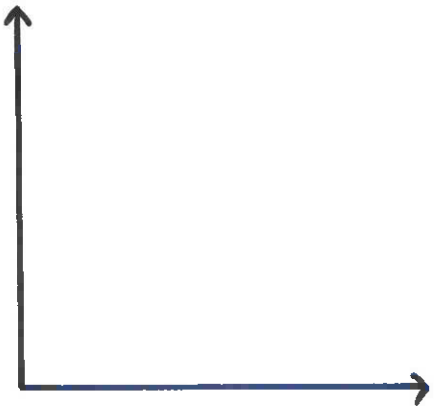
Powers, Exponential & Logarithmic Functions

1 2 3 4 5

Exponential Form Logarithmic Form



Question: Calculate the percentage change Z → Y

Estimating Microbial Growth

→

↳

Question: If bacteria divide every 25 mins, how many bacteria will there be if a single bacterium divides for 9 hours?

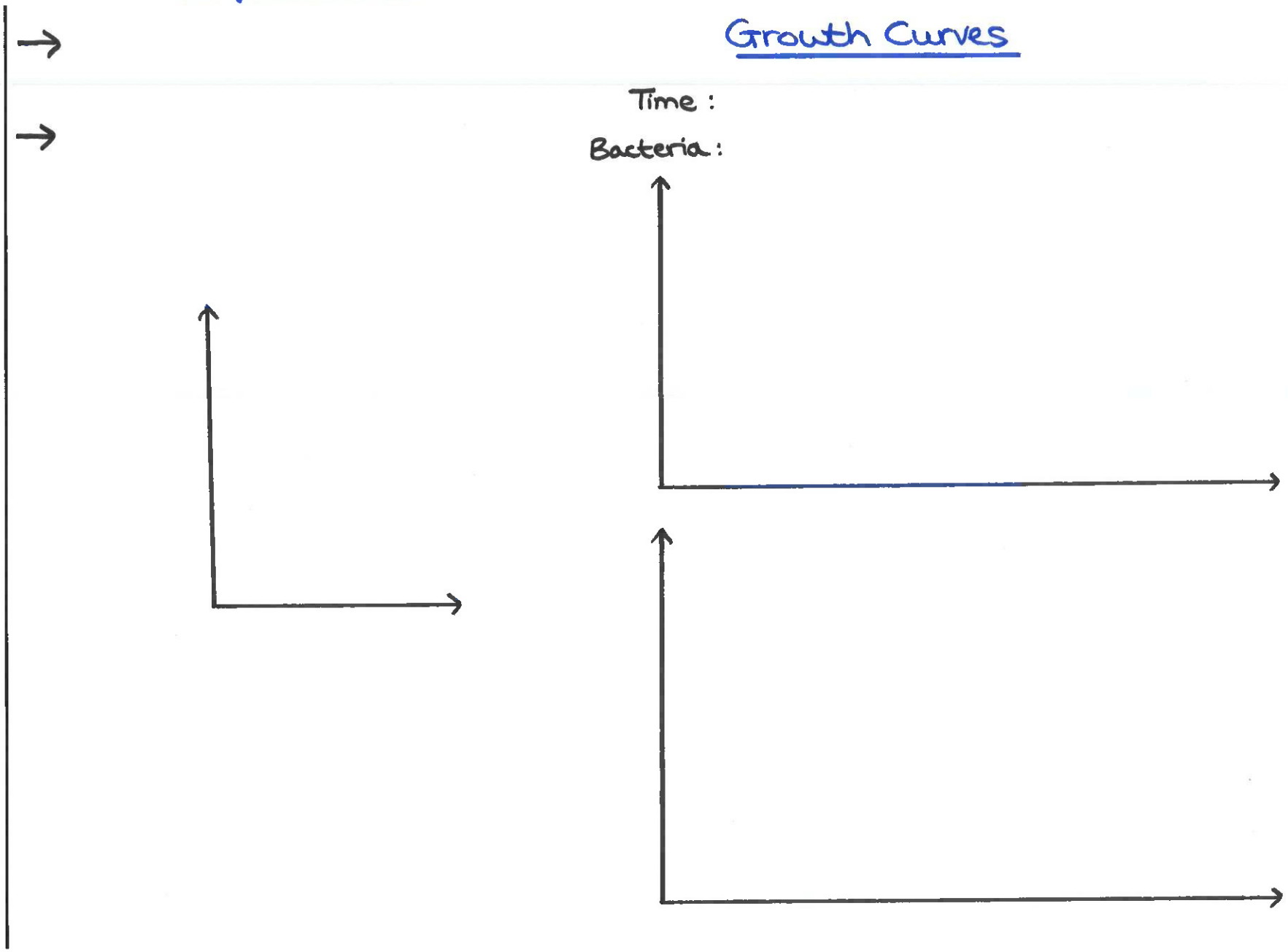
Logarithmic Scale

1 2 3 4 5

Growth Curves

Time :

Bacteria :



Chromatography

1 2 3 4 5

Chromatography

Chromatography:

Paper Chromatography:

Thin layer Chromatography( ):

e.g.

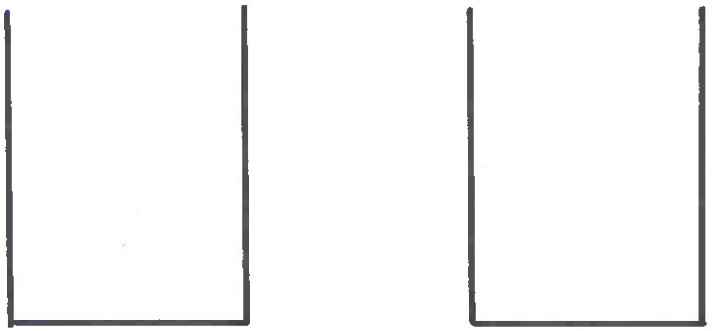
→

↳

→

→

→



Method

1)

2)

3)

4)

5)

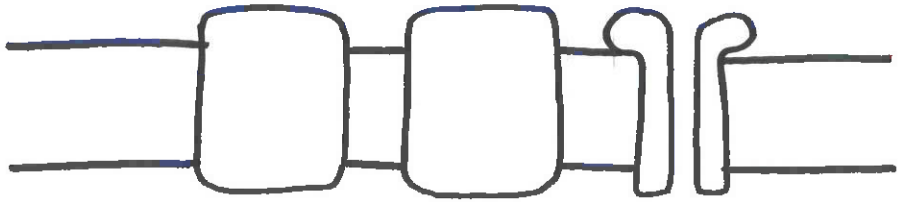
6)

Investigate the Rate of the Light Dependent Reaction in isolated chloroplasts

1 2 3 4 5

Isolating Chloroplasts

Light Dependent Reaction



DCPIP

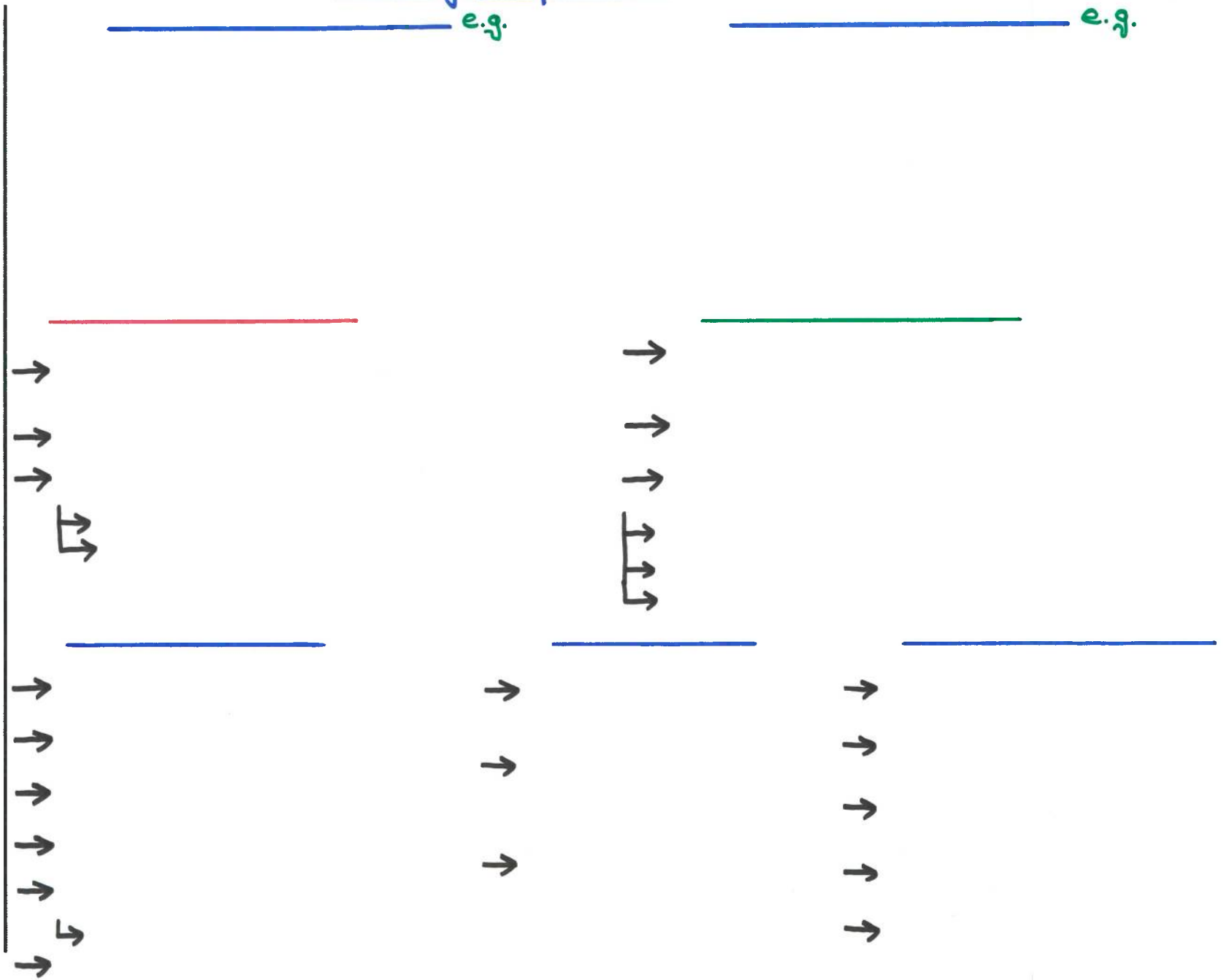
	Leaf Extract	Isolation Medium	Distilled H_2O	DCPIP	Result
①					
②					
③					
④					
⑤					

Rate of Respiration

1 2 3 4 5

e.g.

e.g.



The Effect of an Environmental Variable on the Movement of an Animal

1 2 3 4 5

Taxes

_____:

_____:

Kinesis

Method

→

→

→

→ Record →

→

→

Advantage to Organism →

→ ↳

→ →

→

Behaviour Types

Suggest Another Explaination

→

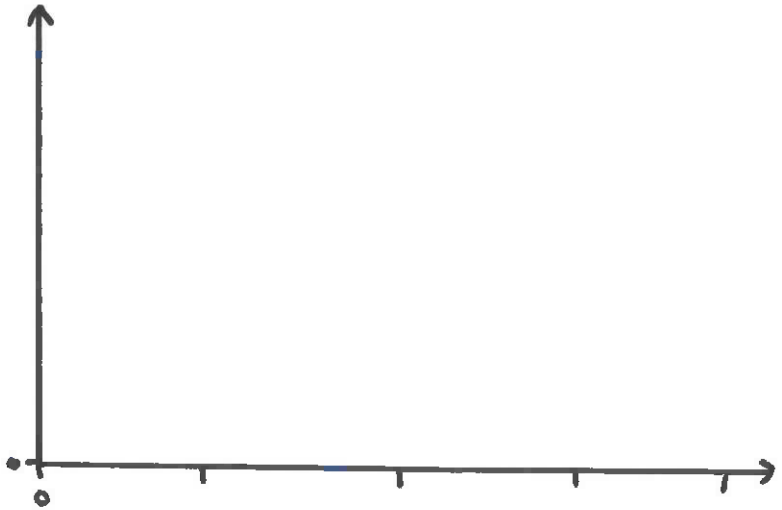
→

e.g.

Identifying the Concentration of Glucose in an Unknown Sample

1 2 3 4 5

Method



Biochemistry Key Terms

1 2 3 4 5

Organic	_____ :
	_____ :
Inorganic	_____ :
Redox	_____ :
Co-enzymes	
Phosphorylation	_____ :
	_____ :
Photo-Phosphorylation	_____ :
Photolysis	_____ _____ _____ :
Electron Transport Chain	_____ :
Proton	

Introduction to Photosynthesis

1 2 3 4 5

Light Reaction

Light Reaction

The Chloroplast

1 2 3 4 5

Chloroplast

_____ :

_____ :

Thylakoid →

Stroma

Thylakoid
→
→

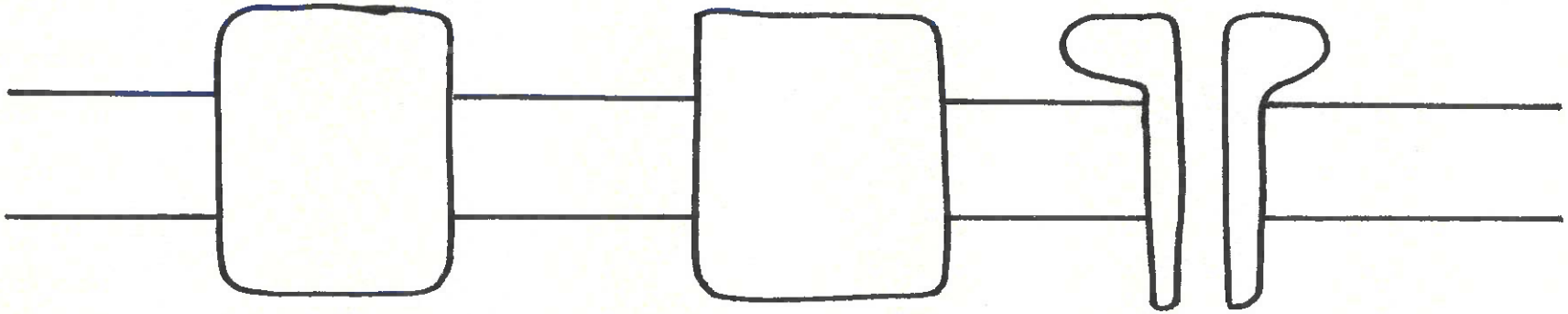
Grana

Lamellae

Starch Grain

Chloroplast DNA

The Light Dependent Reaction



The Light Independent Reaction : The Calvin Cycle

1 2 3 4 5

Calvin Cycle

_____ _____ :

The Calvin Cycle

→

→

→

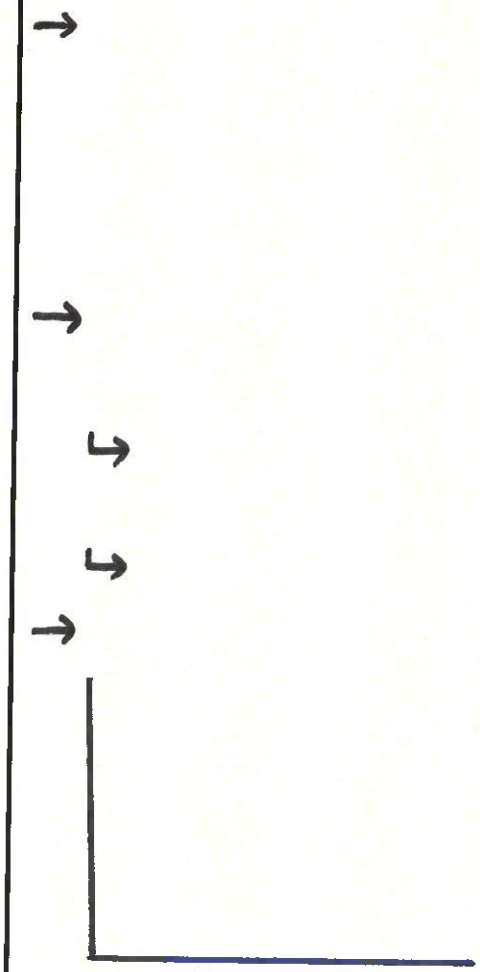
→

→

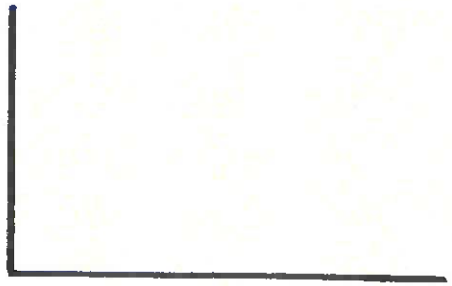
Limiting Factors of Photosynthesis

1 2 3 4 5

Light Intensity

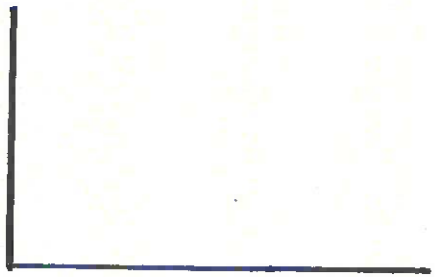


CO_2 Concentration



e.g.

Temperature



Introduction to Respiration

1 2 3 4 5

Aerobic Respiration

→

→

→

→

Anaerobic Respiration

→

→

→

↳

→

Aerobic Respiration : Glycolysis

1 2 3 4 5

key Facts

→

→

→

→

→

→

The Link Reaction

1 2 3 4 5

Dehydrogenation

Decarboxylation

key Facts

→

→

→

→

_____ :

_____ :

Krebs Cycle

1 2 3 4 5

key Facts

→

→

→

→

→

→

→

↳

→

↳

Products:

Oxidative Phosphorylation

Anaerobic Respiration : Glycolysis

1 2 3 4 5

→ Mammals + Bacteria | Plants + Yeasts

→

→

→

→

→

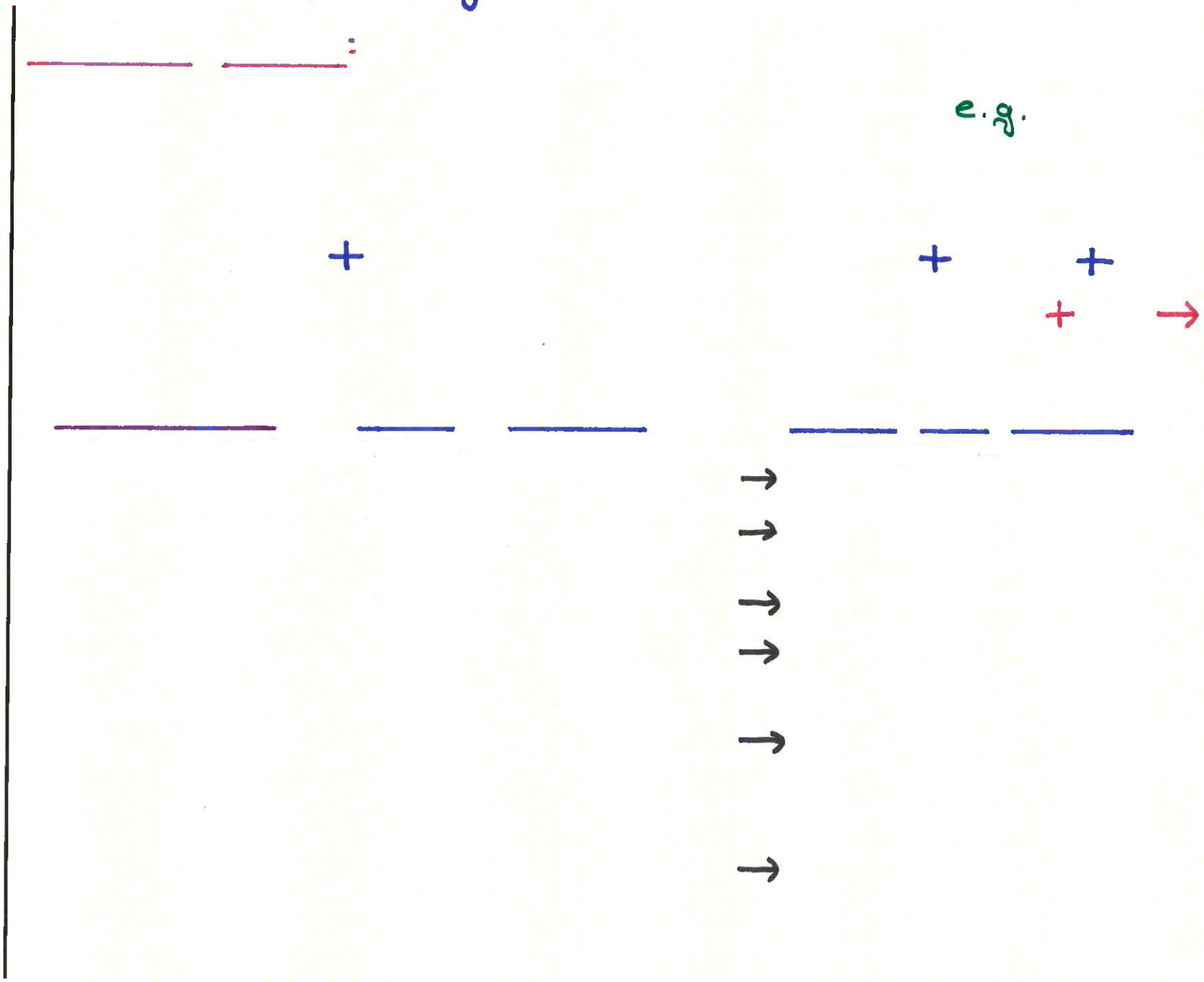
*

Respiratory Substrates

1 2 3 4 5

Respiratory Substrate

e.g.



Mitochondria

1 2 3 4 5

TT

Mitochondria

_____:

e.g.

Outer membrane

Inner membrane

Mitochondrial DNA

Matrix

Cristae

→

→

→

→

Introduction to Ecosystems

1 2 3 4 5

Ecosystem _____ :

Population _____ :

_____ :

Community _____ :

_____ :

Habitat _____ _____ :

Niche e.g. Rock Pool → Playing Field → Large Tree

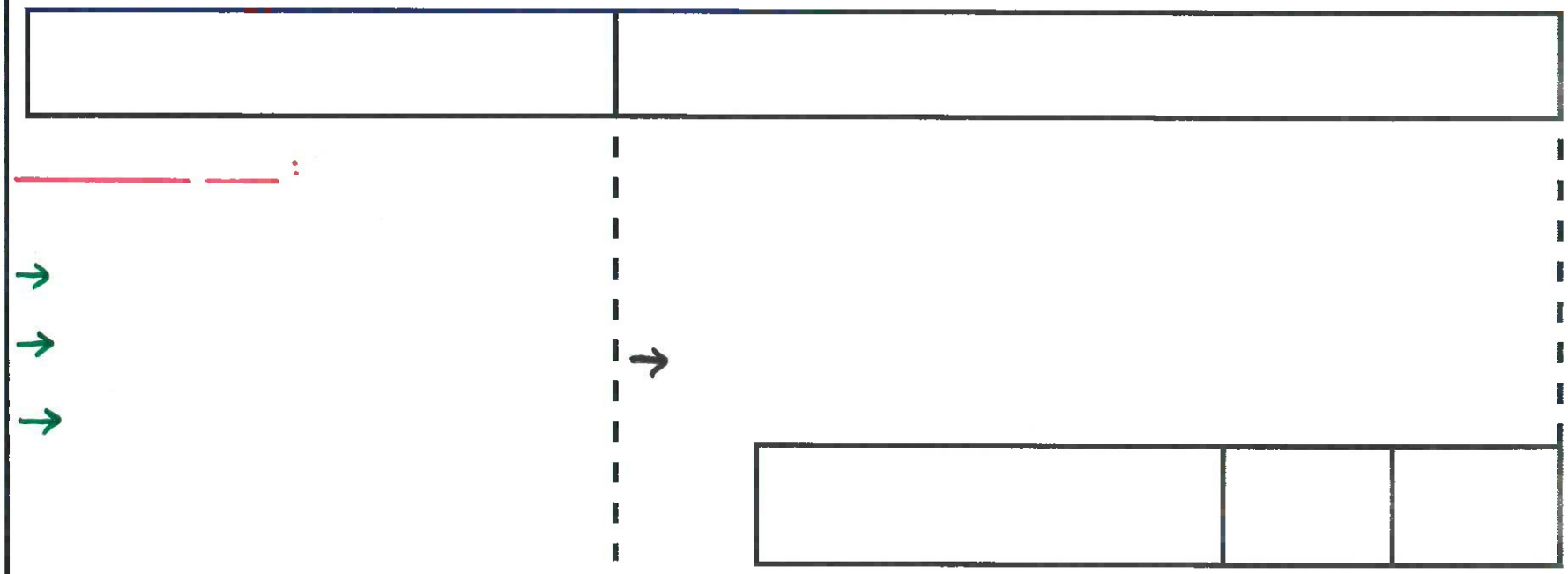
Tropic Level

TT

Respiratory Loss

Productivity_

1 2 3 4 5



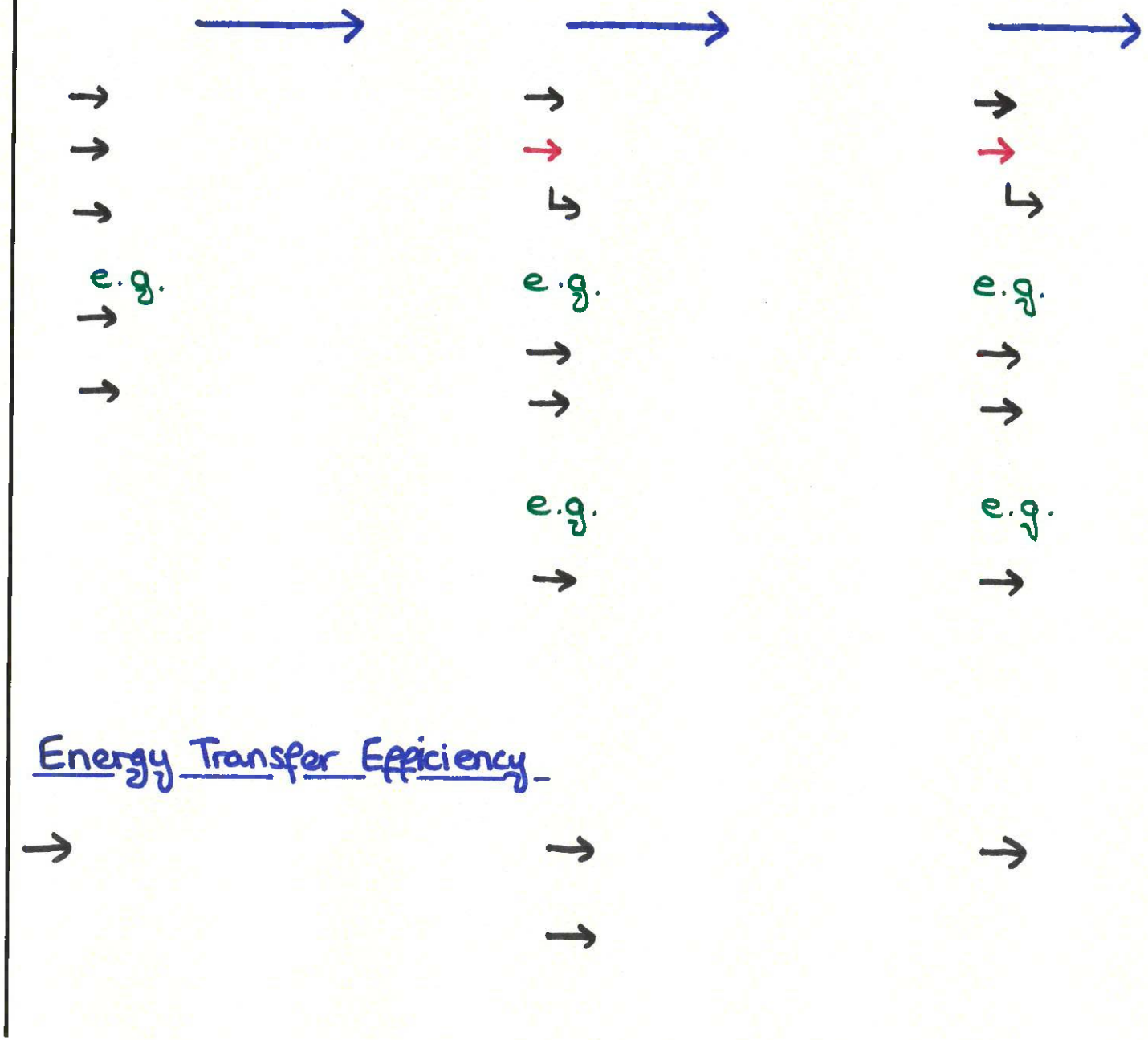
Calculating Energy Transfer Efficiency_

F =

N =

Energy Transfer Efficiency Through Ecosystems

1 2 3 4 5



Energy Transfer Efficiency

Increasing Energy Transfer Efficiency

1 2 3 4 5

Plant Crops

1. →
   - →
   - →
   - →
   - ↳
2.

Animals / Livestock

3. →
   - →
4.
5.
6.
7. Both Plants + Animals:

TT

Calorimetry

Measuring Biomass

① Dry Biomass

→

→

→

↳

→

② Mass of Carbon

→

→

→

→

→

Calculating Energy Stored in Biomass

_____:

→

→

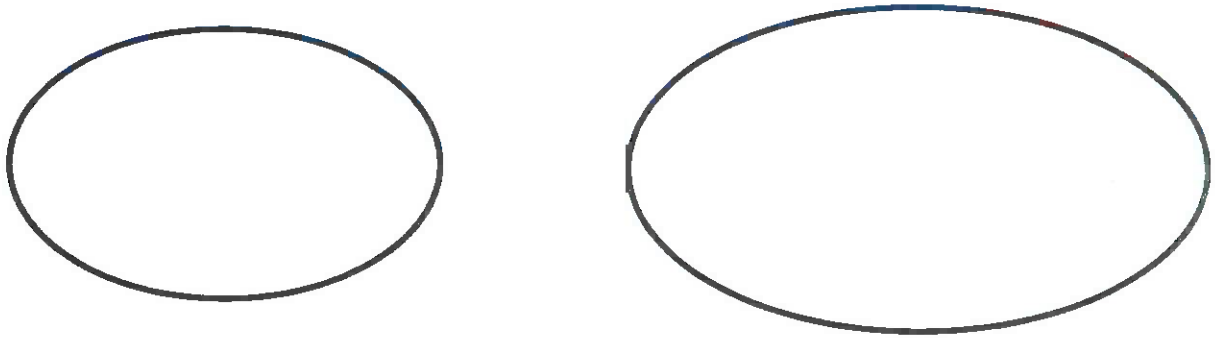
↳

TT

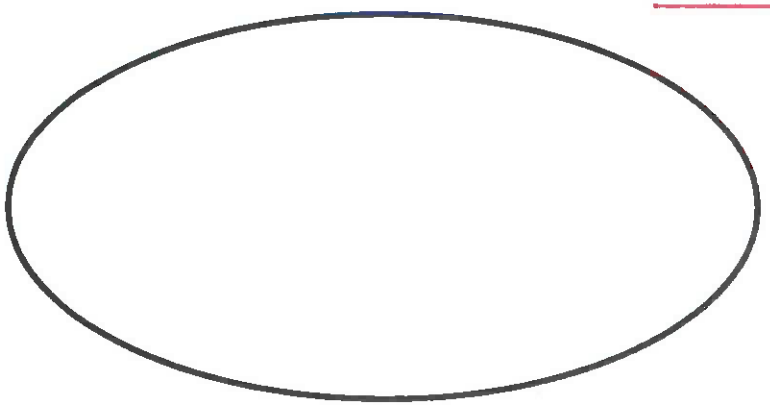
The Nitrogen Cycle

1 2 3 4 5

Saprobiontic Nutrition

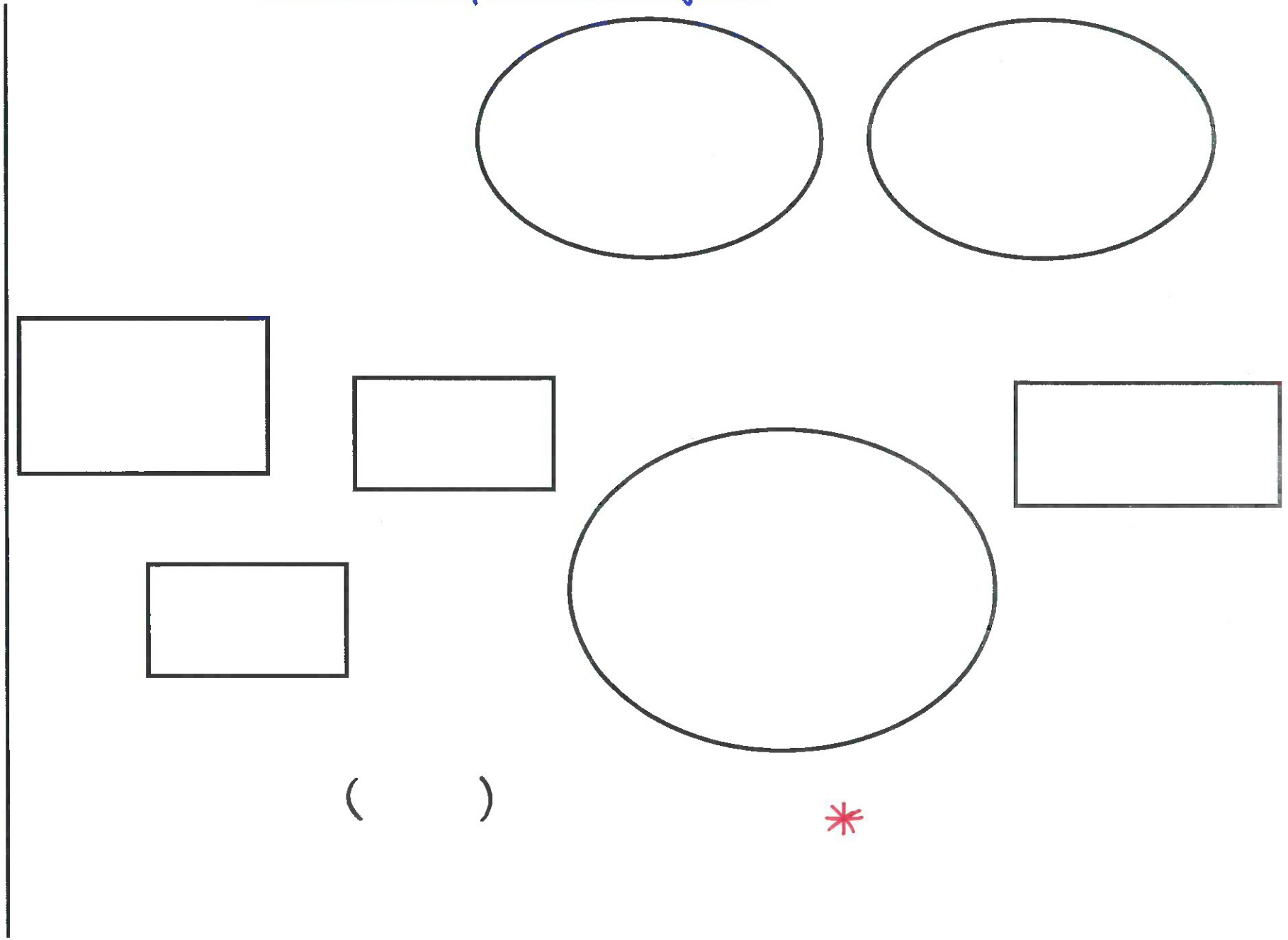


_____ _____ :



The Phosphrous Cycle

1 2 3 4 5



Microorganisms & Nutrient Cycles

1 2 3 4 5

Saprobionts

Recycling Nutrients

→

→

Saprobiontic Nutrition

_____:

_____ _____:

Mycorrhizae

_____:

→

↳

e.g.

→

Fertilisers, Leaching & Eutrophication

1 2 3 4 5

Natural Fertilisers _____ _____:

→

↳

Benefits: → →

→

→

_____ _____:

Artificial fertilisers

Leaching: →

→

Eutrophication:

1)

2)

3)

4)

5)

6)

Harvesting Crops/Livestock

→

→

→

→

TT

Tropism

Plant Responses: Growth Factors (AQA + Edexcel) / Growth Hormones (OCR)

1 2 3 4 5

e.g.

_____:

Growth Factors / Growth Hormones

→

↳

e.g. →

→

→

→

→

_____ _____

Shoots:

Roots:

Shoots:

Roots:

TT

Taxes & Kineses

1 2 3 4 5

Taxes

Kinesis

Taxes

_____ :

e.g.

→

→

Choice Chamber

→

→

→

→

→

kinesis

_____ :

e.g.

→ Unfavourable Conditions

↳

↳

→ Favourable Conditions

↳

↳

TT

Reflex

Reflexes

1 2 3 4 5

_____:

Advantages

→

→

→

↳

e.g.

Pacinian Corpuscle

Rest

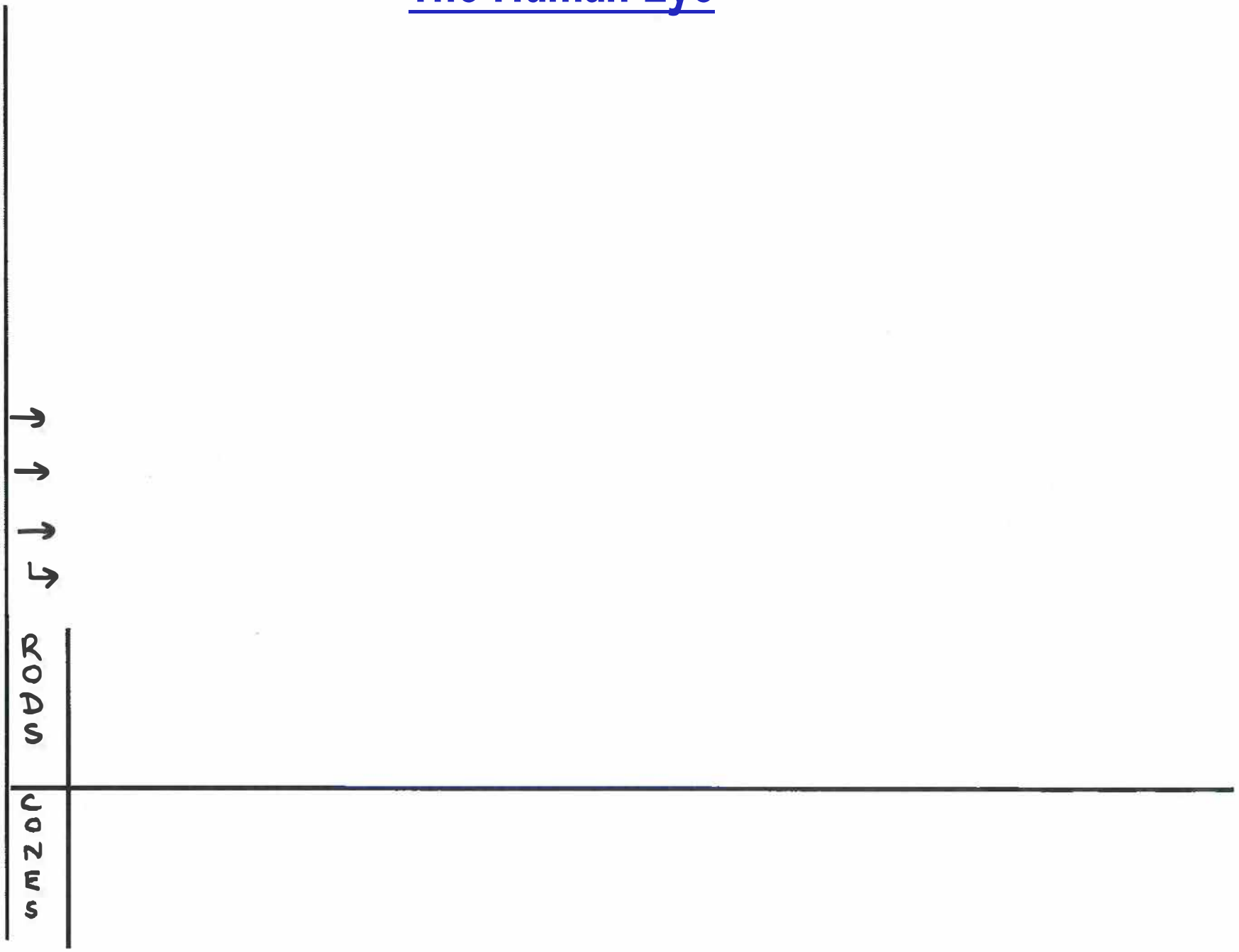
Stimulated

1)

2)

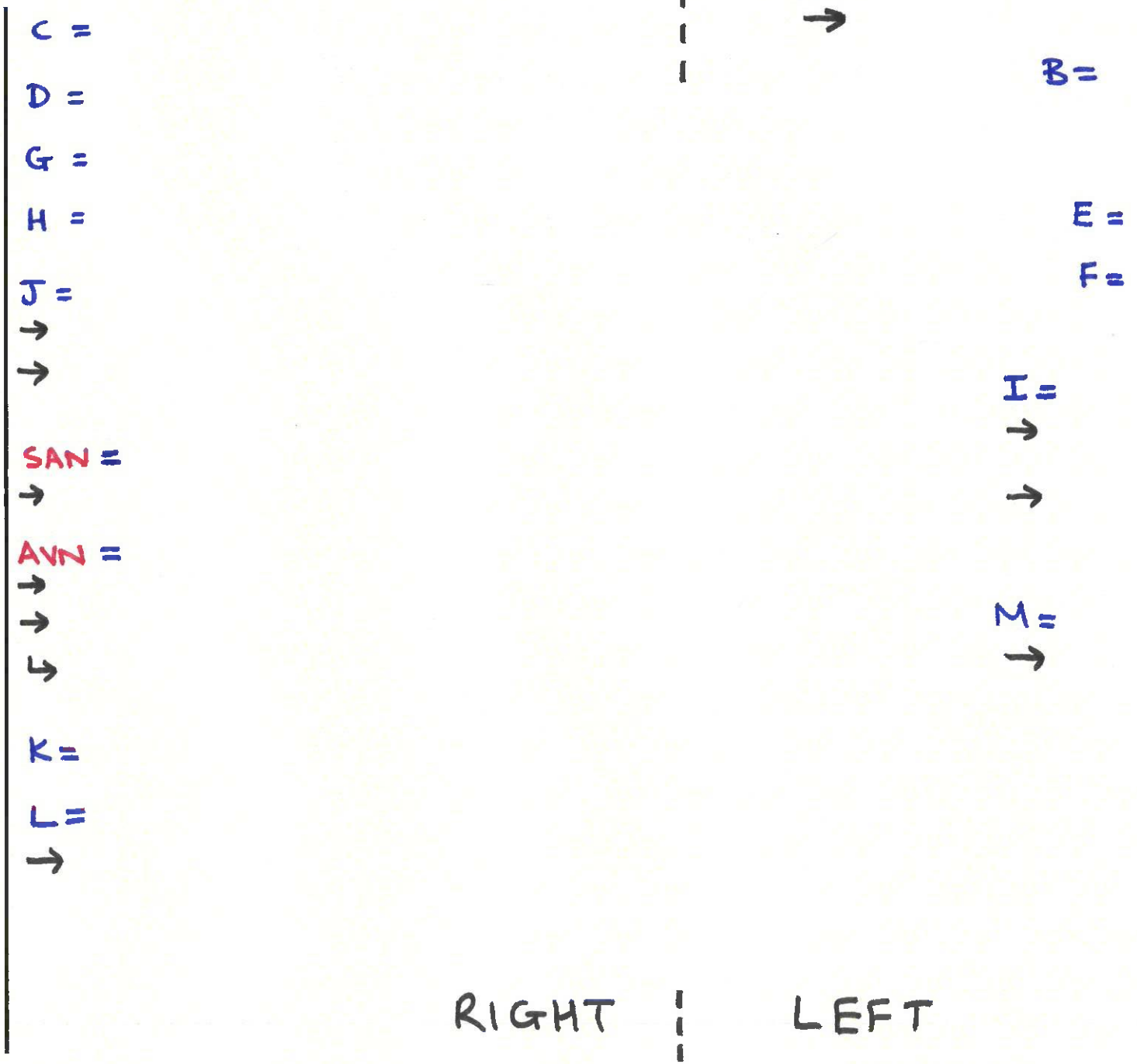
3)

The Human Eye



The Human Heart

1 2 3 4 5



Control of Heart Rate

1 2 3 4 5

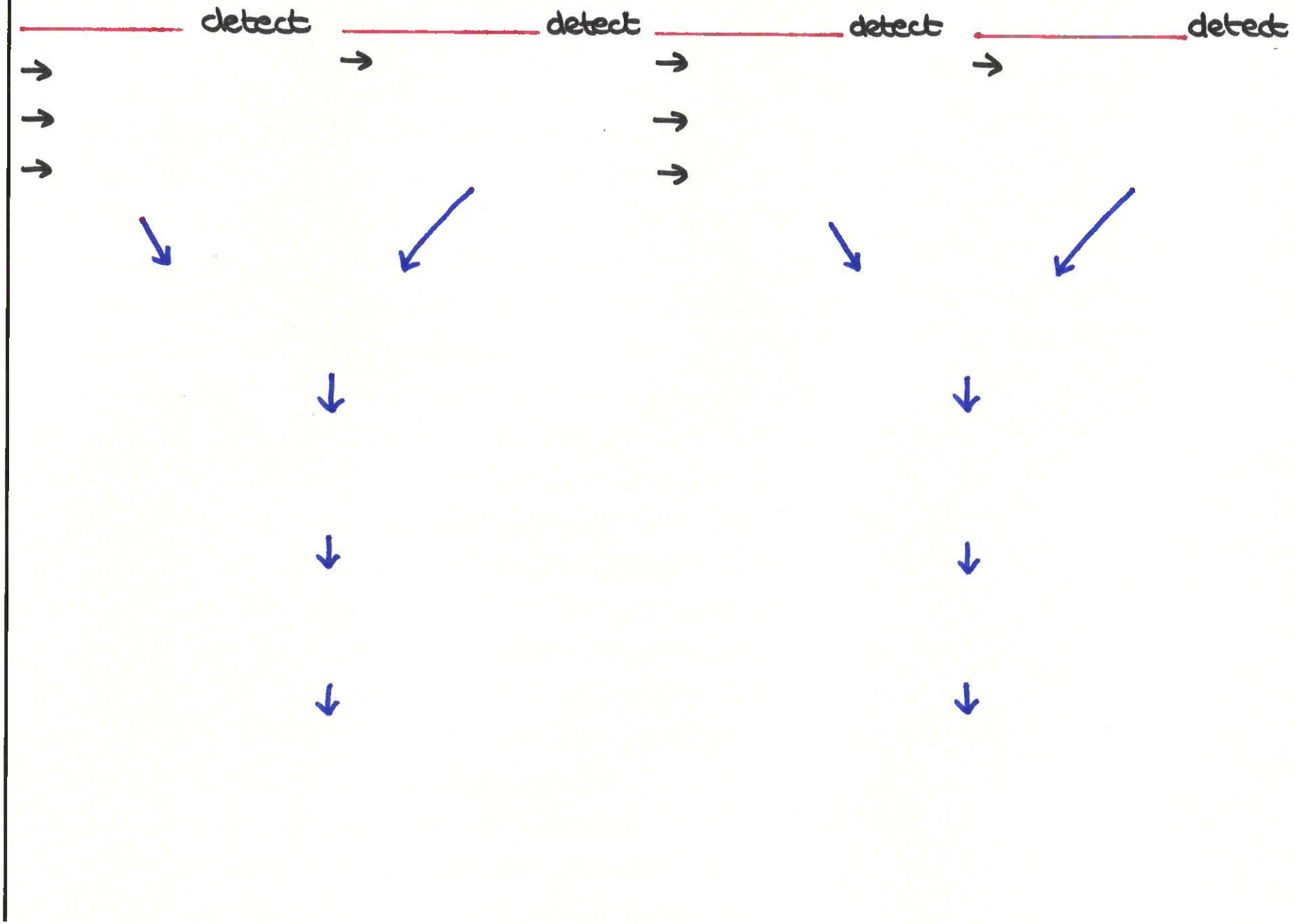
Control

Left Ventricle

Calculating Heart Rate

Changing Heart Rate

1 2 3 4 5



Introduction to the Nervous System

1 2 3 4 5

Nervous Communication

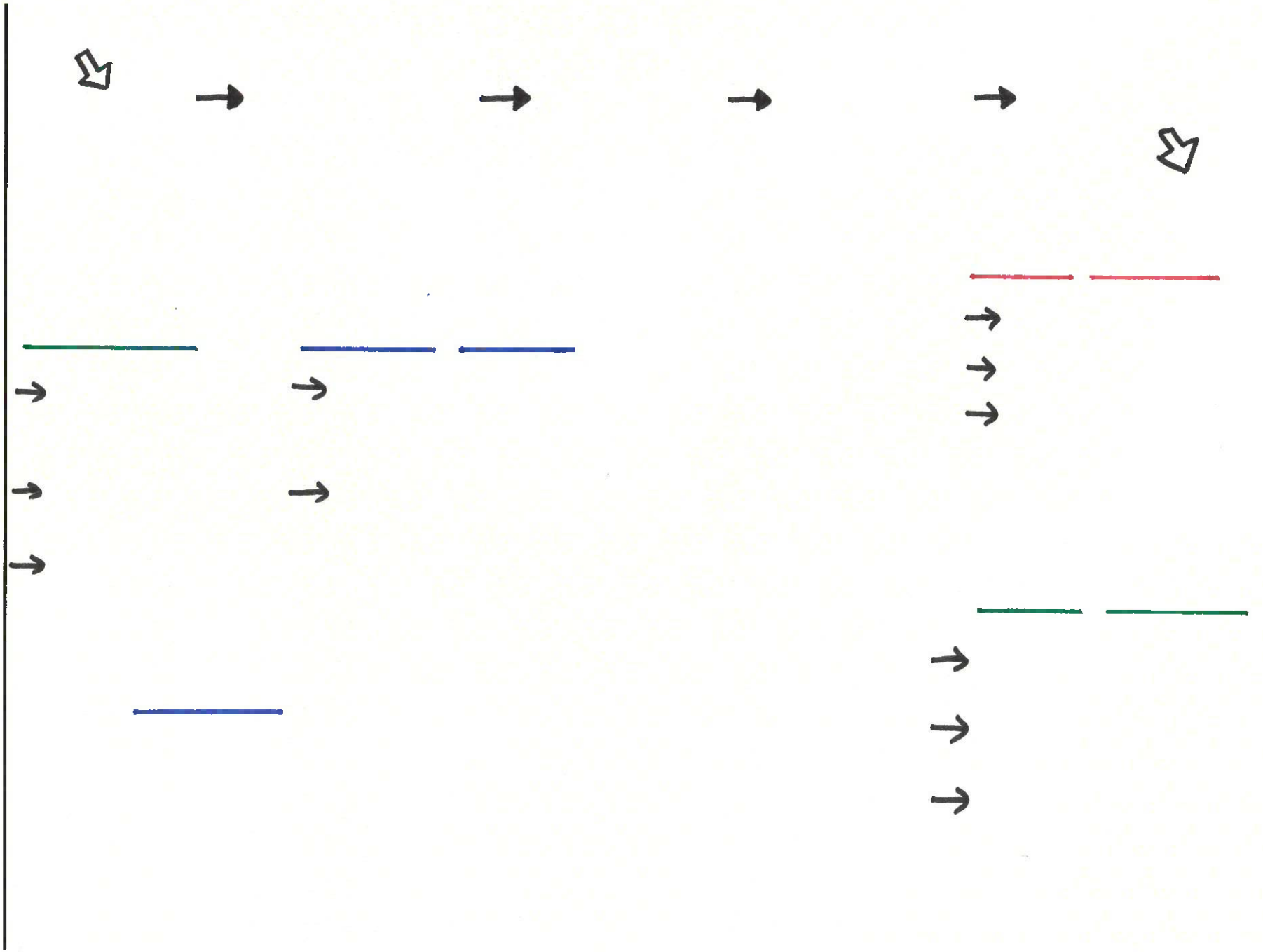
e.g.

e.g.

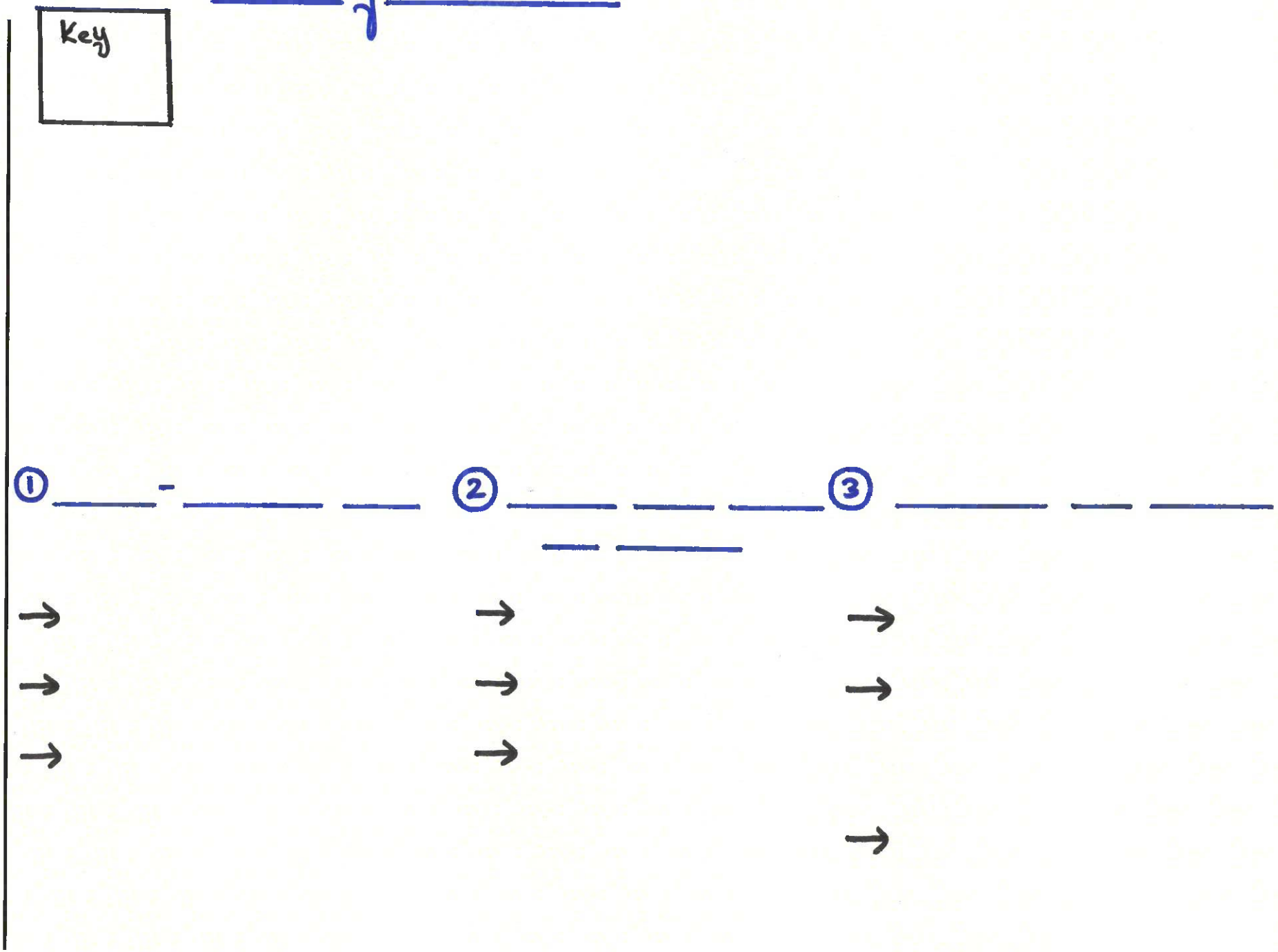
e.g.

e.g.

Receptors & Neurones

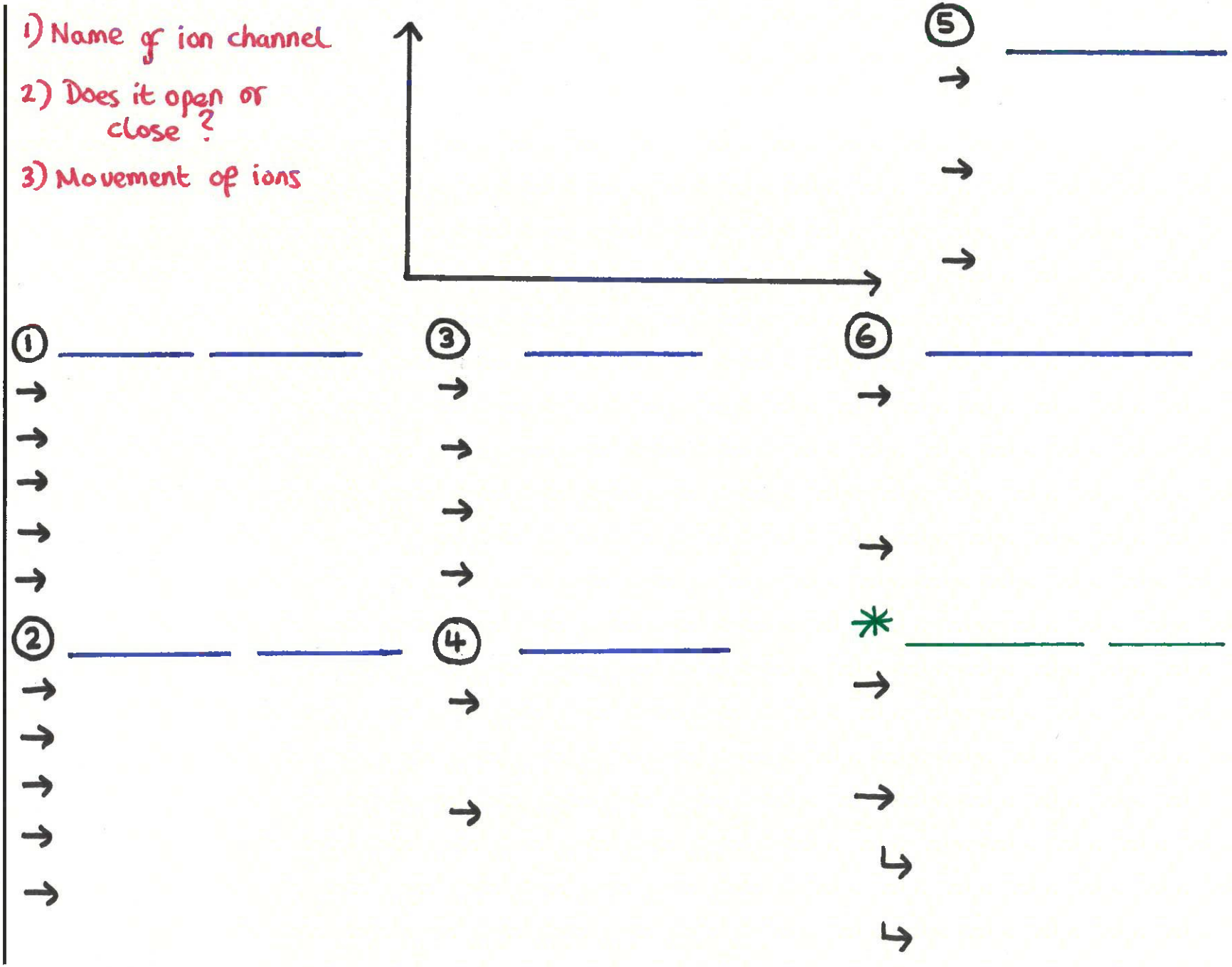


Resting Potential



Action Potentials

1 2 3 4 5



All or Nothing Law

1 2 3 4 5

Resting Potential Depolarisation Repolarisation Hyperpolarisation

All or Nothing Law

→

→

* Refactory Period

→ →

→

→

→

→

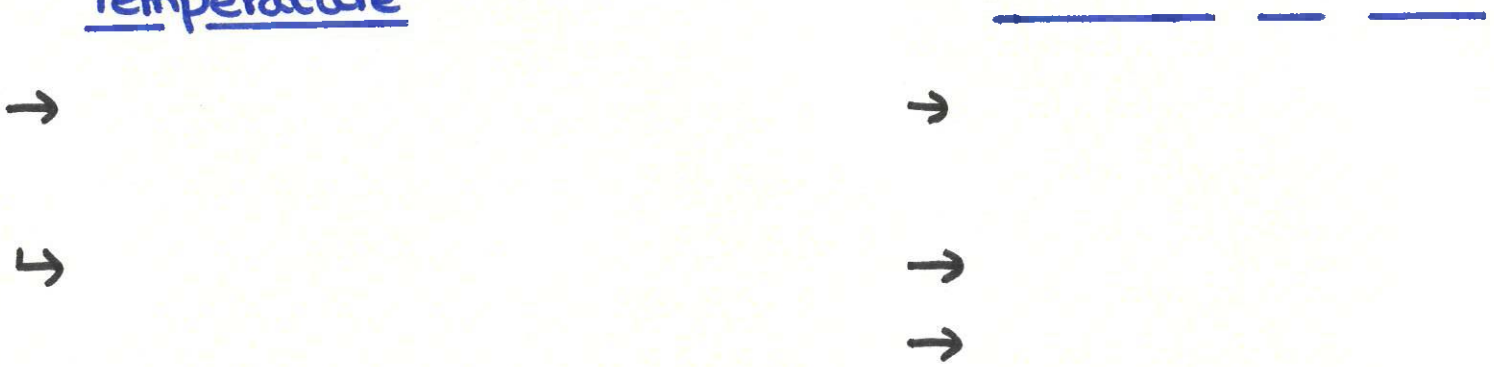
Myelination & Saltatory Conduction

1 2 3 4 5

Saltatory Conduction

Motor Neurone

Temperature



Synapses

Synapse :

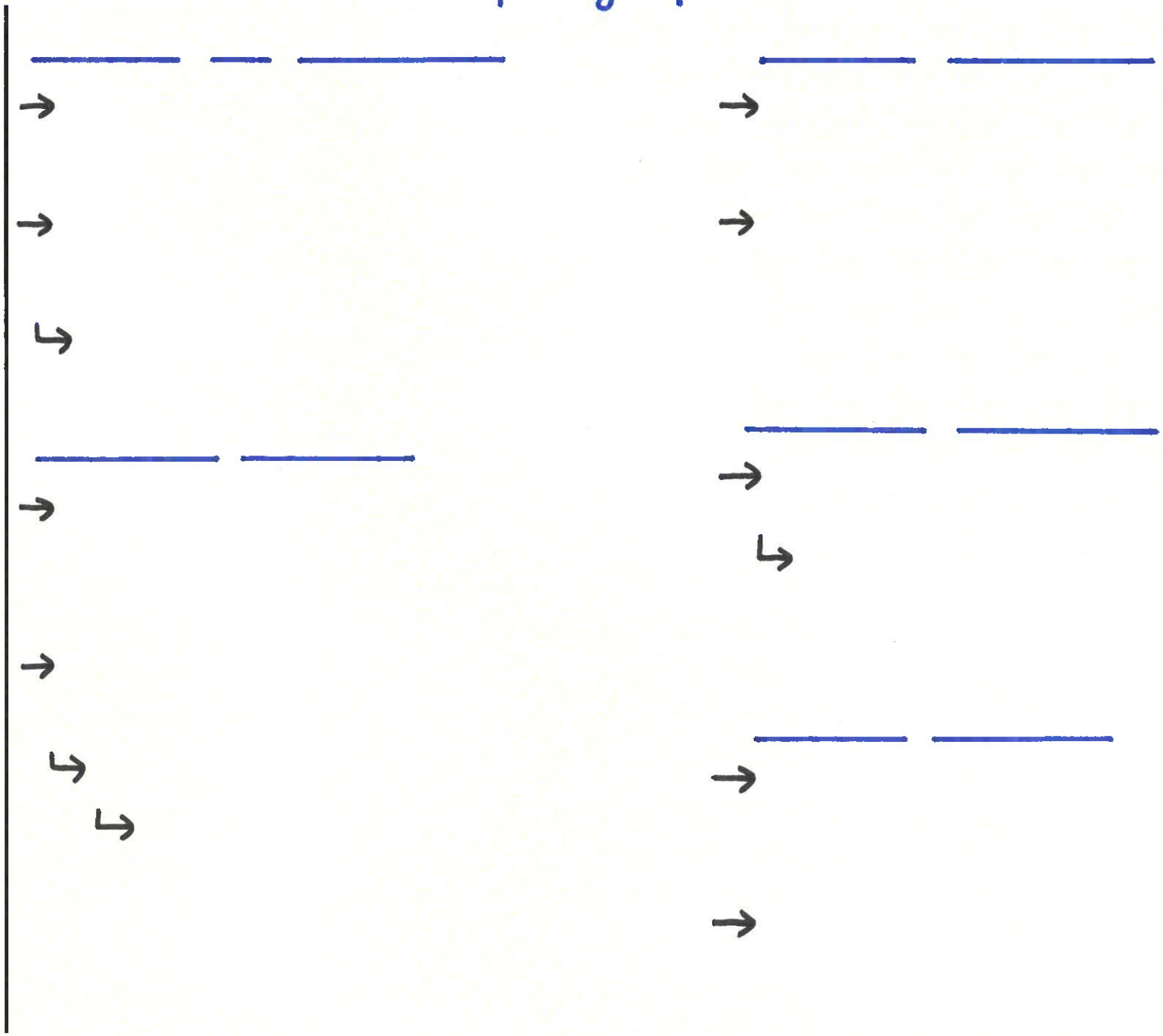
→

e.g.

① ② ③ ④ ⑤ ⑥ ↳ ⑦ ⑧ ⑨ ⑩

Key-

The Role of Synapses



Neuromuscular Junctions

Neuromuscular Junction

_____ _____:

Differences compared to a cholinergic Synapse

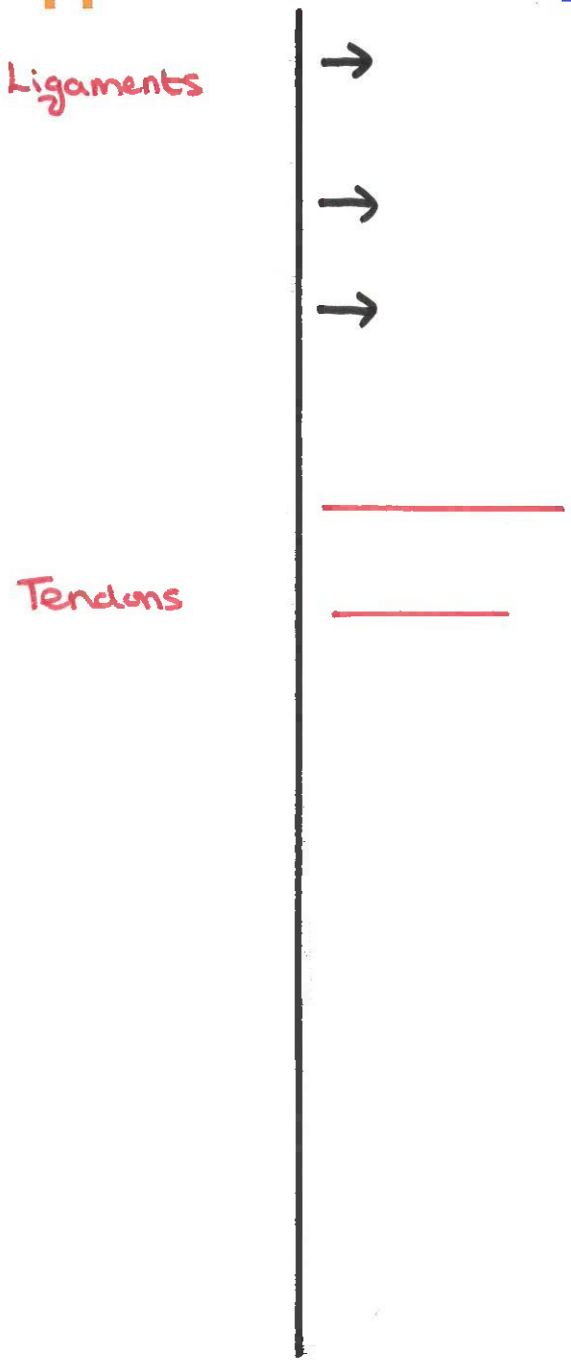
→

↳

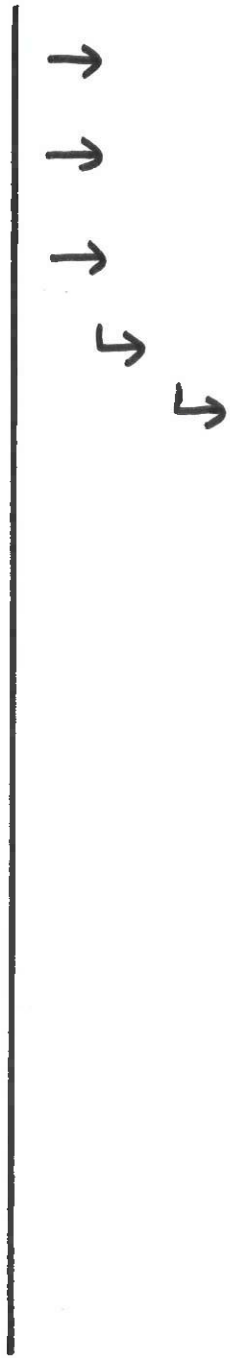
→

→

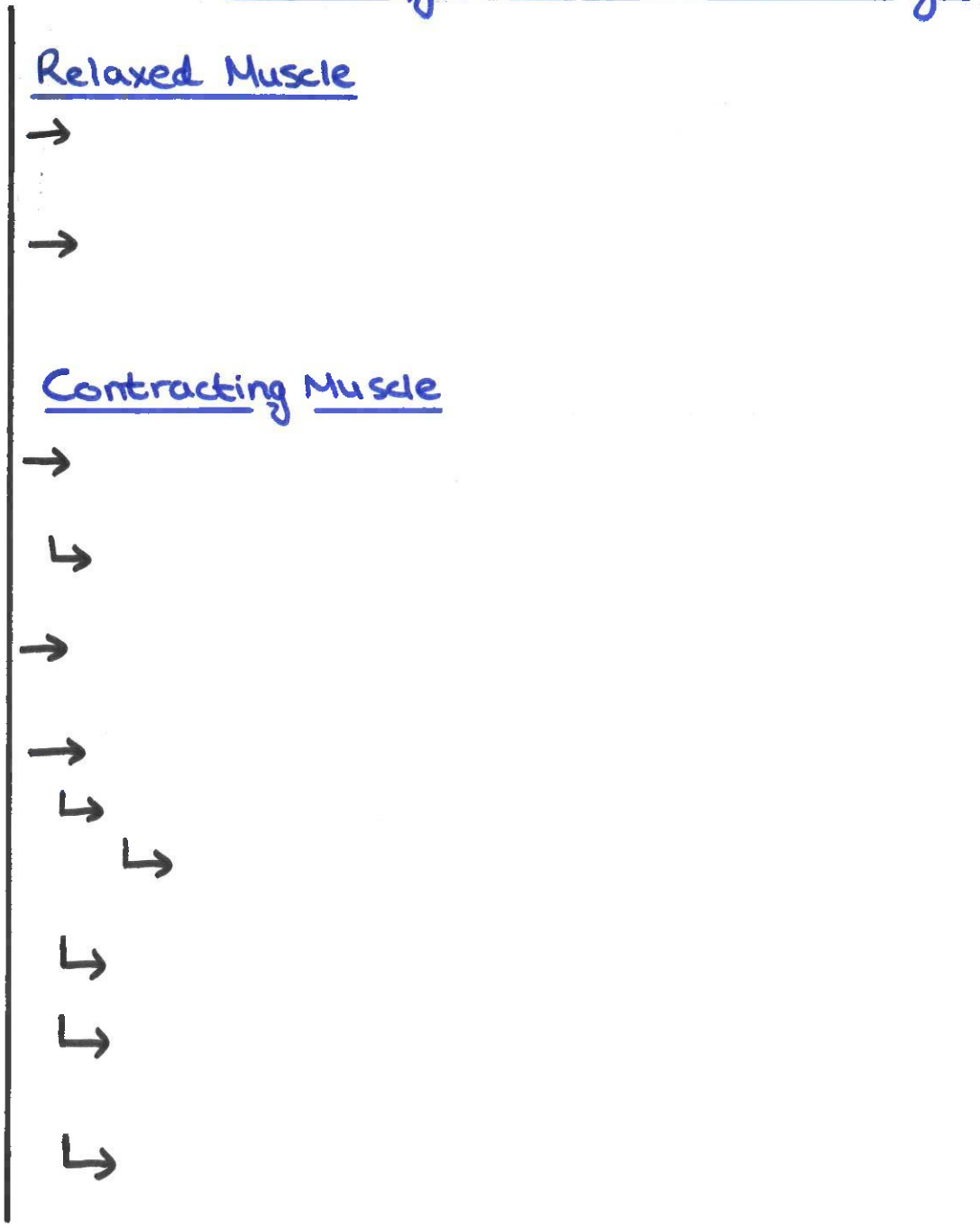
Antagonistic Pairs



Skeletal / Voluntary Muscle



Sliding Filament Theory



Sarcomere Contraction

1 2 3 4 5

Relaxed Sarcomere

Contracted Sarcomere

When a sarcomere contracts...

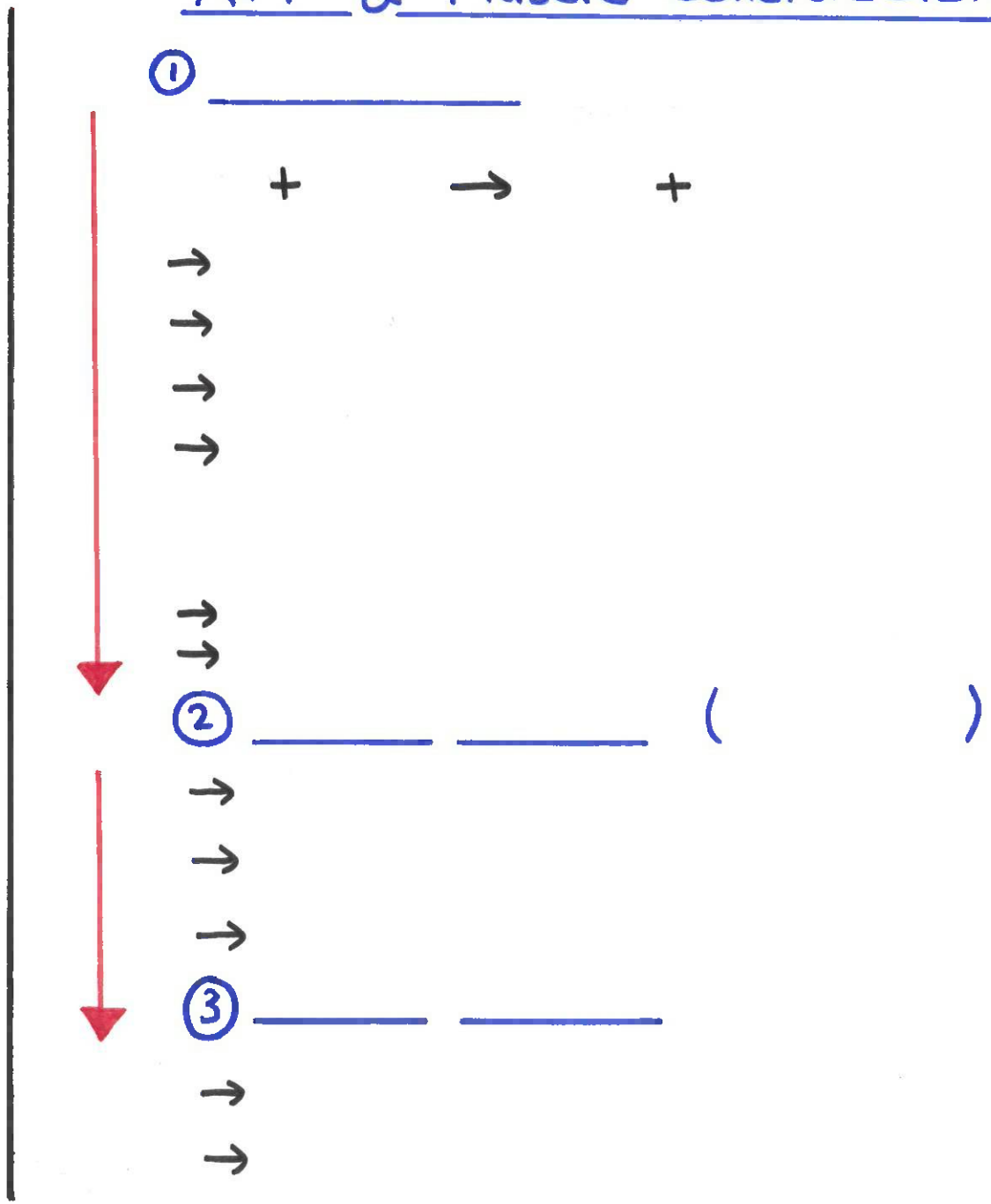
→

→

→

→

ATP & Muscle Contraction



1)

2)

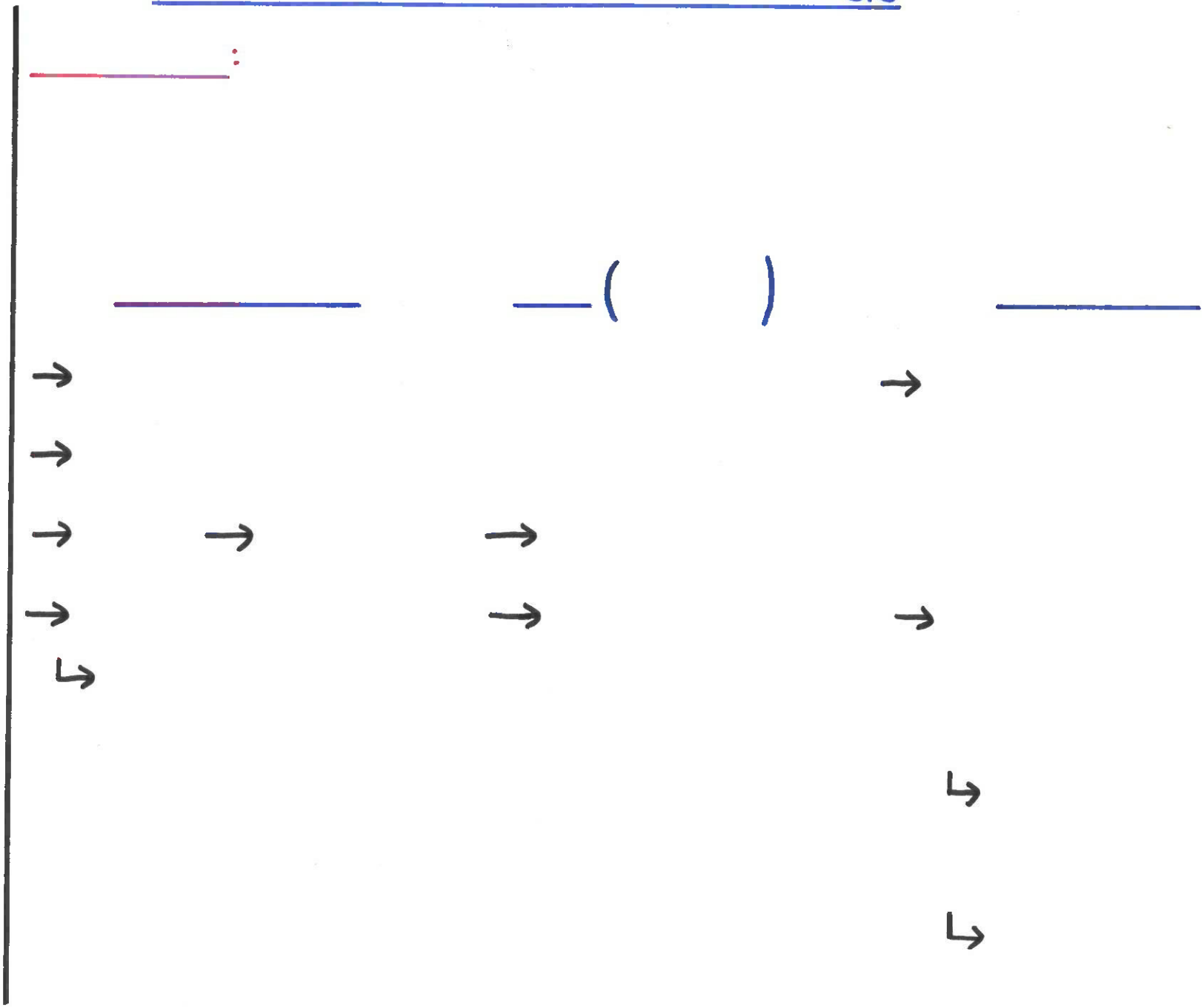
e.g.

Fast & Slow Twitch Muscle Fibres

1 2 3 4 5

Slow Twitch	Fast Twitch
→	→
→	→
→	→
→	→
→	→
↳ Lots of ... →	↳ Few ... →
→	→
→	→
→	→
E.g. e.g.	E.g. e.g.

Introduction to Homeostasis



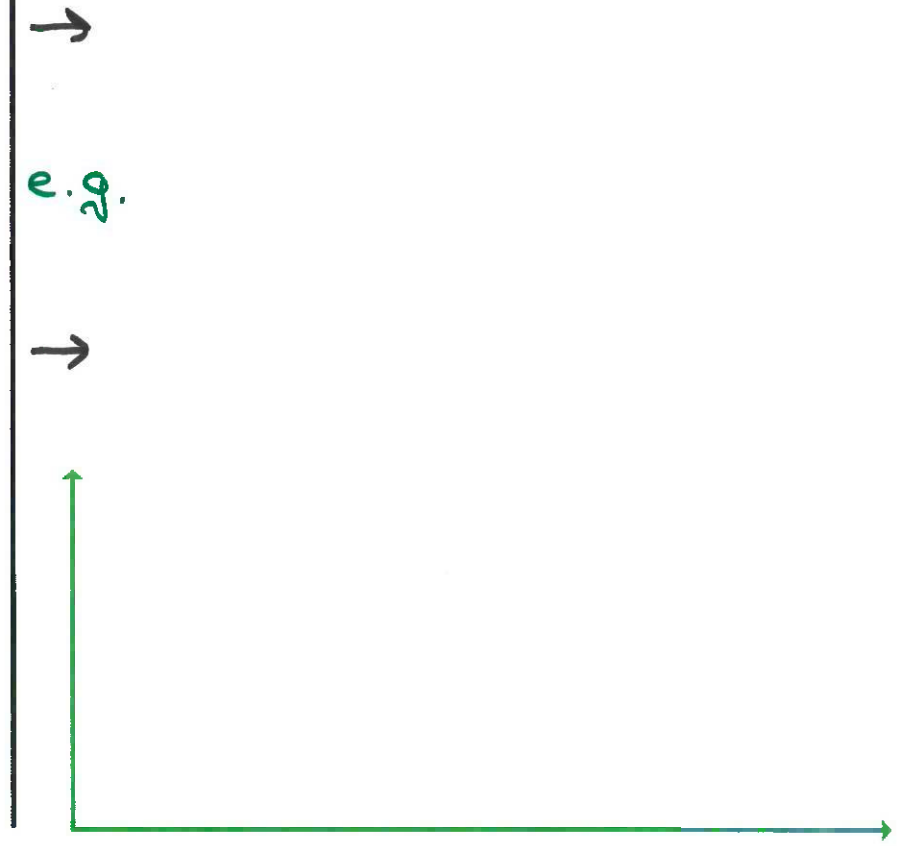
Positive & Negative Feedback

1 2 3 4 5

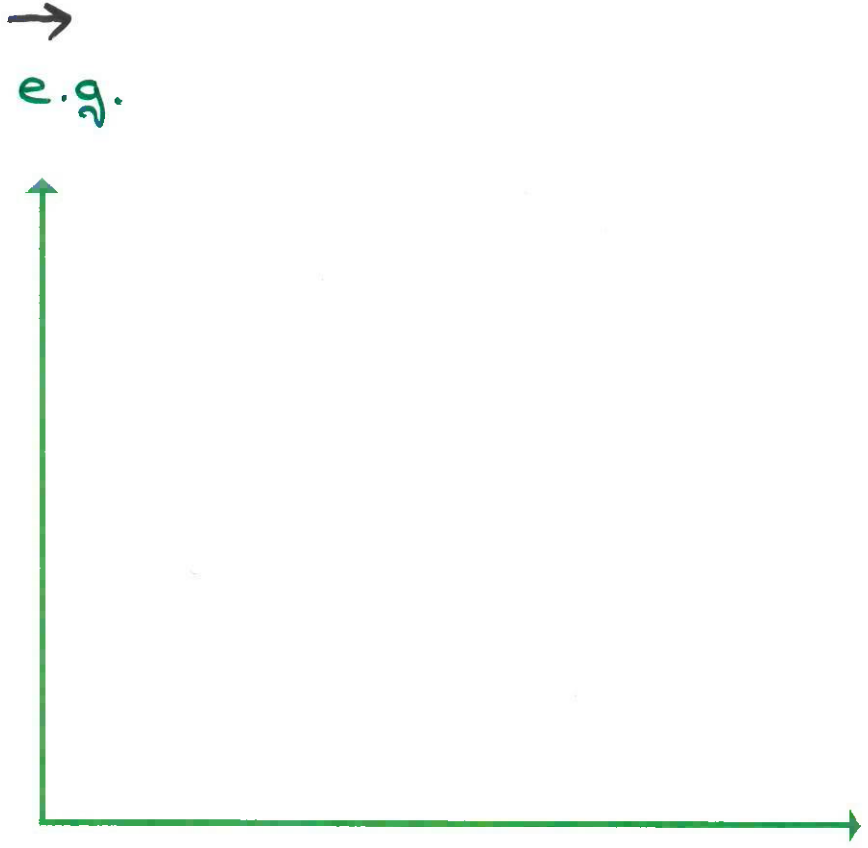
Negative Feedback

Negative Feedback

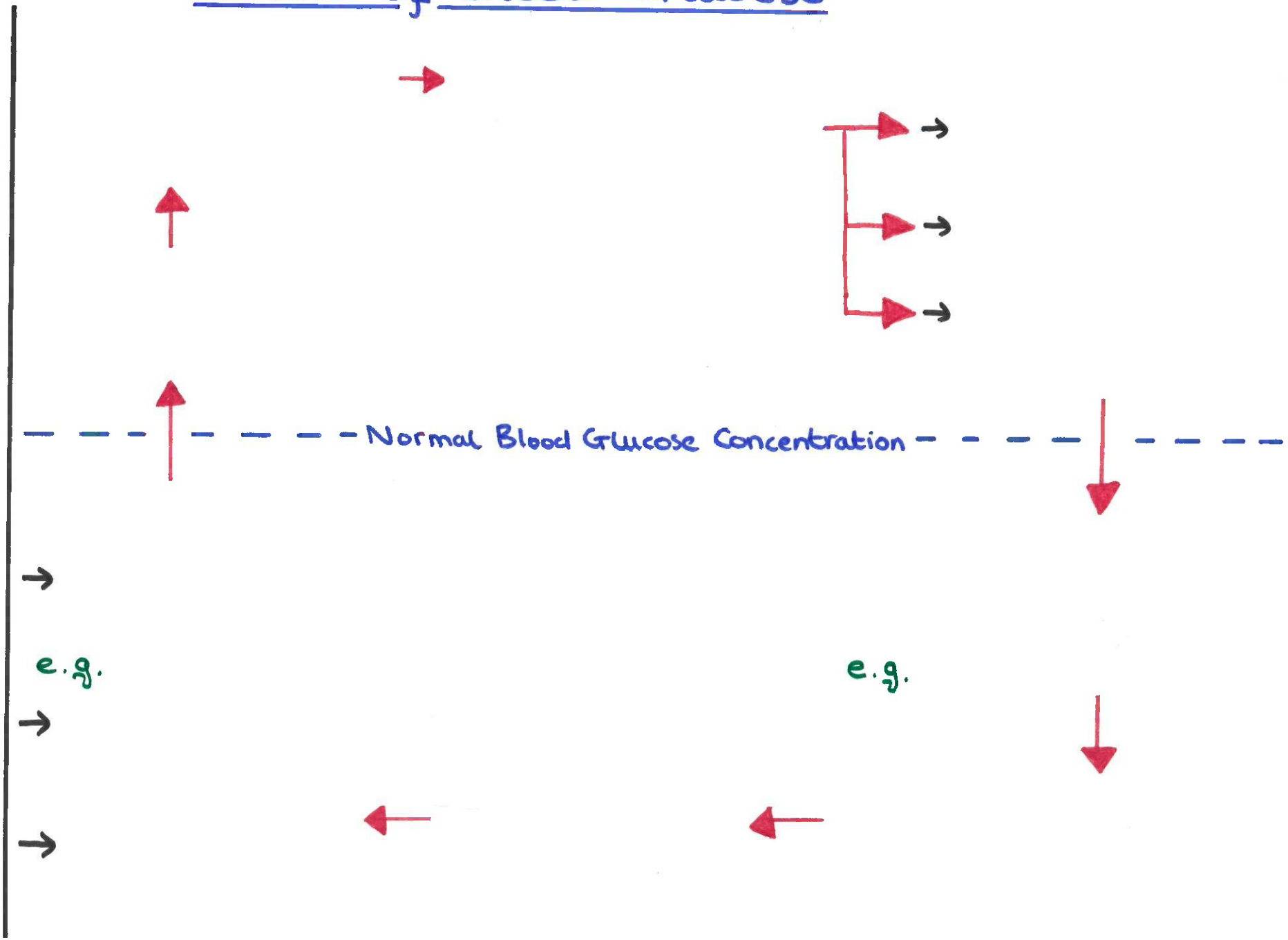
Positive Feedback



Positive Feedback



Control of Blood Glucose



Glycogendolysis, Glycogenesis & Gluconeogenesis

Blood glucose
HIGH

=
=
=

→

←
→

←

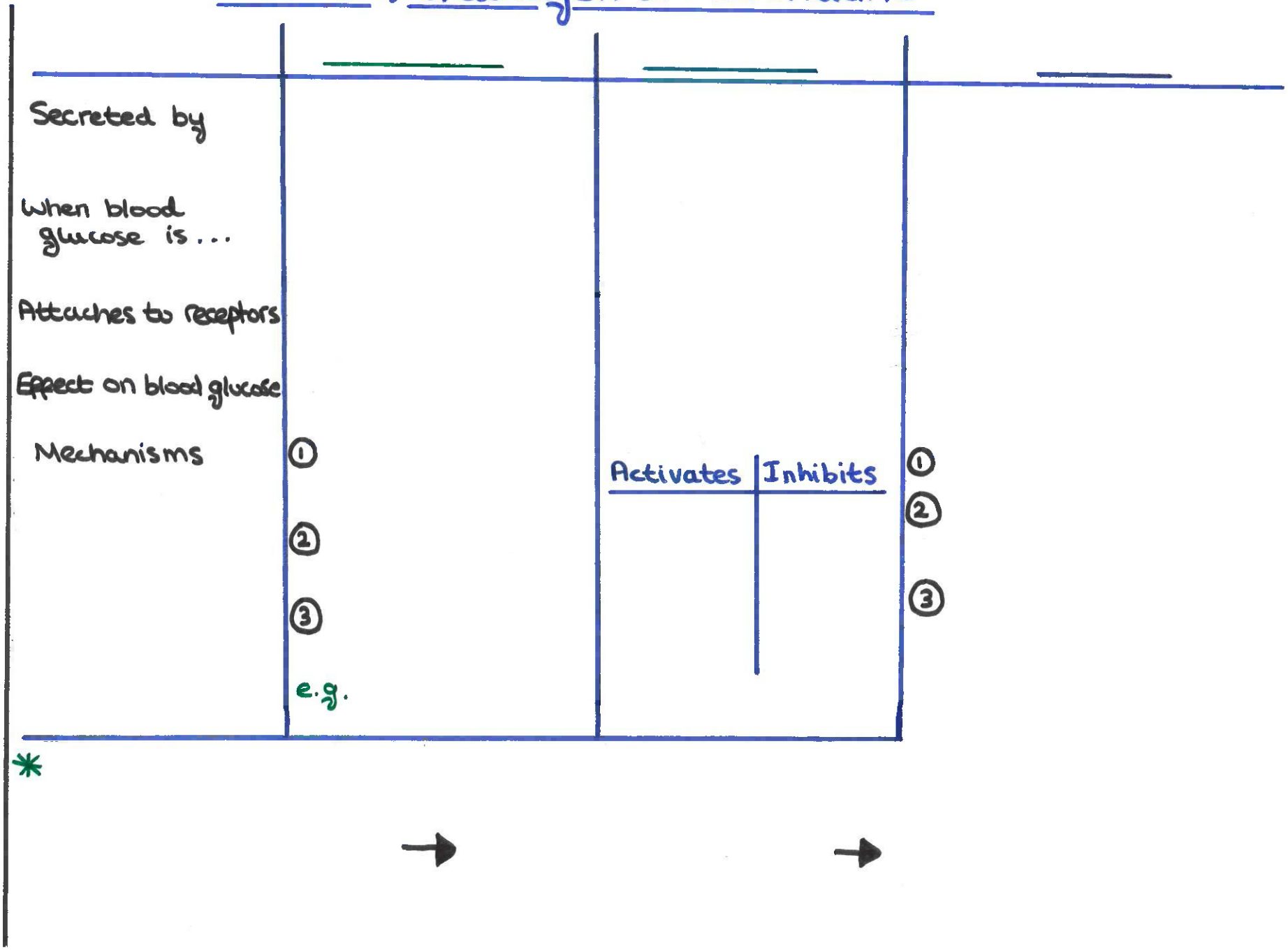
e.g.

→

→

Blood glucose
LOW

Insulin, Glucagon & Adrenaline



Diabetes

1 2 3 4 5

Diabetes Mellitus

_____ _____ :

_____ :

_____ :

Causes →

Hyperglycaemia

Age

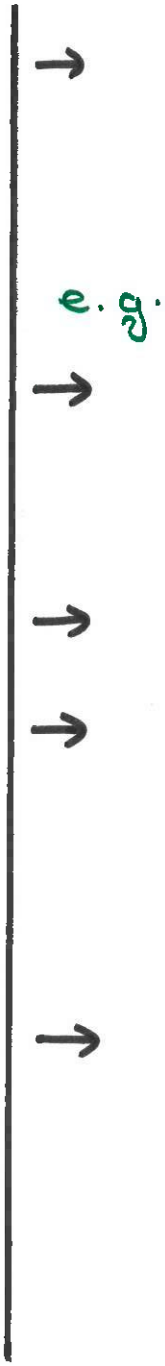
Effect on blood glucose →

Hyperglycaemia

Treatments →

Drugs to →

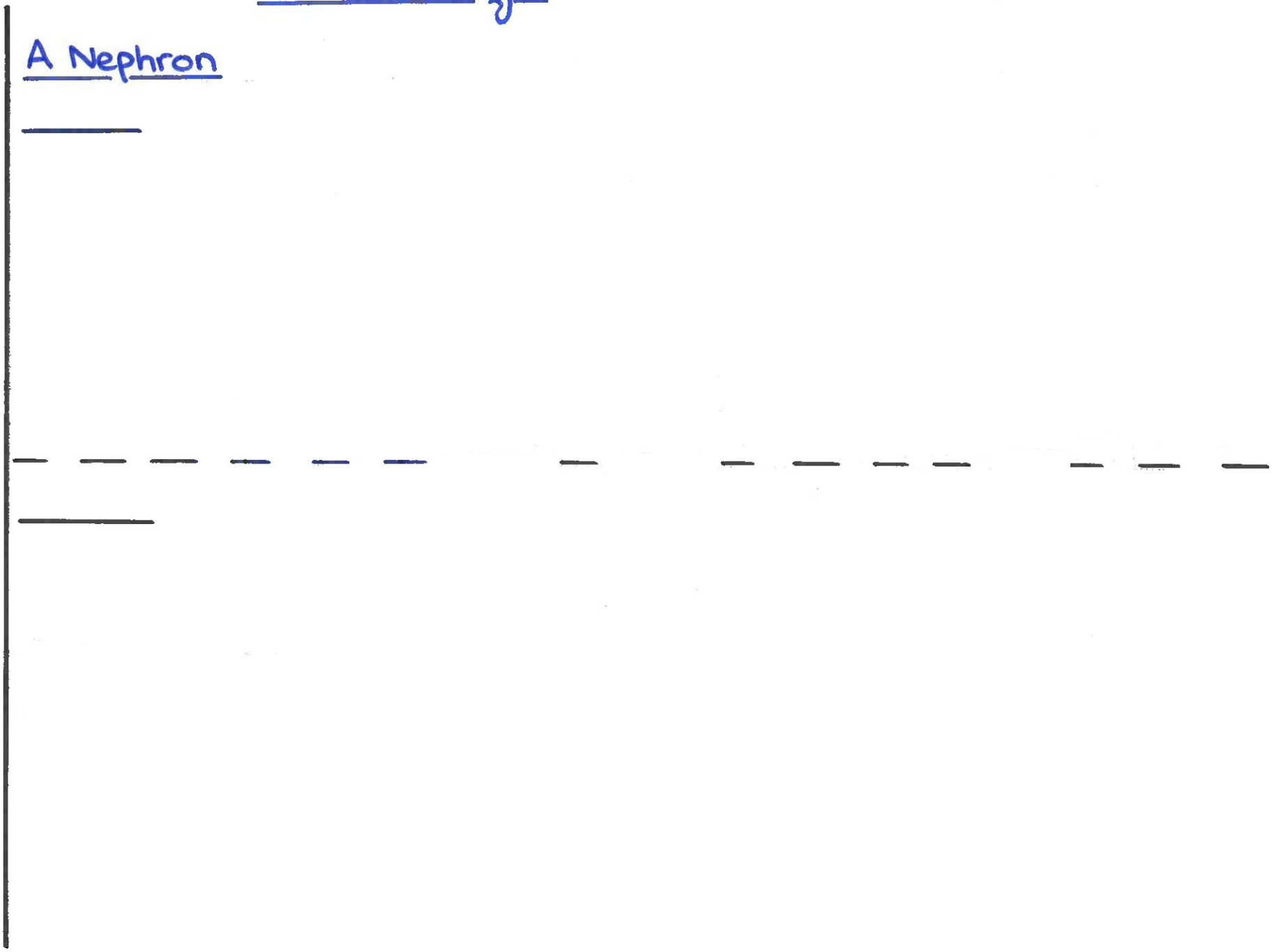
Second Messengers



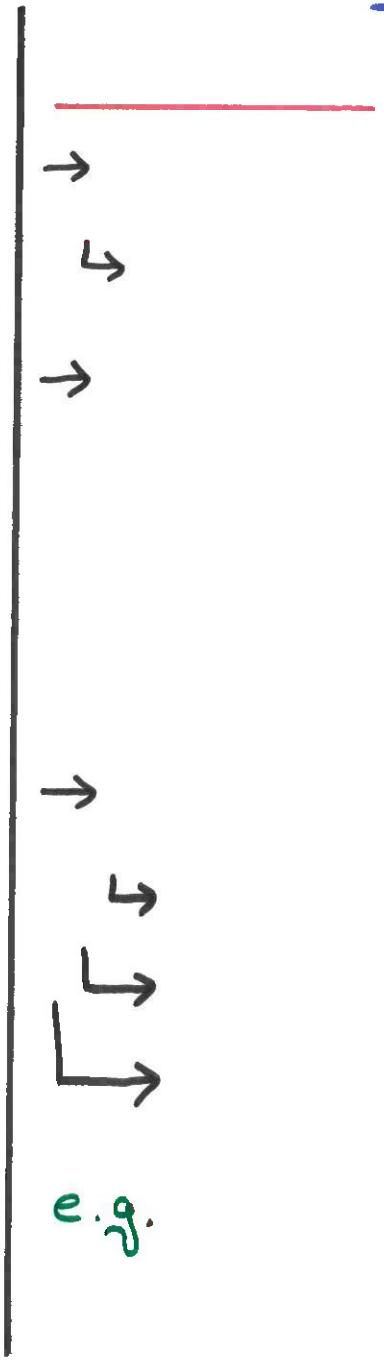
The Kidneys

1 2 3 4 5

A Nephron



Ultrafiltration



e.g.

Selective Reabsorption

1 2 3 4 5

Selective Reabsorption

_____ _____ :

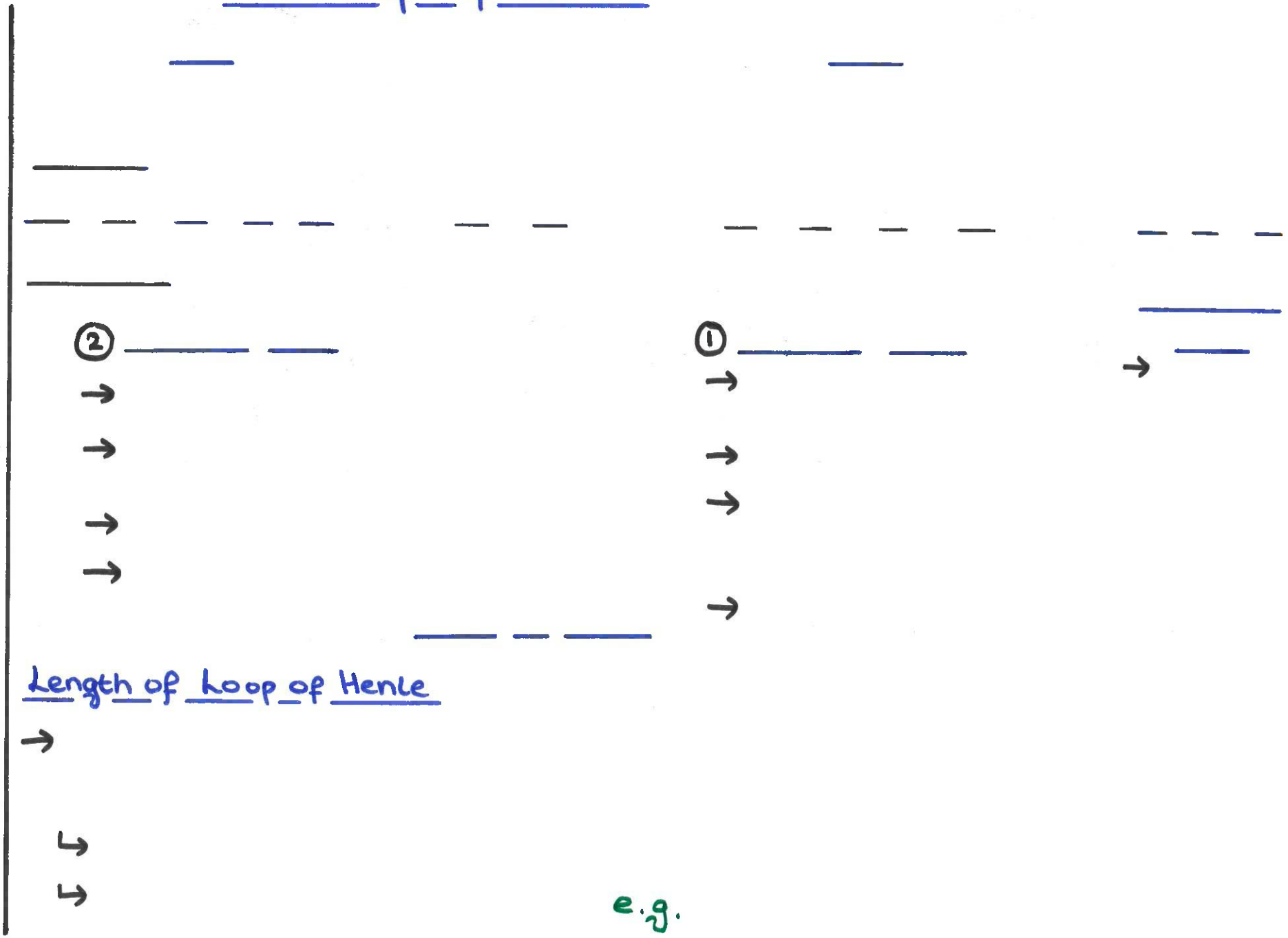
Facilitated Diffusion

Simple Diffusion

Osmosis

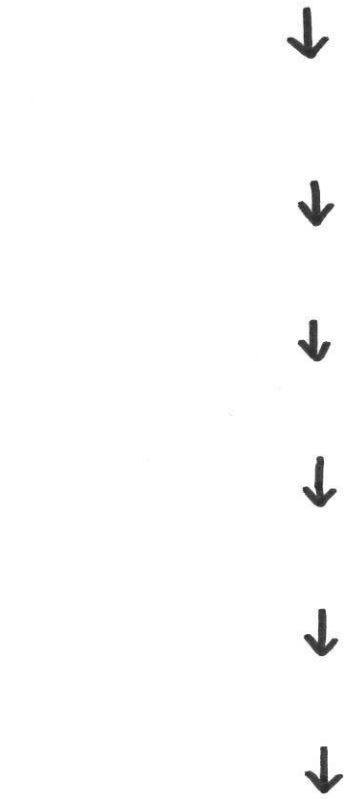
Active Transport

The Loop of Henle



Osmoregulation & Antidiuretic Hormone (__)

1 2 3 4 5



TT

Inheritance Key Terms

1 2 3 4 5

Diploid

Gene

Allele

Genotype

Phenotype

Dominate Allele

Recessive Allele

Codominant Allele

Homozygous

Hetrozygous

Locus

TT

Monohybrid Inheritance

Monohybrid Inheritance

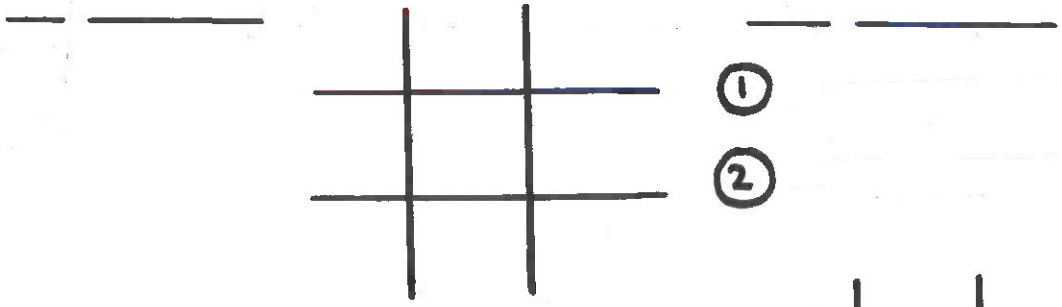
_____ _____ :

e.g.

Parent 1 Parent 2

①

②



①

②

TT

Dihybrid Inheritance

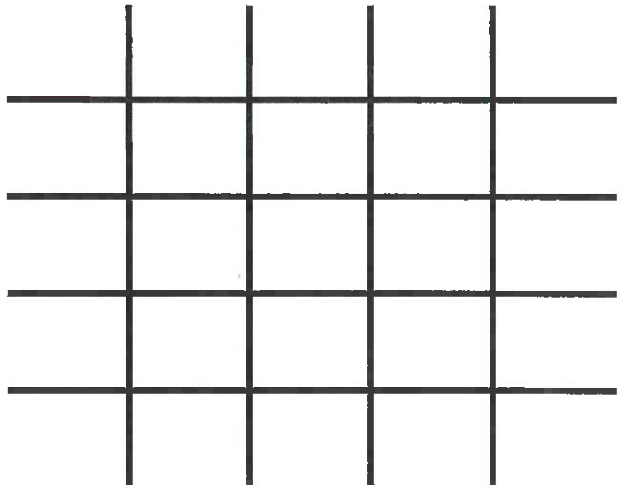
Dihybrid Inheritance

1 2 3 4 5

_____ _____ :

Parent 1 Parent 2

① ②



_ _____

_ _____

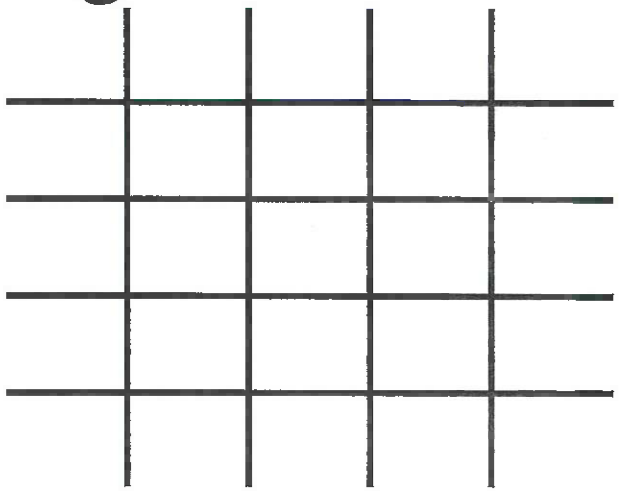
→

→

→

Parent 1 Parent 2

① ②



_____ _____

→ _ _____

Codominance & Multiple Alleles

ABO Blood Group System

→

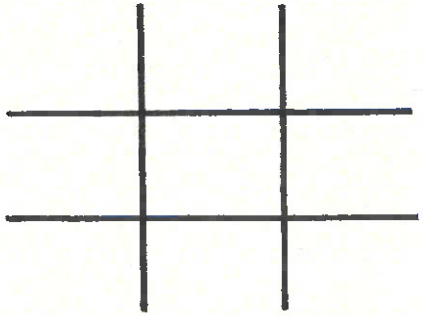
→

→

Parent 1 Parent 2

①

②



F$_1$ Generation:

Genotype :

Phenotype :

Epistasis

Epistasis

_____ :

→

e.g.

→

→

→

→

→

→

Autosome

Autosomal Linkage

_____ :

e.g.

→

→

→

→

→

→

→

Unless . . .

→

→

→

TT

Sex Linkage

1 2 3 4 5

Homologous Pair

_____ ____ :

→ →

____ _____ :

Sex Chromosomes

Female = →

Males = →

Haemophilia

→

↳

→

↳

Sex Linkage

Phenotypic Ratio :

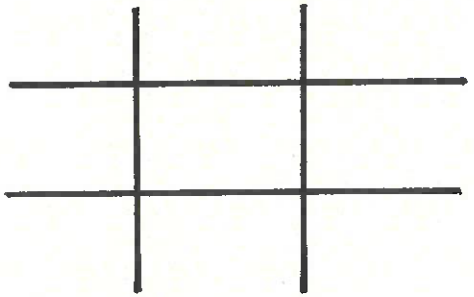
:

:

Parent 1 Parent 2

①

②



Phenotypic Ratio

:

:

F1 Genotypes Phenotypes

=

=

=

=

Normal Phenotypic Ratios

Exceptions →

	Parents	F_1 Phenotypic Ratio →	F_2 Phenotypic Ratio →
Monohybrid Cross			
Dihybrid Cross			
Codominant			

Non-Normal Phenotypic Ratios

Epistasis

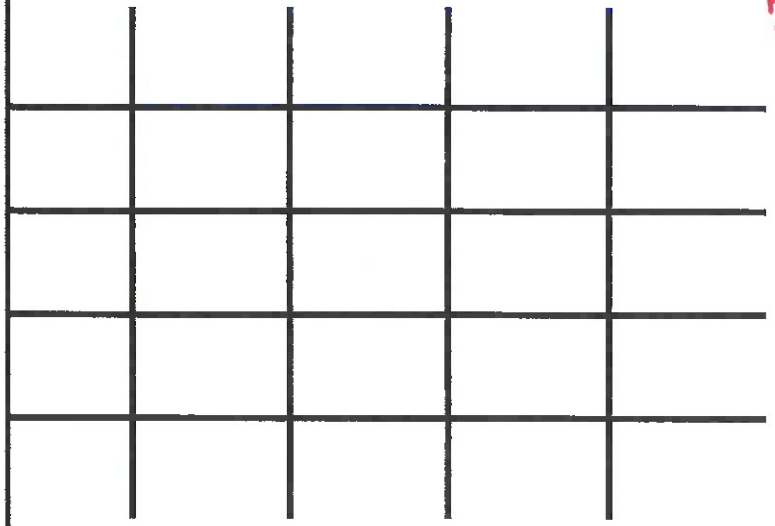
Recessive Epistatic Allele

Parents :

F_1 :

F_2 :

Red Blue Albino



Dominant Epistatic Allele

Albino Red Blue

Non-Normal Phenotypic Ratios

Sex Linkage

Autosomal Linkage

→

↳

→

No linkage

With Autosomal linkage

Population Key Terms

1 2 3 4 5

Species

_____:

_____:

Population

→

Community

_____ _____:

_____ _____:

Gene Pool

e.g.

_____:

Allele Frequency

_____ _____ _____:

Evolution

Differential Reproductive Success

_____:

Speciation

The Hardy-Weinberg Principle

TT

The Hardy-Weinberg Principle

___ ____ - ____ ____ :

Predictions

→

↳

Equation

+ =

+ =

Assumptions

→

→

→

→

→

→

→ + + =

→ **Question** 51% Unbanded bb = banded

→

Variation

1 2 3 4 5

Intraspecific Variation

Interspecific Variation

Continuous Variation

Discontinuous Variation

Genetic Causes	Environmental Causes	Both
e.g.	e.g.	e.g.

TT

Speciation

Speciation

_____:

→

_____ _____ _____ _____

→

→

e.g.

→

↳

→

↳

→

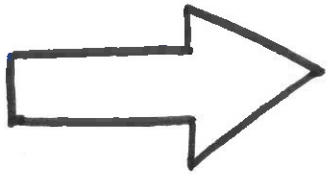
→

→

Genetic Drift

Genetic Drift _____ _____ :

e.g.



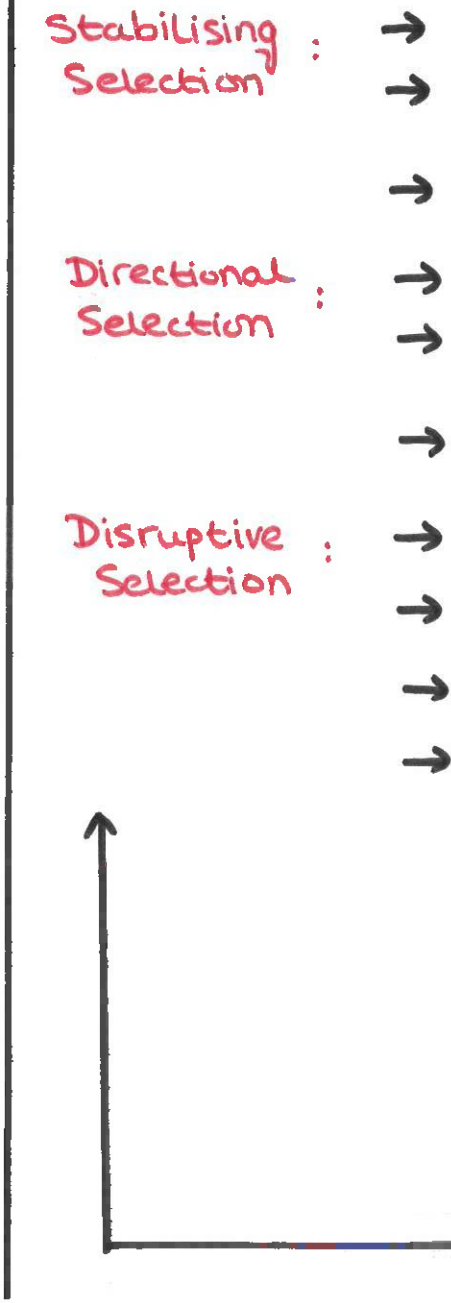
Disruptive Selection

1 2 3 4 5

Stabilising Selection :

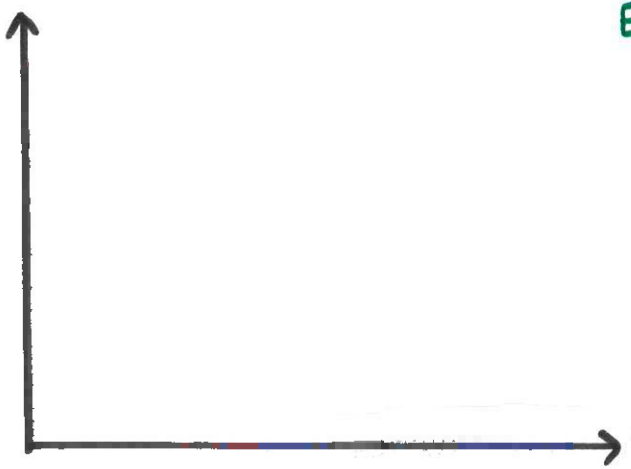
Directional Selection :

Disruptive Selection :



E.g.

Genotype =



Abundance & Distribution of Organisms

1 2 3 4 5

Abundance

Distribution

Carrying Capacity

Limiting Factor

e.g.

e.g.

The Niche Concept

1 2 3 4 5

Niche

_____ :

Biotic Relationships:

→
→
→

Abiotic Relationships:

→
→
→

Each species has its own niche

→

→

→

→

e.g.

→
→
→

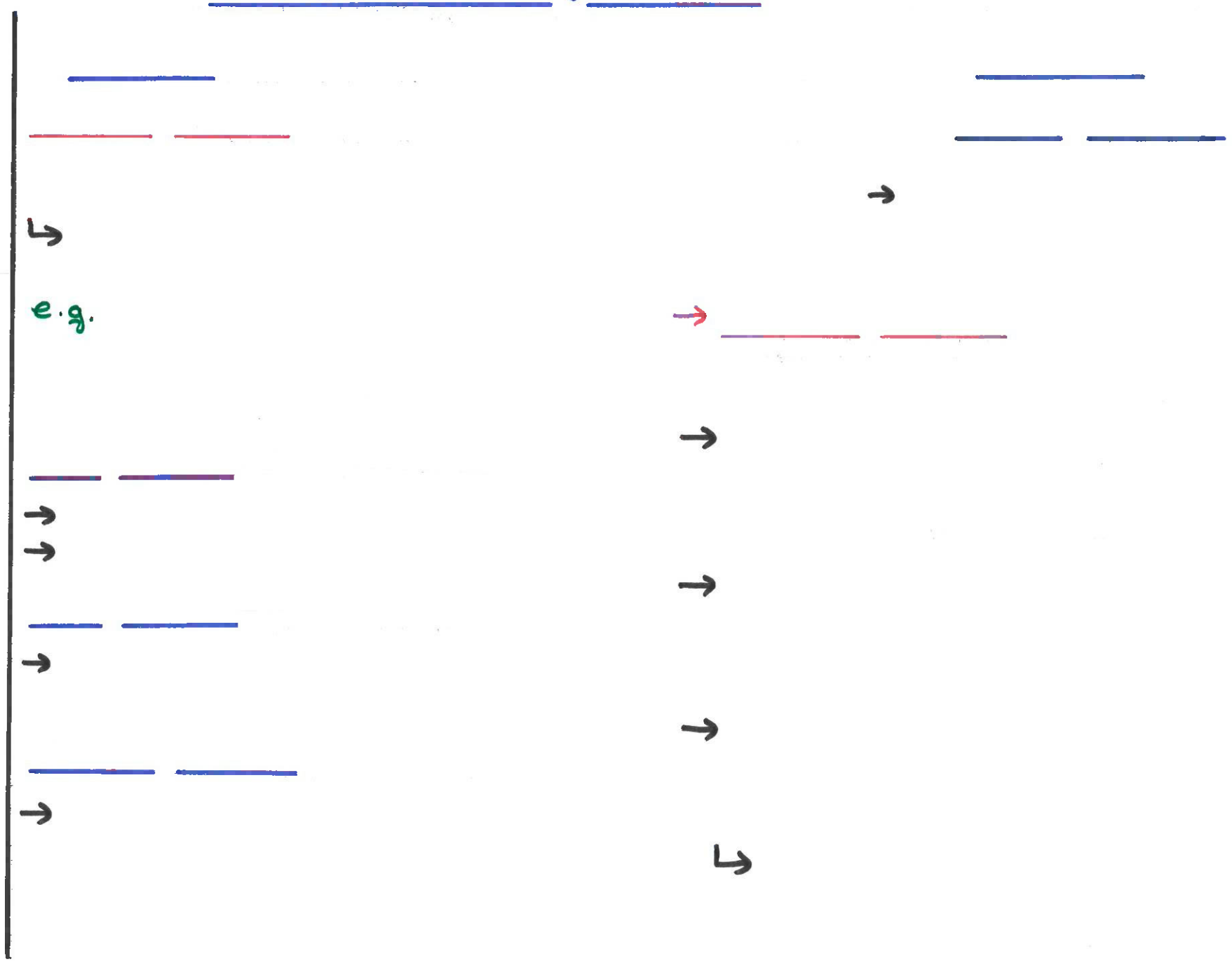
Transects & Quadrats

1 2 3 4 5

Systematic Sampling

e.g.

Random sampling



Mark - Release - Recapture

1 2 3 4 5

$= \frac{\times}{\quad}$

Method

1)
2)
3)
4)
5)

Succession

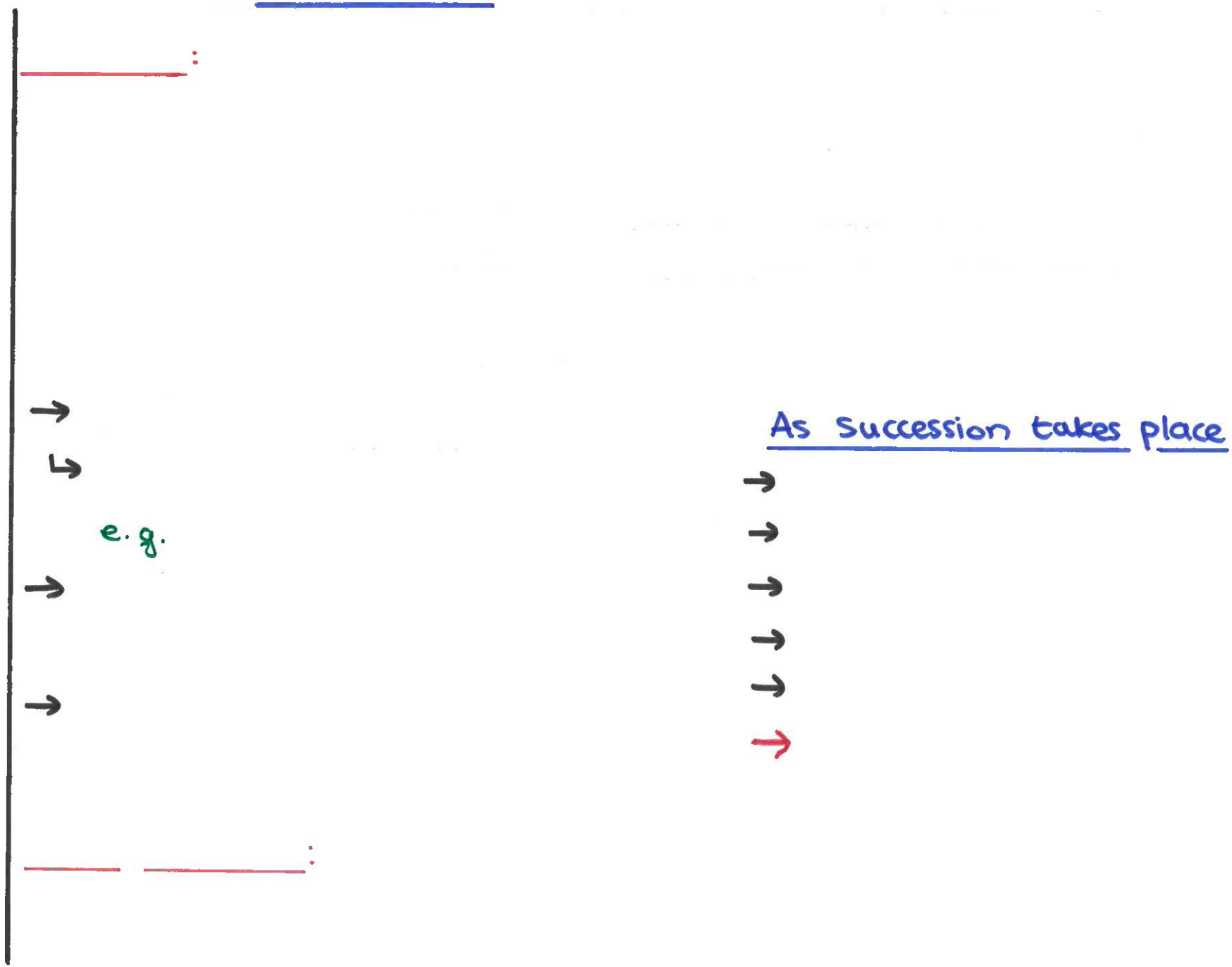
1 2 3 4 5

Succession _____:

Climax Community

e.g.

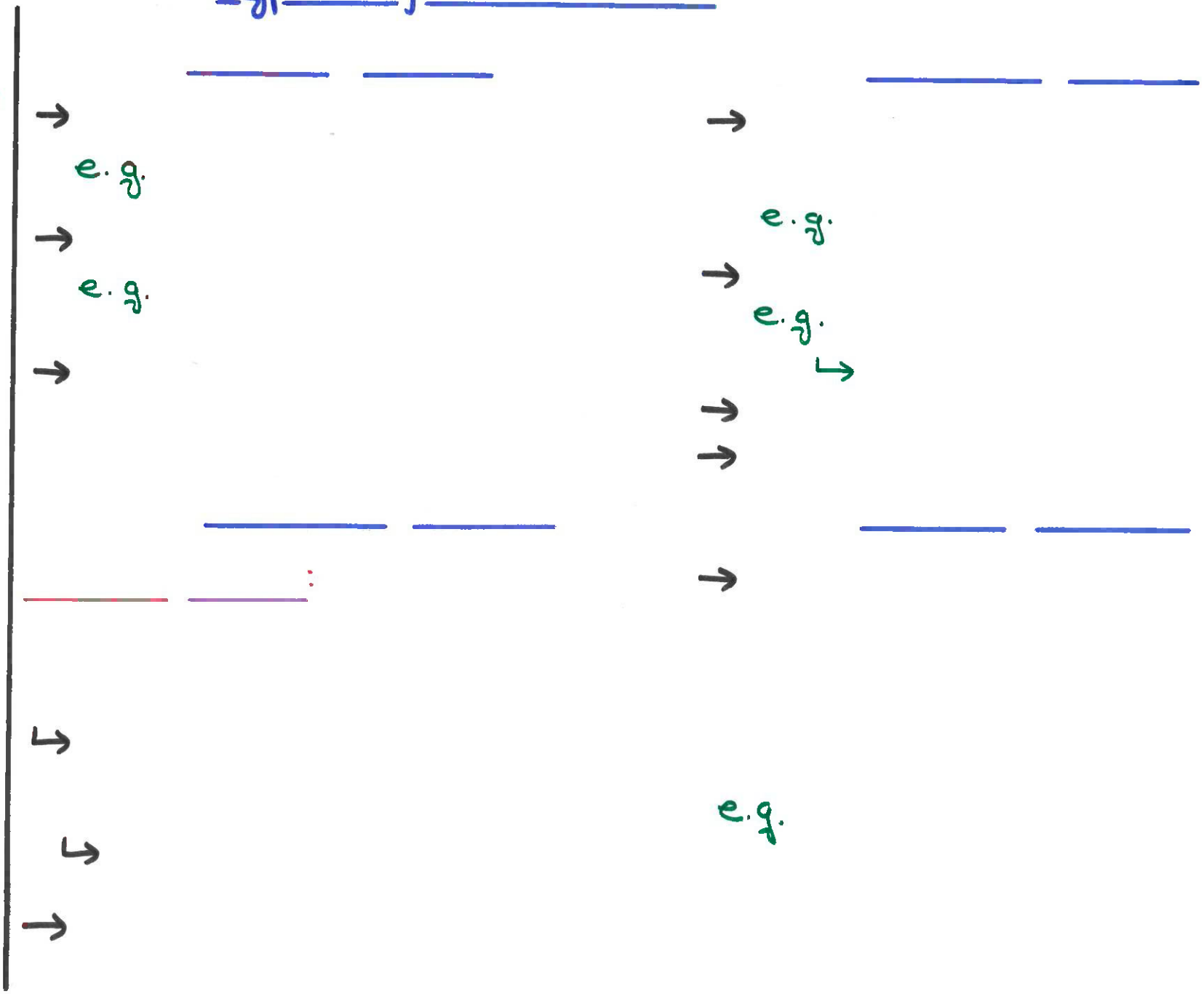
As Succession takes place



_____ _____:

Types of Succession

Deflected Succession



Mutations

1 2 3 4 5

Mutation

_____:

→

_____ _____:

Mutagenic Agent

→ →

Substitution

↳ e.g. ↳

Types of Mutations:

Addition

• _____:

→ →

Deletion

• _____:

• _____:

→ →

Inversion

• _____:

→ → →

Duplication

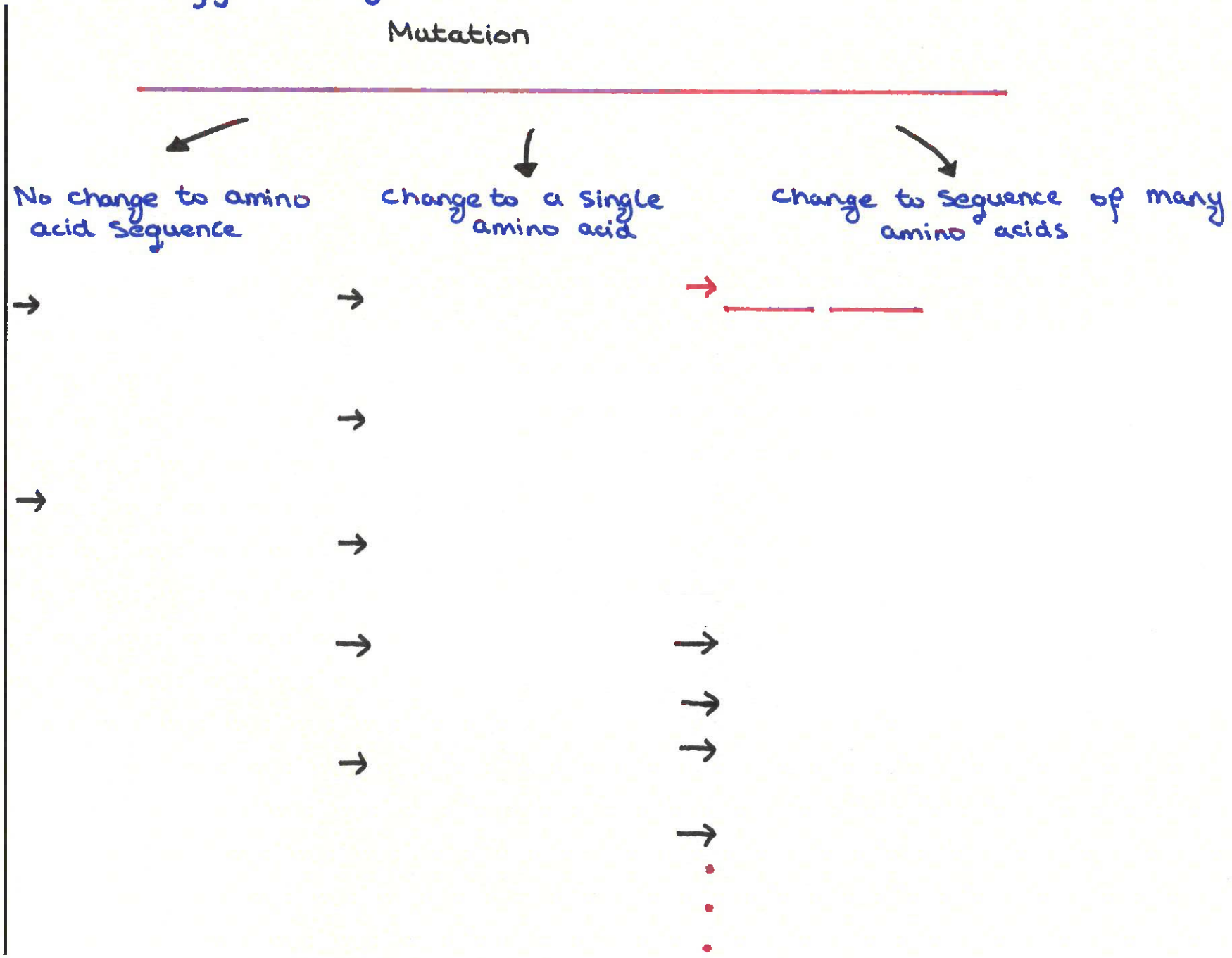
• _____:

• _____:

Translocation

Affects of Mutations

Mutation



Stem Cells

1 2 3 4 5

Stem Cells

Totipotent

Pluripotent

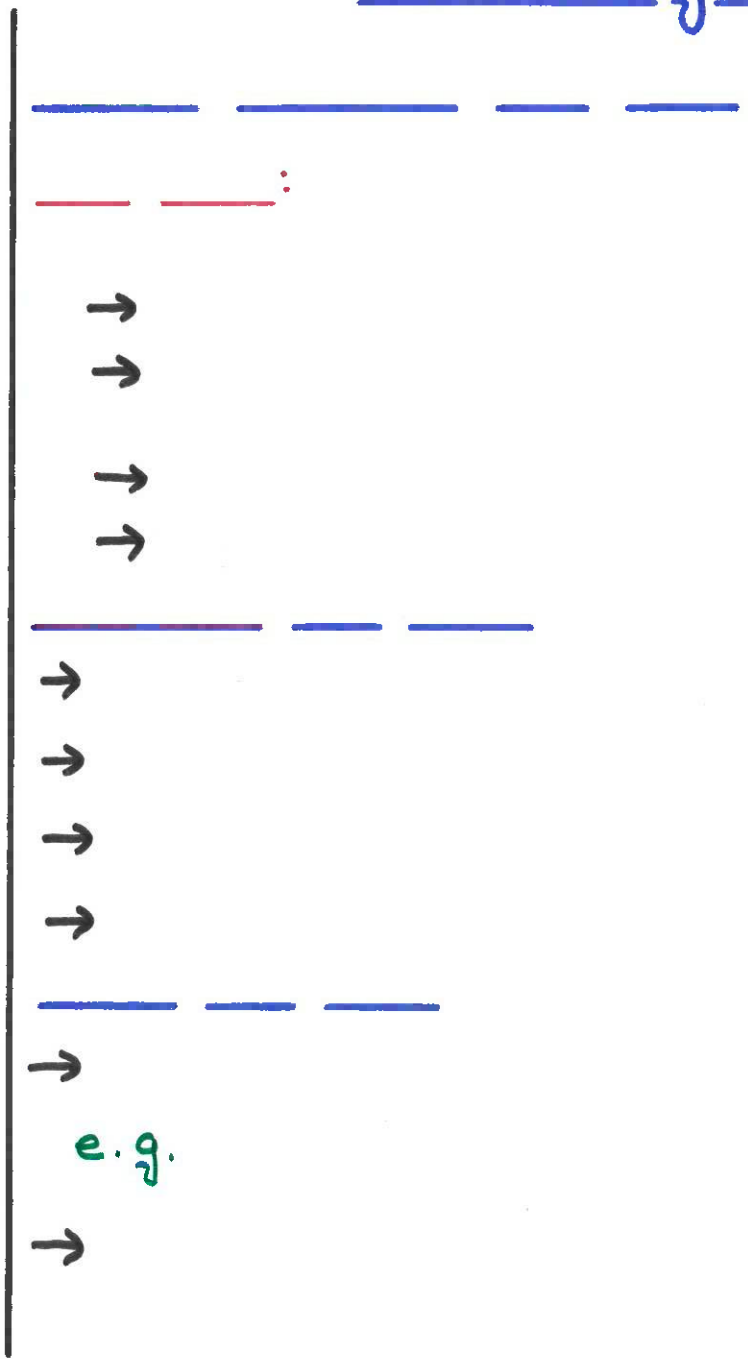
Multipotent

Unipotent

Cell Specialisation / Differentiation

Obtaining Stem Cells

iPS cells



Stem Cells & Medicine

1 2 3 4 5

Bone Marrow Transplant

Grow New Organs

Advantages

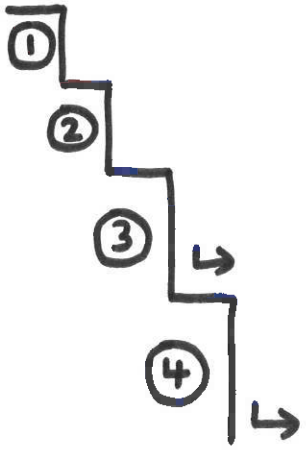
Ethical Issues

Transcription Factors

1 2 3 4 5

Transcription Factors

Promoter Region



e.g.

TT

1 2 3 4 5

Epigenetics

Epigenetics

CpG site

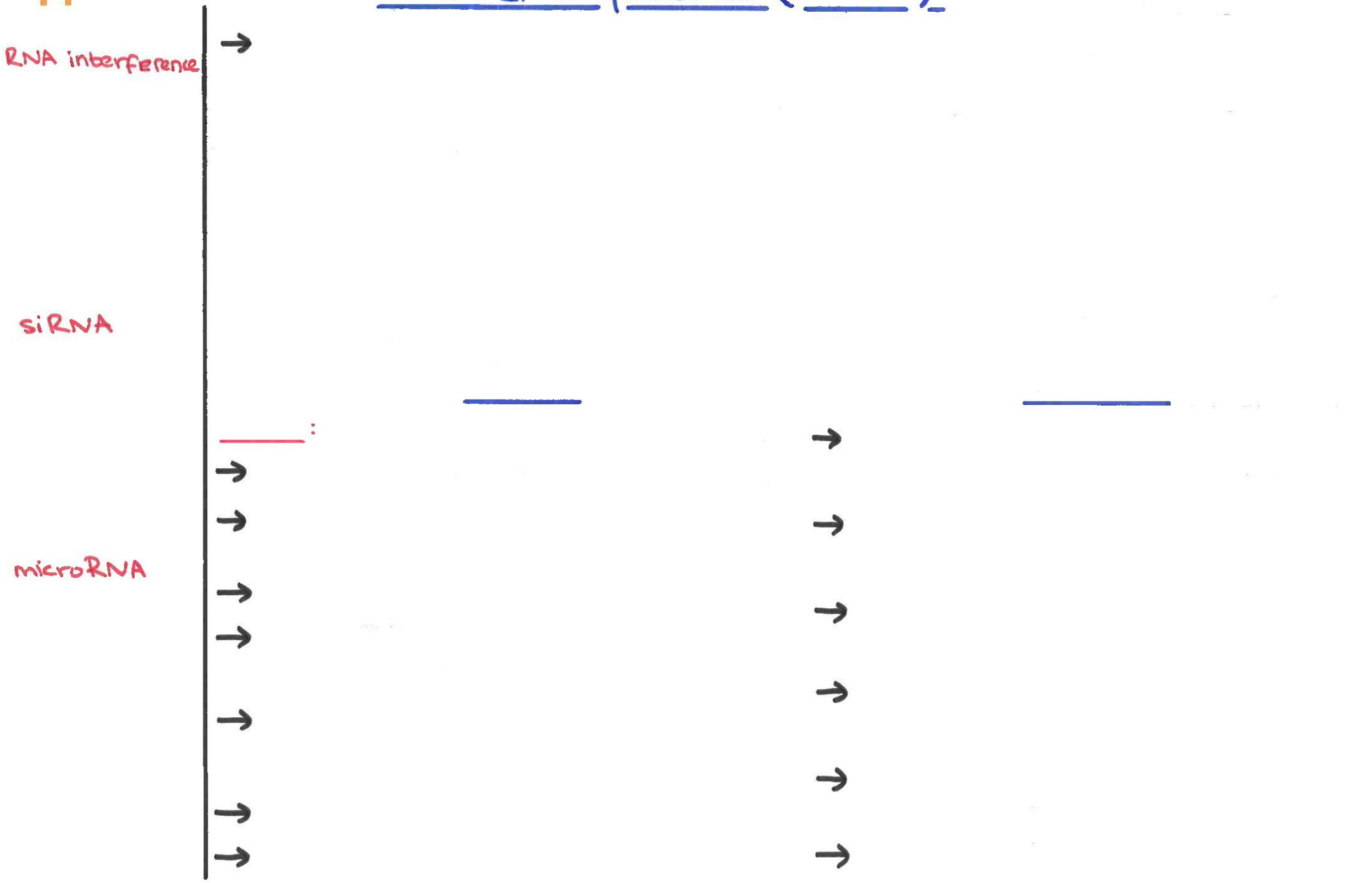
e.g.

Methyl Group

Acetyl Group

Histones

RNA Interference (RNAi)



TT

Cancer

Tumour Suppressor Genes & Proto-oncogenes

1 2 3 4 5

→

_____ :

_____ _____ _____

→

→

→

→

e.g.

_____ - _____

→

→

↳

Cancer & Tumours

1 2 3 4 5

Benign Tumour

Types of Tumour

_____:

Malignant Tumour

_____:

Oestrogen + Breast Cancer

Identifying Tumour Cells

Genome Projects

Genome

Proteome

Simple Organisms

e.g.

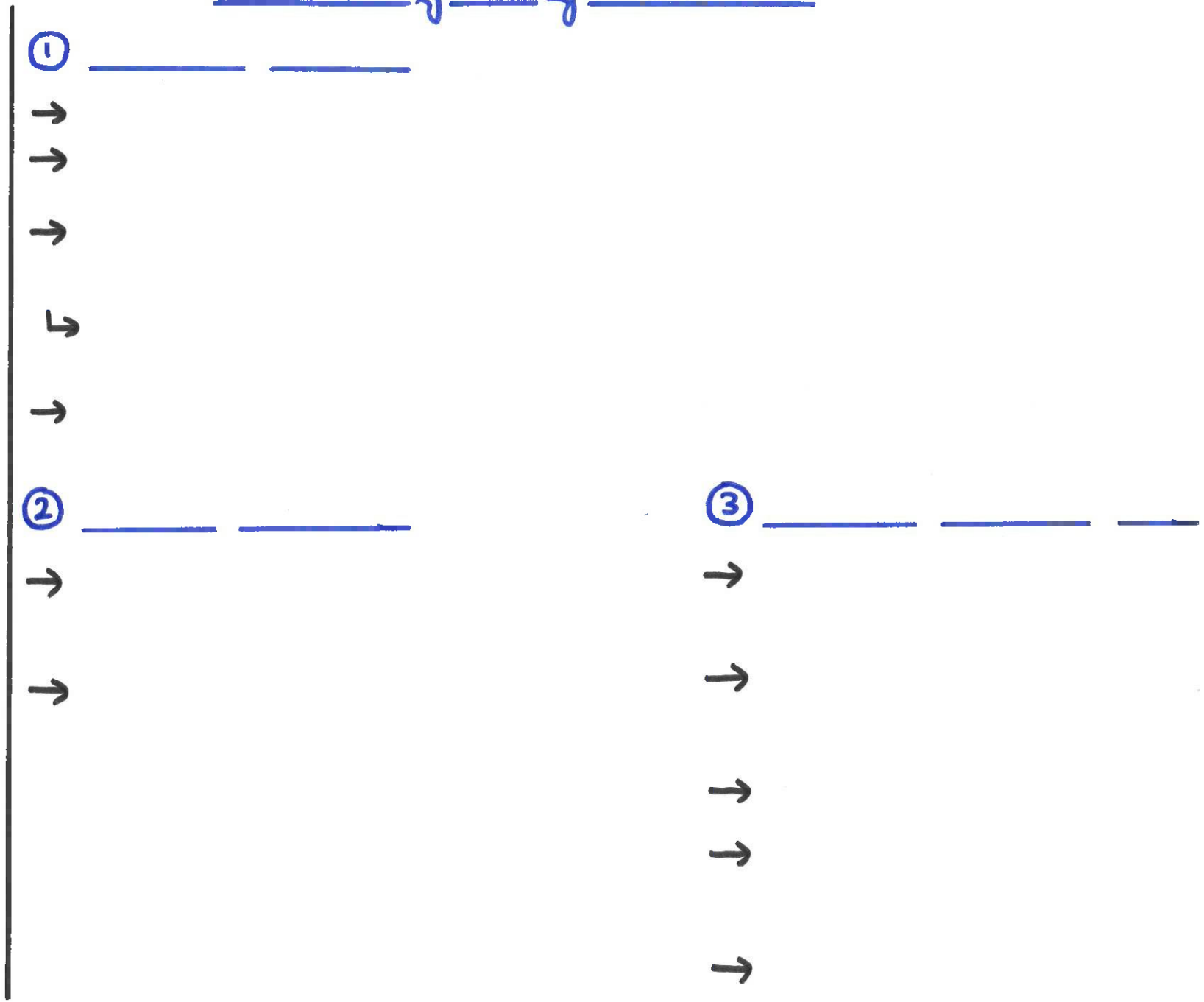
Complex Organisms

e.g.

uses

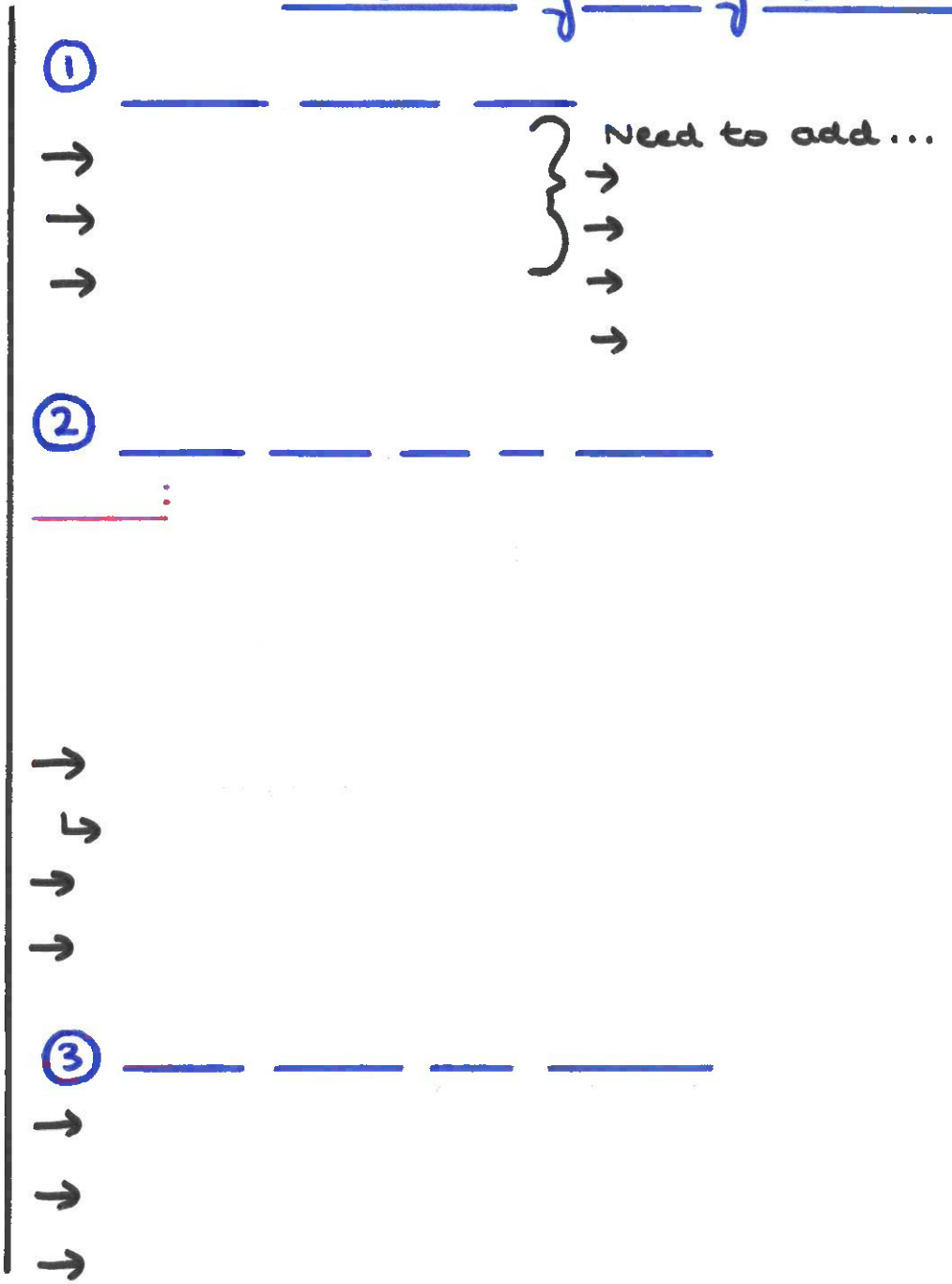
e.g.

Isolating Target Genes



Inserting Target Genes

Vector



Marker Genes

Marker Genes

_____ _____:

→

→

e.g.

→

→

→

①

②

→

Polymerase Chain Reaction (PCR)

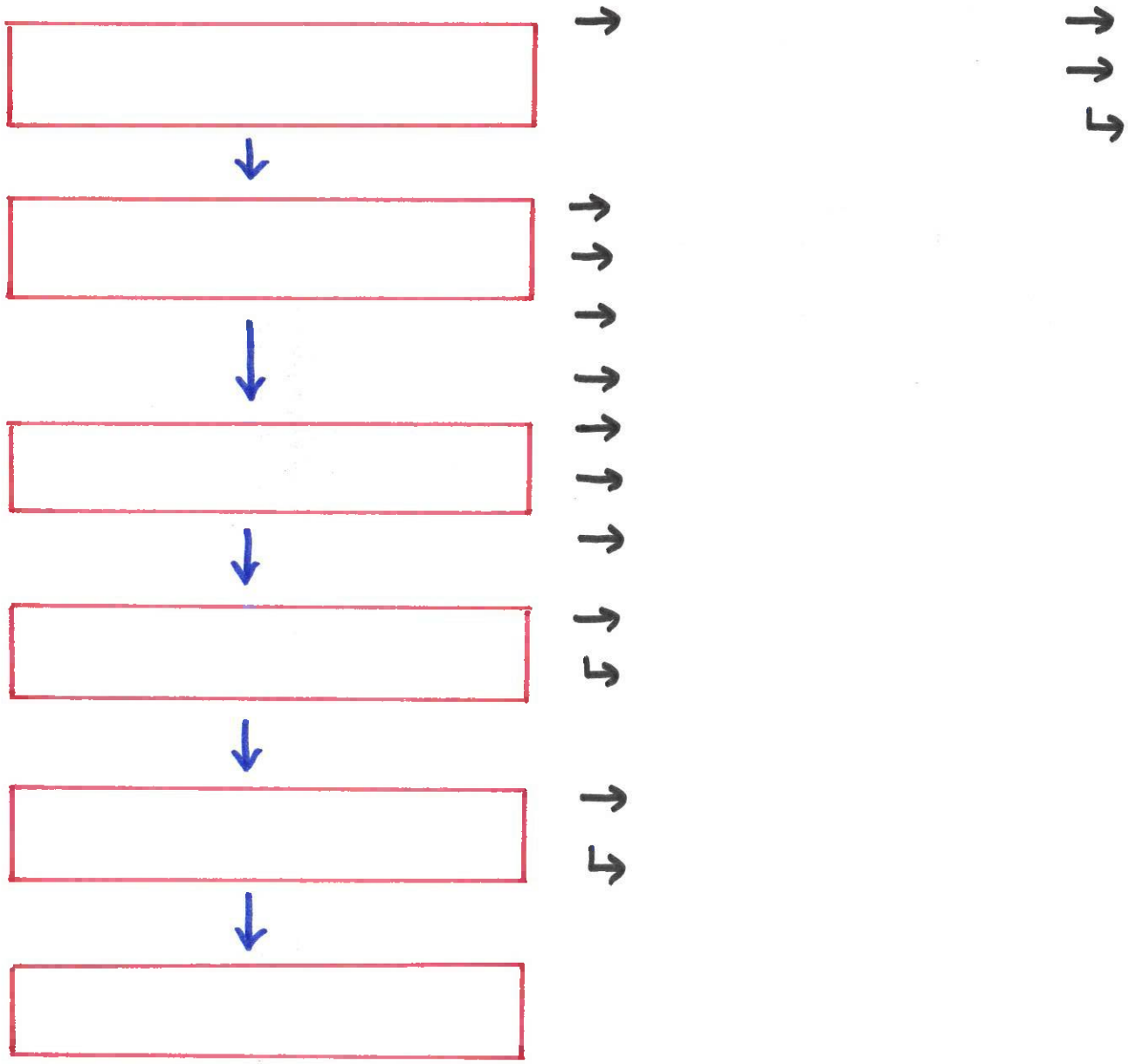
1 2 3 4 5

Ingredients

Method

Method	Reason
1	
2	
3	
4	

Summary of Gene Technology



Gene Therapy

Gene Therapy

e.g.

e.g.

Germ Line Gene therapy

Somatic Gene Therapy

Types of Gene Therapy

Possible Problems

e.g.

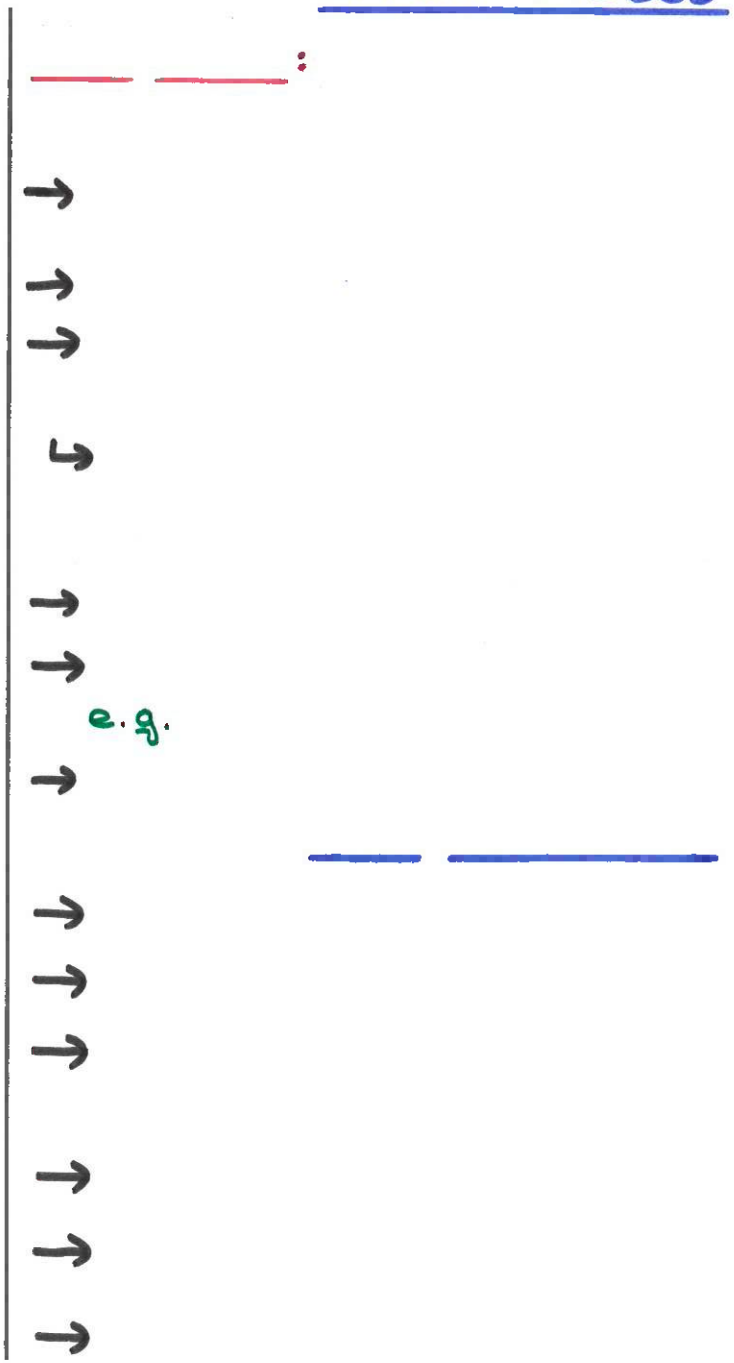
Genetically Modified (Transformed) Organisms

1 2 3 4 5

	Uses	Advantages	Disadvantages
Agriculture e.g.			
Industry & Research			
Medicine 'Pharming' e.g.			

DNA Probes

DNA Probe



Uses of DNA Probes

1 2 3 4 5

Genetic Counselling

→

→

→

e.g.

↳

↳

e.g.

→

→

→

↳

Genetic Screening

→

→

e.g.

→

Personalised Medicine

→

→

Genetic Fingerprinting

1 2 3 4 5

Genetic Fingerprinting

_____ _____ :

→

e.g.

→

→

↳

→

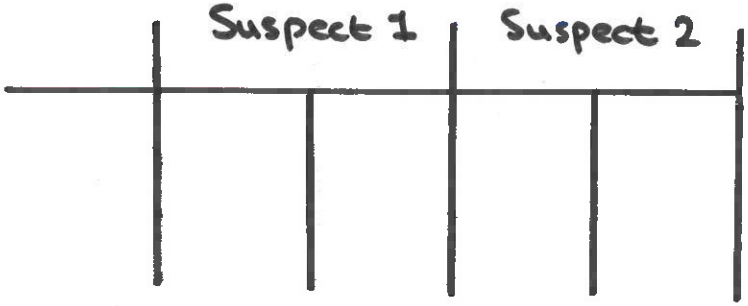
Forensic Use

→

→

→

→



Relatedness

→

e.g.

→

↳

↳

Medical Diagnosis

→

↳

e.g.