ENGLISH PRACTICE TEST 2 - NON-FICTION (Allow 1 hour 15 minutes)

PART A: COMPREHENSION EXERCISE (50 marks)

'The Hubble Story' from the website of NASA (abridged)

Since the dawn of civilization, man was limited by his vision and imagination about his understanding of the universe. The telescope enhanced his vision and tempered his pride, as observations by Copernicus, Galileo and Kepler in the 16th and 17th centuries A.D. rebuffed the millennia-old conceit that the Earth is the centre of the universe, spearheading the Scientific Revolution.

By the 18th century, the telescope would become the indispensable instrument for investigations of the cosmos. Bigger and better telescopes were built all over the world. Planets, stars, and nebulae which could not be seen by the naked eye were now being routinely noted and logged. Advances in spectroscopy, photography, and photometry increased telescope versatility, sensitivity, and discovery power.

By the turn of the 20th century, most astronomers believed that the observable universe consisted of one galaxy, our Milky Way Galaxy, an oasis of stars, dust, and gas in the vastness of space. However, in 1924, American astronomer Edwin Hubble used the 100-inch Hooker Telescope on Mount Wilson near Los Angeles, California, to observe billions of other galaxies besides our own Milky Way, almost all moving away from each other. This suggested that the universe is expanding, unleashing a Pandora's box of seminal inquiries - such as the Big Bang theory - about the possible beginning and end of the universe.

Astronomers like Edwin Hubble (before and after his time), toiled long, frigid nights inside enormous dome-shaped 'observatories' pointing their telescopes skyward, yearning for the best possible snapshot of the heavens. However they faced a major obstacle that stood between them and a clear view of the universe: the Earth's atmosphere. The Earth's atmosphere is a fluid, chaotic soup of gas and dust. It blurs visible light, causing stars to twinkle and making it difficult to see faint stars. It hinders or even totally absorbs other wavelengths of light, making observations of such wavelength ranges as infrared, ultraviolet, gamma rays and X-rays difficult or virtually impossible (it is also these properties which protect us from the harmful effect of these rays).

Observatories with the largest of telescopes in various continents have been perched upon mountain tops and away from distracting city lights, from Caucasus Mountains in Europe to the Australian outback, with varying levels of success. Adaptive optics and other image processing techniques have minimized - but not totally eliminated - the effects of the atmosphere.

In 1923, German scientist Hermann Oberth, one of the fathers of modern rocketry, published *The Rocket into Planetary Space*, which mentioned how a telescope could be propelled into Earth orbit by a rocket. In 1946, Princeton astrophysicist Lyman Spitzer wrote about the scientific benefits of a telescope in space, above Earth's turbulent atmosphere.

Following the launch of the Soviet satellite Sputnik in 1957, the fledgling National Aeronautics and Space Administration (NASA) successfully launched two Orbital Astronomical Observatories (OAOs) into orbit. They made a number of ultraviolet observations and provided learning experiences for the manufacture and launch of future space observatories.

Meanwhile, scientific, governmental, and industrial groups planned the next step beyond the OAO program. Spitzer gathered the support of other astronomers for a 'large orbital telescope' and addressed the concerns of its critics. In 1969, the National Academy of Sciences gave its approval for the Large Space Telescope (LST) project, and the hearings and feasibility studies continued.

After Armstrong's 'giant leap for mankind' on the moon in 1969, funding for NASA space programs began to

dwindle, putting the LST program in jeopardy. LST planners had to design the telescope under budget constraints. NASA brought up the option of developing a vehicle that could achieve orbit and return to earth intact and be reused repeatedly; the concept of the Space Shuttle was born. The Space Shuttle could deploy the LST into space and reel it back for return to Earth. The shuttle could, and would, be used for a myriad of other operations for the space program as well.

47
NASA suggested that the lifetime of the space telescope be fifteen years, which implied that the instruments needed the ability to be replaced on the ground or even serviced in orbit - an ability not afforded to any satellite before or since. Scientists also had to balance the size and quantity of scientific instruments versus their cost. Too many instruments meant financial support was less likely; conversely, instruments of minimal capability would result in the loss of scientific support for the telescope.

52
The European Space Agency (ESA) joined the project in 1975 and provided fifteen per cent of the funding of the LST via contribution of the Faint Object Camera (FOC) and the solar arrays. In return, NASA guaranteed at least fifteen per cent of telescope time - the amount of time astronomers use the telescope for space observations - to European astronomers. In 1977, Congress approved funding to build one of the most sophisticated satellites ever constructed.

57
After an announcement was made to the astronomy community, proposals were received and judged, and five devices were selected as the initial instruments that would be aboard the Space Telescope: the Faint Object Camera, the Wide Field/Planetary Camera, the Faint Object Spectrograph, the High Resolution Spectrograph, and the High Speed Photometer. The Johnson Space Centre in Houston, Texas, and the Kennedy Space Centre in Florida supplied Space Shuttle support. In all, dozens of contractors, a handful of universities, and several NASA centres, spanning 21 states and 12 other countries worldwide, made the dream of a telescope above the clouds and in space a reality.

64
In 1983, the Space Telescope Science Institute (STScI) was established at The Johns Hopkins University in Baltimore, Maryland. The staff of STScI evaluated proposals for telescope time and managed the resulting telescope observations. A number of delays stemming from underestimating the costs and engineering requirements of the state-of-the-art telescope caused the launch date to be moved from December 1983 to the second half of 1986. NASA re-examined interfaces, instruments, and assemblies. The building of the Optical Telescope Assembly encountered engineering challenges. Scientific instruments, like the Wide Field/Planetary Camera (WF/PC), underwent redesign, removing weight and redundancy.

71
In regards to the maintenance and upgrading of the space telescope, plans were made to conduct servicing missions in orbit versus returning the telescope to Earth and refurbishing it on the ground. It was an innovative concept that would be even easier on a budget. In the midst of this spirit of innovation, the Space Telescope was renamed the Hubble Space Telescope (HST). By 1985, the telescope was assembled and ready for launch.

76
However, in 1986 disaster struck. The Challenger accident forced NASA to ground the Space Shuttle fleet for two years. However, these were years well spent by the HST Project. Solar panels were improved with new solar cell technology. The aft shroud was modified to make instrument replacement during servicing easier. Computers and communication systems were upgraded. The HST was subjected to further stress tests in the harsh environments of lift-off and space.

83
Finally, on April 24, 1990, the Space Shuttle Discovery lifted off from earth with the Hubble Space Telescope nestled securely in its bay. The following day, Hubble was released into space, ready to peer into the vast unknown of space, offering mankind a glimpse upon distant, exotic cosmic shores yet to be described.

ENGLISH PRACTICE TEST 2 - COMPREHENSION QUESTIONS

NB: Remember to add quotes or references to the text, to support your interpretation.

The answers to questions 1-10 may be given in note form:

1. What does the acronym HST stand for in lines 78 and 81? (1 mark)

. . . . . .

2. Line 62 refers to '21 states and 12 other countries'. To which country do these 'states' belong? (1 mark)

. . . . . .

3. What was the original launch date of the Hubble Space Telescope? (1 mark)

. . . . . .

4. Which other space agency, besides NASA, became involved in the project to build Hubble? (1 mark)

. . . . . .

5. What was the surname of the man who made the moon landing in 1969? (1 mark)

. . . . . .

6. Who first suggested that a telescope could be sent into space by a rocket? (1 mark)

. . . . . .

7. In that year did the Soviets launch a satellite into space and what was its name? (1 mark)

. . . . . .

8. What was the date on which the Hubble was finally released into space? (1 mark)

. . . . . .

9. What are the names of the two NASA space centres mentioned in this article? (1 mark)

. . . . . .

10. Before the telescope was named the Hubble, what was it called? (1 mark)

. . . . . .

The answers to questions 11-21 should be given in full sentences:

11. How would most astronomers of the year 1900 have described the observable universe, according to the writer? (2 marks)

. . . . . .

. . . . . .

. . . . . .

12. Why does the writer refer to the Earth's atmosphere as a 'soup' in line 19? (2 marks)

. . . . . .

. . . . . .

. . . . . .

13. Find two details in the writer's description of 'astronomers like Hubble' which indicate that the writer thinks they were devoted to their work. (2 marks)

. . . . . .

. . . . . .

. . . . . .

14. Which of Hubble's discoveries lead in time to the Big Bang Theory? (2 marks)

. . . . . .

. . . . . .

. . . . . .

15. Which words in this article suggest that the writer thinks of space as a marvellous thing? (2 marks)

. . . . . .

. . . . . .

. . . . . .

16. Explain, in your own words, how the telescope contributed to the Scientific Revolution in the 16th and 17th centuries (line 4). (4 marks)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

17. What, according to the writer, was the most significant obstacle faced by the astronomers of Hubble's generation? (4 marks)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

18. Explain, in your own words, the dilemma that the Hubble's designers faced in balancing cost against capability (lines 47-51) (4 marks)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

19. Explain, in general terms, why the Challenger accident not a total disaster for the Hubble project (lines 76-82). (4 marks)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

20. Across this article, the writer makes clear that a number of different organisations were involved in the Hubble Project, beyond NASA itself. Identify four such organisations and briefly state what their role was. (4 marks)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

21. Giving references to the text, outline some of the difficulties encountered during the course of the project to get the Hubble into space. (5 marks)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Question 21, cont/...

. . . . . .

. . . . . .

. . . . . .

22. What is meant by these words, as used in the article? (5 marks)

versatility (line 8) . . . . . .

seminal (line 13) . . . . . .

feasibility (line 39) . . . . . .

myriad (line 45) . . . . . .

aft (line 80) . . . . . .

(Total marks: /50) . . . . . .

ENGLISH PRACTICE TEST 2

PART B: COMPOSITION EXERCISE (50 marks)
Answer ONE of the following questions:

EITHER
Write a short story that contains the following element, anywhere in the story: a space craft.
OR
Imagine you are one of the NASA scientists who had worked for many years on the Hubble project. Using information from the comprehension passage, write a letter to a friend describing what happened, and how you felt, when you watched the transmitted images of the Hubble finally being released into space from the Space Shuttle.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(Total marks: /50) . . . . . .

* * END OF TEST * *

(For answers and suggested marking scheme, see English Practice Test 2 - Answers.pdf)