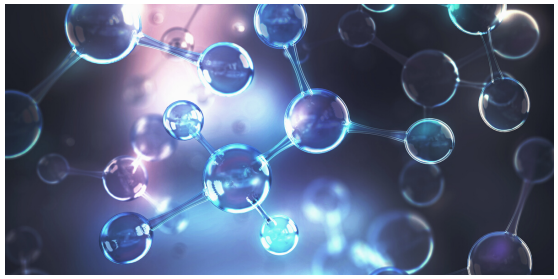
TECHFEST
digital

DNA DETECTIVES

CAITHNESS INTERNATIONAL SCIENCE FESTIVAL



DNA is an amazing molecule that contains the biological instructions to make all living things on Earth. Everyone's DNA is slightly different, and it's the variation in your DNA that makes you unique! Everything from the colour of your eyes, the shape of your nose, and even your blood type – it's all down to DNA!

If scientists were to look at the whole of your DNA sequence (this is known as the **genome**) they would be able to tell an awful lot of information about you without ever having met you! The study of DNA and genomes is a really important branch of science.

All around the world DNA research is being used to develop new medicines and treatments, protect endangered species, grow better crops, learn about ancient people and extinct species and even solve crimes!

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CHALLENGE 1 – MAKE YOUR OWN DNA MODEL

Have you ever seen a picture of a DNA strand before? Did it look a bit like a twisted ladder? Well, this twisted ladder shape is actually called a double helix.

DNA's double helix structure is made from two long strands that join and twist together. The strands are joined together by "**bases**" which make up the rungs of the ladder. The four bases are:

A T C G

These bases stick together in matching pairs – a bit like best friends holding hands! **A** and **T** always match together, and **C** and **G** always match together.

Let's try making our own double helix! Click the YouTube button below or visit our YouTube channel!

In the video I've used sweets to make my double helix, but you can use any materials you like! You could use different coloured beads and pipe cleaners, or plasticine or lego...this is your chance to get creative! And if you don't want to build a model, why not try drawing your double helix structure instead!

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CHALLENGE 2 – HELP THE DNA DETECTIVES DISCOVER THE MISSING FACE

We have already learned about the four bases that make up DNA (**A**, **T**, **C** and **G**), but it's the order of these bases along the DNA strand that is really important. Just like using letters to spell a word, the DNA bases are arranged in a specific order to spell out the instructions of how we look and function.

By looking at the order of letters in someone's DNA we can find out lots of things about them – including what they look like! This can be really helpful when studying ancient people or species as scientists can use DNA from bones to recreate what they looked like.

Cool fact – Because each person has their own unique genetic code forensic scientists can use DNA to help them solve crimes!

All templates can be found at the end of the workshop

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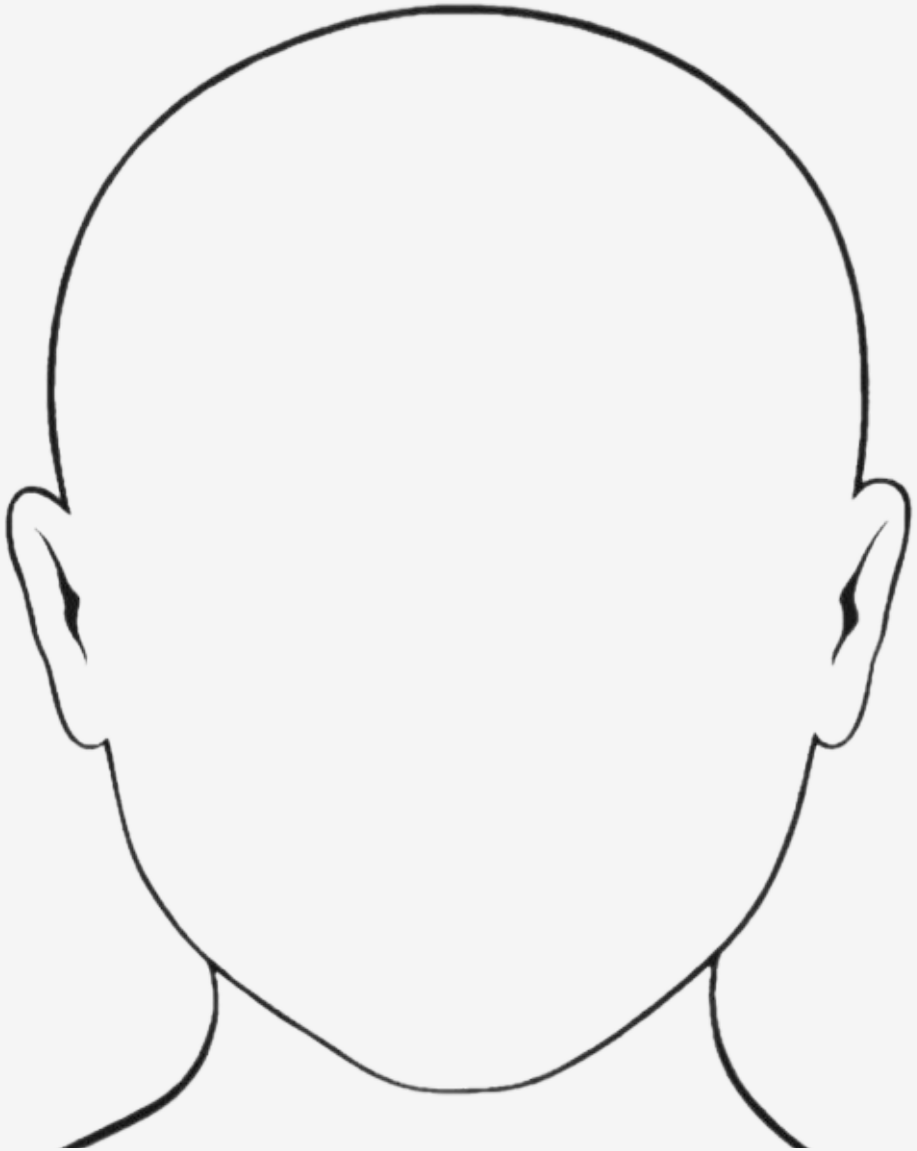
HELP THE DNA DETECTIVES DISCOVER THE MISSING FACE

Can you help the DNA Detectives work out what person X looked like just by looking at their DNA sample? Use the DNA Key on the next page to decode the DNA clues and work out what person X looked like (hint: you can print our template to help get you started, or you can draw your own template)



Person X DNA Sample

Feature	DNA Clue
Gender	XX
Hair Colour	GGCTAA
Hair Texture	CCCTGA
Eye Colour	ATTGGG
Freckles	GGGCCG

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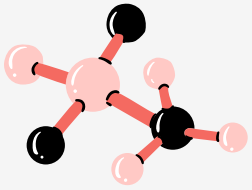
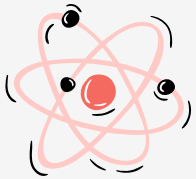
DNA KEY

Feature	DNA Clue	Outcome
Gender	XX	Female
	XY	Male
Hair Colour	AGGCTA	Blonde Hair
	TCAGTC	Brown Hair
	AATCCC	Black Hair
	GGCTAA	Red Hair
Hair Texture	TTAAAT	Straight Hair
	ATCGAT	Wavy Hair
	CCCTGA	Curly Hair
Eye Colour	CTCAGA	Blue Eyes
	GGCTCA	Brown Eyes
	ATTGGG	Green Eyes
Freckles	TGTACA	No Freckles
	GGGCCG	Some Freckles
	AGTCGT	Lots of Freckles





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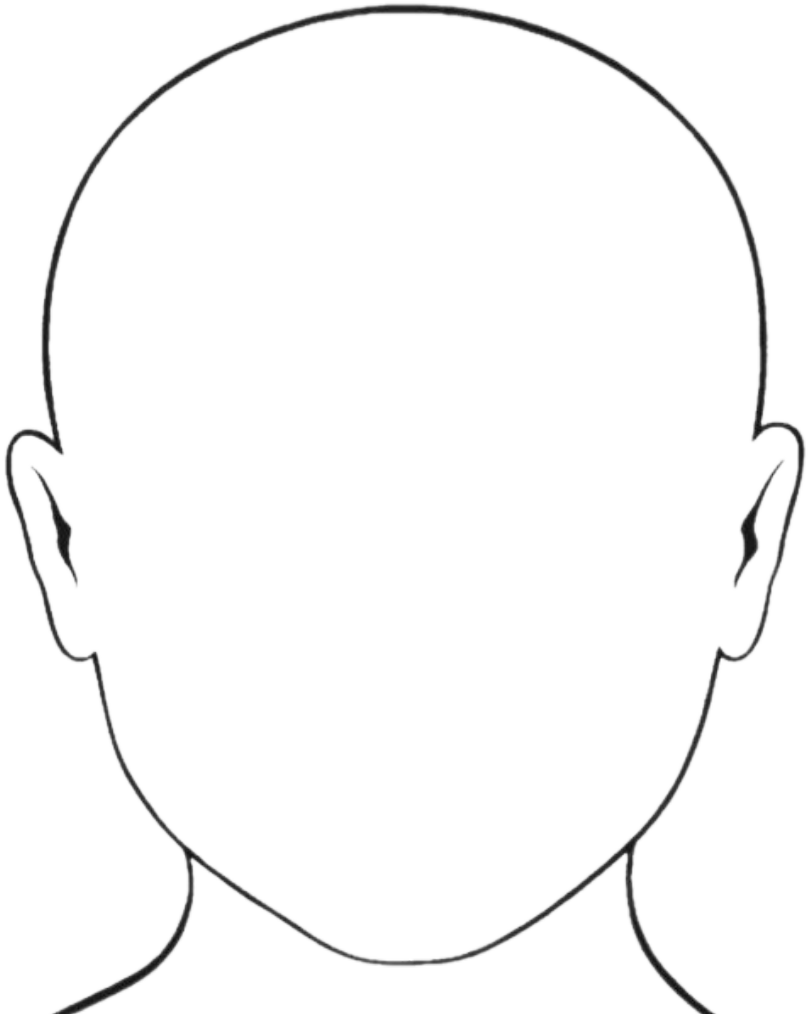
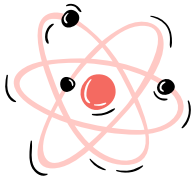
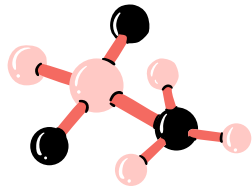
WHY DON'T YOU TRY USING THE DNA KEY TO FILL OUT THE BELOW TABLE WITH YOUR OWN FEATURES!





MY DNA CODE



Gender	
Hair Colour	
Hair Texture	
Eye Colour	
Freckles	

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CHALLENGE 3 – CAN YOU TRANSLATE THE DNA CODE AND SOLVE THE PUZZLE?

We know that the specific order of the four bases (**A**, **T**, **C** and **G**) in our DNA is responsible for writing out the instructions that dictate how we look and function. But how exactly does that work? How can four letters be enough to code all of that information?!

Well, the answer is that the DNA is translated into a sequence of amino acids, which are the building blocks of proteins.

A combination of three DNA bases is called a codon and is code for a particular amino acid. By building a chain of amino acid's your body can make proteins, which are amazing molecules that are responsible for many functions in our bodies - everything from making different eye and hair colours, making our muscles move and even fighting disease! Proteins are essential for making living things function.

Cool fact - Scientists can alter or change a person's DNA sequence to generate a new protein to fix a problem or treat a disease!

Can you use your detective skills to translate DNA sequences just like scientists do?! Click here to complete the crossword puzzle – you can either use the clues or the DNA Codon (see next page) to reveal the missing word!

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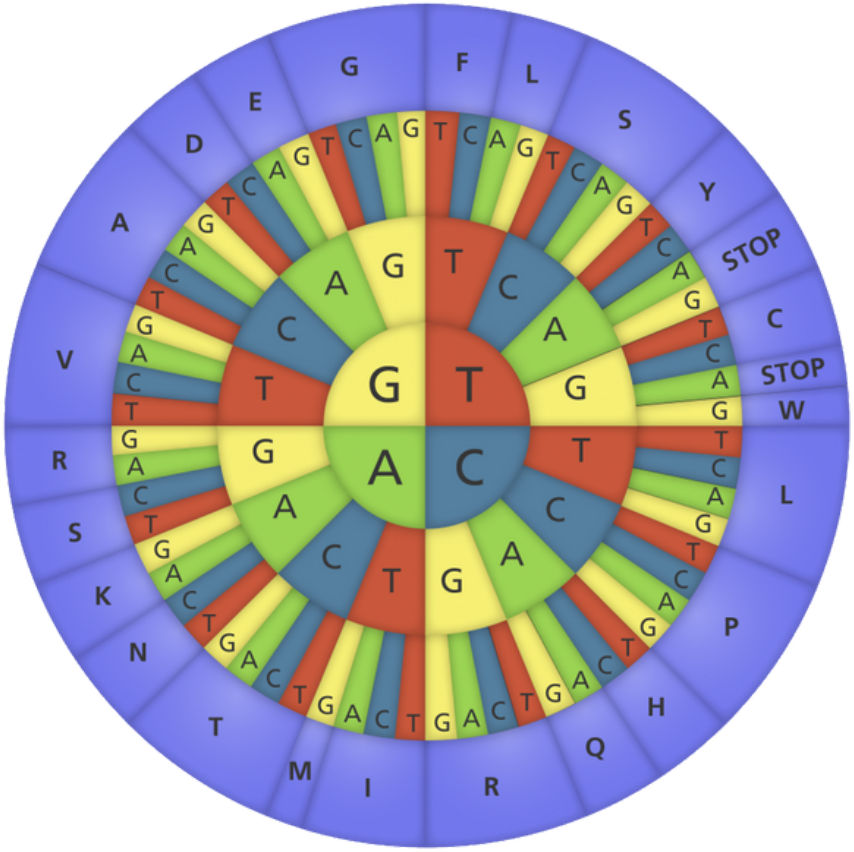
To decode the codon, find the first letter of your sequence in the central circle and work outwards to reveal the corresponding letter. Put the letters together to reveal the missing word then fill in your answers in the crossword!



Across

1. GAT AAC GCA
3. GCG ACC TGT GGG
6. GGG GAA AAC GAG ACG ATA TGT AGC
7. GAG GCA CGC ACC CAT
8. TTT CGA GAA GAT

Down

1. GAT GAG ACA GAA TGT ACT ATC GTA GAA
2. TGC GAG CTT CTG AGC
3. GCA TGC ATT GAT TCA
4. GGC GAA AAT GAG TCG
5. TCC TGC ATC GAA AAT TGC GAG

ANSWERS ON THE NEXT PAGE

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ANSWERS

HOW MANY DID YOU GET CORRECT? LET US KNOW!

Across

1. DNA
3. ATCG
6. Genetics
7. Earth
8. Fred

Down

1. Detective
2. Cells
3. Acids
4. Genes
5. Science

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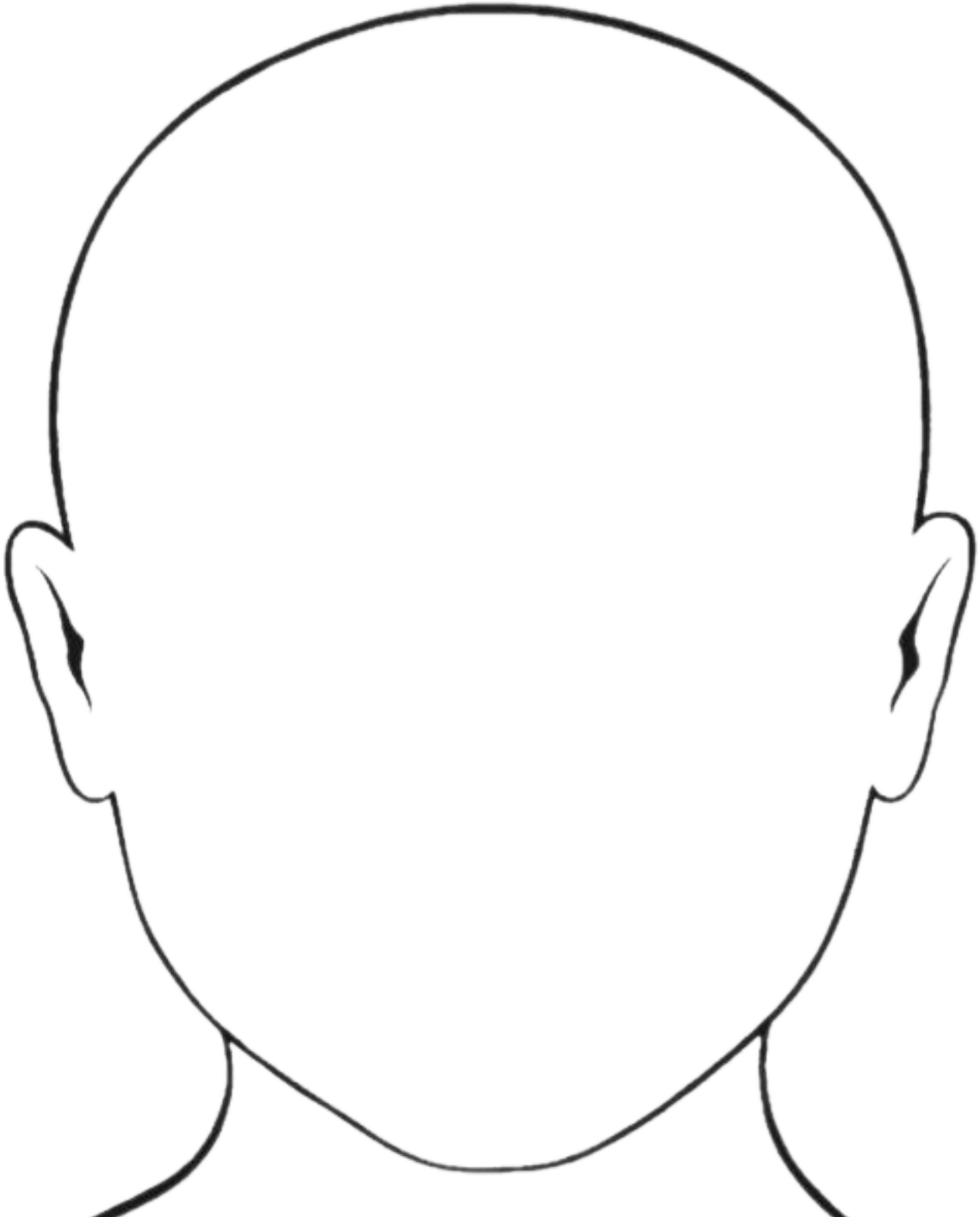
HELP THE DNA DETECTIVES DISCOVER THE MISSING FACE TEMPLATE



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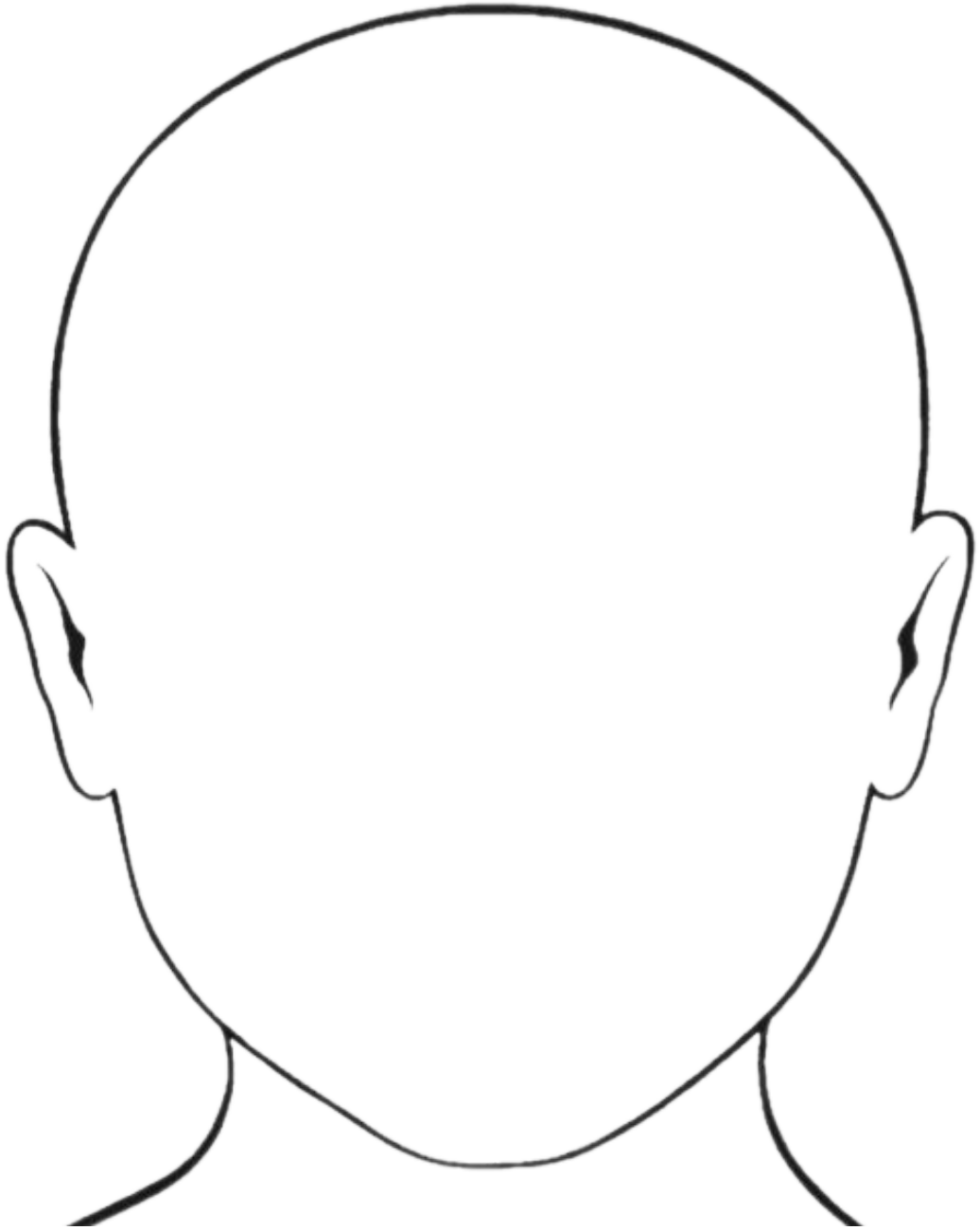
MY DNA CODE TEMPLATE



Gender	
Hair Colour	
Hair Texture	
Eye Colour	
Freckles	

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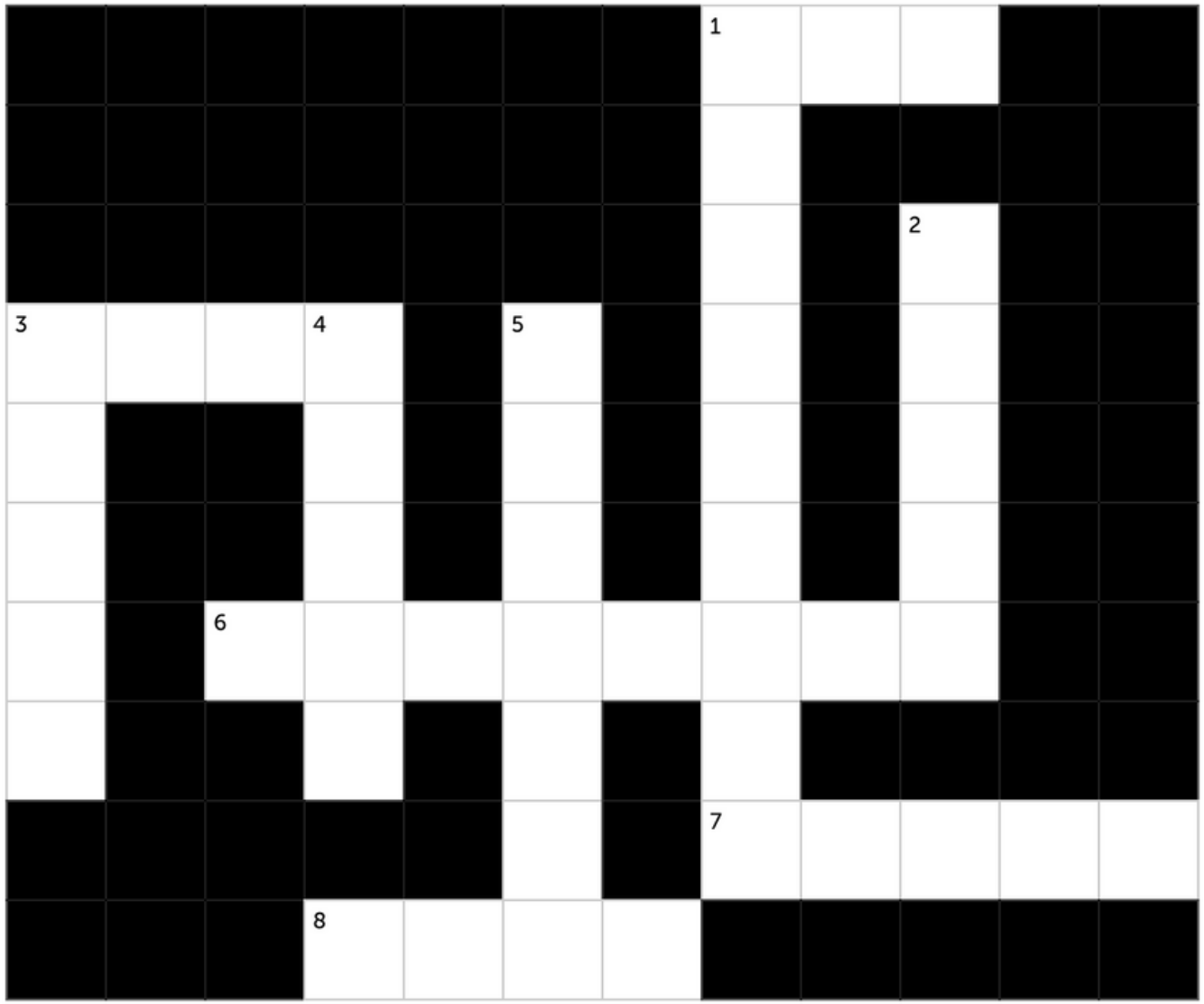
CHALLENGE 3 - CROSSWORD PUZZLE TEMPLATE



ACROSS

1 The molecule a living creature needs to grow, function and reproduce?

3 The four DNA bases

6 The study of genes and genetic inheritance?

7 The planet we live on

8 The name of TechFest's skeleton mascot?

DOWN

1 A person whose job is to find information about someone or something

2 What we are all made off - the basic unit of life

3 The building blocks of proteins are amino _____?

4 The segments of DNA that contain code for a specific protein?

5 What does the S in STEM stand for?

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