

**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: 20 marks are allocated for content and 5 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. Consider the following extracts of speeches made at a conference on genetically-modified (GM) crops, addressing the question 'Are GM crops useful for increasing food production and reducing hunger?':

### Speaker A

GM crop technology is a powerful tool for increasing crop production.

GM herbicide-resistant and insect-resistant crops are promising tools for increasing food production and combating hunger.

80% of suitable agricultural land is already producing food, and 12% is forest or wetlands. Therefore, yield (production per acre) must increase in order to meet demands, unless we are to accept major environmental degradation.

In the United States, GM herbicide-resistant and insect-resistant crops are effective. Economic analysis shows that the two crop protection systems increase yields, or maintain yields while reducing overall pesticide usage.

Source: URL: <http://www.macrovu.com/GM4CropsUseful.html>.

### Speaker B

Farmers in developing countries can't afford GM crop technology. They often farm small plots of land and lack the cash and access to purchase the seeds and inputs required for the new technology.

GM crop technology is an extension of a failed strategy. GM cropping systems are based on the chemically-related agricultural approach that has shown itself to be unsustainable due to pesticide resistance and environmental degradation. Another approach is necessary in order to feed the world in the long term, one that incorporates biological processes, reduces environmental impact, and produces wealth for the farmers, as well as for the businesses that buy, sell, and export their crops.

Source: URL: <http://www.macrovu.com/GM4CropsUseful.html>.

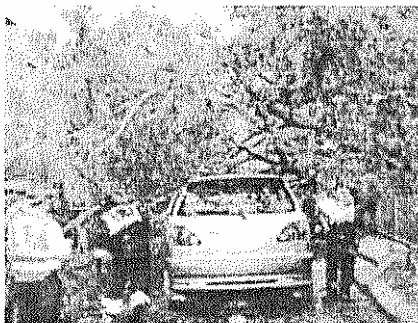
- (a) With reference to the two extracts, identify the main issues of controversy, and contrast the arguments of the two speakers with regard to whether GM crop technology should be pursued. (10 marks)
- (b) What alternatives to GM crops might Speaker B be referring to as a necessary approach to solve the food supply problems in developing countries? Explain your answer. (10 marks)

2. Hong Kong has a busy and compact road network. This makes handling emergencies with a big impact on traffic flow very challenging. Rapid response is of extreme importance in reducing the build-up of serious traffic jams, especially when unforeseen incidents occur on major inter-connected routes within a short period of time.

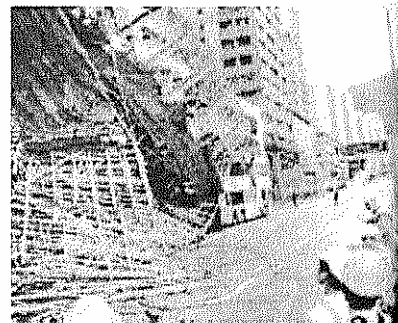
On a certain day in May 2005, there were three incidents, as shown in the photographs below, occurring at the main corridors for eastbound and westbound traffic in Central Kowloon, which brought about abnormally serious congestion in Kowloon. The knock-on effect was felt on the roads leading to the Cross-Harbour Tunnel and the Lion Rock Tunnel and even in Wanchai district. It was suggested that the government should adopt various advanced technologies to handle traffic emergencies.



Loose scaffolding at Argyle Street was reported at 12:37p.m.



A tree fell across Waterloo Road at 12:39p.m.



Scaffolding collapsed at Prince Edward Road East at 12:42p.m.

Source: URL: [http://www.etwb.gov.hk/whats\\_new/Task\\_Force\\_ETC/index.aspx?langno=1&nodeid=1544](http://www.etwb.gov.hk/whats_new/Task_Force_ETC/index.aspx?langno=1&nodeid=1544).

- (a) Suggest an application of current technology for each of the following three aspects through which the government could improve the handling of traffic emergencies. Explain the pros and cons of each of the applications.

- Continuous collection of traffic information by corresponding government departments;
- Implementation of efficient traffic diversions immediately following emergencies;
- Timely and accurate dissemination of traffic information to the public.

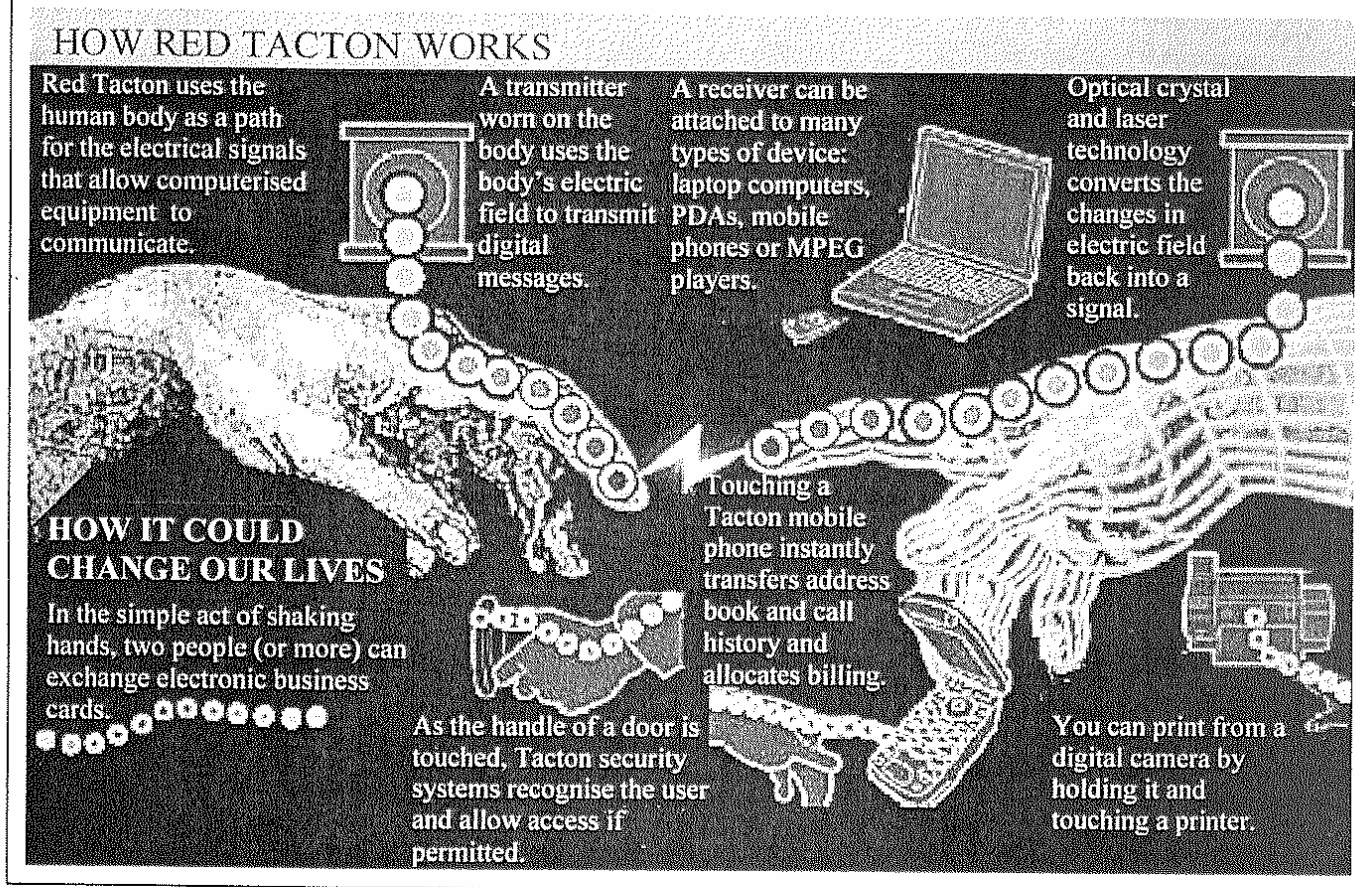
(12 marks)

- (b) Other than making improvements in the three aspects in (a), how could the chance of similar emergencies be reduced in the future?

(8 marks)

3. Consider the following sources:

Red Tacton is a new Human Area Networking (HAN) technology that uses the minute electric field naturally occurring on the surface of the human body. The following figure illustrates its possible applications:



The following is a comment about HAN:

If you are walking down the street and your hand brushes up against a poster by chance, your computer or mobile may get unwanted information! However, this could also be a hidden enslavement agenda! Its real purpose is to assist governments in the monitoring and surveillance of citizens. All important data, personal or otherwise, could be easily downloaded without people's permission. This could be terrible!

Sources: URL: <http://www.redtacton.com>;  
<http://educate-yourself.org/cn/hiddenenslavementagenda15jul05.shtml>;  
<http://sabbah.biz/mt/archives/2005/07/15/red-tacton-download-files-via-flesh>;  
<http://www.snant.com/fp/archives/red-tacton-one-for-the-transhumanists-among-us/>.

- (a) In the light of the figure above and other considerations you might have, to what extent do you agree with the comment? Explain your view by evaluating the possible impact of HAN, as one of the latest developments in information technology, on daily life. (12 marks)
- (b) Under what circumstances do you think that HAN might be extensively used in Hong Kong? (8 marks)



## SECTION 2

Answer *one* question from this section.

4. The following statement is an extract from the address given at the 'Launch of the Einstein Year' by the German Chancellor in January 2005. It concerns his position regarding the possible tension between theoretical research and technological applications:

Of course, it must be our concern to transform scientific findings into innovative products more quickly. But at the same time theoretical research needs the assurance that it can be pursued without the obligation to constantly prove its usefulness.

Source: Jürgen Renn ed., *Albert Einstein: Chief Engineer of the Universe*, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim and Max Planck Institute for the History of Science, Berlin, 2005.

- (a) What are the factors leading some governments to devote more funding to the development of technological applications, rather than adopting the balance suggested by the German Chancellor? (10 marks)
- (b) Using Hong Kong as an example, explain how tension between theoretical scientific research and technological applications might possibly arise in the role of scientists. (10 marks)

5. Consider the following extract:

Scientific theory is a logically self-consistent framework describing the behaviour of a certain natural phenomenon. It either originates from observable facts or is supported by them. It is formulated, developed, and evaluated according to scientific method. Scientific method includes the following steps:

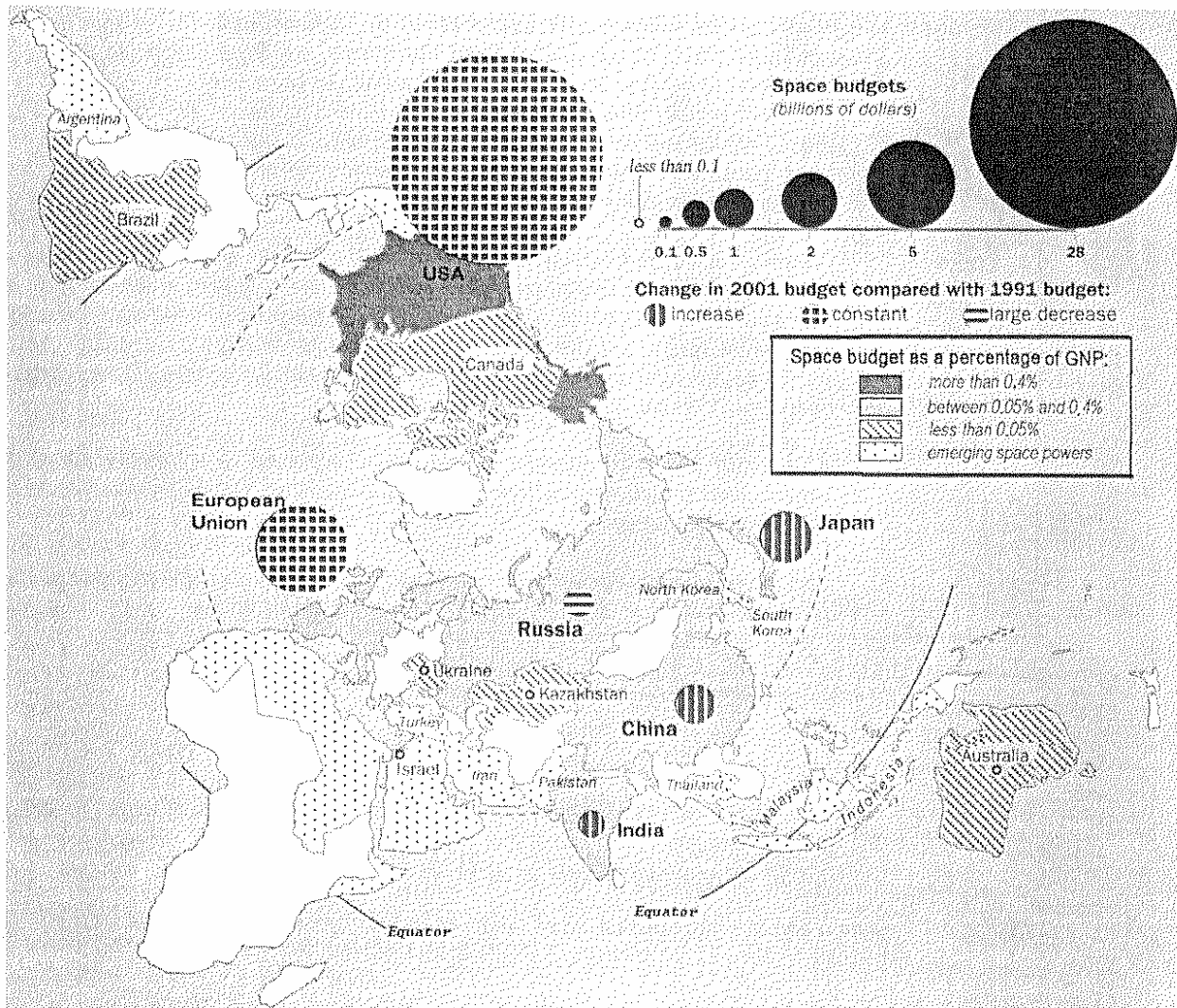
- 'observing' a phenomenon;
- 'making a hypothesis' to explain the phenomenon;
- 'predicting' logical consequences related to the hypothesis;
- 'testing' the prediction; and
- 'reviewing' for any mistakes.

Sources: URL: [http://en.wikipedia.org/wiki/Scientific\\_theory#Science](http://en.wikipedia.org/wiki/Scientific_theory#Science);  
[http://en.wikipedia.org/wiki/Observation#Example:\\_The\\_Big\\_Bang](http://en.wikipedia.org/wiki/Observation#Example:_The_Big_Bang);  
[http://en.wikipedia.org/wiki/Scientific\\_method](http://en.wikipedia.org/wiki/Scientific_method).

In the light of the extract above, discuss whether the two statements 'gravitational force between masses decreases as the distance between them increases' and 'the universe was created from nothing' differ from each other in terms of the nature of scientific theory. (20 marks)

6. Consider the following sources:

### Space budgets around the world in 2001



Source: Fernand Verger, Isabelle Sourbes-Verger, Raymond Ghirardi (ed.), *The Cambridge Encyclopedia of SPACE: Missions, Applications and Exploration*, tr. Stephen Lyle and Paul Reilly, Cambridge University Press, 2003.

#### USA Strategic Space Policy

It is essential to prevent unfriendly nations from using satellite communications, space stations and other space services. Such nations should not be able to exploit resources in space in the same way the United States and its allies can. The policy will require sea, air, land, and space-based attack systems capable of preventing unauthorized use of the space services of friendly nations, as well as destroying the capabilities of the enemy's space hardware.

Source: URL: <http://cns.miis.edu/research/space/index.htm>.

- With reference to the space budgets in 2001, their percentages of GNP and their changes as compared with 1991 figures, discuss the space developments of the USA, Russia, China and Japan. (10 marks)
- Explain the possible impact of the USA Strategic Space Policy on the prospects for space exploration in the whole world. (10 marks)

7. 'Brain prosthesis' is the use of microchips to replace nerve pathways in the brain. This technology has been successfully tested on rats' memory-forming brain tissue outside the body and later, testing may possibly take place in human subjects.

The following are two comments on brain prosthesis:

**Comment A:** People might unnecessarily over-react to the new technology. It may provoke similar reactions to the case of heart transplants, which some people think of as unacceptable because they assume that having the heart you were born with is an important part of your personal identity. However, this worry is invalid. There should not be serious ethical problems with brain prosthesis any more than with heart transplants. One should be optimistic that we can fully accept brain prosthesis for human subjects in future.

**Comment B:** People in need of brain prosthesis will be those with a damaged brain region concerning memory formation. They may also have reduced ability to form any new memories. However, if someone has difficulty in forming new memories, they might forget that they have consented to have the brain operation. In this sense, no genuine consent from the patient could be sought for this type of operation. Patients' rights would be violated.

After brain prosthesis surgery, people might be forced to remember things they would rather forget, even though forgetting is the most effective method of dealing with painful situations.

For these reasons, we should not waste any money on this type of medical research.

Sources: URL: <http://www.newscientist.com/article.ns?id=dn6574>;  
<http://www.newscientist.com/article.ns?id=dn3488>.

- (a) To what extent do you agree or disagree with the above comments? Explain your answer. (10 marks)
- (b) If everyone had brain prosthesis, what might be the impact on schooling and learning? Do you think that such changes are desirable? Explain your answer. (10 marks)

**END OF PAPER**