

LIBERAL STUDIES (SCIENCE, TECHNOLOGY & SOCIETY) AS-LEVEL

8.30 am – 11.00 am (2½ hours)
This paper must be answered in English

1. This paper consists of **Section 1 and Section 2**. Section 1 carries 75% of the module marks, and Section 2 carries 25%.
2. **Section 1** consists of three questions, *all* of which are to be answered. **Section 2** consists of four questions, of which candidates may attempt any *one*.
3. Each question is worth 25 marks : 18 marks are allocated for content and 7 marks for effective communication.
4. The maximum content marks are indicated in brackets at the end of each question and sub-question. They are a guide to the length of answer required, which may vary from one to several paragraphs.
5. Candidates are reminded that this subject emphasises the ability to present and support points of view in clear, concise and logical manner, rather than the ability to recite facts.

SECTION 1

Answer *all* the questions in this section.

1. Consider the following data from a local newspaper dated 23 July 1999.

| RACE TO BE DIGITAL : HONG KONG VS SINGAPORE | | |
|---|---|--|
| | Hong Kong | Singapore |
| Government philosophy | <ul style="list-style-type: none">• Market driven• Government acts as regulator | <ul style="list-style-type: none">• Limited deregulation• Government both regulates and leads new development |
| Public services offered over Internet | <ul style="list-style-type: none">• Extensive provision of information• The ability to offer some key services is awaiting improvements to security and verification, expected next year | <ul style="list-style-type: none">• Extensive provision of information• Limited services available, including payment of fines |
| Telephone lines per 100 people | 56 | 46 |
| Percentage of digital lines | 100% | 100% |
| Internet service providers licensed | 133 | 4 |
| High-speed home access | <ul style="list-style-type: none">• Netvigator Ultra Line offers up to 1.5M bps^①• Costs HK\$238 a month, with unlimited off-peak usage plus peak-hour charge of HK\$2 per hour• Service is entirely commercial | <ul style="list-style-type: none">• Singapore ONE^② offers 512K bps for sites outside Singapore, 2.5M bps for sites inside• Costs HK\$273 a month for 30 hours• Service is the result of government initiative |
| Dial-up Internet accounts per 100 people | 11 | 10 |

^① bps : bits per second

^② Singapore ONE : nationwide high-speed broadband cable network in Singapore

- (a) With reference to the above data, discuss whether you think Hong Kong or Singapore has a higher potential for developing into a global information and communications technology centre. (12 marks)
- (b) What factors other than those mentioned in the above table are crucial for the successful development of information technology? Explain your answer. (6 marks)

2. Consider the information in the following table.

| Scientific Discoveries and Innovations of the 20th Century | |
|--|--|
| 1901 | Wireless radio |
| 1903 | Aeroplane |
| 1909 | Synthetic plastic |
| 1915 | Einstein's quantum theory |
| 1923 | Television |
| 1928 | Penicillin |
| 1930 | Jet Engine |
| 1943 | Computer |
| 1945 | Atomic bomb |
| 1953 | Discovery of the structure of DNA |
| 1954 | Contraceptive pills |
| 1957 | Launching of <i>Sputnik</i> (first artificial satellite) |
| 1958 | Laser |
| 1961 | Launching of the first spacecraft carrying astronauts |
| 1967 | Heart transplant |
| 1969 | Arpanet (the forerunner of Internet) ; moon walk |
| 1978 | Test-tube baby |
| 1989 | Worldwide Web |
| 1993 | Cloning of human embryos |

- (a) What major changes occurred in people's lives during the 20th century as a result of the scientific discoveries and innovations listed in the above table? (12 marks)
- (b) Which *one* of the above do you think deserves to be awarded the title 'The Greatest Scientific Discovery/Innovation of the 20th Century'? Explain your choice. (6 marks)

3. Consider the following extract from a British newspaper dated 29 August 1999.

Head transplants give new hope to the paralysed

A leading brain surgeon has unveiled plans to perform the first human head transplant. The operation, already carried out successfully on dogs and monkeys, would initially cost £ 800,000.

Among those who could benefit are quadriplegics* with conditions similar to those of Christopher Reeve, the Superman actor paralysed after a fall from a horse.

The technique for transplanting heads was proven in principle with small mammals in the early 1990s. However, it was abandoned when scientists realised that the extra time needed to reconnect larger human arteries and muscles would deprive the brain of oxygen and cause tissue damage.

Last week it was claimed that this obstacle has finally been overcome. Robert J. White, an American neurosurgeon, said he had developed a blood-cooling system that meant a living head could be disconnected from its blood supply for up to an hour without ill effect.

Head or brain transplants have long been seen as the most wanted technology in neurosurgery. In theory, they offer the nearest anyone could get to immortality.

In reality, however, White's technique would have a very limited application. Despite many recent advances in medical technology, surgeons still cannot reconnect or regrow severed spinal nerves. This means that anyone who underwent a head transplant would be paralysed from the neck down.

Most of the demand for head transplants would, however, almost certainly come from the elderly or dying millionaires with enough money to pay for the operation and the years of aftercare. This is bound to trigger off a heated moral debate.

'The Frankenstein legend, where a human being is constructed by sewing parts together, will become a reality early in the 21st century,' White said.

* quadriplegics : people who are permanently unable to move any of their arms or legs, often because their spine has been injured

- (a) In the light of the above extract, discuss whether head transplant surgery can really benefit paralysed people. (6 marks)
- (b) With reference to the number of people who can benefit, use of resources and moral questions, discuss whether you think head transplant technology should be developed. (12 marks)

SECTION 2

Answer *one* question from this section.

4. Consider the following data on software piracy.

| Country/Region | Piracy rate* | | Losses incurred due to piracy (US\$m) | |
|--------------------|--------------|------|--|--------|
| | 1996 | 1998 | 1996 | 1998 |
| United States | 27% | 25% | 2,361 | 2,875 |
| China | 96% | 95% | 704 | 1,193 |
| Japan | 41% | 31% | 1,190 | 597 |
| Britain | 34% | 29% | 337 | 465 |
| South Korea | 70% | 64% | 516 | 198 |
| India | 79% | 65% | 255 | 197 |
| Australia | 32% | 33% | 128 | 192 |
| Taiwan | 66% | 59% | 117 | 141 |
| HKSAR [#] | 64% | 59% | 129 | 89 |
| Global | 43% | 38% | 11,306 | 10,976 |

* Piracy rate : percentage of pirated software in the market

[#] HKSAR : Hong Kong Special Administrative Region

- (a) What trends can you conclude from the above data with respect to the problem of software piracy? How would you account for these trends? (6 marks)
- (b) How would the software piracy problem deter investors from developing high technology in Hong Kong? What actions do you suggest the government should take to tackle the software piracy problem in Hong Kong? (6 + 6 marks)

5. Consider the following extract from a local newspaper published in November 1999.

China launches unmanned spacecraft

China has launched its first unmanned spacecraft, hailing it as a milestone towards putting an astronaut in space.

The spacecraft, named '*Shenzhou*', was in space for 21 hours after blast-off on Saturday (20 November) and orbited the earth 14 times, Xinhua said.

The flight made China the third nation to launch a craft into space. The others are Russia and the United States. 'China deserves a place in the world in the area of high technology. The successful test flight demonstrates that China's spacecraft and carrier rocket are excellent in performance,' Xinhua quoted the head of China's manned space-flight programme.

Military officers have written about the need to improve satellite communications and to develop space-based weapons. The successful launch of the *Shenzhou* spacecraft has enhanced China's ability to conduct space surveillance and anti-ballistic missile operations, military experts said.

However, American expert James Oberg said China already had unmanned reconnaissance craft* in space and that there were no direct security implications in the launch.

Experiments conducted during the mission on space remote sensing, environmental monitoring, space materials, astronomy and physics helped the use of space for peaceful purposes, Xinhua said.

* reconnaissance craft : aircraft sent on a preliminary investigation or survey (e.g. for military or scientific purposes)

- (a) In the light of the above extract, discuss the factors prompting many nations to participate in the space-flight competition. (8 marks)
- (b) Explain whether you think it is worthwhile for China to invest huge amounts of its resources to develop space technology. (10 marks)

6. Consider the following opinion of an environmentalist about genetically modified foods.

At present, humans understand no more than the most superficial phenomena of cosmic and natural laws. By focusing on simplistic causal relationships (such as measurable effects of adding a gene to something) instead of looking at the whole picture with its long-term, chain reaction consequences, genetic modification of our foods demonstrates the height of human stupidity and arrogance.

Before long, people will never know what exactly they are eating. Billions of people will suffer from allergies and physical incompatibility, a vegetarian way of living will no longer be possible, organic farming will be wiped out, and global ecological collapse will follow. Genetic engineering will replace nuclear technology as the most unethical and irresponsible technology in human history.

The citizens of Hong Kong are now being forced to consume these 'Frankenstein foods' every day. We have never been consulted or even told about this. Recently, items with '*Free from Genetically Engineered Ingredients*' declarations have turned up on our supermarket shelves. It is time for our government to legislate for strict labelling requirements, so that we can know what to choose, and eliminate 'Frankenstein foods' from this planet by using our consumer power.

The government should stop supporting any genetic engineering research immediately, and regulate and control such acts against the well-being of all living things.

- (a) Comment on the environmentalist's opinion about :
- (i) the effects of genetically modified foods on humans; and (6 marks)
 - (ii) government actions concerning genetic engineering research. (6 marks)
- (b) Explain whether you think the government should legislate for strict labelling requirements for genetically modified foods. (6 marks)

7. Consider the following viewpoints concerning the development of robots.

| | |
|---------------|---|
| Scientist A : | <i>‘Within 30 years, we’ll have housekeeper-type robots with monkeylike thinking power. These robots will be able to say how they feel and will offer you flowers if they think you are sad. I expect robots will surpass human intelligence in the next 50 years.’</i> |
| Scientist B : | <i>‘We’ll have humanoid robots* with a certain level of usefulness within 30 years. However, robots will never duplicate humans.’</i> |
| Scientist C : | <i>‘I don’t think that, in our lifetime, we’ll see machines that can think in an abstract way and discuss the existence of God. However, as long as there are robotics researchers like us, sooner or later I’m sure we’ll make it. That’s my hope.’</i> |
| Scientist D : | <i>‘Developing humanoid robots challenges humans’ last refuge of uniqueness. At first they said that a computer couldn’t play chess, and when a computer could play chess, they said it couldn’t feel. We’re trying to push on that boundary to see whether we can make a machine that has emotions. What we’re doing is putting humanity into robots.’</i> |

* humanoid robots : robots with the appearance and qualities of humans

In the light of the above viewpoints, explain your own views on whether the development of humanoid robots would contribute to improving the quality of our lives. (18 marks)

END OF PAPER