Islamic Primary School

2022-2023

General Studies

P.4 2nd term

Theme-based STEAM project

Climate and air

Name: _____

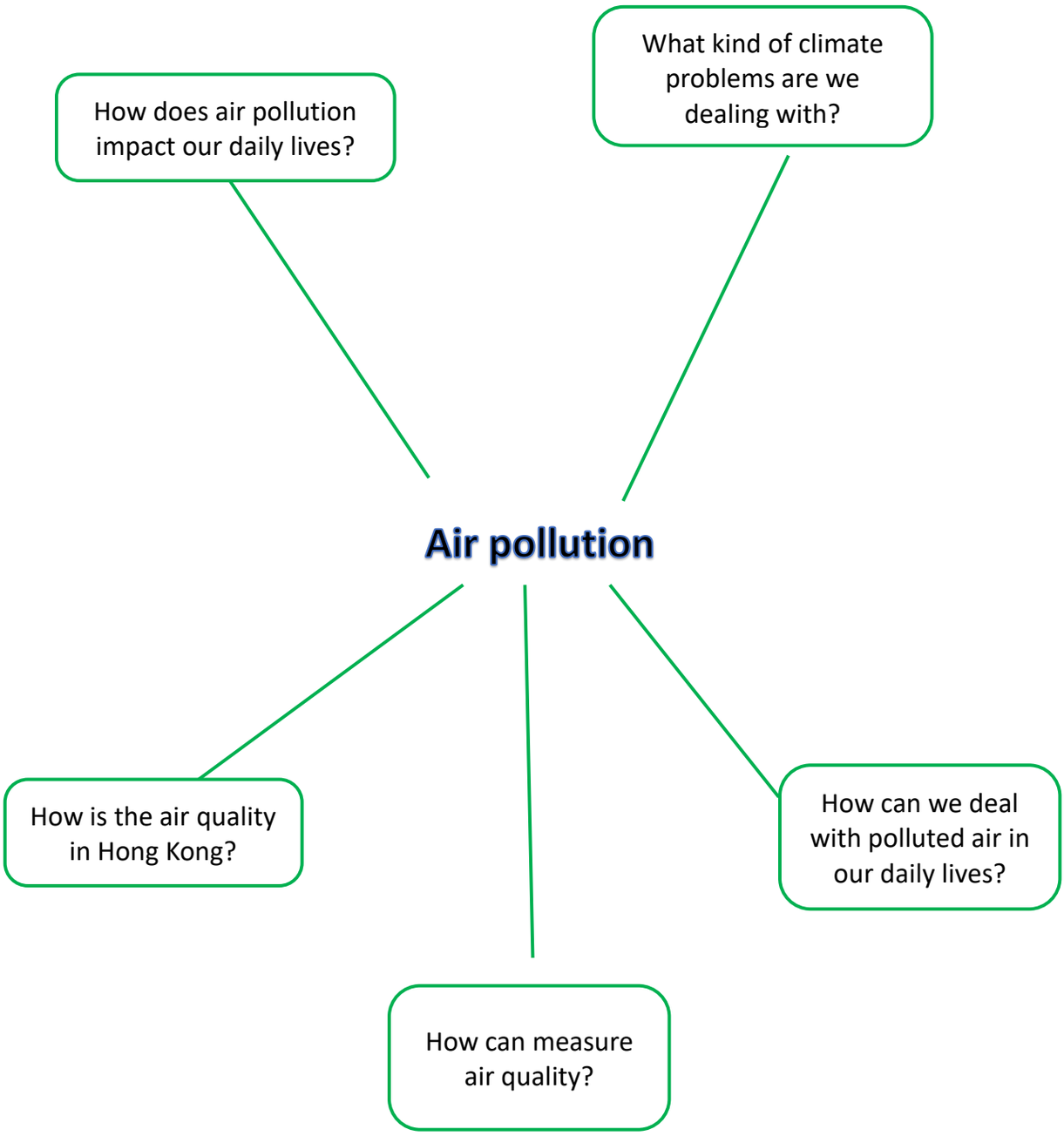
Class: _____

Learning Objectives:

Humans cannot live without air. Fresh and clean air helps keep us healthy physically and mentally. As society develops, cars, factories, restaurants and other sources produce exhaust gas every day. It can be difficult to get a breath of fresh air in the city. On days when air pollution is severe, we might need to wear masks when we go out, and people with allergic rhinitis suffer even more. In this project, you will do research and find solutions to deal with the problems.

Knowledge	• Learn about air pollution in Hong Kong. • State the impact of air pollution on daily life. • List everyday methods to deal with air pollution.
Skills	• Protect oneself on days when air pollution is severe. • Search for and organise information. • Develop an DIY air purifier with everyday items.
Values / Attitudes	• Develop the spirit of mutual help and collaboration.
STEAM	• Air pollutant, source of pollution • How to filter the pollutant? • Design an air purifier • Measuring the pollutant(proper units for measuring)

1. Let's think: (group discussion)



Self-learning (please search it online)

2. **Study material 1**

Climate change and air pollution

https://www.cdc.gov/climateandhealth/pubs/air-quality-final_508.pdf

SCAN ME

https://www.youtube.com/watch?v=P-65ik9UKew&t=5s

SCAN ME

When we burn fossil fuels, such as coal and gas, we release carbon dioxide. When it builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket trap in heat. This extra trapped heat disrupts many of the interconnected systems in our environment. Climate change might also affect human health by making our air less healthy to breathe. Higher temperatures lead to an increase in allergens and harmful air pollutants. Higher temperatures associated with climate change can also lead to an increase in ozone, a harmful air pollutant.

3. **Study material 2**

Hong Kong suffers serious air pollution

Air pollution in Hong Kong keeps worsening. The Air Quality Health Index (AQHI) recorded in many districts fell into the health risk categories of Very High and Serious levels. *The highest AQHI of 10+ was recorded in 9 districts, including the Western and Central District, Tsuen Wan, Yuen Long,* Tuen Mun, Causeway Bay, Tong Chung, Mong Kok, Kwun Tong and Shum Shui Po. The Very High level of 10 was recorded in Tseung Kwan O, Tai Po, Sha Tin and Grass Island.

The Environmental Protection Department explained that Hong Kong is under the effect of a polluted air mass. With only a light breeze, pollutants cannot disperse well. Citizens should avoid strenuous outdoor activities and reduce the amount of time spent outdoors, especially in places with busy traffic.

1. The air quality in Hong Kong is **(good / poor)**.

2. I live in the _____ district. According to the Environmental Protection Department, the Air Quality Health Index in the past 24 hours is _____, which means that_____

_____

Environmental Protection Department AQHI website: https://www.aqhi.gov.hk/en.html

4. **Study material 3 (group discussion)**

The price of air pollution

A study conducted by the HKU School of Public Health estimates that in the first half of 2018, air pollution led to 867 premature deaths and 1.26 million medical visits. Hong Kong people pay a heavy price for air pollution.

Source: Clean Air Network website

Health impact of air pollution

Breathing in polluted air can lead to symptoms like nose and throat irritation, shortness of breath, coughing and chest tightness. When exposed to air pollutants, the condition of individuals suffering from asthma or chronic respiratory diseases can worsen. Children and seniors are also more easily affected by air pollution.

Source: Centre for Health Protection website

Who?	1.What kinds of people are more easily affected by air pollution? _____ _____
What?	2.What symptoms can air pollution cause? _____
	3.What consequences do we face by air pollution? _____

5. Study material 4

5.1 What is Air Quality Index?

The Air Quality Index is based on measurement of particulate matter **($PM_{2.5}$and PM_{10})** and Carbon Monoxide (CO) emissions.

Health Risk Category	AQHI
Low (Green)	1
	2
	3
Moderate (Orange)	4
	5
	6
High (Red)	7
Very High (Brown)	8
	9
	10
Serious (Black)	10+

Source : https://www.gov.hk/en/residents/environment/air/aqhi.htm

5.2 What is $PM_{2.5}$? and how can $PM_{2.5}$ affect my health?

Particles in the $PM_{2.5}$ size range are able to travel deeply into the respiratory tract, reaching the lungs. Exposure to fine particles can cause **short-term health effects** such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath.

5.4 Learn more about air quality

https://www.youtube.com/watch?v=JZx_mRTpSts&t=8s

5.5 Health problems caused by air pollution

People experience a wide range of health effects from being exposed to air pollution. Effects can be broken down into short-term effects and long-term effects.

Short-term effects, which are temporary, include illnesses such as pneumonia or bronchitis. They also include discomfort such as irritation to the nose, throat, eyes, or skin.

Air pollution can also cause headaches, dizziness, and nausea. Bad smells made by factories, garbage, or sewer systems are considered air pollution, too. These odors are less serious but still unpleasant.

Long-term effects of air pollution can last for years *or for an entire lifetime*. They can even lead to a person's death. Long-term health effects from air pollution include heart disease, lung cancer, and respiratory diseases such as emphysema. Air pollution can also cause long-term damage to people's nerves, brain, kidneys, liver, and other organs. Nearly 2.5 million people die worldwide each year from the effects of outdoor or indoor air pollution.

People react differently to different types of air pollution. Young

children and elderly whose immune systems relatively weaker, are often more sensitive to pollution. Conditions such as asthma, heart disease, and lung disease can be made worse by exposure to air pollution.

Name one short-term effect and one long-term effect caused by air pollution

Short-term effect: _____

_____

Long-term effect: _____

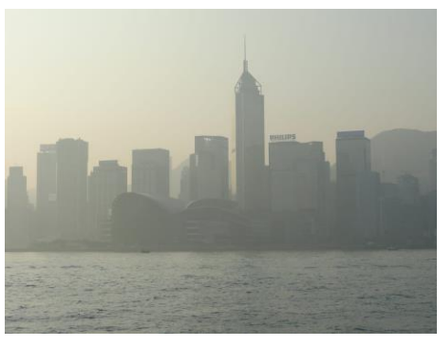
_____

Source: https://education.nationalgeographic.org/resource/air-pollution/

6. <u>Does Hong Kong have smog?</u>

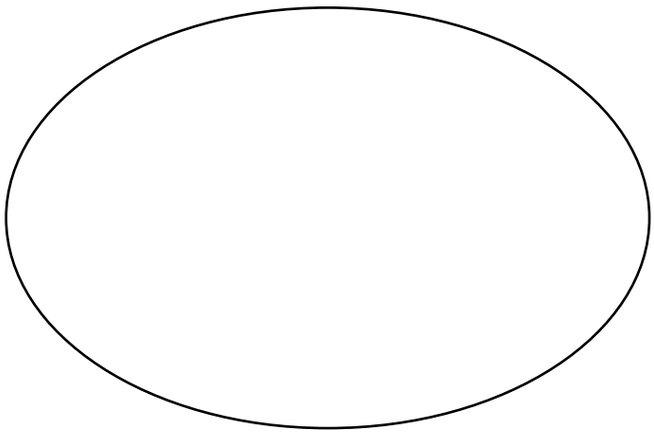
How bad is the air quality in Hong Kong?

The quality of air in Hong Kong is considered a serious matter. For over 30 per cent of the year, visibility is less than 8 kilometres. **Haze is often seen** hanging over the city which **can last for several days**, depending on the direction of the prevailing winds.

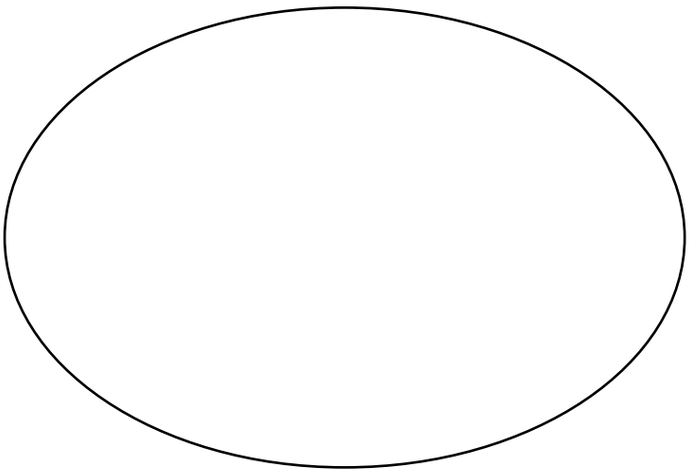


7. <u>How can we protect ourselves from air pollution</u>? 🤔

When we go out:



Staying indoors:



8. <u>Let's do some research</u>:

I collected information relating to air pollution from the website(s)/video(s).

***Source 1*: _____**

Content of information: _____

_____

***Source 2*: _____**

Content of information: _____

Do you believe the above information? Why?

_____

_____

9. <u>Summary (presentation and peer evaluation)</u>

After organising the information, I have the following conclusion and suggestions.

Conclusion:

After groups discussion and research, I concluded that

_____

_____

_____

Suggestions: (about people and the environment)

I have the following suggestions, _____

_____

_____

_____

_____

10. What is air purifier?

1. How does an air purifier work? Research it online.

What can the air purifier filter away?

☐ Mold ☐ Odor ☐ Pollen

☐ Dust mites ☐ Dust

☐ Bacteria ☐ Smoke ☐ Others: _____

2. What materials can be found in an air purifier?

Material	Functions

11. STEAM activity

Activity:	Design and make an air purifier to improve the indoor air quality.
Objective:	To investigate the effectiveness of the DIY air purifier.

Test: the dust filtering performance of different materials. (1st test)

- **Divide students into 4 groups, each group will be assigned to test 1 material**
- **Collect all the data after testing to analyze the filtering performance**

a. Place different material on top of a device (each group will choose 1 material for testing)

b. Place 3 incenses in the box to simulates dirty air

c. Burn the incenses for 2 minutes to accumulate dirty air

d. uses the PM2.5 sensors to see the performance of filtering

e. record the readings (take 10 readings)

f. teacher will do the same experiment but without any material as a control device for comparison.

Data recording (please record the 10 readings)

	Readings of Cotton pad	Readings of Duster paper	Readings of Coffee filter paper	Readings of Other everyday item _____
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Use a Microsoft excel form to find the average

The average is _____.

Material	*Dust filtering performance (use PM2.5 sensor)* ***Average reading***	*Control device performance*	*Calculate the differences (compare the readings found in performance)*
Cotton pad			
Duster paper			
Coffee filter paper			
Other everyday item: _____			

Besides using PM sensors to measure, what other aspect would we like to measure?

_____

_____

12.Based on the test result, choose the materials listed in P.12,13 to make a DIY air purifier.

1.How will you arrange the materials to maximize the performance of the air purifier?

2.What are the placement of the materials? Why?

3.You can choose different materials and the number of layers of the materials

Draw the DIY air purifier below.

13. Prediction

What result will you get?

---

14. Test the filtering performance of DIY filter. (1st test)

	Readings		Readings
1		6.	
2		7.	
3		8.	
4		9.	
5		10.	

Use a Microsoft excel form to find the average

The average is _____.

15. Improvement

How can you improve the performance of the air purifier? Discuss with other group members and think about the following points.

1. What would we like to change?

_____

_____

16. Test the filtering performance of DIY filter. (2nd test)

	Readings		Readings
1		6.	
2		7.	
3		8.	
4		9.	
5		10.	

Use a Microsoft excel form to find the average

The average is _____.

Conclusion:

The performance of the modified DIY air purifier (improved / did not improve).

17. Group presentation

Group name	Creativity	Purifier performance	Appearance
	✧ ✧ ✧	✧ ✧ ✧	✧ ✧ ✧
	✧ ✧ ✧	✧ ✧ ✧	✧ ✧ ✧
	✧ ✧ ✧	✧ ✧ ✧	✧ ✧ ✧
	✧ ✧ ✧	✧ ✧ ✧	✧ ✧ ✧

3✧ is the best

18. Peer evaluation

Members' name	Collaboration/attitude in group supporting	Creativity
	✧ ✧ ✧	✧ ✧ ✧
	✧ ✧ ✧	✧ ✧ ✧
	✧ ✧ ✧	✧ ✧ ✧
	✧ ✧ ✧	✧ ✧ ✧

3✧ is the best

19. Project reflection

(a) Did you and your groupmates face any problems in these steps during the activity? If yes, put a ✓ in ☐ the box.

☐ Getting the information needed ☐ Choosing suitable materials

☐ Designing ☐ Making the air purifier

☐ Measuring and testing

☐ Communicating and working with groupmates

☐ Others:

_____

(b) How did you solve the problems?

_____

_____

_____

20. Self-reflection

What did you learn from this activity? Please ✓

☐ Air pollution is serious in Hong Kong. ☐ Air pollution harms health.

☐ The EPD monitors the air quality in Hong Kong and issues warnings.

☐ I learned about the structures and principles of air purifiers on the market.

☐ I learned how to make a DIY air purifier.

☐ Skills in designing a DIY air purifier

☐ I learned how to solve problem and do not give up.

☐ I became more confidence.

☐ Others: _____