

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

1.30 pm – 4.00 pm (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 a clear, concise and logical manner, rather than the ability to recite facts.

SECTION 1

Answer *all* the questions in this section.

1. The one-person, battery-powered scooter shown in the picture below is an invention announced in December 2001. It was reported that it could automatically balance itself and detect which way the rider wants to go. The following is some basic information about the machine:

Cost:	about US\$3,000	
Maximum speed:	8 km per hour to 27 km per hour, depending on settings	
Range:	about 27 km per battery charge on level ground; decelerating or going downhill generates electricity, thus extending its range	
Recharging time:	1 hour of charge for 2 hours of operation	
Energy cost:	less than US\$0.10 per day	
Load it can carry:	passenger: about 113 kg cargo: about 34 kg	
Weight:	29.5 kg to 36.3 kg, depending on the model	

Sources: Figures: John Heilemann, "Reinventing the Wheel", URL: <http://www.time.com/time/business/article/0,8599,186660,00.html> (2 December, 2001).

Picture: Suzanne Plunkett, URL: http://dailynews.yahoo.com/h/ap/20011203/ts/secret_invention.html.

- (a) What do you think would be the advantages and disadvantages of the scooter as a means of transport for home-workplace commuting? (9 marks)
- (b) Do you think the scooter will become popular in Hong Kong? Explain your answer with reference to the existing transport infrastructure of Hong Kong. (9 marks)

2. 'Digital Divide' can be defined as 'the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies and to their use of the Internet'.

The following table shows both the personal computer (PC) penetration rates and the Internet penetration rates by household income in Hong Kong:

Monthly Household Income (HK\$)	PC Penetration Rate*	Internet Penetration Rate [#]
< 10, 000	15.3%	7.7%
10,000 – 19,999	45.9%	29.5%
20,000 – 29,999	62.8%	46.7%
30,000 – 39,999	70.7%	55.9%
40,000 – 49,999	74.2%	60.2%
≥ 50,000	82.8%	71.5%
Overall	49.7%	36.4%

Source: Legislative Council Panel on Information Technology and Broadcasting, *Digital Divide*, Hong Kong: Information Technology and Broadcasting Bureau, April 2001, URL:<http://www.legco.gov.hk/yr00-01/english/panels/itb/papers/1143-02e.pdf>.

* PC Penetration Rate: % of households that have a personal computer

[#] Internet Penetration Rate: % of households that have access to the Internet from home

- (a) Describe and account for the Digital Divide in Hong Kong as reflected in the data shown in the table above. (9 marks)
- (b) In what ways can the Digital Divide bring about differences in the life-styles of households at various income levels in Hong Kong? (9 marks)

3. In Hong Kong, some people have proposed a food labelling system which requires all foods containing more than 5% genetically-modified (GM) materials to be labelled accordingly. Consider the scenario below:

Representatives from different fields were invited to join a discussion on the proposed labelling system.

The group included:

- a scientist,
- the manager of a GM food supplier,
- an environmentalist, and
- a representative from a GM food detecting company.

Some of their comments were:

Comment A: It is not easy to detect the percentage of GM materials in foods very accurately. The proposed labelling system is pragmatic and sensible, and is similar to the one adopted in Japan.

Comment B: Although there is no evidence that GM foods are harmful to health, the government has the responsibility to protect consumers from all potential danger. The labelling system should be as safe as it can be. Moreover, consumers have the right to know whether they are purchasing foods that contain a percentage of GM materials higher than they are willing to eat. Thus, labelling should be required if the foods contain more than 1% of GM materials, just like the practice adopted in Australia, New Zealand, and countries of the European Union.

Comment C: Genetic engineering will help produce more food and solve the starvation problem occurring in many parts of the world. However, the GM food labelling requirement is hindering further development of genetic engineering because the requirement creates unnecessary anxiety among consumers and deters them from buying GM foods. The requirement also damages the image of this new technology.

- (a) Among the representatives listed above, who would have made Comment A and who would have made Comment B? Explain your answer. (6 marks)
- (b) How far do you agree with Comment C? Explain your answer. (12 marks)

SECTION 2

Answer *one* question from this section.

4. Consider the following story:

Egypt lacked sufficient electricity, and so the Egyptians built the Aswan High Dam. The power from the project supplied new industries with electricity and created new job opportunities.

However, no one anticipated the side-effects that the building of the Dam would have. Because of the construction of the Dam, the lower part of the Nile no longer carried mud from the upper part of the Nile or flooded the fields. Because this source of natural fertilisers was removed, increased use of chemical fertilisers was required.

The greater use of chemical fertilisers raised the cost of agricultural production and worsened the problem of water pollution.

Also, the clear water below the Dam was then able to carry more silt and this accelerated the erosion of the river banks. And because it carried fewer nutrients, it provided less food for marine life in the waters off the Nile Delta, with far-reaching consequences.

No one thought about any of these possibilities when the Dam was being planned.

Source: Dietrich Dörner, *The Logic of Failure*, tr. Rita and Robert Kimber, New York: Metropolitan Books, 1996.

In the light of the story above, discuss the merits and demerits of the following attitude towards using technology:

‘We want X.
We can get X by adopting technology Y.
Therefore, we should adopt technology Y.’

(18 marks)

5. Consider the following comments on the creation of transgenic animals* carrying human genes:

Comment A: Transgenic animals can be designed to have certain human genes. We can use such animals to study diseases that human beings have and test the ways to cure the diseases.

Comment B: Transgenic animals can be made to have human organs, and such organs can be used for organ transplant. As a result, the shortage of organs for transplant can be relieved.

Comment C: We do not know the risk of such development. It may have disastrous consequences that will be impossible to change.

Comment D: Such a move will blur the line between human beings and animals. It is horrible to create some half-human half-animal creatures.


Comment E: Transgenic animals are patented by big companies. Only the rich will benefit from their research.


* transgenic animals: animals that have had genes from other species inserted into their chromosomes


In the light of the above comments, discuss whether you think research in creating transgenic animals carrying human genes should be encouraged.
(18 marks)

6. Consider the following chart, which relates to the budget of the National Aeronautics and Space Administration (NASA) of the USA from 2000 to 2006 on the allocation of funds to three major areas of space exploration programmes. The percentage figures shown on the chart are corrected to the nearest integer, and so in some years they do not add up to 100.



 Human space flight: money to be spent on the International Space Station and Space Shuttle programmes, including flight support for cooperative programmes with Russia and other nations

 Scientific research and development: money to be spent on earth and space science, aeronautics*, life and microgravity science, technology investments, and education programmes

 Mission support: money to be spent on space communication services, safety and quality assurance, and facilities maintenance

Source: David Lurie, "Multi-year Budget, National Aeronautics and Space Administration FY 2002 – Congressional Budget Home Page", URL: <http://ifmp.nasa.gov/codeb/about/budget.htm> (12 July, 2001).

*aeronautics: the technology and science of designing, building and operating aircraft

- (a) Identify the changes in the proportions of the above three areas in NASA's budget from 2000 to 2006. What do you think could be the reasons for NASA's change of the proportions? (8 marks)
- (b) For the sake of bringing the greatest benefits to humankind, which of the three areas of the budget do you think should be allocated most of the money available? Explain your answer. (10 marks)

7. Galileo (1564-1642) was an Italian scientist. His scientific beliefs put him into conflict with the Catholic Church at the time. He was forced to spend the last eight years of his life under house arrest.

Consider the following dialogue between Galileo and his landlady, who told Galileo that she had found out that her servant Joseph was spying on him:

Landlady:	<p>Let me tell you what happened. It struck me that Joseph sometimes disappeared for a few hours. Then last Friday noon when I went to the market, I saw him in a doorway, whispering with a Catholic priest. This was, of course, suspicious, but I was not yet sure about its meaning.</p> <p>I thought I should test the fellow. I put a fierce bird into a bag and asked a friend to send it to us, pretending that it was sent to you. When I heard somebody knocking at the door, I sent Joseph to open it. After a few minutes I went after him. The bird was flying around in the corridor, and Joseph, with bloody hands, was trying to catch it and put it back into the bag.</p> <p>I was almost sure, but I still had some doubts. Perhaps he was only curious. I decided to do another test. I wrote a letter to the Archbishop in which I gave an account of your health. I intentionally left the letter on the table. After this I poured ink on the floor. Then I called Joseph and asked him to wipe it up, and then I went out to the garden, but in my mirror I watched what he was doing. I saw him reading the letter eagerly and making notes on it.</p> <p>At that time I was quite sure of my hypothesis, but as a final test I asked him the next day, 'Do you know how to read and write?' He answered that he did not know how to write, not even his own name. 'Get out of my house. I do not need such an illiterate,' I said.</p>
Galileo:	<p>For what you said, I see that although you never learned it, you have more knowledge of the scientific method than all the professors in the university.</p>

Source: Alfréd Rényi, *Dialogues on Mathematics*, San Francisco: Holden-day, 1967.

In the dialogue, Galileo said that his landlady's discovery that Joseph was spying on him showed that she had a good knowledge of the scientific method. Explain in what ways the landlady's procedure is similar to the scientific method. (18 marks)

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