READING PASSAGE 1

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

Isambard Kingdom Brunel (1806-1859) — an extraordinary engineer

A Isambard Kingdom Brunel possessed the essential spark of engineering - the drive to Innovate. His French father, Marc Isambard Brunel, was himself a famous engineer. Marc settled in Britain and married an English woman, Sophia Kingdom. Isambard was born in 1806. At the age of 14, he was sent to France to study mathematics and science, later returning to England to assist his father, who was building a tunnel under the River Thames in London. Isambard was injured in a tunnel cave-in, and while recuperating near Bristol, in the west of England, he became involved with his own first major project - the Clifton Suspension Bridge, over the River Avon.

B Two design competitions were held, and Brunel presented four proposals. He won with a design for a bridge with a span longer than any existing at the time, at a height of about 75 metres above water. The technical challenges of this engineering project were immense, and Brunel dealt with them with thoroughness and ingenuity. Unfortunately, he only got so far as to put up the end piers in his lifetime. The Clifton Suspension Bridge in Bristol was completed by engineering colleagues in 1864, and is still in use.

C While Brunel was still in Bristol, working on the bridge project, he learned that the civic authorities saw the need for a railway link to London. Railway location was controversial, since private landowners and towns had to be dealt with. Mainly, the landed gentry did not want a messy, noisy railway anywhere near them. Brunel showed great skill in presenting his arguments to the various committees and individuals, and won them over. He was awarded the contract and constructed the railway line

D Brunel's ready acceptance of new ideas overpowered good engineering judgement (at least in hindsight) when he advocated the installation of an 'atmospheric railway' in South Devon. It had the great attraction of doing away with the locomotive, and potentially could deal with steeper gradients. However, materials were not up to the task, and the mechanism was troublesome and expensive to keep in good repair. The system was withdrawn from use after a year.

E The idea of using steam to power ships to cross the ocean appealed to Brunel. He formed the Great Western Steamship Company, and construction started on the Great Western in Bristol in 1836. Built of wood, and powered by sail and steam-driven paddle wheels, it was launched the following year. The first trip to New York took just 15 days one way - a great success, as the normal sailing time was over a month. The Great Western was the first steamship to be engaged in transatlantic service and made 74 crossings to New York.

F Brunel immediately got to work on an even bigger ship. The Great Bntain was made of iron and also built in Bristol. The initial design was for the ship to be driven by paddle wheels, but Brunel had seen one of the first propeller driven ships to arrive in Britain, and he abandoned his plans for paddle-wheel propulsion. The ship was launched in 1843 and was the

first screw-driven iron ship to cross the Atlantic. For years it sailed from England to Australia and other parts of the world, setting the standard for ocean travel

G Conventional wisdom in Brunel's day was that steamships could not carry enough coal to make long ocean voyages. But he correctly figured out that it was a question of size. He designed a ship that was five times larger than any previously built, big enough to carry enough fuel to reach Australia without refueling. In addition, it would carry 4,000 passengers. This was to be the Great Eastern.

H Brunel chose John Scott Russell, a well-established engineer and naval architect, to construct the ship in London, beginning in 1854, but the contract did not go well. Among other things, Scott Russell kept his estimates unrealistically low, costs soon rose, and the project kept running out of money. Serious technical difficulties led to its launch date being put back more than once, and the Great Eastern was finally ready for its maiden voyage in September 1859. Brunel was too sick to go, and died soon afterwards. Being intended to carry 4.000 passengers to Australia, the ship would have presented serious competition for sailing ships and made a fortune. But the Suez Canal was now in operation and the Great Eastern was too large to use it. Any journey the ship now made to Australia would not be competitive, and it was too large to be economical on the Atlantic run. Although it crossed the Atlantic several times, and survived hurricane conditions that would almost certainly have sunk any other ship, it was not a financial success, and had to be sold in 1864.

I Its new owner used it to carry 5.000 tons of telegraphic cable, to be laid on the floor of the Atlantic between Europe and North America. This inaugurated a hundred years of transatlantic communication by cable. In 1874, the Great Eastern was superseded by a custom-made ship. It was subsequently used as a funfair in Liverpool, and in 1888 was sold for scrap.

Questions 1-6

Look at the following statements (Questions 1-6) and the list of projects below.
Match each statement with the correct project, ***A-G****.*
Write the correct letter, A-G, in boxes 6-9 on your answer sheet.
NB *You may choose any letter more than once.*

1 It had financial problems.
2 People who would be affected by it opposed it.
3 Isambard Kingdom Brunel was not responsible for it.
4 It was taken out of service shortly after completion.
5 It was finished without Isambard Kingdom Brunel.
6 It was repeatedly delayed.

List of projects

A tunnel under the Thames
B Clifton Suspension Bridge
C Bristol-London railway
D 'atmospheric railway'
E Great Western
F Great Britain
G Great Eastern

Questions 7-10

Reading Passage 1 has nine paragraphs, ***A-I.***
Which paragraph contains the following information?
Write the correct letter, A-I, in boxes 1-6 on your answer sheet.
NB *You may choose any letter more than once.*

7 an example of Isambard Kingdom Brunel's persuasive powers
8 a reference to one of Isambard Kingdom Brunel's designs becoming the generally accepted model of its type
9 how one of Isambard Kingdom Brunel's ships was used for a purpose he had not intended
10 a reason why one of Isambard Kingdom Brunel's ships was unprofitable

Questions 11-13

Complete the notes below.

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

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

The Great Eastern

- was originally intended to carry passengers to 11. ……
- became less viable commercially as a result of the construction of the 12. ……
- was bought for use in laying 13. ……