

**PHYSICS**  
AT WORK  
for HKDSE

# NSE WORKSHEETS

Sample

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Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trade mark of Oxford University Press in the UK and in certain other countries

Published in Hong Kong by  
Oxford University Press (China) Limited  
39th Floor, One Kowloon, 1 Wang Yuen Street, Kowloon Bay,  
Hong Kong

© Oxford University Press (China) Limited 2023

First Edition published in 2023

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ISBN: 978-6-31-000990-2

1 3 5 7 9 10 8 6 4 2

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# National Security Education worksheet

## Book 5 Radioactivity and Nuclear Energy

<b>Related chapter in textbook</b>	<b>Ch1: Radiation and Radioactivity</b> <ul style="list-style-type: none"><li>• <b>Radiation safety</b><ul style="list-style-type: none"><li>- discuss potential hazards of ionizing radiation and the ways to minimize the radiation dose absorbed</li><li>- suggest safety precautions in handling radioactive sources</li></ul></li></ul> <b>Ch3: Nuclear energy</b> <ul style="list-style-type: none"><li>• <b>Nuclear fission and fusion</b><ul style="list-style-type: none"><li>- realize the release of energy in nuclear fission and fusion</li><li>- realize nuclear chain reaction</li></ul></li></ul>
<b>Related strand of National Security Education</b>	<b>Strand 7:</b> <ul style="list-style-type: none"><li>- understand the impact of human activities on the ecological environment and our responsibilities</li><li>- understand the needs of sustainable development</li><li>- recognize the necessity of safeguarding ecological security, resource security, nuclear security and new security domain</li></ul>

With the rapid growth of global energy demand, greenhouse gases emitted by coal-fired power plants have been increasing. It is predicted that the global temperature will rise by 5 °C by the end of the century if the greenhouse gas levels continues to rise. Meanwhile, nuclear power provides an alternative source of energy which emits much less greenhouse gases. However, nuclear fuel and waste are radioactive which require special handling and storage. It could also lead to serious consequences if nuclear accidents happen.

### Activity

- 1 State TWO advantages and TWO potential dangers of using nuclear energy.
- 2 In 1986, a nuclear accident occurred in Chernobyl Nuclear Power Plant. Gather information on the accident and discuss its impact on ecological security.
- 3 Suggest TWO measures of handling nuclear waste produced by nuclear power plant.

Reference:

- 1 [https://www.hko.gov.hk/en/radiation/tidbit/200609/chernobyl\\_2e.htm](https://www.hko.gov.hk/en/radiation/tidbit/200609/chernobyl_2e.htm)
- 2 [https://www.hko.gov.hk/en/radiation/tidbit/200612/chernobyl\\_3e.htm](https://www.hko.gov.hk/en/radiation/tidbit/200612/chernobyl_3e.htm)
- 3 <https://www.nationalgeographic.com/culture/article/chernobyl-disaster>

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Answer:

1 Advantages (any two, or other reasonable answers):

- Emits much less greenhouse gases and air pollutants than coal-fired power plant
- Nuclear fuel is smaller in size than coal and the storage space required is smaller
- Relatively low cost in generating electricity

Potential dangers (any two, or other reasonable answers):

- Leakage of radioactive wastes
- Disastrous nuclear accidents
- Growth of nuclear weapons

2 (May include the following points:)

- Up to 30% of 190 tons of uranium and other radioactive products in the reactor leaked to the environment.
- 50 emergency workers died of acute radiation syndrome, 9 children died of thyroid cancer.
- An estimated total of 3940 deaths from radiation-induced cancer and leukaemia among about 600,000 people who were exposed to higher radiation dose in the accident.
- More than 120 000 km<sup>2</sup> of land in Belarus, Russia and Ukraine contaminated.
- An area of 30 km radius from the Chernobyl Nuclear Power Plant is considered the 'exclusion zone' and is uninhabited.
- Clean up work expected to last through 2065.

3 Wastes are sealed in steel containers.

High-level waste is buried several hundred metres under the ground.

# National Security Education worksheet

## Book E1 Astronomy and Space Science

<b>Related chapter in textbook</b>	<b>Ch2: Conservation of energy in orbital motions</b> <ul style="list-style-type: none"><li>- understand the enlightenment brought by the advancement of space science and its impact on the society</li></ul>
<b>Related strand of National Security Education</b>	<b>Strand 7:</b> <ul style="list-style-type: none"><li>- understand the impact of human activities on the ecological environment and our responsibilities</li><li>- understand the needs of sustainable development</li><li>- recognize the necessity of safeguarding ecological security, resource security, nuclear security and new security domain</li></ul>

In recent years, countries around the world have made significant investments in space technology. While space technology seems distant to us, it is actually closely linked to our daily life. How could space technology be applied to various aspects in daily life? What is its impact on the society?

### Activity

- 1 There are many artificial satellites orbiting the Earth. Suggest THREE uses of the artificial satellites.
- 2 Artificial satellites that launched into space would finally become space junk. What safety issues would space junk cause?
- 3 Space technology may help solve the world's food problem. Search information on how it works and describe briefly.

Reference:

- 1 [https://hk.space.museum/en\\_US/web/spm/resources/curators-blog/2021/09/where-are-the-artificial-satellites.html](https://hk.space.museum/en_US/web/spm/resources/curators-blog/2021/09/where-are-the-artificial-satellites.html)
- 2 [https://www.lcsd.gov.hk/CE/Museum/Space/en\\_US/web/spm/resources/curators-blog/2021/09/space-junk.html](https://www.lcsd.gov.hk/CE/Museum/Space/en_US/web/spm/resources/curators-blog/2021/09/space-junk.html)
- 3 <https://www.bbc.com/future/article/20220708-how-china-is-creating-new-foods-in-space>

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Answer:

- 1 Artificial satellites can provide positioning, communication and weather forecast services.  
(Or other reasonable answers)
- 2 Space junk may collide with other space technology (such as artificial satellites and spacecraft) and causing damage. It may even threaten the lives of astronauts.
- 3 Crop seeds can be sent to space stations, where they are subjected to microgravity and are bombarded by cosmic rays, which trigger the plants to mutate. While some of the mutations leave the plants unable to grow, some become hardier and able to withstand more extreme growing conditions while others produce more food from a single plant or grow faster or require less water. The improved seeds are then sent back to the Earth for planting. Scientists believe this will help solve the world's food shortage problem.



# National Security Education worksheet

## Book E3 Energy and Use of Energy

<b>Related chapter in textbook</b>	<b>Ch4: Energy sources and energy consumption</b> <ul style="list-style-type: none"><li>• <b>Renewable and non-renewable energy sources</b><ul style="list-style-type: none"><li>- realize the characteristics of renewable energy and non-renewable energy sources</li></ul></li><li>• <b>Environmental impact of energy consumption</b><ul style="list-style-type: none"><li>- realize the impact of extraction, conversion, distribution and use of energy on the environment and society</li><li>- understand the effect of greenhouse gases on global warming</li></ul></li></ul>
<b>Related strand of National Security Education</b>	<b>Strand 7:</b> <ul style="list-style-type: none"><li>- understand the impact of human activities on the ecological environment and our responsibilities</li><li>- understand the needs of sustainable development</li><li>- recognize the necessity of safeguarding ecological security, resource security, nuclear security and new security domain</li></ul>

The growth in global population and economic lead to a higher demand of energy. However, the major energy source, fossil fuels, leads to serious environmental consequences. How could we help to lessen the harm to the environment due to energy consumption?

### Activity

- 1 Suggest TWO advantages of renewable energy over non-renewable energy.
- 2 How does burning fossil fuels cause global warming? Discuss the environmental impacts.
- 3 Suggest TWO ways to help in energy saving in daily life.

Reference:

- 1 [https://re.emsd.gov.hk/english/gen/overview/over\\_why.html](https://re.emsd.gov.hk/english/gen/overview/over_why.html)
- 2 [https://www.hko.gov.hk/en/climate\\_change/climate\\_change.htm](https://www.hko.gov.hk/en/climate_change/climate_change.htm)
- 3 [https://www.emsd.gov.hk/energyland/filemanager/common/pdf/EMSD\\_Home\\_Eng.pdf](https://www.emsd.gov.hk/energyland/filemanager/common/pdf/EMSD_Home_Eng.pdf)

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Answer:

- 1 Non-renewable energy sources will be used up one day, while renewable energy sources are sustainable.  
Renewable energy causes less pollution and destruction to the environment.  
(Or other reasonable answers)
  
- 2 Burning fossil fuels emits greenhouse gases, e.g. carbon dioxide. This enhances the greenhouse effect and leads to global warming.  
Rise in global temperature would lead to melting of polar sheet, rise in sea level, and more frequent tropical cyclones, increasing the threat from storm surge in coastal regions.  
(Or other reasonable answers)
  
- 3 Any two, or other reasonable answers:
  - Use energy saving devices, e.g. LEDs, inverter air conditioners.
  - Set and maintain air-conditioned room temperature between 24 °C and 26 °C or above in summer.
  - Use electrical appliances of higher energy performance grade.
  - Turn off the electrical appliances that are not in use or after use.

