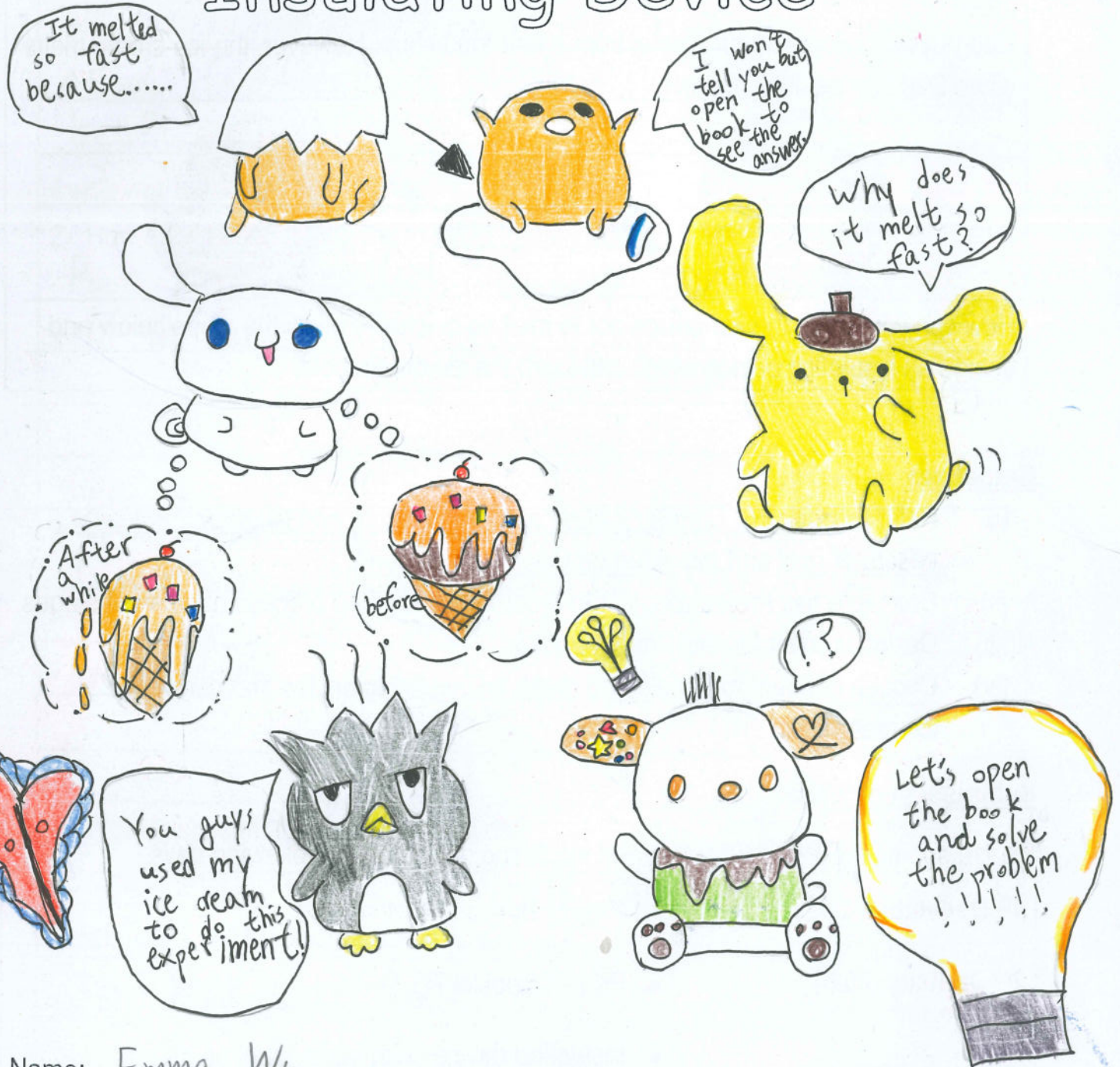


Insulating Device



Name: Emma Wu

Class: P3_Reverence

No.: (29)

Primary Three General Studies First Term Project

All Primary Three students will have to complete a General Studies Project from late November to December, 2023.

Topic: Insulating Device

Task:

Dad buys an ice-cream for Daniel from a fast-food shop. However, the ice-cream melts when Dad comes back home.



After 20 minutes...



How can you make the ice-cream not to melt so quickly? Follow the steps below and design an insulating device which can keep the ice-cream cold.

Guidelines

- (i) Refer to Book 3B: Chapter 1 Heat and Temperature and Chapter 2 Amazing effects of heat and the video on Google classroom.
- (ii) Complete this Project Booklet to record your learning process at different stages.
- (iii) Design a cover for this Project Booklet.
- (iv) Choose different materials and make an insulating device that can keep ice-cream cold.

Submission of work:

Please submit the Project Booklet and insulating device on the following days.

4 th December, 2023	<ul style="list-style-type: none">• Project Booklet Pg. 1 -76
2 nd January, 2024	<ul style="list-style-type: none">• Project Booklet Pg. ^{8 14}9-15• Insulating device (with name label on it)

Be active and creative!

Date: 2nd December, 2023

A. Collecting information. (4 marks)

Think about the following questions. Collect information about **heat conductivity** and **heat insulation** from different sources such as websites, videos, books and magazines. Answer the following questions and list out the sources of information.

1. Why does ice-cream melt?

When ice-cream is exposed to a temperature above its freezing point, its molecular structure begins to break down, causing it to melt.

(information from google) \wedge Heat is transferred from the environment to the ice-cream.

2. How do we keep things warm / cold in daily life?

Poor heat conductors can keep things warm or cold in daily life.

3. What materials are usually used for keeping things warm / cold?

Usually we used poor heat conductors materials to keep things warm or cold e.g. cloth, styrofoam, corrugated paper.

4. What is special about these materials?



They transfer heat slowly and are poor heat conductors. (information from General Studies textbook)

***Please note that some insulating bags have a shiny and silvery layer inside. However, this is using another scientific principle about heat but not because of heat conductivity.*



Source of information:

(The links and QR codes in examples are only for you to access to the information easily. It is not necessary to put any links or QR codes.)

Types of information (Circle the answer)	Name of information
e.g. (Website / Book / <u>Video</u> / Newspaper / Magazine / Other: _____)	<ul style="list-style-type: none"> (Why do woolen clothes keep us warm? https://youtu.be/DWaWocvbpQI) 
e.g. (<u>Website</u> / Book / Video / Newspaper / Magazine / Other: _____)	<ul style="list-style-type: none"> (Don't Melt the Ice! Science Experiment for Kids https://frugalfun4boys.com/ice-melting-science-experiment/) 
(Website / Book / <u>Video</u> / Newspaper / Magazine / Other: _____)	<ul style="list-style-type: none"> (Who doesn't love a bowl of creamy ice cream)
(Website / Book / <u>Video</u> / Newspaper / Magazine / Other: _____)	<ul style="list-style-type: none"> (How much do you know about the proper) https://youtu.be/ZRFfN1B-D9M?si=30gFe4rr5e082WslH
(Website / Book / <u>Video</u> / Newspaper / Magazine / Other: _____)	<ul style="list-style-type: none"> (P3/4 science) https://youtu.be/0Dqd0M2sdQc?si=gNfqyWLnL9vWT7IQ
(Website / Book / <u>Video</u> / Newspaper / Magazine / Other: _____)	<ul style="list-style-type: none"> (myGuru is a learning portal that is develo) https://youtu.be/Jbm1AZCl5fo?si=OE8-usw1wc1ZehkQ
(Website / Book / Video / Newspaper / Magazine / Other: _____)	

B. Thinking. (3 marks)

1. How is heat transferred?

(Put a ✓ in the appropriate () and circle the correct answers.)

		The ice-cream is (<u>colder</u> / hotter).
(✓)	()	The air is (colder / <u>hotter</u>).
Heat is transferred from the (<u>ice-cream</u> / air) to the (ice-cream / <u>air</u>).		

2. Do all materials transfer heat at the same speed? If no, which materials can transfer heat faster? (Put a ✓ in the appropriate () and write the answers on the line.)

() Yes, all materials transfer heat at the same speed.

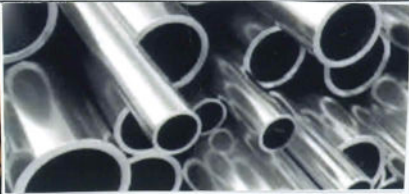
(✓) No, good heat conductors can transfer heat faster.
metals

3. (a) Are the following materials good or poor heat conductors?

(Circle the correct answers.)

<p>Cloth</p>	<p>Corrugated paper</p>	<p>Tinfoil</p>
(Good / <u>Poor</u>) conductor of heat	(Good / <u>Poor</u>) conductor of heat	(<u>Good</u> / Poor) conductor of heat
<p>Newspaper</p>	<p>Cling wrap</p>	<p>Styrofoam</p>
(Good / <u>Poor</u>) conductor of heat	(Good / <u>Poor</u>) conductor of heat	(Good / <u>Poor</u>) conductor of heat

(b) Collect **TWO to THREE** more materials base on the information you have found in Part A. Are they good or poor heat conductors? (Paste the materials or their pictures in the boxes below, write their names and circle the correct answers.)

		(Paste the materials or their pictures here.)
Other: <u>wood</u>	Other: <u>metal</u>	Other: <u>plastic</u>
(Good / <u>Poor</u>) conductor of heat	(<u>Good</u> / Poor) conductor of heat	(Good / <u>Poor</u>) conductor of heat

4. To make an insulating device which can keep the ice-cream cold, should you choose the materials which transfer heat faster or slower?

(Circle the correct answer.)

I should choose the materials which transfer heat (faster / slower).

5. Which of the **materials in Question 3(a) and 3(b)**, would you choose for making an insulating device? Why? (Write the answers on the lines.)

I would choose newspaper and styrofoam because they both are poor heat conductors. They transfer heat slowly.

6. What factors may also affect the keeping-cold function of the insulating device?

(Put a ✓ in the appropriate ().)

() Colour of the materials

() Thickness of the materials

() Shape of the containers

() Method of wrapping the container

() Others: size of containers

7. Besides the performance of keeping cold, what other factors would you think about when you design the device? (Circle the correct answers.)

My device should be...

• (light / heavy)

• (safe / not safe) to use

• (small / big)

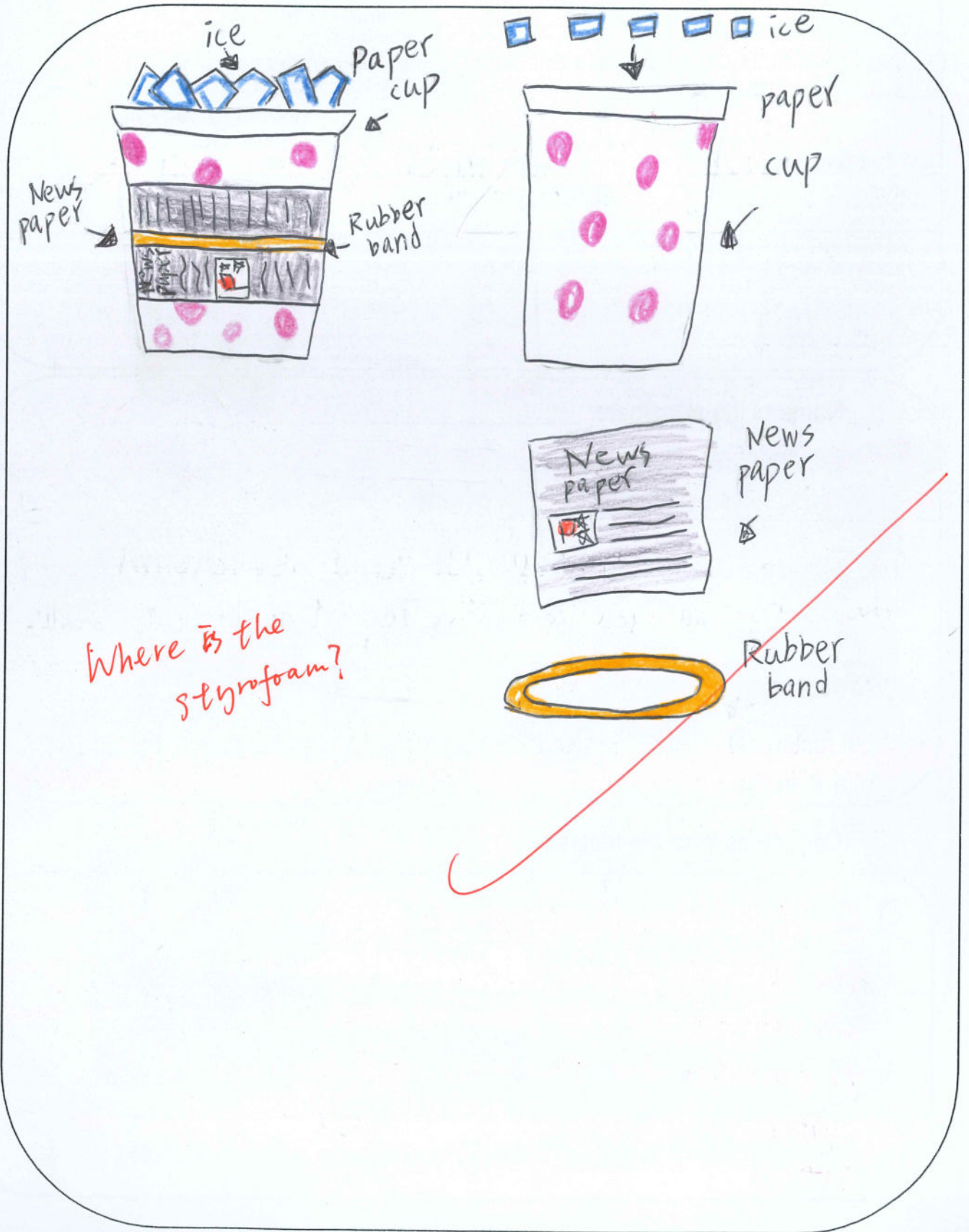
• (easy / difficult) to use

• Others: _____

C. Designing. (4 marks)

i. Design an insulating device for keeping the ice-cream cold with the materials mentioned in Part B Question 5.

1. Draw your design and label the materials used for different parts in the box below.



Date: 5th December, 2023

2. Present your design to 2 classmates. What do they think about your design?
Ask your classmates to write down their comments in the boxes below.

Name of the classmate: Sonia

Comment(s):

Your design is great! I love your design, is eco-friendly! Good to earth! And I love your drawing! ♡ ☺ You wrote too hard! ☺

Name of the classmate: Alicia

Comment(s):

Your design is beautiful, but the news paper is a bit uneco-friendly. But if it is ice, you have to make sure that you pour the ice out at the same time because you can't wait for the ice to melt, so if you pour the ice out of the containers one by one, the ice in the other cup will have time to melt.

3. Comments from the teacher

Good to use newspaper to be the material for the insulating device. Just to think about whether you will still use the styrofoam as well. Also, you may need to consider the thickness and coverage of the materials. You may need to use more newspaper for better performance.

Date: 31st December, 2023

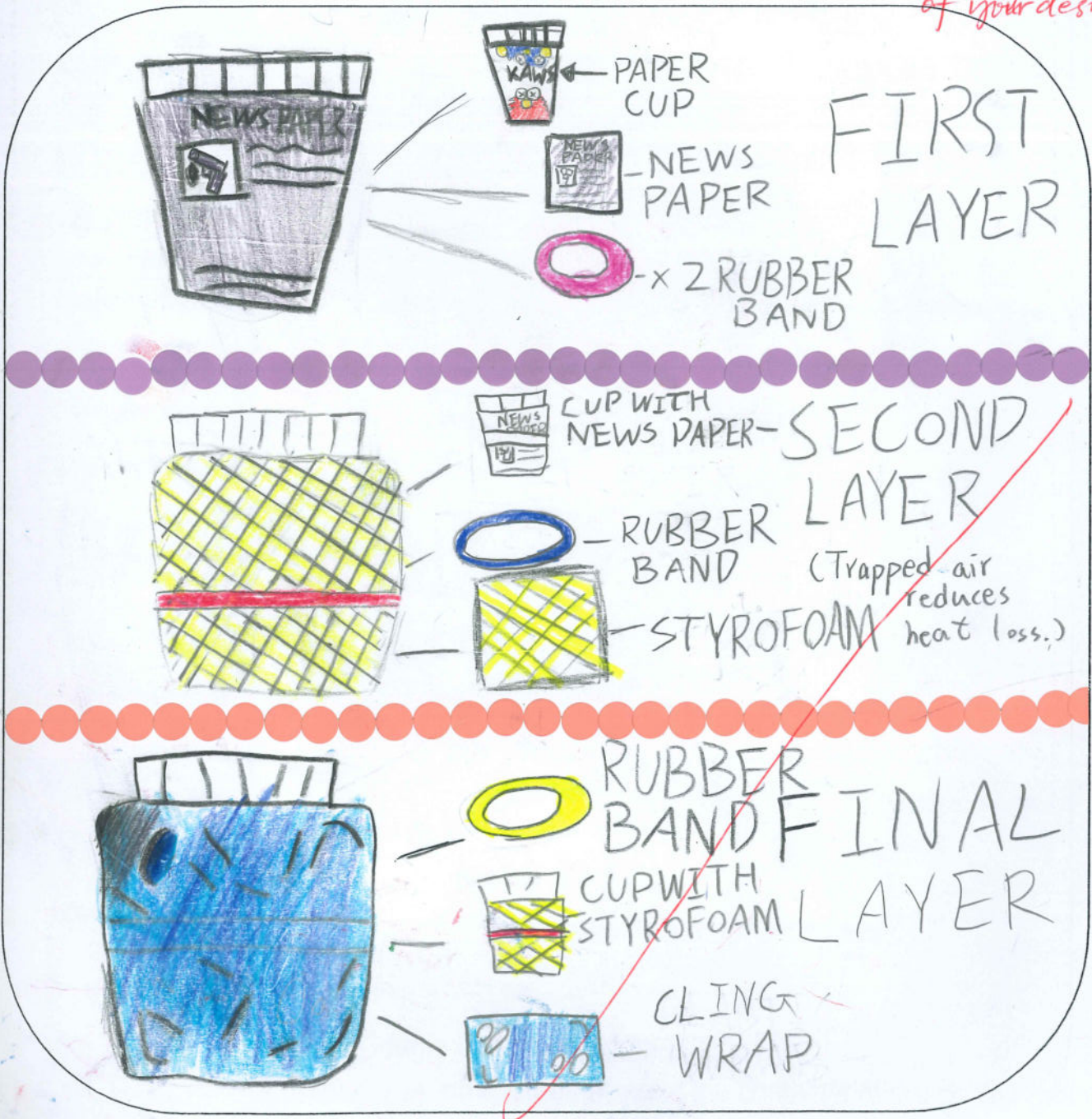
ii. Modification of your insulating device.

Regarding the comments from classmates and teacher, would you like to modify your design? (Put a ✓ in the () to show your choice.)

() Yes, I would like to modify my design in this way.

(Draw your modified design and label the materials used for different parts in the box below.)

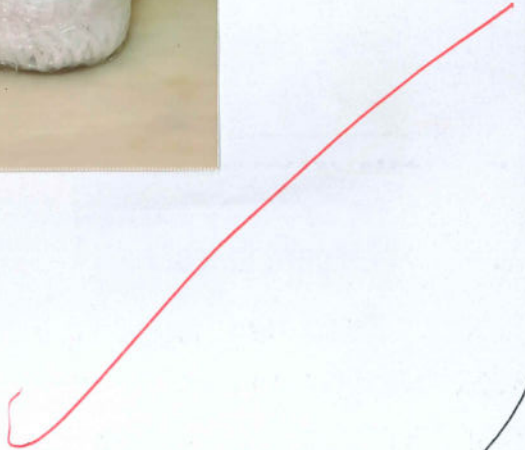
Very detailed illustration of your design!



() No, my design is good enough. I would not like to modify my design.

D. Making. (2 marks)

Make your insulating device according to your design.
Take a picture and paste it in the box.



(a) Take **CLEAR** pictures at the beginning and at the end of experiment. Paste the pictures in the boxes below.

At the beginning of the experiment:

Ice cubes in my insulating device



Ice cubes in the container of the control group



After 15 minutes:

Melted water from my insulating device



Melted water from the container of the control group



(b) Results (Circle the correct answers):

- (More / Less) ice cubes have melted in my insulating device.
- My device (can / cannot) keep ice-cream cold.

(c) Why does your device work or not work?

After 15 minutes test, melted water from my insulating device is 0.8ml. While melted water from the container of the control group is 10.6ml, which proves that my device work.

*Why your device work?
is it because you've used
the poor heat con
as the mat*

F. Improvement. (2 marks)

1. Think about your device. Besides the performance in keeping cold, is your insulating device... (Circle the appropriate answers.)

- (a) reusable? (Yes / ~~No~~)
- (b) easy to use? (~~Yes~~ / No)
- (c) safe to use? (~~Yes~~ / No)
- (d) beautiful (~~Yes~~ / No)

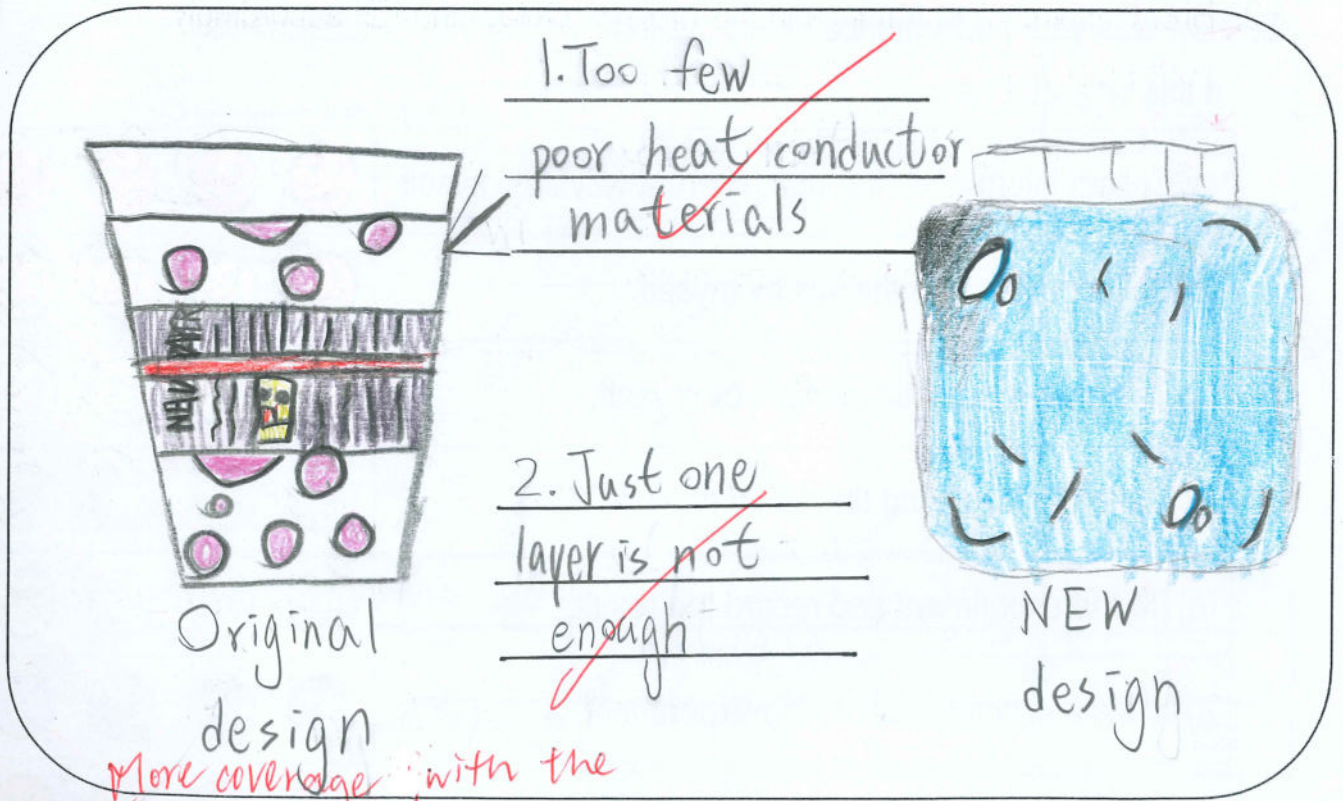
2. What do you want to improve for your insulating device?

(Put a ✓ in the appropriate ().)

- () The performance of keeping cold.
- () The convenience of using my insulating device.
- () The safety of my insulating device.
- () The look of my insulating device.
- () Others: _____

3. What changes do you want to make in order to make your insulating device better?

(a) Draw and label your modified design in the box.



(b) What has been changed in your new design?

More coverage with the
Poor heat conductor materials is a lot more coverage, even at the bottom, and the layers have changed from one to three.

conductor materials?

G. Self-evaluation and Reflection. (5 marks)

1. Did you face any difficulties in the following steps? Put a ✓ in the () if you had this difficulty and write down how you solved the problems.

Steps	Ways to solve the problems
(✓) Getting information	Search for different results from the Internet
(✓) Choosing materials	Search online for different material characteristics
(✓) Designing	Discussion with parents discussion
(✓) Making	The first one didn't work, so I try and try until the final design.
(✓) Testing	Use an electronic scale to display the test results clearly.
() Others:	yes! science experiment is about trial and error!

2. How was your performance in this project? Colour the ☺ accordingly.

In this project, I can...

(a) Collect information through different ways by myself.	☺ ☺ ☺ ☺
(b) Collect different materials by myself.	☺ ☺ ☺ ☺
(c) Design the insulating device by myself.	☺ ☺ ☺ ☺
(d) Make the insulating device by myself.	☺ ☺ ☺ ☺
(e) Do the experiment and record the result.	☺ ☺ ☺ ☺
(f) Draw a conclusion from the experiment.	☺ ☺ ☺ ☺
(g) Apply what I have learnt in the lessons.	☺ ☺ ☺ ☺
(h) Solve the problems by myself.	☺ ☺ ☺ ☺

Good applying what you've learnt to your daily life!

3. What have you learnt from this project?

Be aware of the differences in materials. Good or Poor conductor of heat.

It reminds me my clothes are made out of different materials, will have different

4. Which part of the project do you like most? Why? *warm effects, which I don't notice in my daily*

I love the hands-on experiment and every change to the device brings new discovery to me. life.

The difference between the materials is something I don't usually notice.

5. Do you like this project? Why?

I love doing this project. It is exiting to try on the various materials for insulating effects. I also love doing the experiments as my parents are very helpful. They give me a lot of guidance and

Other assessment criteria:

suggestions.

- Creativity and eco-friendliness (3 marks)
- Bonus (2 marks)

A lot of efforts are shown in this project! Well done!
It is good to see that you can apply what you've learnt from this project in everyday life. Science is everywhere



Marks

Worksheet		
Part A. Collecting information	4	14
Part B. Thinking	2.5	13
Part C. Designing	3.5	14
Part D. Making	2	12
Part E. Testing	4.5	15
Part F. Improvement	2	12
Part G. Self-evaluation and reflection	5	15
Creativity and eco-friendliness	2.5	13
Bonus	2	12
Total	28	130

around us. Good to hear more discovery from you!