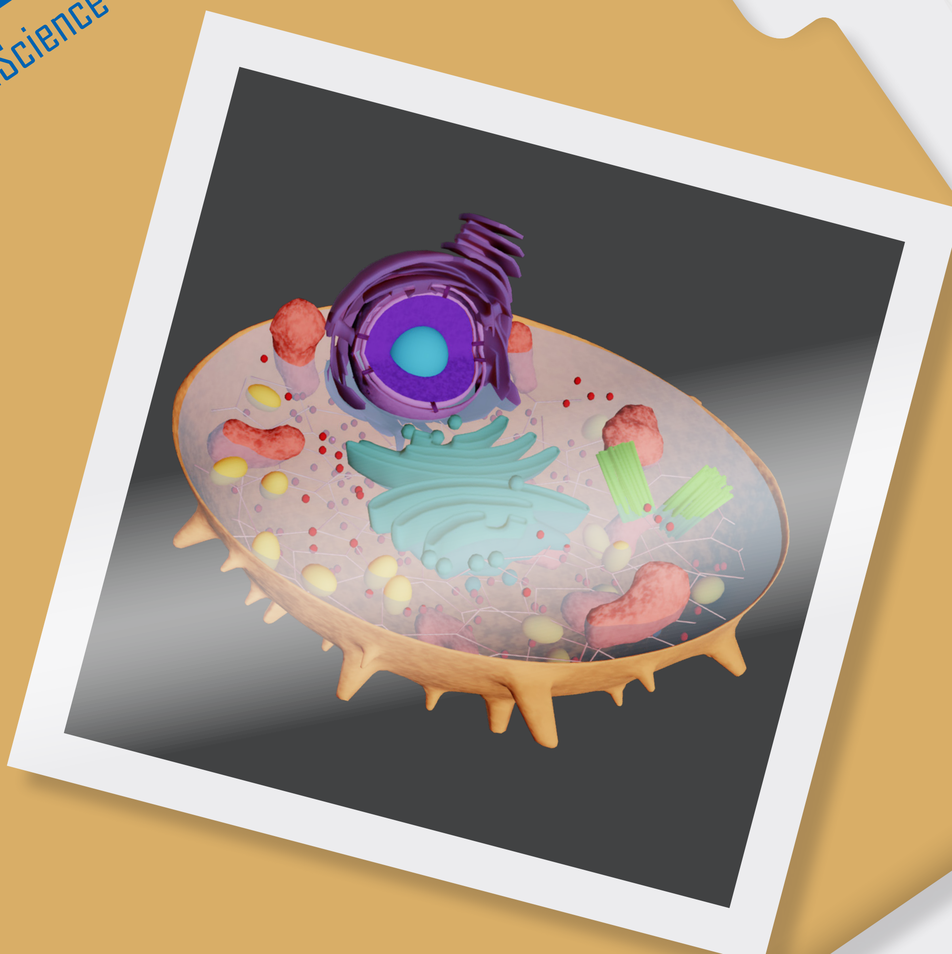
Protein Mission Support File

- BIOLOGY -

NovaScience

Support File



Background

A patient is suffering from hemophilia, a genetic disease that causes blood coagulation problems. This disease can be treated through gene therapy by injecting the patient with a virus to introduce the "normal" gene. The defective gene is corrected **using the CRISPR-Cas9 technology**, which can recognize a specific DNA sequence and replace it with the corrected gene.

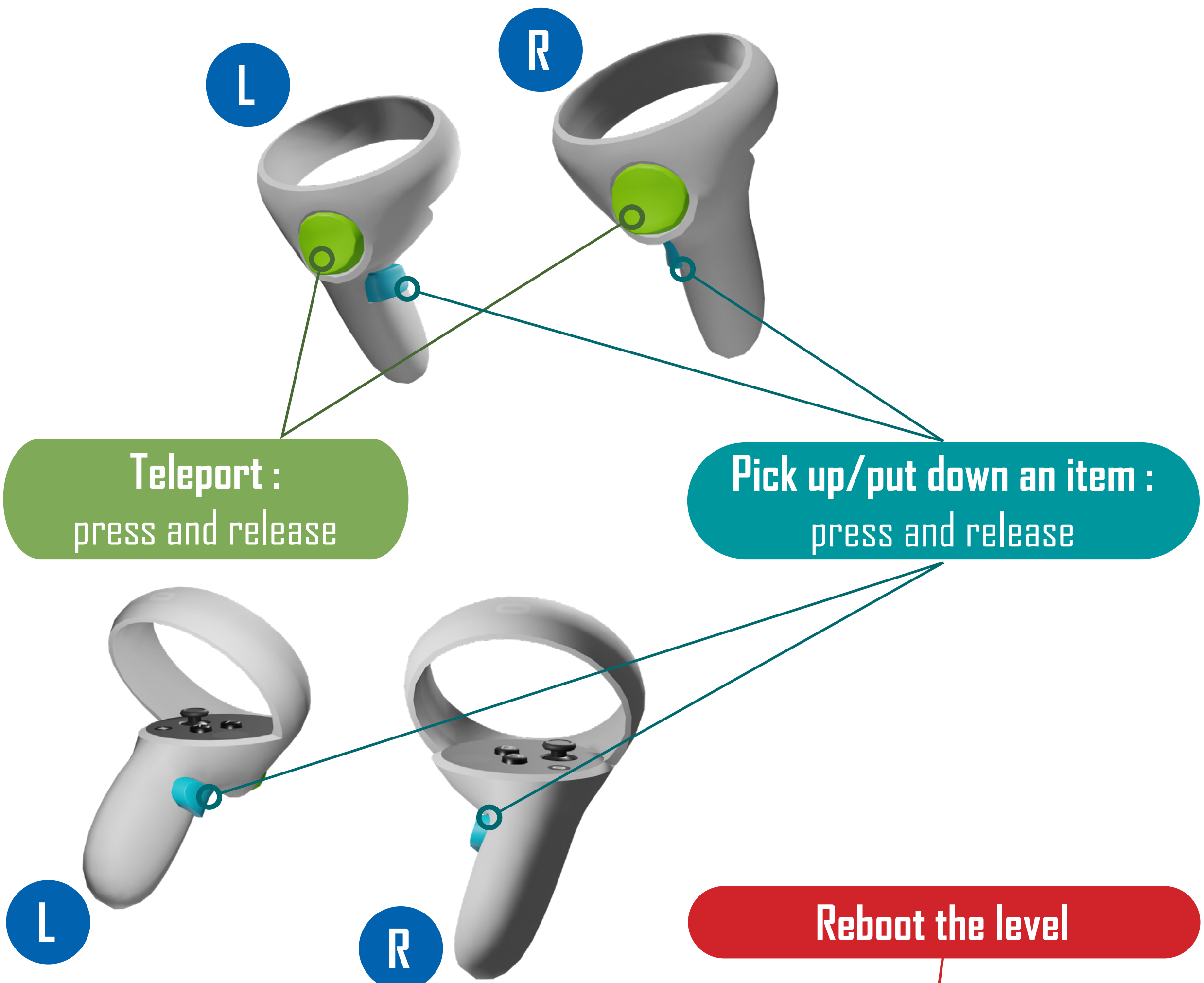
For this mission, your partner will be injected into one of the patient's cells with the gene.

Your objective is to synthesize the protein using the "corrected" gene.

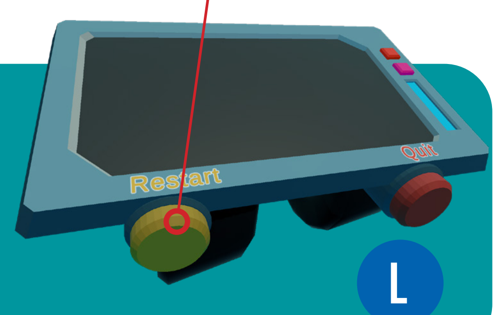
With your partner, complete the chart by entering the missing information to confirm that you have the competencies required before helping in the synthesis of the corrected protein.

Assistance to the partner

Your colleague will have **special equipment** on hand. If they need help with the manipulations, **refer to the equipment's user manual.**



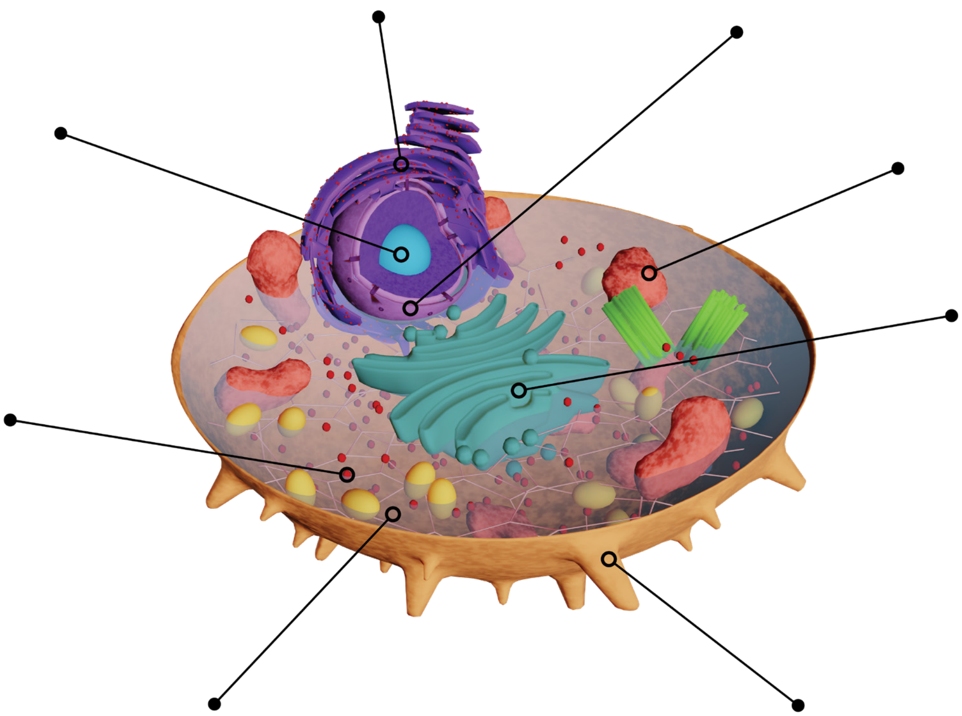
* Your colleague will also receive the information on the screen on their arm. Remind them to look at it.



STAGE 1: The Cell

Now is the time to help your colleague place the word magnets on the chart.

Cross-section of a eukaryotic cell



Organelles of the eukaryotic cell to be identified

Nucleus	Nuclear envelope	Mitochondrion	Plasma membrane
Rough endoplasmic reticulum	Cytoplasm	Ribosome	Golgi complex

STAGE 2: Transcription

You must help your colleague place the correct nucleotides on the mRNA strand.

Base-pairing rule

Pyrimidines

Purines

Cytosine ⟷ Guanine

DNA

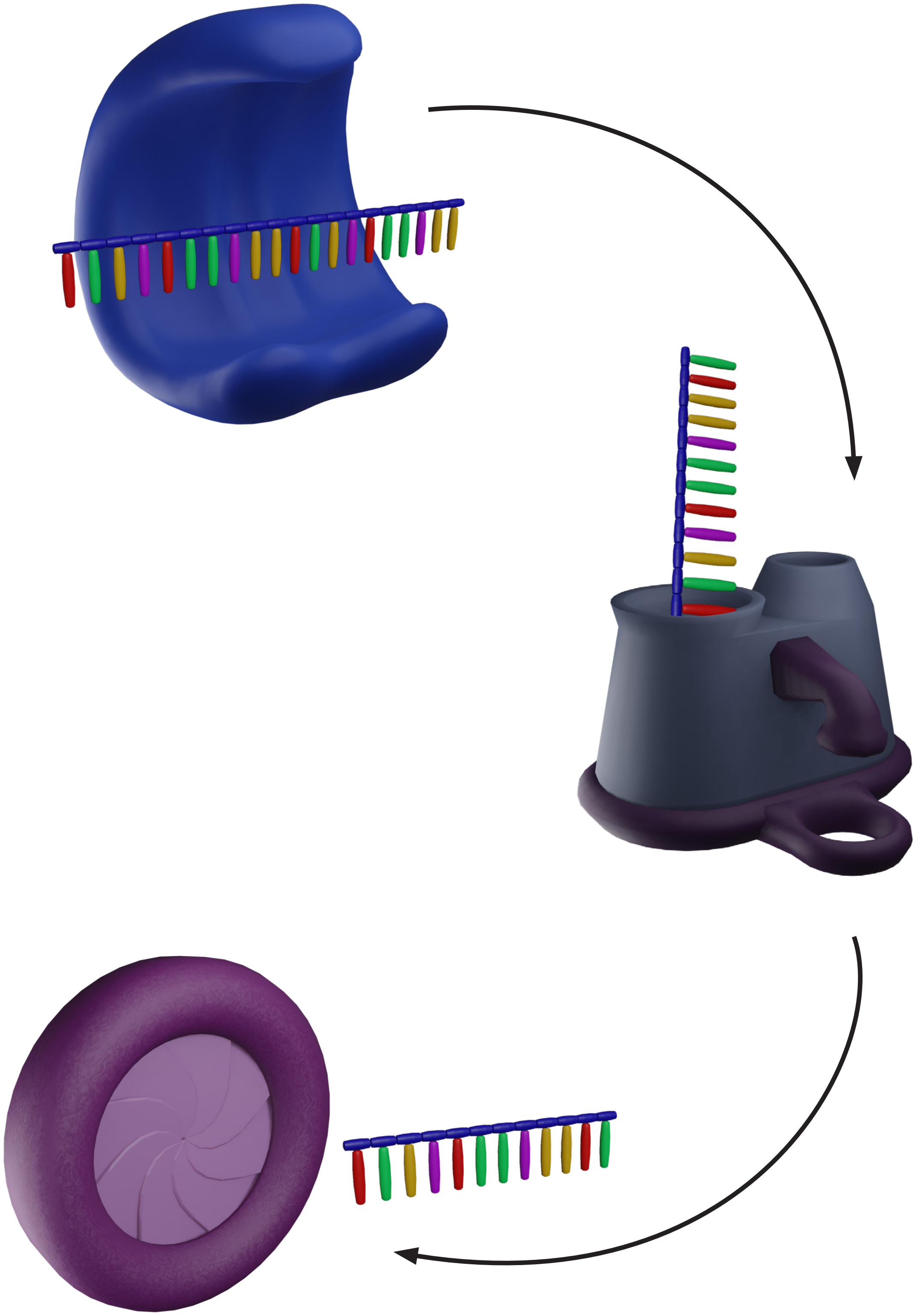
Thymine ⟷ Adenine

mRNA

Uracil ⟷ Adenine

STAGE 3: mRNA processing

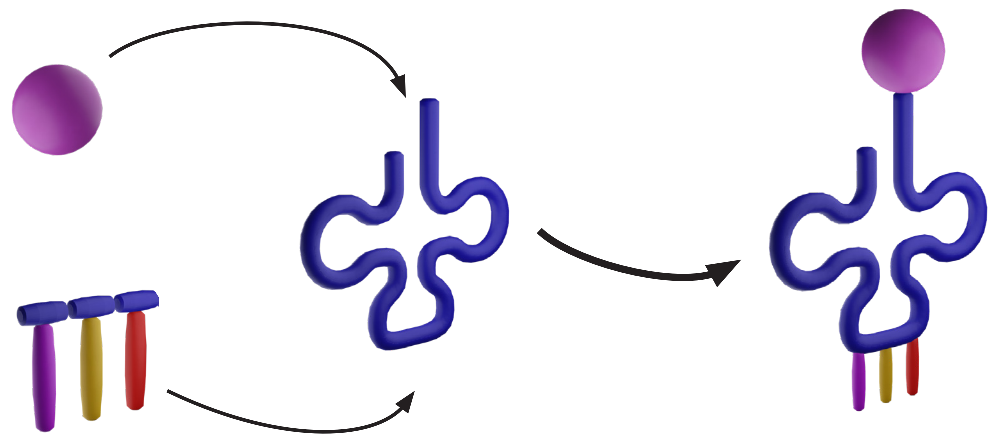
Guide your colleague through mRNA splicing and migration out of the nucleus.



STAGE 4: Translation

Help your colleague match the correct anticodon and the correct amino acid on the tRNA that will be placed on the ribosome to synthesize the protein.

Transfer RNA



Genetic code

Base 2

Base 1	U		C		A		G		Base 3
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC	Phe	UCC	Ser	UAC	Tyr	UGC	Cys	C
	UUA	Leu	UCA	Ser	UAA	STOP	UGA	STOP	A
	UUG	Leu	UCG	Ser	UAG	STOP	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC	Leu	CCC	Pro	CAC	His	CGC	Arg	C
	CUA	Leu	CCA	Pro	CAA	Gln	CGA	Arg	A
	CUG	Leu	CCG	Pro	CAG	Gln	CGG	Arg	G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC	Ile	ACC	Thr	AAC	Asn	AGC	Ser	C
	AUA	Ile	ACA	Thr	AAA	Lys	AGA	Arg	A
	AUG	Met and start	ACG	Thr	AAG	Lys	AGG	Arg	G
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
	GUC	Val	GCC	Ala	GAC	Asp	GGC	Gly	C
	GUA	Val	GCA	Ala	GAA	Glu	GGA	Gly	A
	GUG	Val	GCG	Ala	GAG	Glu	GGG	Gly	G

STAGE 4: Translation

Amino acid	Abreviation	Amino acid	Abreviation
Alanine	Ala	Lysine	Lys
Arginine	Arg	Methionine	Met
Asparagine	Asn	Phenylalanine	Phe
Aspartic acid	Asp	Proline	Pro
Cysteine	Cys	Serine	Ser
Glutamic acid	Glu	Threonine	Thr
Glutamine	Gln	Tryptophan	Trp
Glycine	Gly	Tyrosine	Tyr
Histidine	His	Valine	Val
Isoleucine	Ile		
Leucine	Leu		

STAGE 5: Folding the protein

Your protein must follow the sequence shown in order to fold correctly.
Guide your partner to complete it properly.