first computer programmer?

Augusta Ada King (now commonly known as Ada Lovelace) was born on December 10th, 1815, to the well-regarded poet Lord Byron and his wife Anne Byron. Lord Byron, a restless man who had conceived other children out of wedlock, left his wife in a bitter divorce just weeks after Ada's birth. Following the separation he headed immediately to Europe, where he died in Greece several years later, never having seen his daughter again.

Anne Byron, forever averse to what she perceived as 'dangerous' poetic tendencies after her troubling experiences with her wayward former husband, began from an early age trying to prevent the young Ada from following too closely in her father's footsteps. Some of Anne's strategies were relatively draconian – Ada was not permitted, for example, to look at any portraits of her father until she reached adulthood at twenty years of age. But others proved fortuitous. Attempting to nudge Ada away from poetry, literature and other pursuits that she feared would encourage caprice and self-indulgence in her daughter's young mind, Anne instead focused Ada's attention on areas of study that required more discipline and sober calculation instead: music and mathematics. It was through the latter that Ada found her calling, and eventually her place in the history books.

Although it was unusual for young women of her era to pursue mathematics as a discipline, and Ada did not enjoy the privilege of formal education, her position in society allowed her access to some of the greatest minds of her day. Among these tutors was Mary Somerville, a noted mathematician and astronomer, whose legacy is continued in the naming of women's colleges around the world. Another tutor, logician Augustus De Morgan, informed Anne that her daughter had the potential to become 'an original mathematical investigator, perhaps of first-rate eminence'.

It was through Somerville, however, that Ada was introduced to the researcher who would play the greatest role in shaping her legacy: Charles Babbage. Babbage, a professor of mathematics at Cambridge, was widely known for having invented and developed the Difference Engine, a calculating machine more advanced than any of its time. In 1834, Babbage wanted to develop another, even more sophisticated apparatus, an Analytical Engine. Although he enjoyed great

prestige, being a founder of the Astronomical Society, and a member of international organisations including the American Academy of Arts and Sciences, his sponsors were reluctant to support his Analytical Engine project, and for some time it appeared as if Babbage's intentions would never be fulfilled.

Assistance eventually came from the Italian mathematician Luigi Menabrea, who produced a memoir documenting the Analytical Engine. The memoir was published in French, however, and Babbage recruited Ada to help make it accessible to an English-speaking audience. Over a nine-month period during 1842–1843, Ada devoted herself to completing the work, eventually producing not only an English version of Menabrea's work, but a set of appendices longer than the original document itself. In these appendices, Ada wrote a detailed account, in Section G, of how a sequence of Bernoulli numbers¹ could be calculated using the Analytical Engine. Although the Engine was never built, retrospective studies have concluded that Ada's calculations would have been correct had the Engine existed at the time. In addition to her mathematical accuracy, Ada's other notes, some more speculative, show an awareness of computing potential that went beyond mere number crunching. Ada anticipated advances, such as computer-generated music, which would not be fully realised until a century and a half later. For these contributions, Ada has been dubbed the 'first computer programmer'.

Not everyone is convinced that Ada deserves this title, however. Some historians have suggested that Ada functioned more as an editor or compiler rather than as a mathematician in her own right. These critics note that, although published under her name, the algorithms had been completed by Babbage several years earlier, and that her correspondence with Babbage indicates that Ada relied a great deal on his guidance and authority in composing her appendices, while making only minor corrections herself. Other historians defend her role. According to Benjamin Woolley, Ada's biographer, Ada's great contribution lies in her discussion of the implications of Babbage's work and her conceptual vision of what computing might become. In accomplishing this, Woolley suggests, Ada 'rose above the technical minutiae of Babbage's extraordinary invention' and revealed its 'true grandeur'. For his part, Babbage always insisted that Ada's work, while the product of an extensive dialogue between them, was entirely her own.

Disputes aside, Ada's legacy in both computing and the wider popular imagination is now firmly established. The British Computer Society now awards a medal bearing her name, and the United States Department of Defence has named a computer language, Ada, in her honour. In addition, a number of organisations, inspired by the example she set, also exist to foster the development of women in the fields of computing, science and technology.

¹ Bernoulli numbers (named after Swiss mathematician Jakob Bernoulli) are the sequence of rational numbers; extremely important in number theory and analysis and the subject of the first computer program.

Questions 14–19

Do the following statements agree with the information given in Reading Passage 2?

In boxes 14–19 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*

- 14 Ada Lovelace was born after her father's death.
- 15 Ada was never allowed to see any images of Lord Byron as a child.
- 16 Ada wanted to read books and poems as a child.
- 17 Ada did not go to school.
- 18 Mary Somerville was a greater mathematician than Augustus de Moran.
- 19 Ada met Charles Babbage at university.

Questions 20–24

Fill in the gaps in these sentences using NO MORE THAN THREE WORDS from the passage.

Write your answers in boxes 20–24 on your answer sheet.

- 20 Babbage did not receive any help for his Analytical Engine from
- 21 Ada translated Menabrea's work and created a for him.
- 22 Long before its time, Ada predicted the development of
- 23 Ada's suggests that the work she did for Menabrea was not completely original.
- 24 Ada's biographer felt that she had a of the future of computer science.

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.

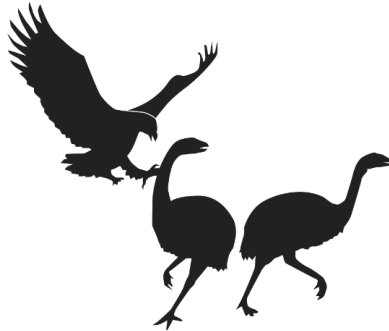
- 25** What is the best summary of Ada Lovelace?
- A** She was an original mathematician.
 - B** She was a pioneer in women's education.
 - C** She was a visionary thinker.
 - D** She was a famous woman in her time.
- 26** What is the writer's purpose in Reading Passage 2?
- A** to examine scholars' conflicting views surrounding Ada's work
 - B** to introduce Ada and her significant achievements
 - C** to provide a general overview of Ada's life
 - D** to explain how Ada invented the first computer

READING PASSAGE 3

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

Haast's Eagle

'Tiger of the skies'



A As a result of being separated for tens of millions of years from other mainland ecosystems such as Australia or continental Asia, the biota of New Zealand evolved to include some of the most unique plants and animals on earth. Until the arrival of humans and their associated introduced species, such as rats and dogs, New Zealand was not home to a single ground mammal, and this encouraged birdlife to prevail. Another common feature of island ecosystems, whereby some species significantly outgrow their mainland relatives, also occurred in New Zealand. From these twin forces – the dominance of birds, and the tendency toward larger body sizes in island ecosystems – emerged one of the most formidable flying predators known on earth: the Haast's eagle.

B The largest known eagle ever documented, this fearsome creature weighed up to fifteen kilograms and sported wings spanning two to three metres in diameter. Although this wingspan is comparatively small (the Wandering Albatross and Andean Condor, for instance, each have wing spans in excess of three metres), the Haast's eagle possessed a much larger body mass to wing ratio. While stubbier wings made the eagle ill-suited to prolonged flight, they did enable the Haast's eagle to nimbly and swiftly manoeuvre its large frame around trees, which would have been vital for pursuing prey through New Zealand's dense forest and scrubland.

C The most impressive aspect of the bird's anatomy, however, was its enormous talons. At almost 23 centimetres in length, these are comparable to those of some wild cats and have justifiably earned the Haast's eagle the nickname 'Tiger of the Skies'. With these talons the eagle would attack its prey in the only way it knew how – grasping the animal's pelvis with one talon while crushing its skull with the other in a strike that, according to New Zealand researcher Richard Holdaway, is akin to that of a 15 kilogram concrete block dropping from an eight-storey building. This force was enough to bring down very large animals, and indeed the Haast's eagle preyed primarily on the moa – a clumsy, flightless bird nearly fifteen times its size. Once immobilised, a large catch could feed the eagle over several days. With no other large predators, the Haast's eagle could afford to take its time with the carcass of its prey until ready to return to the hunt.

D This leads to an important question: How did such a ferocious predator fall from the top of the food chain and rapidly become extinct around AD 1500? The answer is that, like many other extinct animals, the Haast's eagle could not diversify its behaviours and adapt to changing circumstances quickly enough to survive. Moa, an easy source of prey for the eagle, were likewise an easy source of food for Maori tribespeople when they began to settle in New Zealand around AD 1200. These settlers quickly drove the moa to extinction, and with it went the primary food supply of the Haast's eagle. This enormous predator then faced a scarcity of food. Undoubtedly, the horror stories of human encounters with the eagle in Maori legend are true to some extent; if the Haast's eagle could take down a two hundred kilogram moa, some Maori tribesmen would have fallen prey to its massive claws at some point. The occasional human victim was insufficient to sustain the dietary requirements of a creature its size, however, and when the moa disappeared, the Haast's eagle soon followed.

E Mythology surrounding the existence of the Haast's eagle has been passed down through Maori tradition for centuries, but due to a lack of physical evidence (only three full skeletons have ever been recovered), much about this bird remains a mystery. Artists have depicted the plumage of the Haast's eagle in different ways; for example, some see it as more of a muted brown, in line with other large forest eagles still in existence today, whereas others envision it displaying extravagant hues of green, red and purple. All of this is speculation, however; recovered bones and further DNA evidence can tell us about the genealogy of the Haast's eagle and its size and skeletal structure, but the colour of its feathers, along with many other specifications, will forever be guesswork.

F It is difficult to say whether the demise of the Haast's eagle was tragic or fortuitous. No doubt the sight of this majestic bird swooping down from its perch at eighty kilometres per hour would have been an awe-inspiring sight, and it is easy to see why some early Maori settlers exalted the eagle in their imaginations as some kind of 'Bird God'. If it were still around, however, there is no doubt that hiking, camping or even just taking a leisurely stroll through the woods in New Zealand would be a far more dangerous activity. With a force of impact powerful enough to knock an adult male unconscious, many people would never know what had hit them.

Questions 27–34

Reading Passage 2 has six paragraphs, **A–F**.

Which paragraph contains the following information?

*Write the correct letter, **A–F**, in boxes 27 - 34 on your answer sheet.*

- 27 a description of how the Haast's eagle attacked its prey
- 28 a discussion about whether the Haast's eagle killed humans
- 29 an explanation of how the body proportions of the Haast's eagle made it an efficient hunter
- 30 the mental image that the Maori people had of the Haast's eagle
- 31 facts about the early ecology of New Zealand
- 32 conflicting views on the appearance of the Haast's eagle
- 33 a comparison between the Haast's eagle and other birds
- 34 an explanation of why the Haast's eagle could eat its kills slowly

Questions 35–36

Choose **TWO** letters, **A–E**.

Write the correct letters in boxes 35 and 36 on your answer sheet.

Which **TWO** of the following are given as reasons why the Haast's eagle originally evolved?

- A** New Zealand has many unusual birds and plants.
- B** New Zealand had no natural bird predators.
- C** New Zealand has no native mammals.
- D** New Zealand settlers brought other creatures with them.
- E** New Zealand is an isolated island.

Question 37

Choose the best answer. Write the correct letter, **A–D**, in box 37 on your answer sheet.

Which of the following is NOT true?

- A The Haast's eagle could only fly for short distances.
- B The Haast's eagle was adapted to flying through forests.
- C The Haast's eagle's wings were shorter than other large birds.
- D The Haast's eagle had small but very efficient claws.

Questions 38–39

Choose **TWO** letters, **A–E**.

Write the correct letters in boxes 38 and 39 on your answer sheet.

Which TWO of the following are given as reasons why the Haast's eagle died out very quickly?

- A The first settlers ate all the moa.
- B The eagle was hunted by the first settlers.
- C The eagle could not survive by eating people.
- D The settlers destroyed the eagle's habitat.
- E The eagle flew slowly and was easily caught.

Question 40

Choose the best answer. Write the correct letter, **A–D**, in box 40 on your answer sheet.

Which of the following is NOT the author's opinion?

- A If the Haast's eagle had not died out it would have attacked people.
- B It is sad that the Haast's eagle died out because it was beautiful.
- C We can understand why the first settlers worshipped the Haast's eagle.
- D The Maori people should have preserved the Haast's eagle.