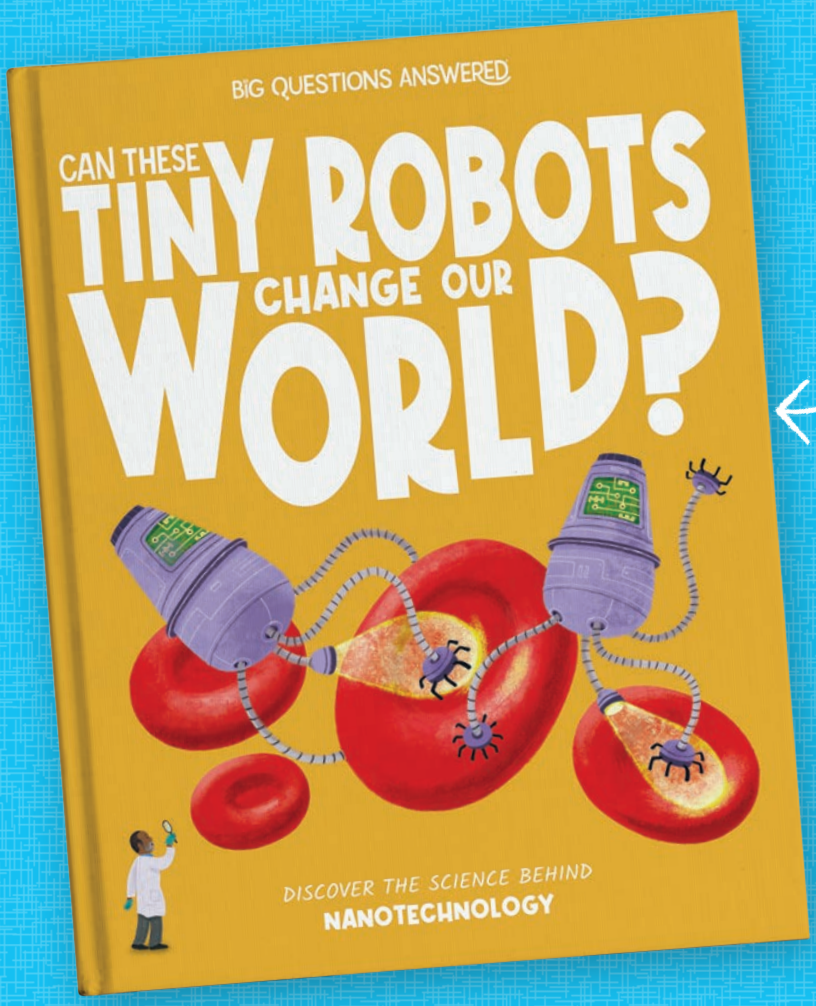
BIG QUESTIONS ANSWERED

YOUNG NANOTECHNOLOGISTS' ACTIVITY PACK



Full of fun and exciting activities to accompany this book!

CONTENTS:

Picture Credits:
(t = top, b = bottom, m = middle, l = left, r = right)

Shutterstock - KaterynaKon 14BR; Koya979 14BL; Leo Matyushkin 14BLM; Robert Davies 14BRM

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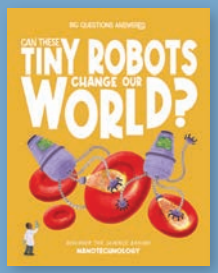
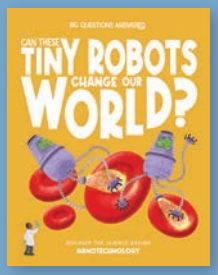


NANO TRICKSTERS

That sneaky nanobot is playing games with us! Can you spot the 6 differences between the two scenes? Circle them when you spot them.

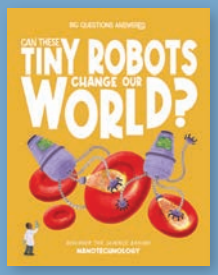


MICROSCOPIC WORD HUNT

Scientists use all sorts of words when learning about nanotechnology! Can you find and circle the words listed below, in the grid. Words can be found in any direction (including diagonals) and can overlap each other.

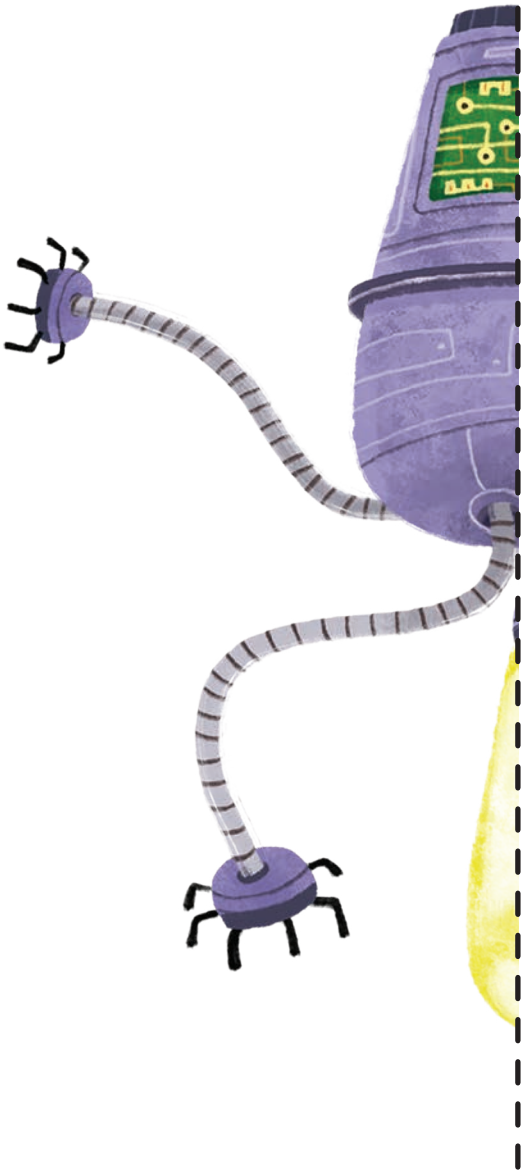
N	F	L	O	N	A	I	P	M	E	T	A	L	U	I
E	A	K	C	H	I	P	Z	O	E	R	T	Y	L	O
C	W	N	A	Y	U	M	H	L	H	N	I	M	P	K
P	F	E	O	S	I	R	T	E	G	B	N	F	V	D
C	O	Q	W	S	S	X	A	C	Z	E	V	H	A	R
P	O	W	S	R	C	K	T	U	M	L	E	S	O	N
W	D	R	E	D	G	A	V	L	A	E	A	G	M	P
D	Z	U	O	R	L	T	L	E	D	C	T	E	C	H
D	U	C	W	T	F	L	R	E	F	T	D	S	A	Z
P	F	H	G	L	E	U	M	N	A	R	O	U	W	E
A	A	A	O	B	O	T	L	W	X	I	T	R	D	M
X	C	Z	D	P	U	D	L	R	W	C	U	O	O	D
P	R	O	D	X	C	A	R	B	O	N	D	T	W	U
T	I	N	Y	W	E	Y	W	A	L	L	A	A	S	D

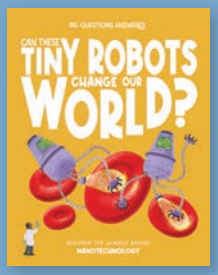
NANOBOT	CARBON	TECH
ATOM	CHIP	ELECTRIC
MOLECULE	POWERFUL	METAL
NANOSCALE	INVENT	TINY



SMALL SCALE SYMMETRY

Nanostructures are often symmetrical at the molecular level. Below is an illustration of a half-built nanostructure – get creative and complete the drawing so it is fully symmetrical! Complete the picture by coloring it in.

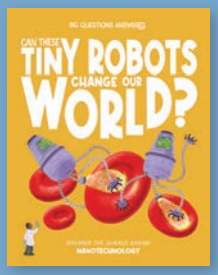




TINY TECH TALES

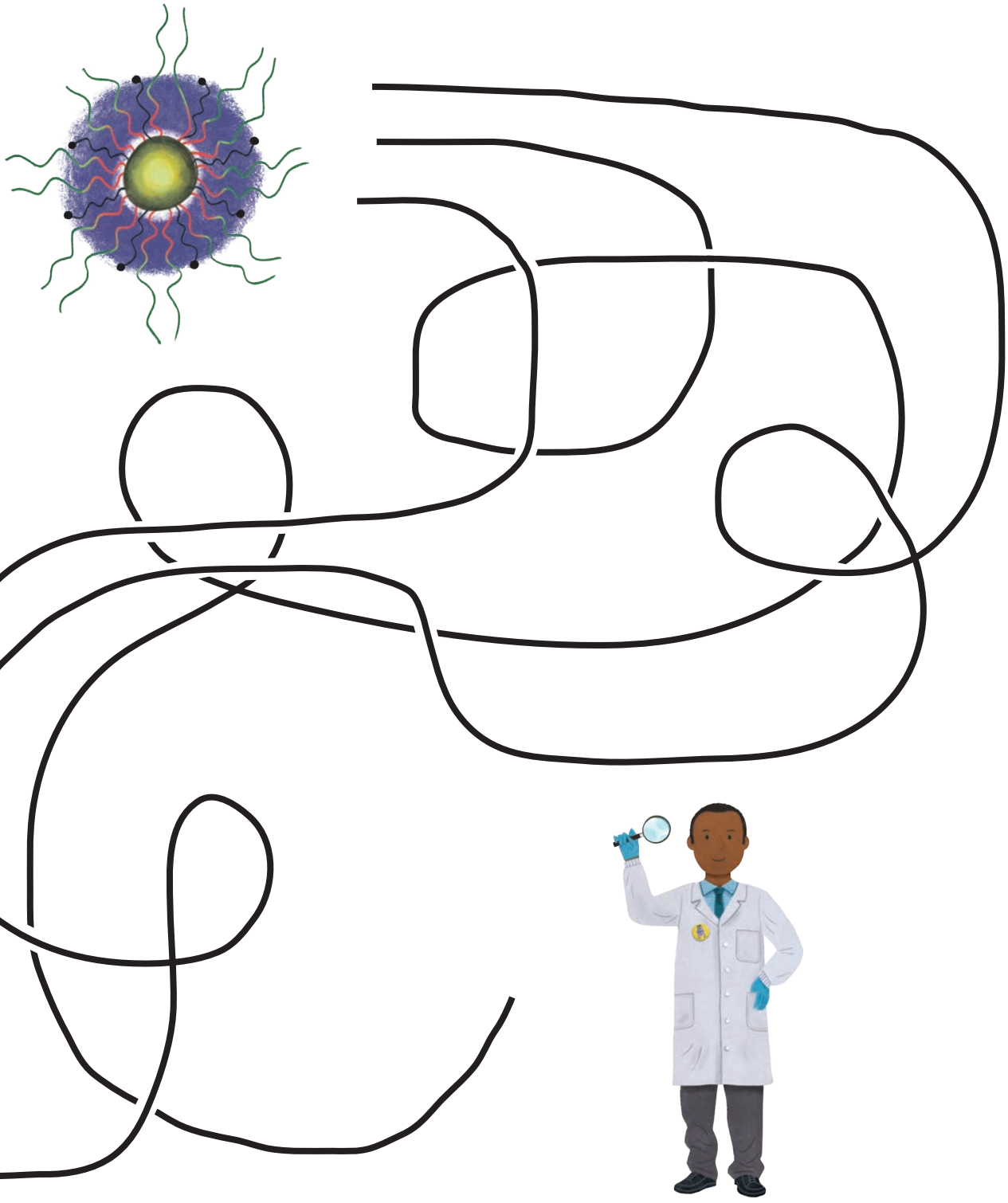
Can you write a story of your own about nanotechnology, making sure to include the 3 key words below?

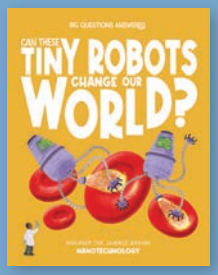
NANOBOT **NANOSCIENTIST** **NANOSCALE**



RACE TO RECHARGE

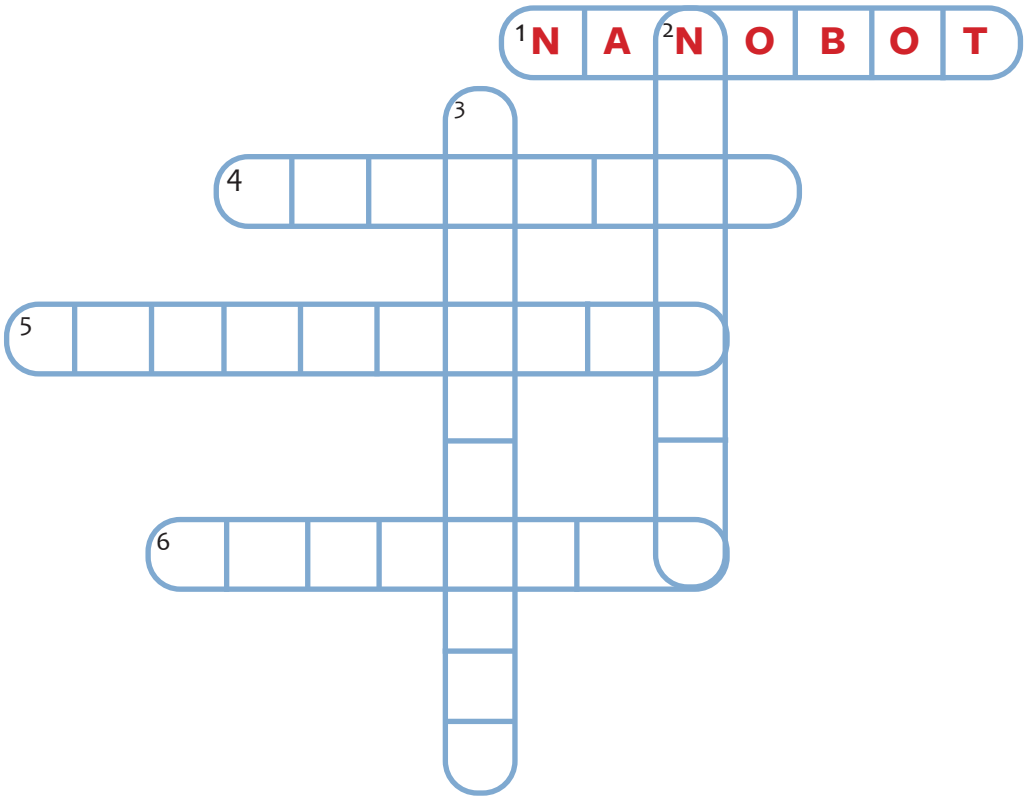
A nanobot has wandered too far from its charging station and is trying to find its way back to its inventor. Can you help the nanobot find its way back to recharge?





CHANGING WORLD

Scientists use lots of words to describe nanotechnology. Use the clues below to work out the different terms they use and then fill in the boxes. The first one has been done for you.



~~NANOBOT~~ | MOLECULE | MEDICINE

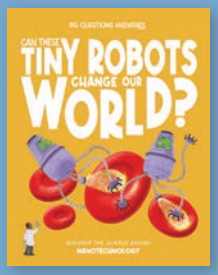
SPACECRAFT | NANOTUBE | MICROSCOPE

ACROSS

1. A robot too small to be seen without a microscope.
4. The most technical field nanobots can assist in.
5. A type of vehicle nanobots can repair.
6. A group of atoms bonded together.

DOWN

2. A material used to make electronics smaller and faster.
3. A piece of equipment you would need to see a nanobot.



NANOTECH DISCOVERY FILE

Choose a nanobot – any you like – and see what amazing things you can find out about it! Draw your chosen nanobot, color it in, and fill in all of the information below.

Draw the nanobot in here!

This nanobot is called .....

How small is it? .....

What is it used for? .....

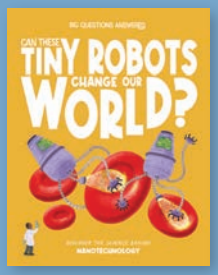
This nanobot helps with .....

Cool facts about this nanobot:

1. .....

2. .....

3. .....



NANO THINK TANK

Read the questions below and think about your own opinions before filling in your answers.

What do you find most interesting about nanotechnology?

.....

.....

.....

Would you like to see nanobots used in hospitals? Why or why not?

.....

.....

.....

If you were a nanoscientist, what would you most enjoy – inventing new nanobots, or making discoveries about new materials?

.....

.....

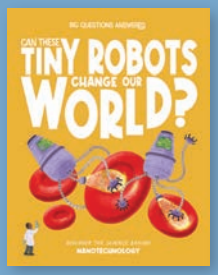
.....

What would be your big question about nanotechnology?

.....

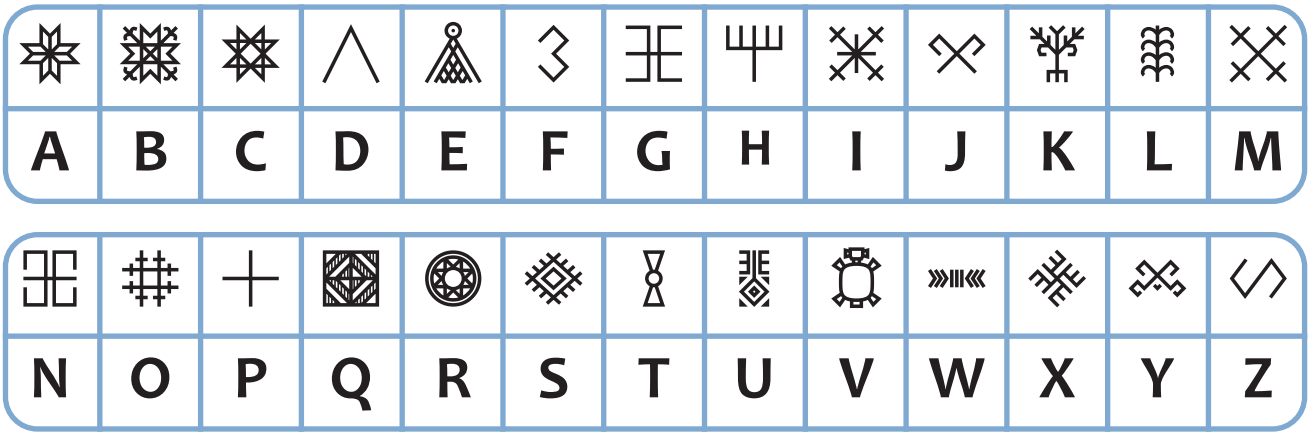
.....

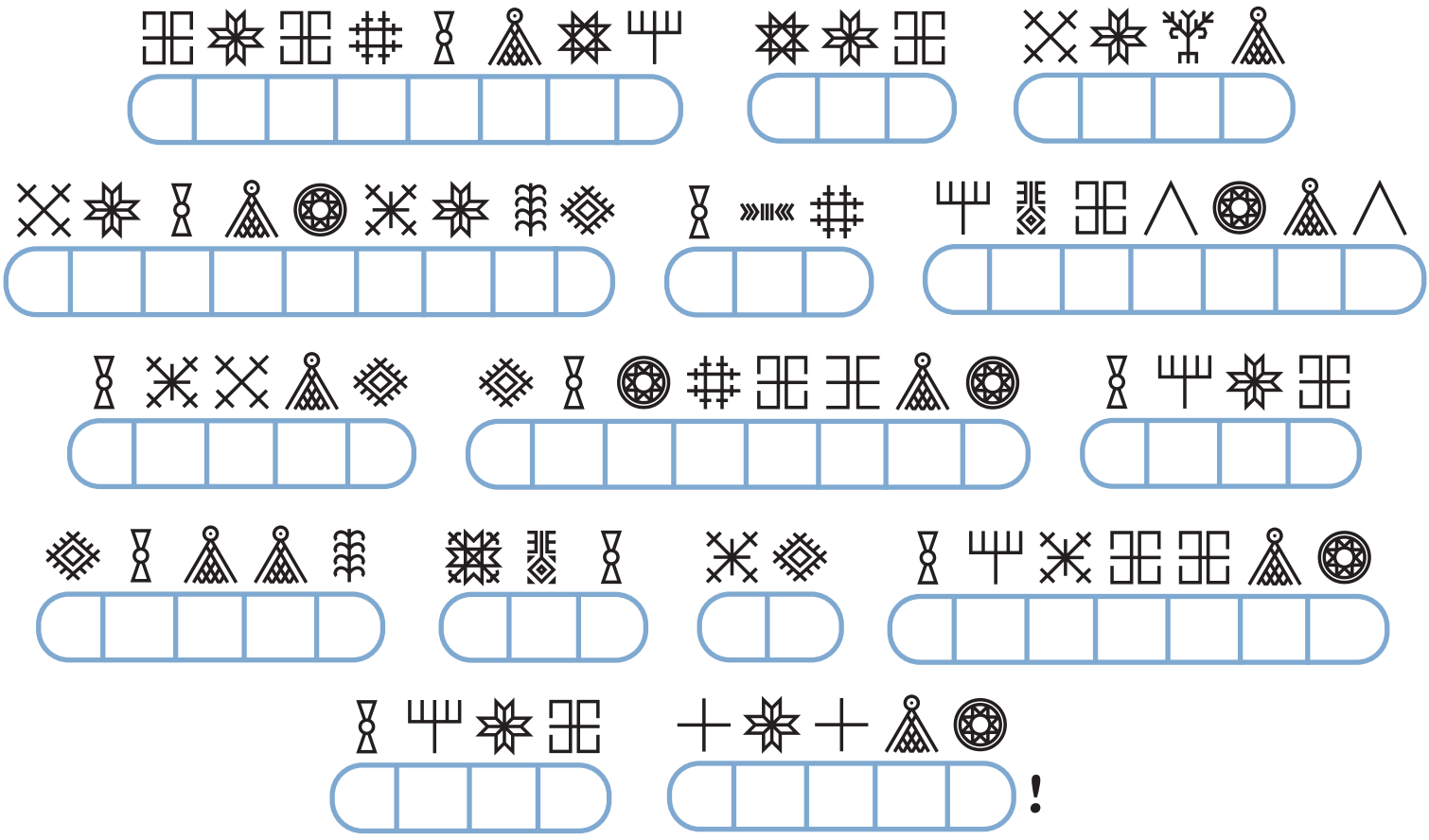
.....

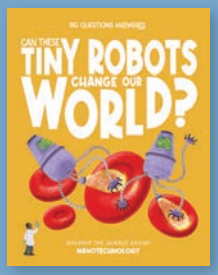


A SECRET CODE!

You are looking through a microscope when you spot a strange nanoscale code. Suddenly, you realise it's a hidden message! Can you use the code below to work out what the message says?







NANO WONDERS

Can you use the words below to fill the blanks and discover some stunning nanotechnology facts? Each answer can only be used once.

molecules **invisible** **strong**

light **computer**

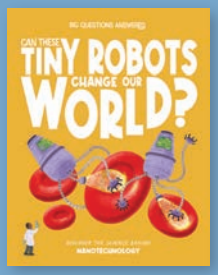
1. Nanotechnology has already been used to make faster and smaller_____ chips.

2. Some nanomaterials are so small they appear_____.

3. Carbon nanotubes are stronger than steel but very _____.

4. Graphene is so thin it's almost weightless, yet incredibly _____.

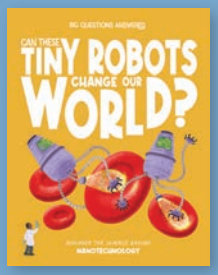
5. Nanotechnology allows scientists to move single _____ around like building blocks.



TRUE OR TINY?

Can you use what you've learned about nanotechnology to work out which of these sentences are true and which are false?

	SENTENCE	TRUE	FALSE
1	Nanotechnology works at the scale of atoms and molecules.		
2	All nanotechnology can be seen with the human eye.		
3	Nanobots may one day deliver medicine directly inside the human body.		
4	Nanotechnology is only used in medicine.		
5	Graphene is just one atom thick.		



MATCH THE MARVEL

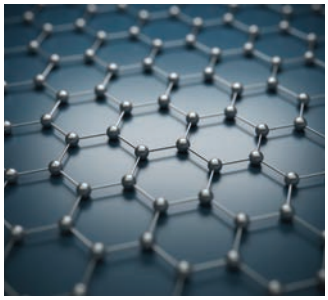
Scientists have made lots of exciting discoveries and new inventions thanks to nanotechnology. Can you match up the photograph and name of each invention with its description? Draw a line to match up the picture with the correct name.

Fact:
I am stronger than steel but lighter than plastic.

Fact:
I can be programmed to deliver medicine inside the body.

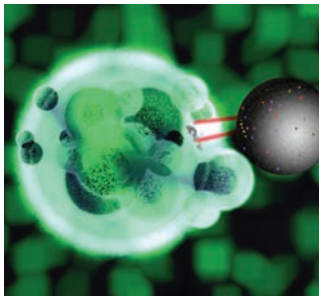
Fact:
I am just one atom thick and can conduct electricity better than copper.

Fact:
I am so small that I can change color depending on my size.

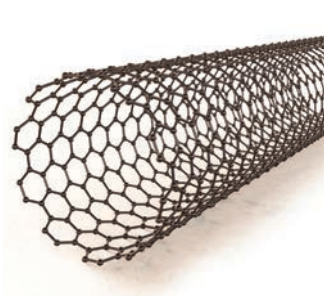


I am...
GRAPHENE

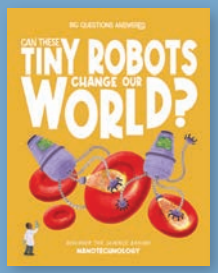
I am...
A QUANTUM DOT



I am...
A DNA NANOBOT

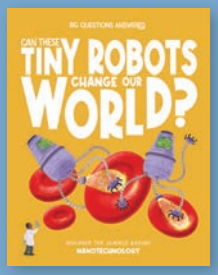


I am...
A CARBON NANOTUBE



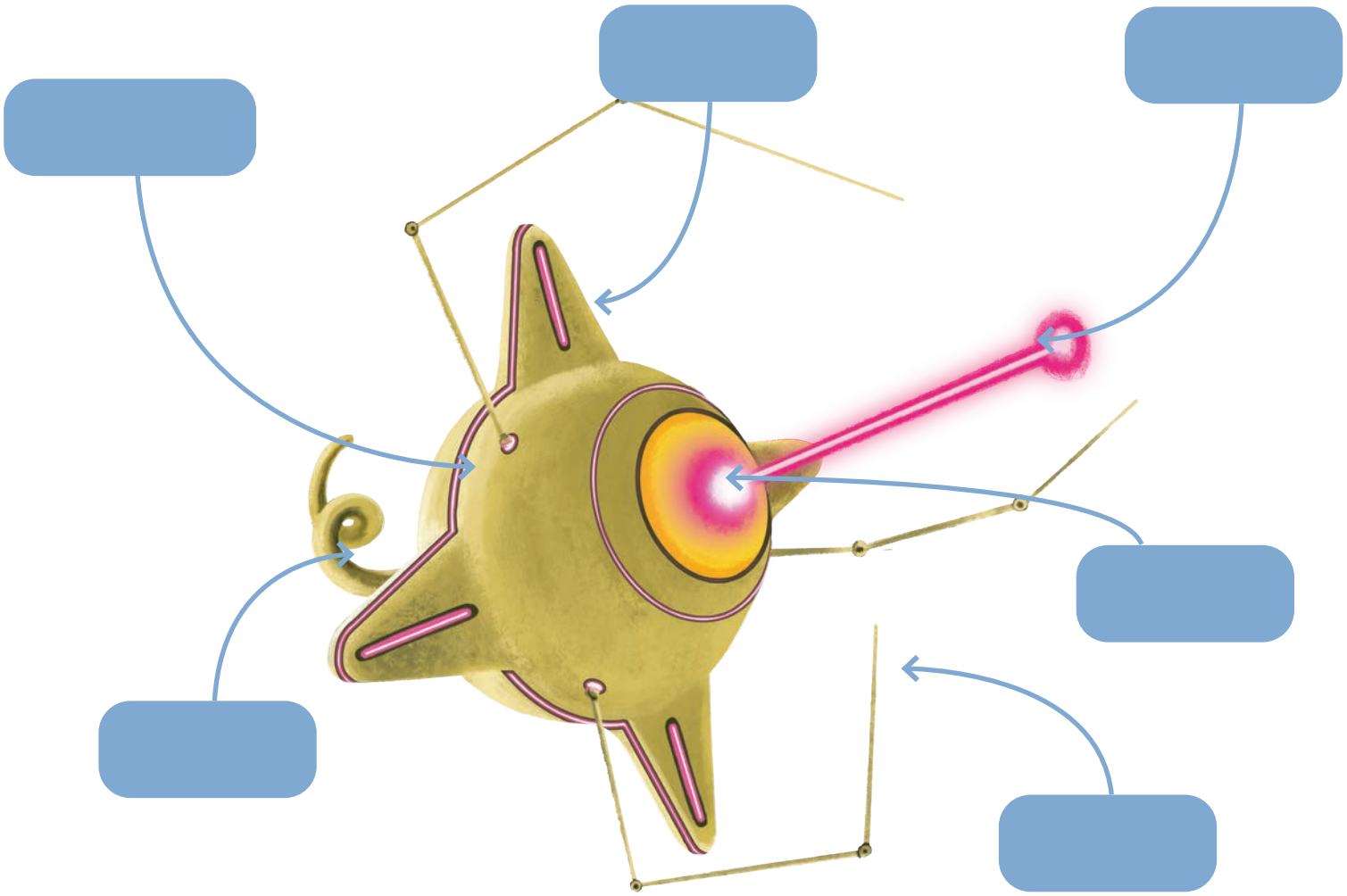
ODD BOT OUT

Look at all these nanostructures! Can you spot the one that doesn't belong?



BUILD-A-BOT

Nanobots come in many shapes and designs. Can you fill in the boxes to label this nanobot's parts? Each answer can only be used once.



SENSOR | ARM | EYE

LASER | PROPELLER | CORE

MORE FUN NANOTECHNOLOGY ACTIVITIES

COLORING SHEETS & MORE!

The following activities aren't based on any specific scenes in the book. They can be used on their own or alongside the book as extra activities.

FIND THE SCIENTIST

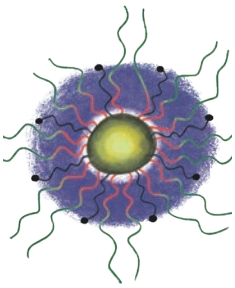
There are lots of different scientists below. Can you find the nanotechnologist? Circle them when you find them – there's only one!

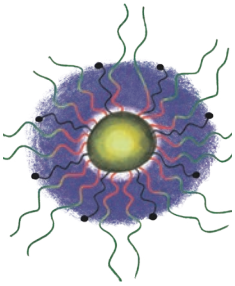
SIMPLE SUMS

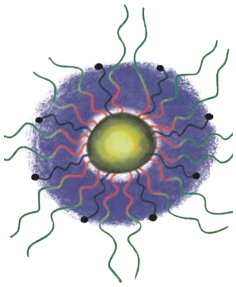
Below are 3 objects which represent different numbers.
Work out the sum based on what each object represents and write your answers in the boxes.

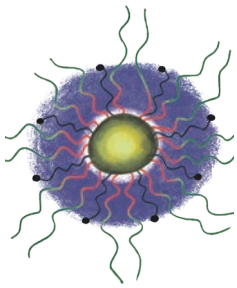
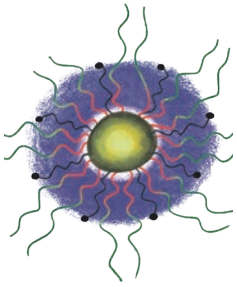
 = 2

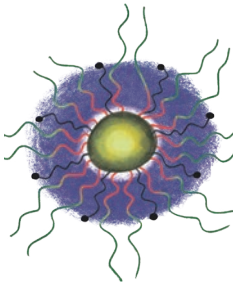
 = 5

 = 3

 +  −  = ☐

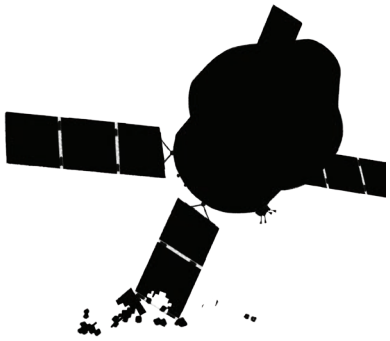
 −  +  = ☐

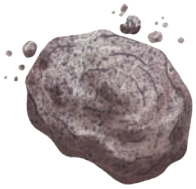
 +  +  = ☐

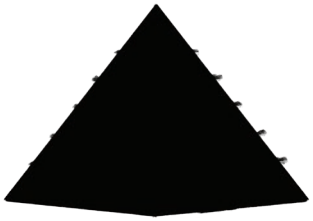
 +  −  = ☐

MATCH THE SHAPE

Can you match each shadow to the correct picture? Draw a line to connect them.

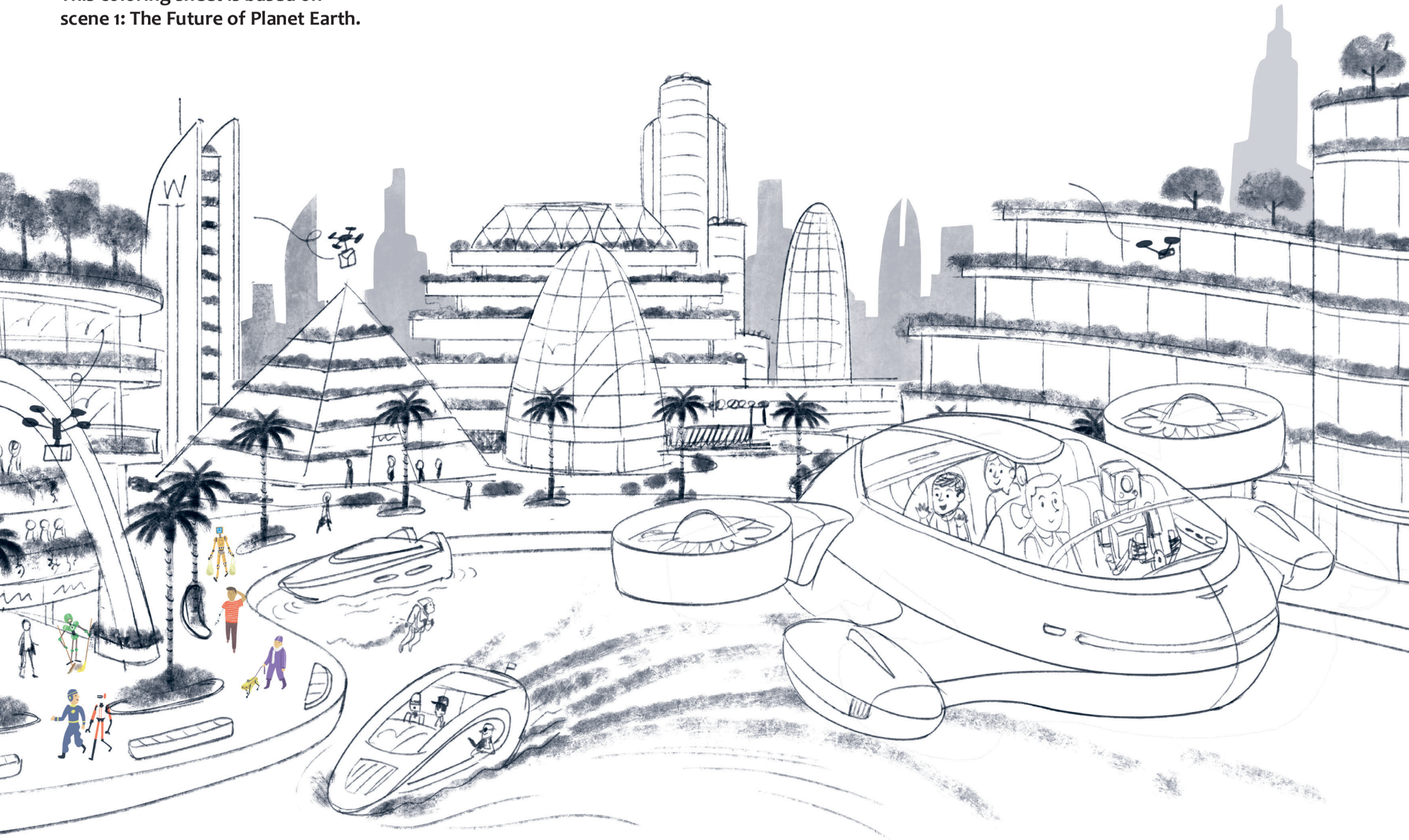






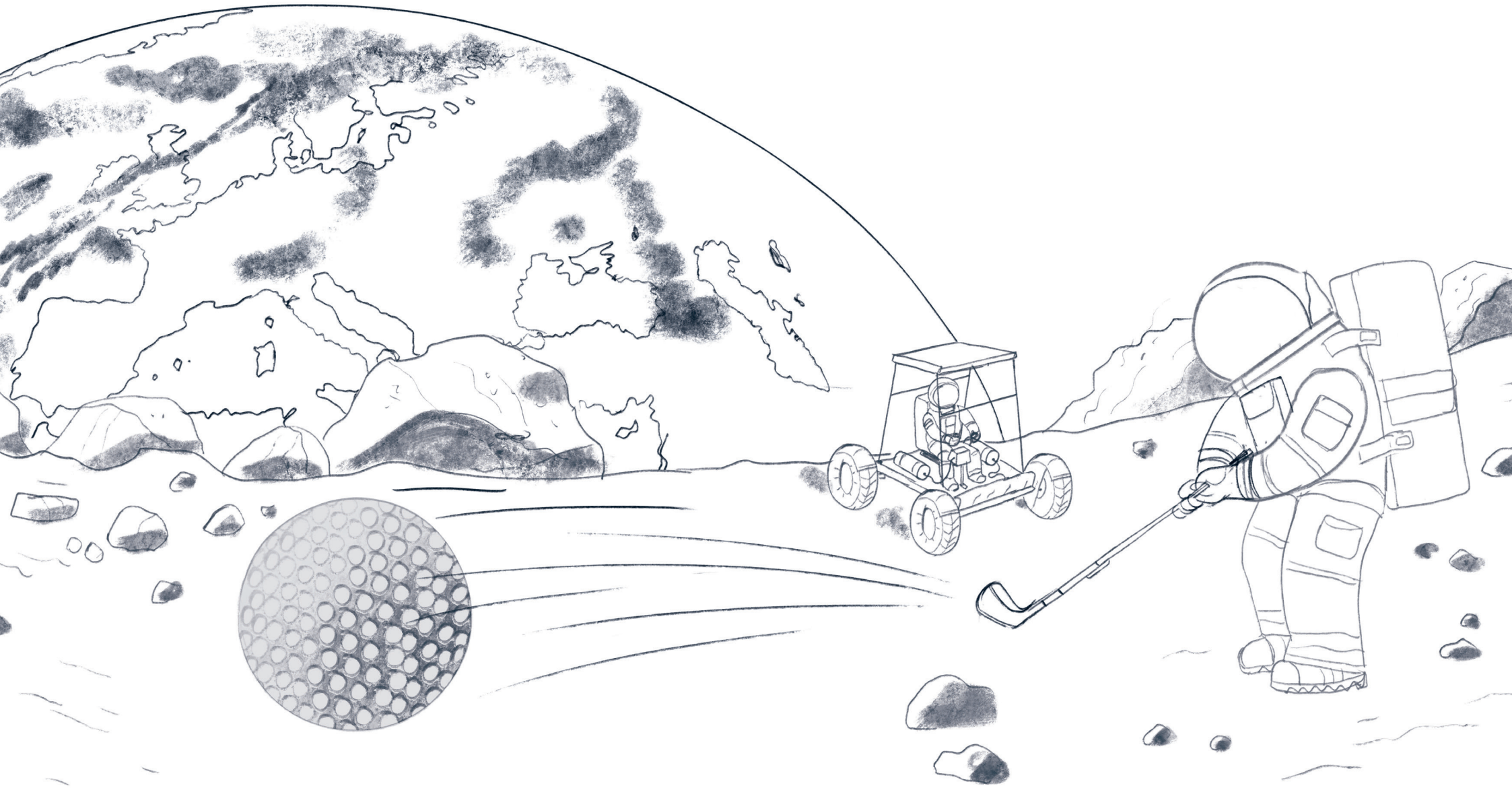
COLOR ME IN!

This coloring sheet is based on scene 1: The Future of Planet Earth.



COLOR ME IN!

This coloring sheet is based on scene 2:
Introducing the Nanometer.

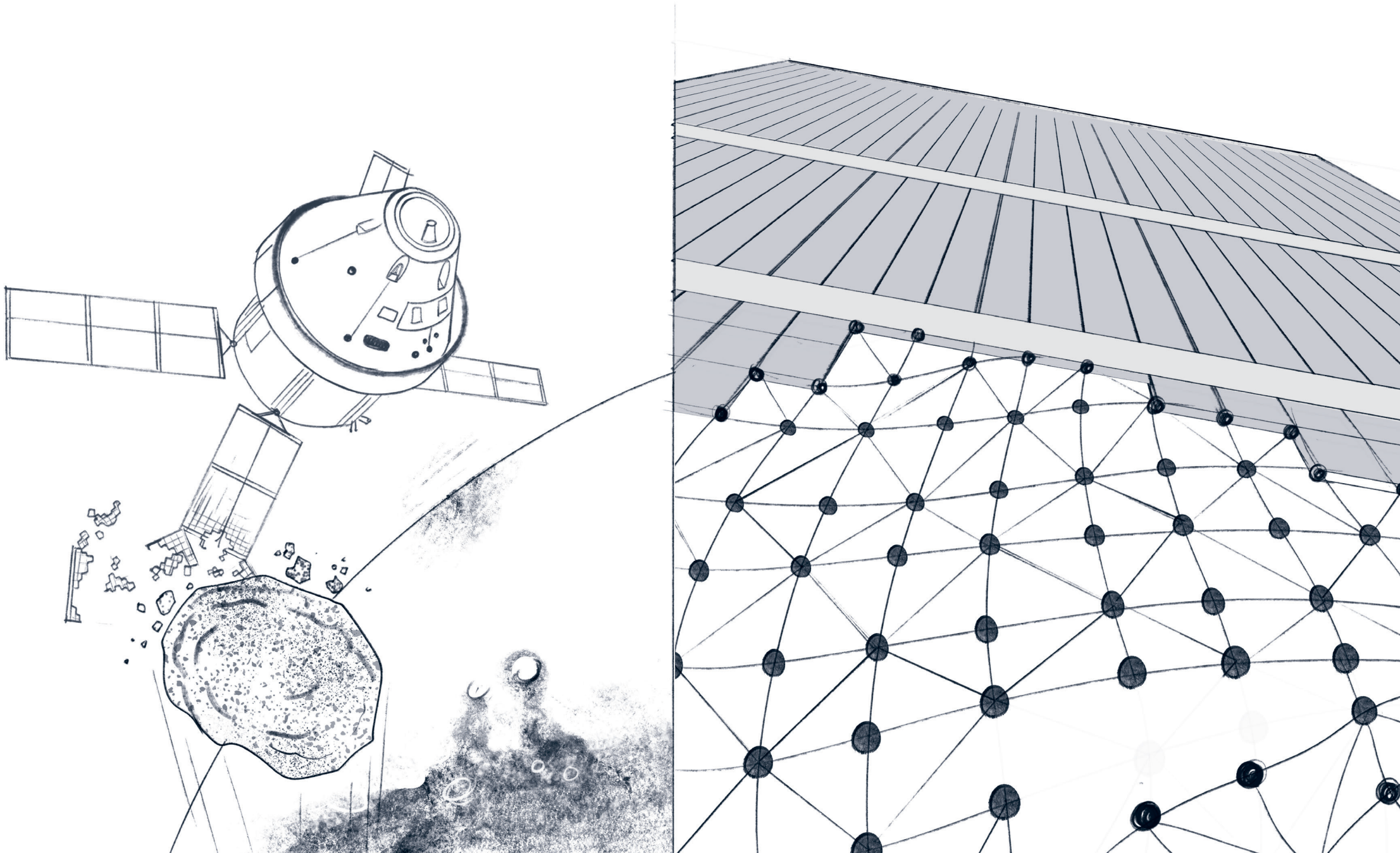


COLOR ME IN!

This coloring sheet is based on scene 3: Nanobots in Bloodstreams.

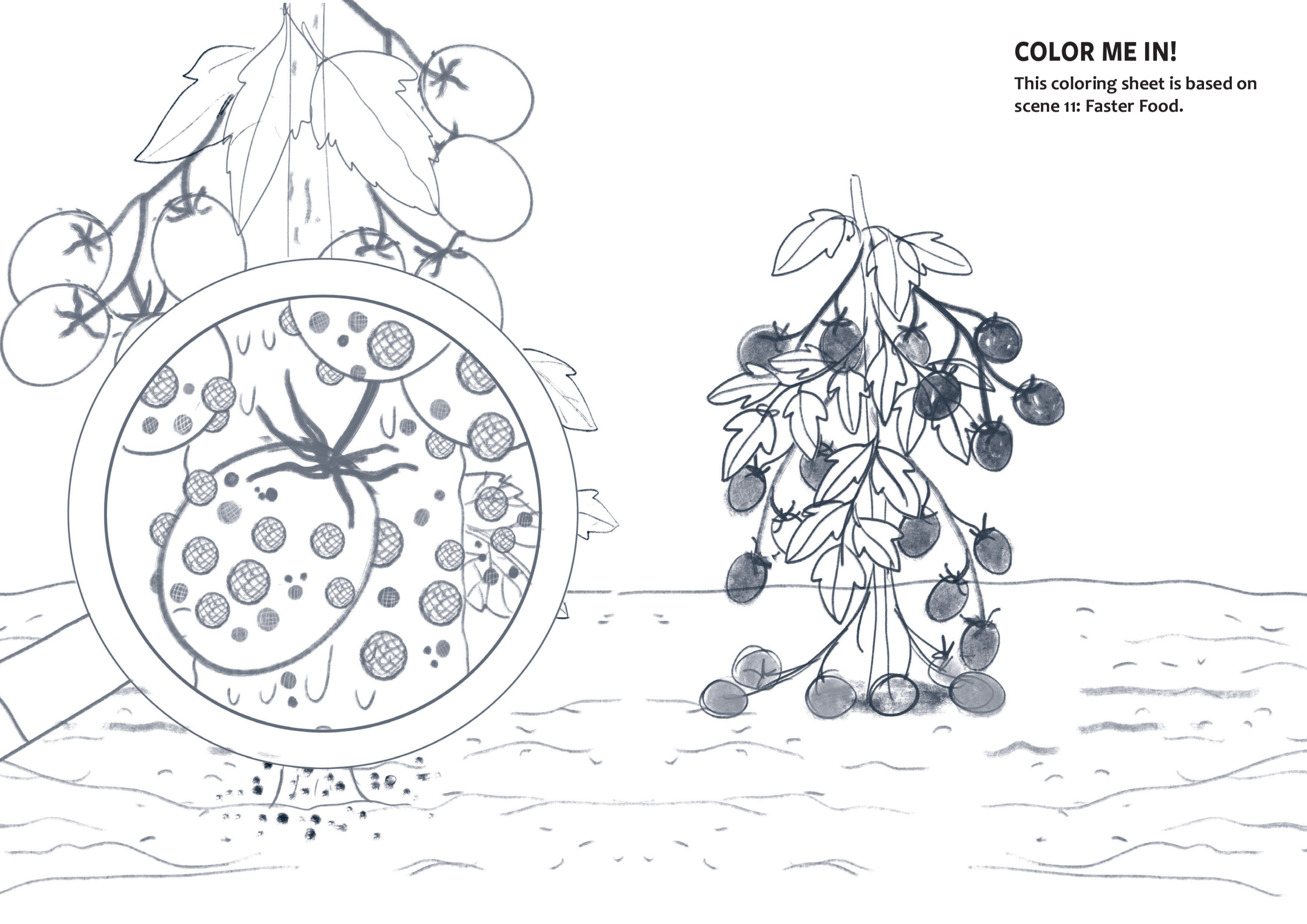
COLOR ME IN!

This coloring sheet is based on scene 7: Repairs in Space.



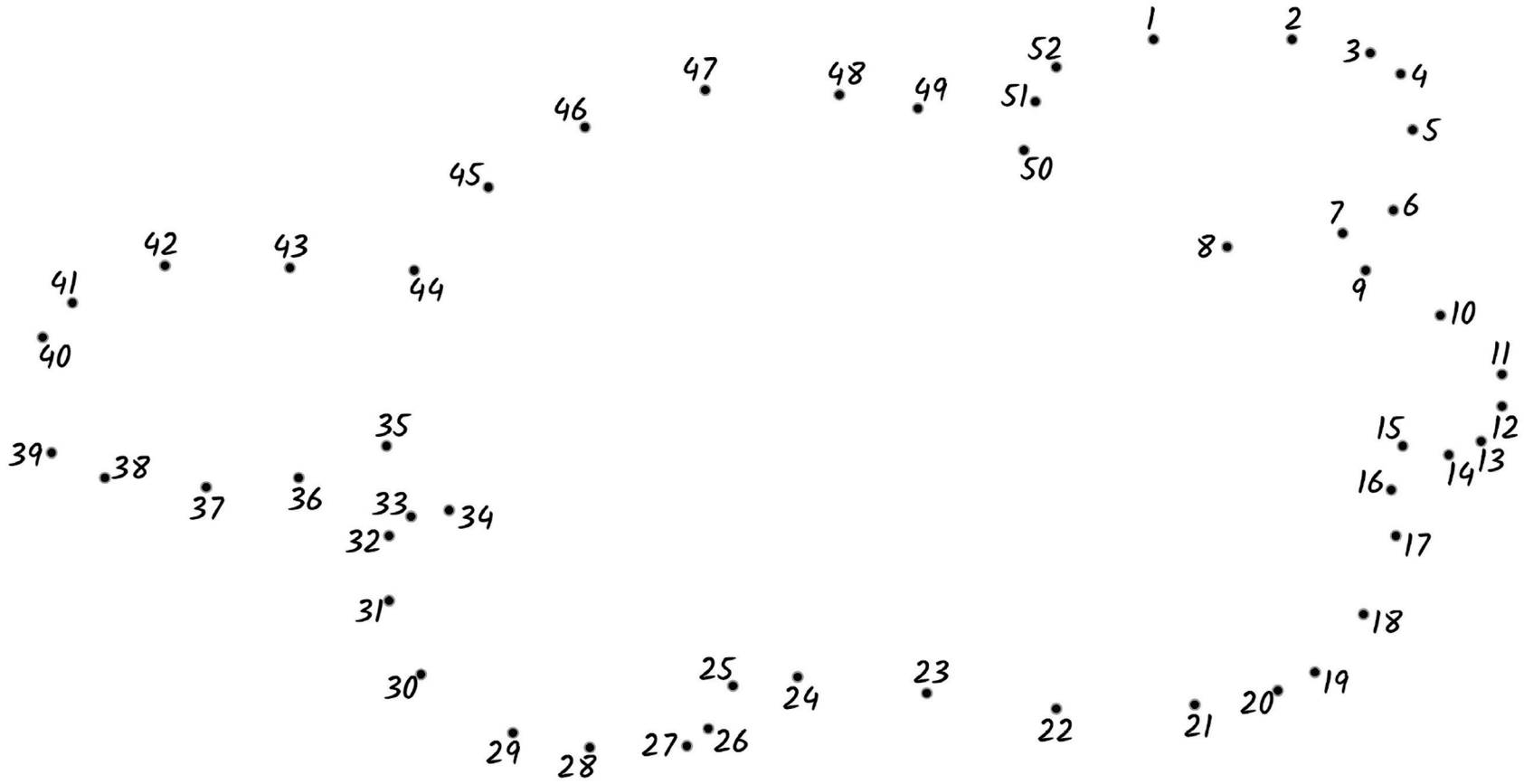
COLOR ME IN!

This coloring sheet is based on scene 11: Faster Food.



DOT-TO-DOT

Starting from 1, draw a line connecting the numbers to create a picture. Why not color it in afterwards?



DOT-TO-DOT

Starting from 1, draw a line connecting the numbers to create a picture. Why not color it in afterwards?

YOUNG NANOTECHNOLOGISTS' ACTIVITY ANSWERS

Find the answers to the activities on the following pages.

ACTIVITY ANSWERS

Check your answers against the correct answers below!

NANO TRICKSTERS ANSWERS

The answers below are for the "spot the difference" activity on page 3.

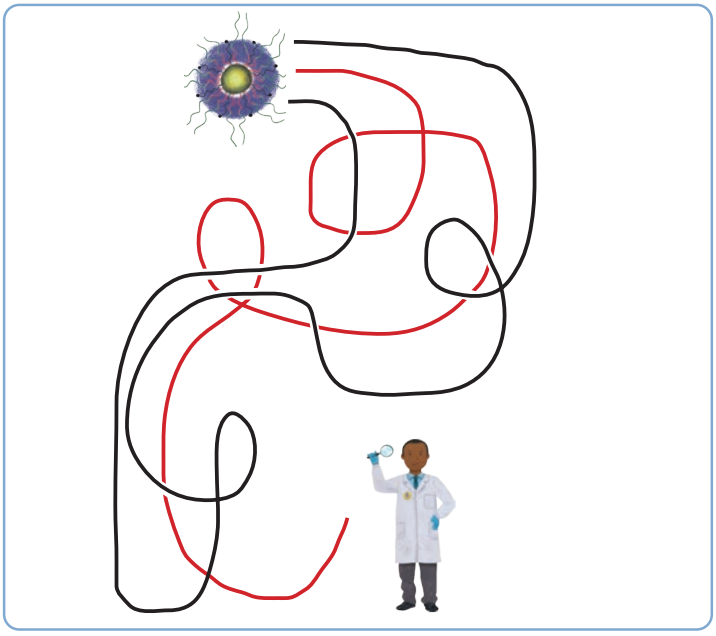
MICROSCOPIC WORD HUNT ANSWERS

The answers below are for the "word search" activity on page 4.

N	F	L	O	N	A	I	P	M	E	T	A	L	U	I
E	A	K	C	H	I	P	Z	O	E	R	T	Y	L	O
C	W	N	A	Y	U	M	H	L	H	N	I	M	P	K
P	F	E	O	S	I	R	T	E	G	B	N	F	V	D
C	O	Q	W	S	S	X	A	C	Z	E	V	H	A	R
P	O	W	S	R	C	K	T	U	M	L	E	S	O	N
W	D	R	E	D	G	A	V	L	N	E	N	G	M	P
D	Z	U	O	R	L	T	L	E	D	C	T	E	C	H
D	U	C	W	T	F	L	R	E	F	T	D	S	A	Z
P	F	H	G	L	E	U	M	N	A	R	O	U	W	E
N	A	N	O	B	O	T	L	W	X	I	T	R	D	M
X	C	Z	D	P	U	D	L	R	W	C	U	O	O	D
P	R	O	D	X	C	A	R	B	O	N	D	T	W	U
T	I	N	Y	W	E	Y	W	A	L	L	A	A	S	D

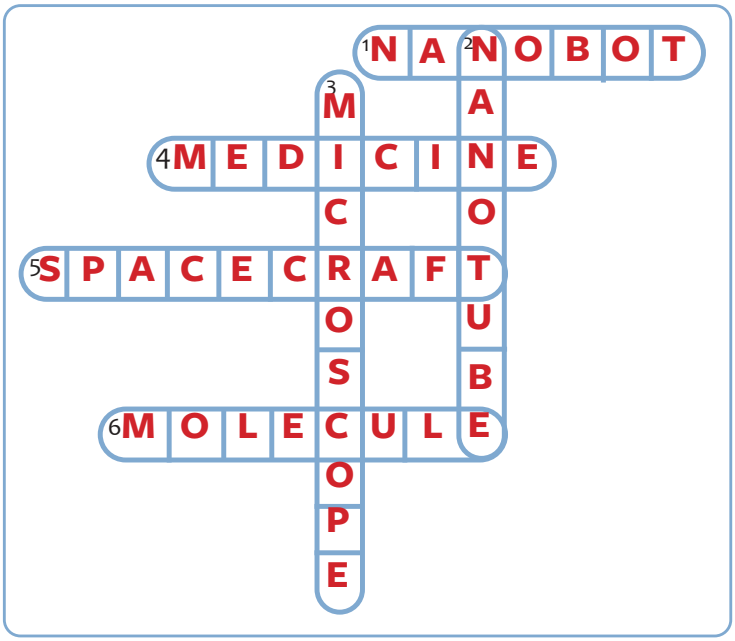
RACE TO RECHARGE ANSWERS

The answers below are for the "fill in the blanks" activity on page 7.



CHANGING WORLD ANSWERS

The answers below are for the "match up" activity on page 8.



A SECRET CODE! ANSWERS

The answers below are for the "decoding challenge" activity on page 11.

NANOTECH CAN MAKE
MATERIALS TWO HUNDRED
TIMES STRONGER THAN
STEEL BUT IS THINNER
THAN PAPER!

NANO WONDERS ANSWERS

The answers below are for the "fill in the blanks" activity on page 12.

1. Nanotechnology has already been used to make faster and smaller COMPUTER chips.

2. Some nanomaterials are so small that they appear INVISIBLE.

3. Carbon nanotubes are stronger than steel but very LIGHT.

4. Graphene is so thin it's almost weightless, yet incredibly STRONG.

5. Nanotechnology allows scientists to move single MOLECULES around like building blocks.

TRUE OR TINY? ANSWERS

The answers below are for the "true or false" activity on page 13.

	SENTENCE	TRUE	FALSE
1	Nanotechnology works at the scale of atoms and molecules.	TRUE	
2	All nanotechnology can be seen with the human eye.		FALSE
3	Nanobots may one day deliver medicine directly inside the human body.	TRUE	
4	Nanotechnology is only used in medicine.		FALSE
5	Graphene is just one atom thick.	TRUE	

MATCH THE MARVEL ANSWERS

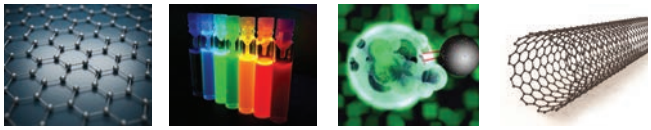
The answers below are for the "match up" activity on page 14.

Fact: I am stronger than steel but lighter than plastic.

Fact: I can be programmed to deliver medicine inside the body.

Fact: I am just one atom thick and can conduct electricity better than copper.

Fact: I am so small I can change color depending on my size.



I am... **GRAPHENE**

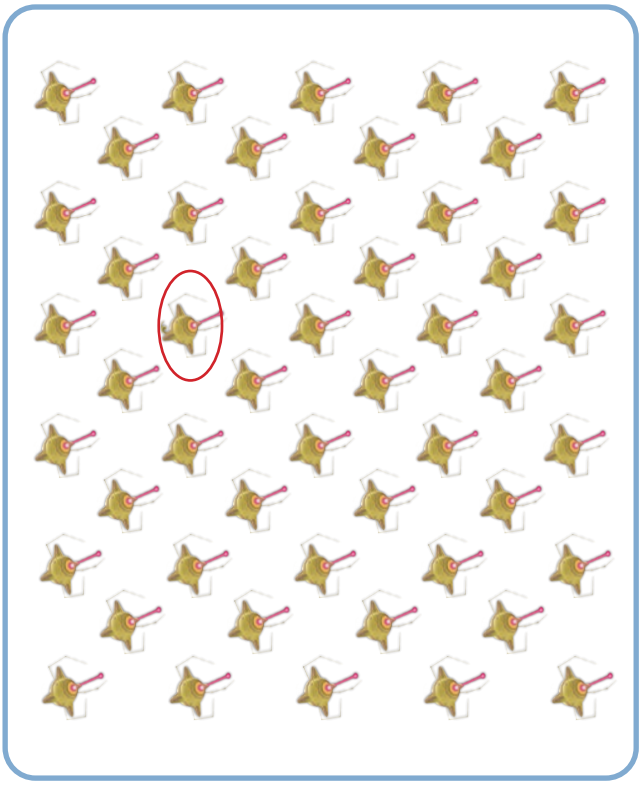
I am... **A QUANTUM DOT**

I am... **A DNA NANOBOT**

I am... **A CARBON NANOTUBE**

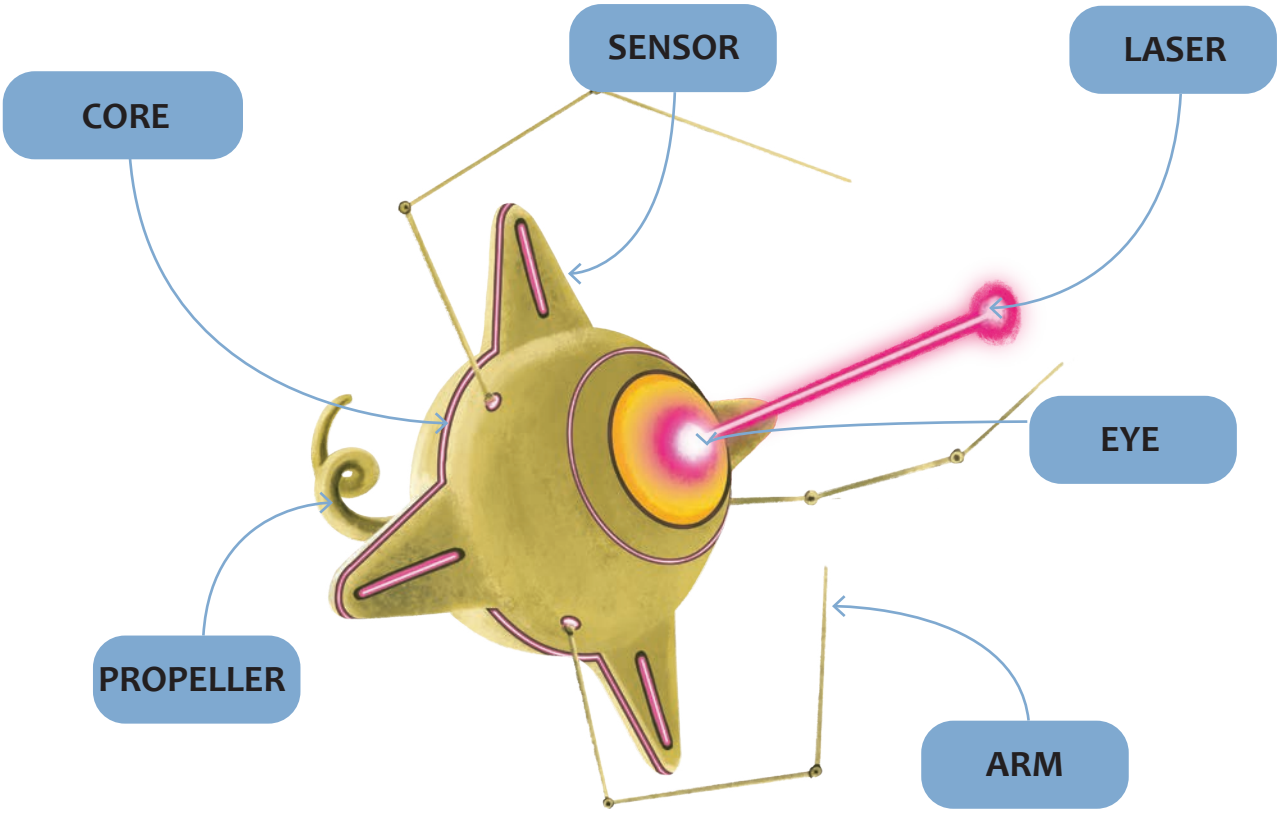
ODD BOT OUT ANSWERS

The answers below are for the "odd one out" activity on page 15.



BUILD-A-BOT ANSWERS

The answers below are for the "label the part" activity on page 16.



EXTRA ACTIVITY ANSWERS

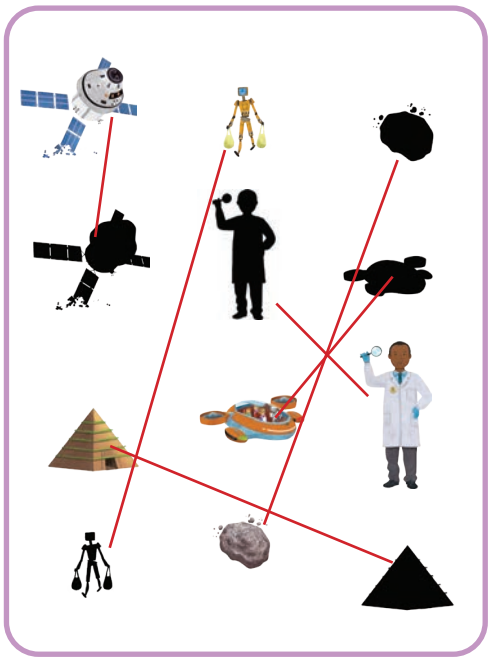
Check your answers against the correct answers below!

FIND THE SCIENTIST

The answers below are for the activity on page 18.

MATCH THE SHAPE

The answers below are for the activity on page 19.



SIMPLE SUMS

The answers below are for the activity on page 20.