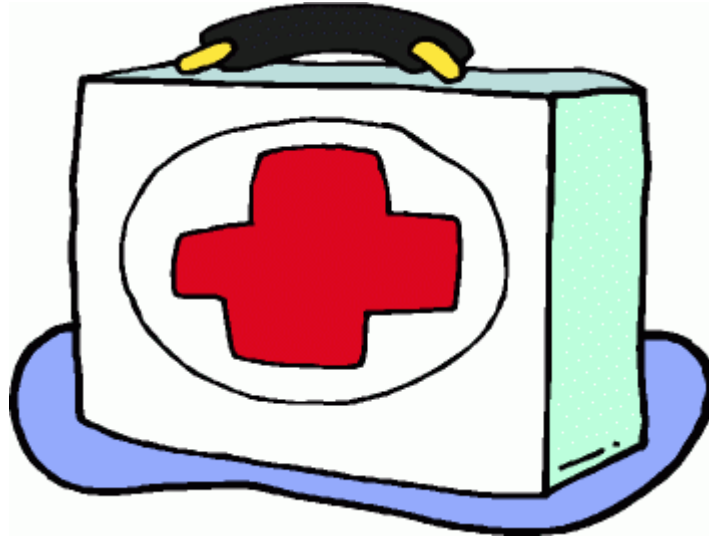


MEDICAL MISSION DESIGN WORKBOOK

Year 4



STUDENT WORKBOOK

Name: _____

Other group members: _____

Group Number: _____ Class: _____



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

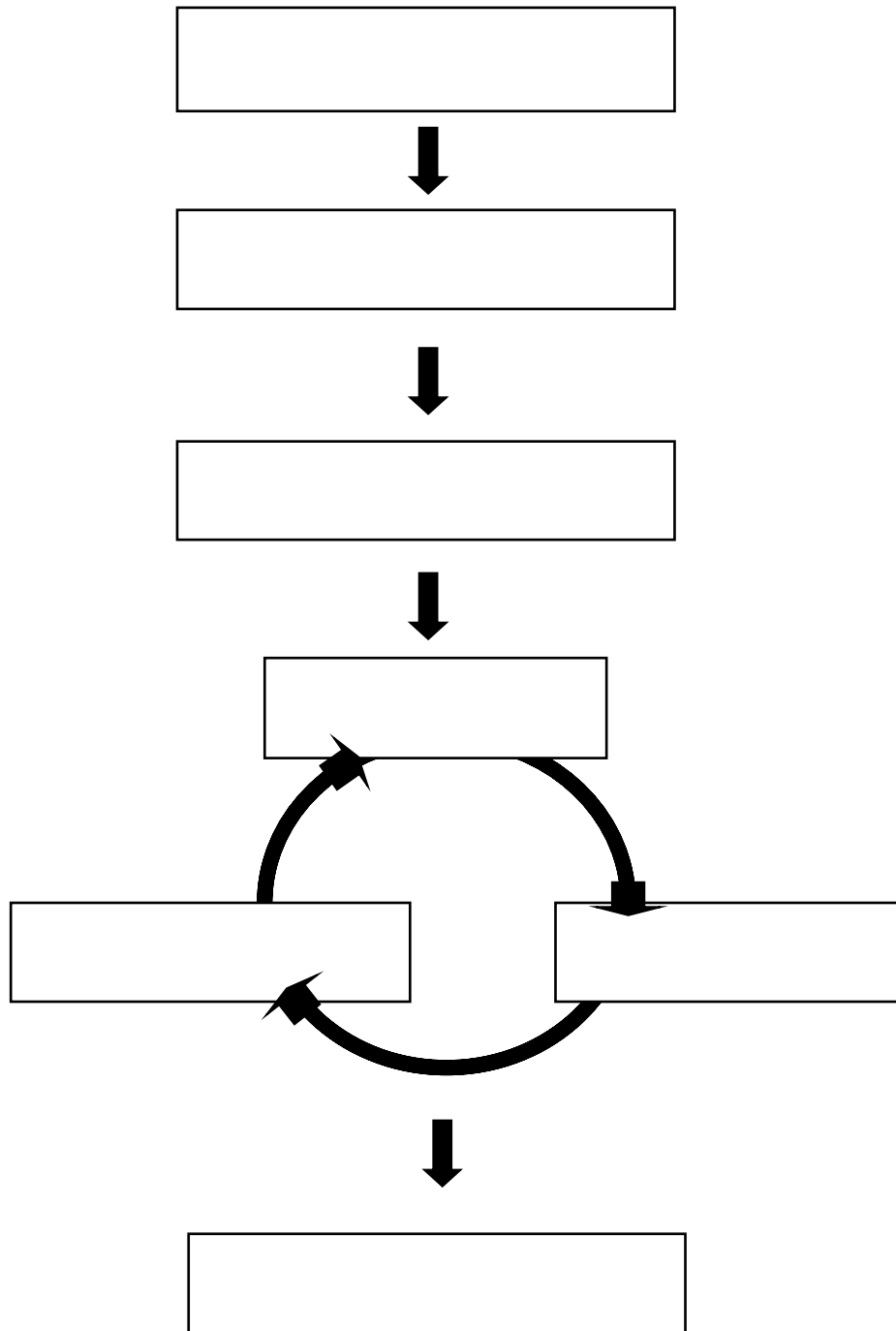
PART 1

ENGINEERS WORKING WITH MATERIALS



1. **Complete** the engineering design model below.

ENGINEERING DESIGN MODEL



Adapted from pbs.org model



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

THE PROBLEM



2. **Read** about the problem you will be solving:

To design and make a strong, covered 3D shape to carry medicines (such as eye drops) at a cool temperature from a helicopter to an injured person in the rainforest.

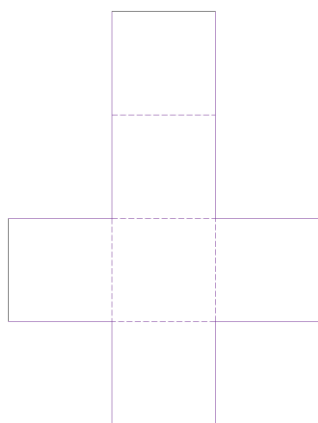
Before you start on your design, you will learn about some things that will help you with your design.

EXPLORING 3D SHAPES

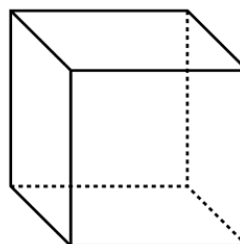


3. Try to **make** a cube. **Cut** along the lines of the net of a cube but do NOT cut the dotted lines. **Fold** the dotted lines to make a cube.

Trace around the edges. **Trace** over the faces. **Point** to the vertices (corners).



Net of a cube



Cube



Describe the cube. Think about the faces, edges and vertices.



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...



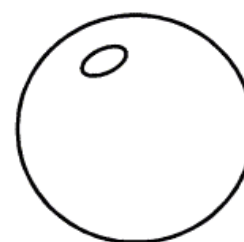
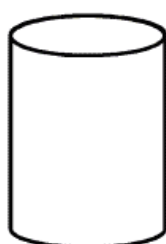
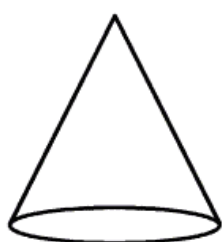
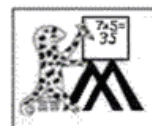
4. **Explore** regular 3D shapes (a cuboid is also known as a rectangular prism).

- Can you identify objects with these shapes in your classroom or outside environment?
- Can you tell how many edges, faces and vertices there are for each shape?

Name

Date

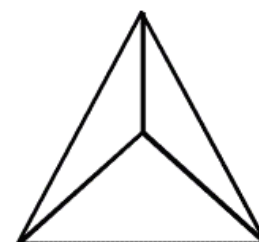
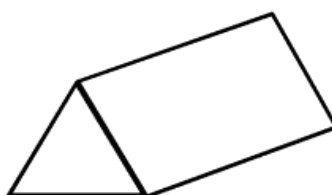
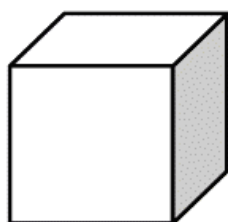
3D SHAPE SHEET



cone

cylinder

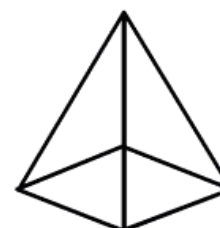
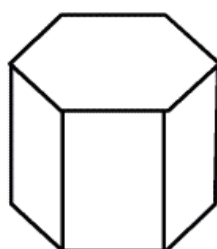
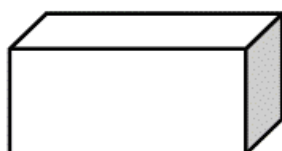
sphere



cube

triangular prism

triangular based pyramid



cuboid

hexagonal prism

square based pyramid



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THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

TEMPERATURE



5. **Draw** a picture to show the different temperatures.

Remember: 0°C is the freezing point for water and 100°C is the boiling point for water.

0°C	25°C	100°C

STATES OF MATTER



6. **Watch** the video explaining how *water* has three different states.

Watch the videos about the three states of *matter*.



Role play the three states of matter.

TESTING THE PROPERTIES OF MATERIALS

“*Properties*” means how the material looks, feels, and behaves with different push and pull forces.



7. Look at the “**Testing the Properties of Materials**” table on the next page.
Your task:
- Predict** what will happen to the material and *underline* YES, UNSURE or NO.

- b. **Observe** what happens to the material and *circle* YES, UNSURE or NO.
- c. **Explain** to your group what happened and why.



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

Predict –underline
 Observe – circle
 Explain to group

Testing the Properties of Materials

Material	Squash			Stretch			Twist			Scratch it			Waterproof		
	Yes	Unsure	No	Yes	Unsure	No	Yes	Unsure	No	Yes	Unsure	No	Yes	Unsure	No
Aluminium (metal)															
Paper															
Plastic															
Fabric															
Polyfoam															



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...



What material will you choose to cover your 3D shape to stop the ice from melting so quickly?



Why did you choose this material?





THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

PART 2

THE PROBLEM AND DISCUSSING RESOURCES

8. **The problem:**

Remember the problem to solve for the **MEDICAL MISSION...** That is, design and make a strong medical kit (covered 3D shape) to carry medicine to an injured person. The aim is to keep the medicine safe and cool.

Materials:

- 16 pipe cleaners (10cm long)
- 16 straws (5cm long)
- Material to cover the container (foil, paper towel, bubble wrap, fabric, polyfoam)
- Scissors
- Sticky tape

Instructions:

- Use the straws and pipe cleaners to make any 3D shape – regular or irregular. You can strengthen this shape in any way you want with the resources provided. This shape will become your medical kit and will be used to keep the medicine in.
- You can join pipe cleaners by bending and twisting them around each other.
- Cover your container with your chosen material.
 - Use scissors to cut your material to fit your container.
 - Use sticky tape to attach the material to your container.
- Your container needs to have a lid/door/opening flap so that you can place your ice cube inside.



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

DESIGNING AND MAKING THE MEDICAL KIT

9. **Design** a strong medical kit (covered 3D shape) as a container to carry medicine. **Draw** and **label** your design below.



Build your medical kit.



Now, **draw** and **label** your design *after* making it.



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...



Record answers to the following questions about your design.

a. What do you think is good about your design?

b. Will your medical kit be strong enough to carry the medicines? **Why** or **why not**?

c. **Why** do you think the covering will work to keep the medicine cool?

Extension: **Describe** your design.



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

TESTING THE COVERING OF THE MEDICAL KIT DESIGN – STAGE ONE



10. Follow the instructions below to **test** the covering of your design.

- a. Carefully take your medical kit (covered 3D shape design) outside along with your booklet and pencil.
- b. Set it up in direct sunlight and out of the wind.
- c. One for the whole class - Take an ice cube and put it in a small 30mL plastic container. Leave this one in the direct sunlight. This is known as the *control*.
- d. Take another ice cube and put it in another small 30mL plastic container. Place it inside your medical kit and close it.



e. **Record** the time and temperature below.

Time: _____ Temperature: _____

DISCUSSIONS DURING TESTING – STAGE ONE

11. While you are waiting for the class ice cube (*control*) to melt, you can do the following:



Observe other students' 3D designs. **Discuss** these designs.

Learn how to use the syringe to measure in mL.



When the *control* ice cube has melted, **watch** while the remaining water is measured in mL.



Record the amount of water for the *control* in mL.

_____ mL



Work with other group members to **measure** the amount of water left for each of your 3D designs.

- Be careful when removing the 30mL container from your medical kit.
- Use a syringe to draw up the remaining water.



Record the amount of water from your container in mL.

_____ mL



THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

RECORDING RESULTS – STAGE ONE



12. **Record** the class results in the table below.

Table 1. Material and melted ice cube measurement

Material	Melted ice in sunlight: mL Temp: °C			
	0mL to 2mL (most effective)	>2mL to 5mL	>5mL to 8mL	>8mL (least effective)
Aluminium				
Paper				
Plastic				
Fabric				
Polyfoam				





THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

TESTING THE STRENGTH OF THE MEDICAL KITS – STAGE TWO



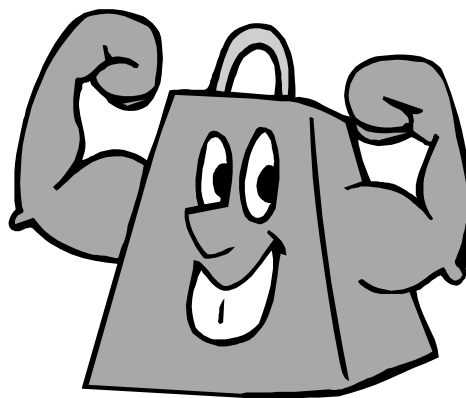
13. Follow the instructions below to **test** the strength of your design.

- a. In your group, two students hold a piece of cardboard on top of a medical kit.
- b. The owner of the medical kit places weights on top of the cardboard directly over the medical kit.
- c. When the medical kit starts to fold (collapse) or the cardboard begins to move downwards while loading, the owner of the kit adds up the weights, including the weight of the cardboard (15g).



Record each group member’s name and measurement in grams (g) in the table below.

Name:	Name:	Name:	Name:
g	g	g	g





THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

EVALUATION AND REDESIGN

14. **Record** answers to the following questions about designing and testing your medical kit.

a. What did you learn from designing and testing your medical kit?

b. What would you like to change in your medical kit design?





THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...



If you could use any materials at all, how would you **redesign** your medical kit?

Draw and label a picture below.



Why would this new design be better?



























THINKING SPACE

... drawings, diagrams, observations, notes, reflections ...

MEDICAL MISSION FEEDBACK

15. Please **colour in the face** to show how you felt about the different parts of the *Medical Mission*.

Did you like:	Did not like it	Not sure	Liked it
1. ... the activity about a Medical Mission?			
2. ... having a real problem to solve?			
3. ... testing the different materials?			
4. ... designing a 3D shape?			
5. ... making a strong medical kit?			
6. ... testing your medical kit?			
7. ... recording the results of your medical kit?			
8. ... thinking about how to make your medical kit better?			

Next time I would like to:
