

## Lesson plan “Science Education” subject of Secondary 1-3

Duration (min)	Teaching purpose	Teaching activity	Teaching process
3'	Raise the interest of the students	Ask questions	<p>Questions:</p> <p>(1) Do you spend more time indoors or outdoors? (Students: Indoors.)</p> <p>(2) How would you feel if we close all the windows of our classroom for a long time? (Students: uncomfortable/smelly/unhappy)</p> <p>(3) Do you want to know what indoor air quality is and how to make our indoor air quality better? (Students: Yes.)</p> <p>Today we will learn more about IAQ.</p>
5'	Explain to students why indoor air quality is so important.	Exercise and questions	<p>1. Exercise: Look at the pictures in the handout and discuss: How would you feel if you were in the conditions below? (PPT slide 2&amp;3: Why is indoor air quality important)</p> <p>2. Question: Find out the places that you and your family members always stay in and evaluate the indoor air quality of these places.</p>
30'	Inform students of IAQ pollutants, their sources, how to improve the indoor air quality; the importance of ventilation	Play the video and use questions and matching exercise	<p>1. Play the video (20 mins);</p> <p>2. Finish the matching exercise in the handout (10 mins) (PPT slide 4 shows answer)</p> <p><b>Conclusion: It is important to maintain good ventilation for good indoor air quality.</b></p>
10'	Inform students the relationship between PPMV and %.	Ask questions and discussion	<p>1. Now every student has learned about the importance of indoor air quality and common pollutants. Do you know how to improve our indoor air quality to make it better?</p> <p>2. Calculation: Unit of CO<sub>2</sub> concentration (PPMV) VS percentage (%). (Answer: CO<sub>2</sub> ≈ 390 PPMV ≈ 0.039 % in the air)</p>
12'	Discuss the importance of ventilation, Conclusion	Worksheet	<p>1. Distribute the worksheets to the students, given the formular, and provide 5 points, ask students to plot the chart. (PPT 7 shows the answer)</p> <p>2. Emphasizes the importance of ventilation, because according to the formula <math>C = C_o + G/V</math>, if V decreases, C will increase.</p>
			<i>More information can be found in some websites mentioned in Handouts-teacher's edition.</i>

## Teacher's Supplement Information

The indoor air quality is a function of the background concentration of a pollutant  $C_0$ , pollutant generation rate  $G$  and ventilation rate  $V$ . The concentration of a pollutant in a house can be estimated by the following formula (Assume the pollutant is not captured or transferred to other substances during process):

$$C = C_0 + G/V$$

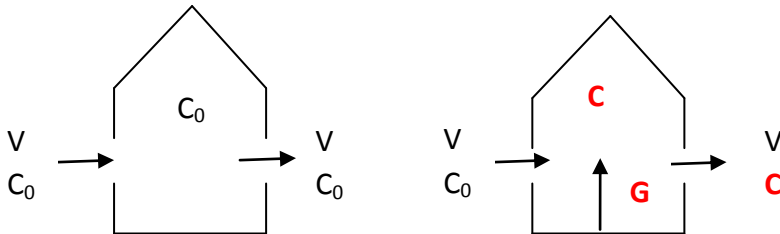
where  $C$  = concentration of a pollutant in the house ( $\mu\text{g}/\text{m}^3$ )

$C_0$  = background concentration of that pollutant in the ventilation air ( $\mu\text{g}/\text{m}^3$ )

$G$  = generation rate of the pollutant inside the house ( $\mu\text{g}/\text{min}$ )

$V$  = ventilation air flow rate ( $\text{m}^3/\text{min}$ )

The above formula is based on Mass Conservation Law of that pollutant:

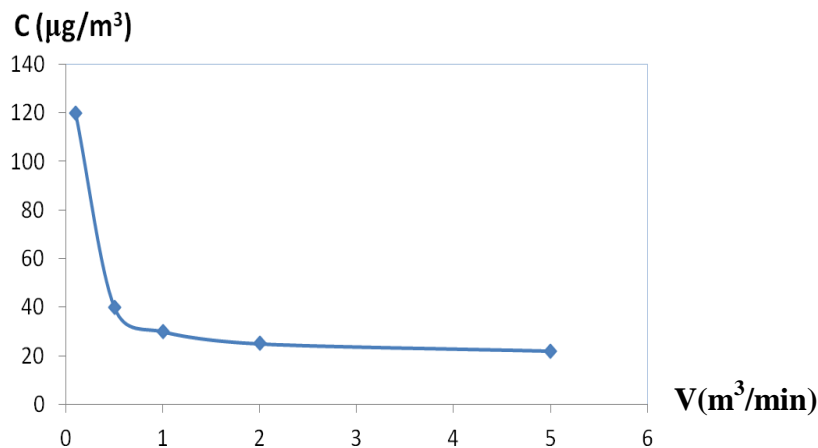


$$VC = VC_0 + G \quad \longrightarrow \quad C = C_0 + G/V$$

**Reference answer of the worksheet exercise :**

If  $C_0 = 20 \mu\text{g}/\text{m}^3$ ,  $G = 10 \mu\text{g}/\text{min}$ ,  $V = 0.1, 0.5, 1, 2, 5 \text{ m}^3/\text{min}$ , Please calculate  $C$  and plot the curve:

$V(\text{m}^3/\text{min})$	0.1	0.5	1	2	5
$C(\mu\text{g}/\text{m}^3)$	<b>120</b>	<b>40</b>	<b>30</b>	<b>25</b>	<b>22</b>



# Secondary 1-3 Worksheet

The concentration of a pollutant in a house can be estimated by the following formula:

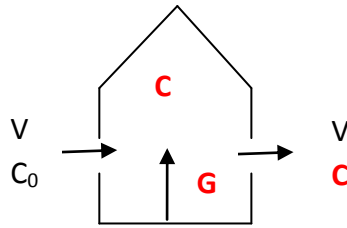
$$C = C_o + G/V$$

where  $C$  = concentration of a pollutant in the house ( $\mu\text{g}/\text{m}^3$ )

$C_o$  = background concentration of that pollutant in the ventilation air ( $\mu\text{g}/\text{m}^3$ )

$G$  = generation rate of the pollutant inside the house ( $\mu\text{g}/\text{min}$ )

$V$  = ventilation air flow rate ( $\text{m}^3/\text{min}$ )



If  $C_o = 20 \mu\text{g}/\text{m}^3$ ,  $G = 10 \mu\text{g}/\text{min}$ ,  $V = 0.1, 0.5, 1, 2, 5 \text{ m}^3/\text{min}$ , Please calculate  $C$  and plot the curve:

$V(\text{m}^3/\text{min})$	0.1	0.5	1	2	5
$C(\mu\text{g}/\text{m}^3)$					

