

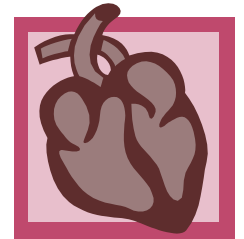
# Sixth form induction - biology



# What topics are covered in year 1?

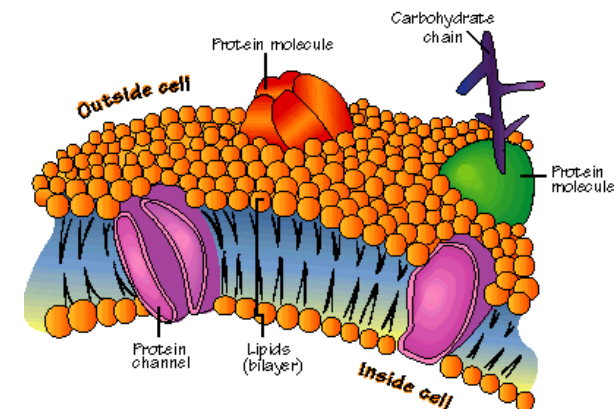
## Topic 1: Lifestyle, health and risk

Includes heart structure, causes and risk factors involved with cardiovascular disease, carbohydrate and fat molecular structures.....



## Topic 2: Genes and health

Includes the science behind cystic fibrosis, the structure of cell membranes, protein structure and synthesis, gene therapy...



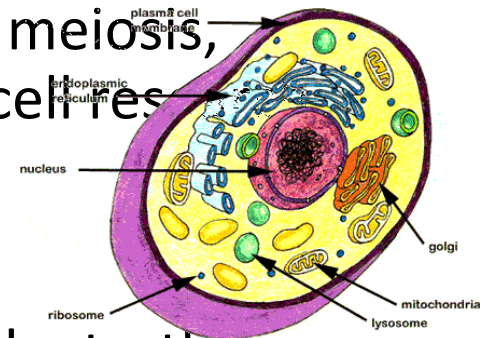
# What topics are covered in year 1?

## UNIT 2

### Topic 3: Voice of the genome

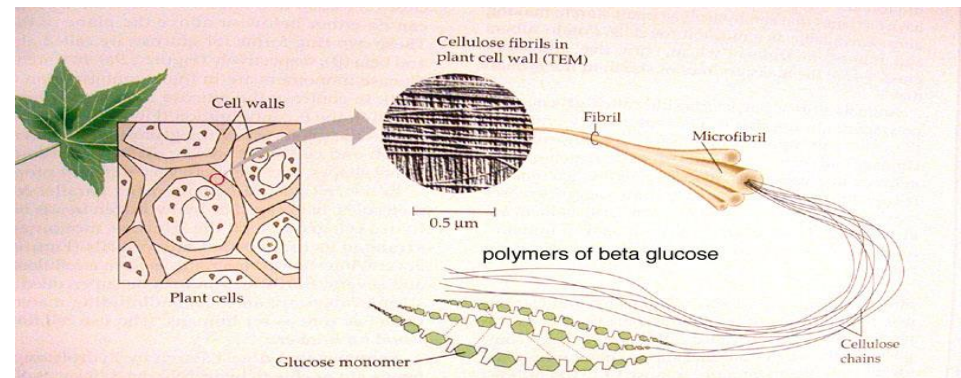
Includes cell structure, cell specialisation, genotype and the environment,

mitosis, meiosis, cancer, stem cell res



### Topic 4: Biodiversity and natural resources

Includes plant cell structure, water transport through plants, the use of plant products, classification, biodiversity, genetic diversity, natural selection....



# How the course works

## A level

All papers include assessment of maths and practical skills.

Paper 3 includes questions on a pre-release article.

### Paper 1

33.3% weighting



2 hours

100 marks

Covers half the A level topics and some AS content

Find out more 

### Paper 2

33.3% weighting



2 hours

100 marks

Covers half the A level topics and some AS content

Find out more 

### Paper 3

33.3% weighting



2 hours

100 marks

Covers all AS and A level topics

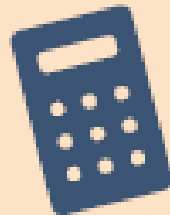
Find out more 

UI19a

## Assessing mathematical skills



Makes up **10%** of the assessment and AS at A level.



Maths needs to be assessed at **Level 2** (GCSE Higher tier) or above.

The specification is divided into **eight** topics.

The topics for AS Biology are the same as those for the first year of A level, so that the two specifications are **co-teachable**.

AS:  
Available in summer.  
**First assessment summer 2016**



A level:  
Available in summer.  
**First assessment summer 2017**

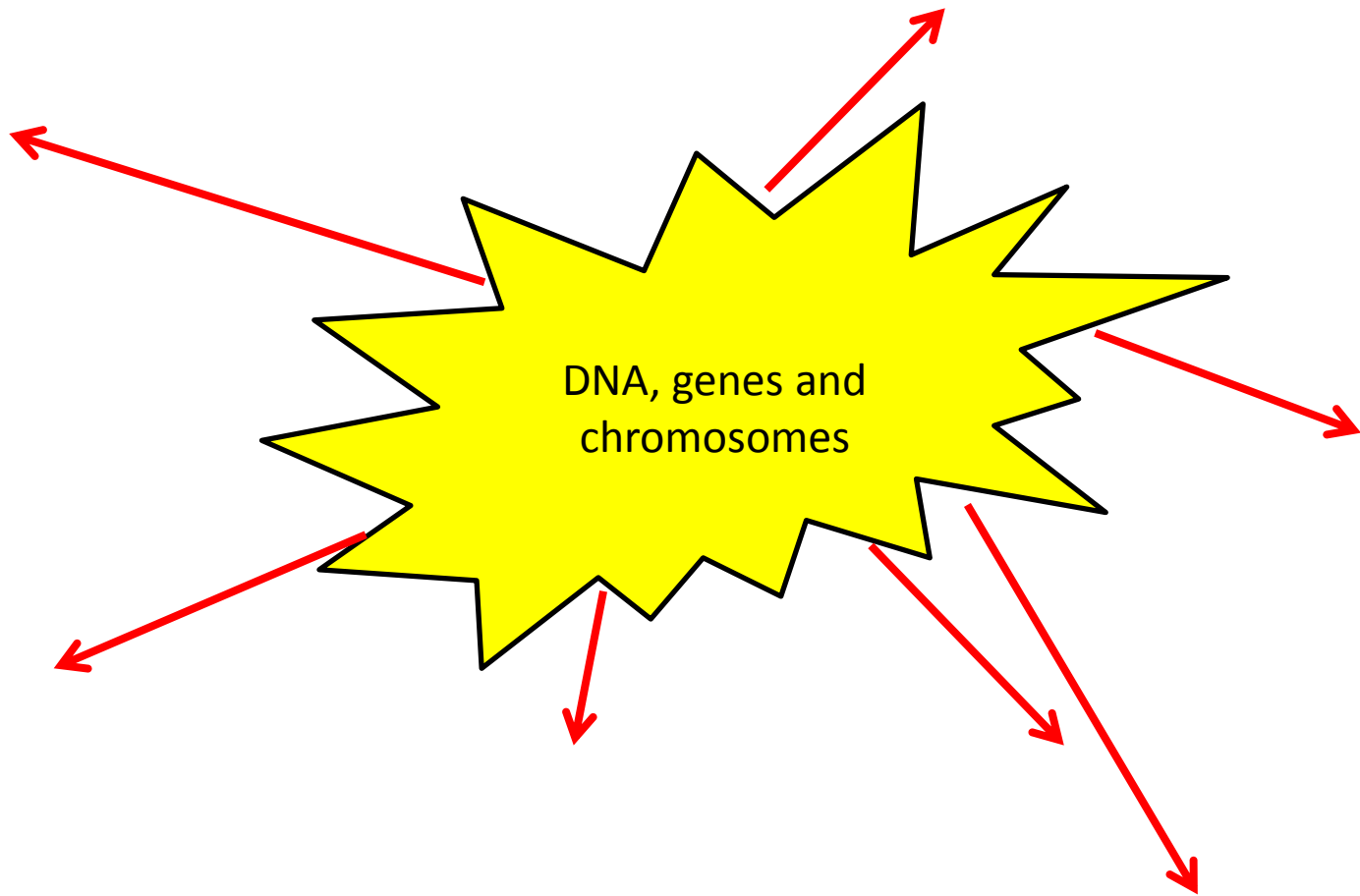


# So getting on with it...

On your white boards write down anything that you can remember about genes, chromosomes and DNA.....

# Objectives

- To recap on cellular structure
- To understand the molecular structure of a DNA and RNA molecules.
- To understand bonding within DNA and RNA molecules
- To be able to explain how DNA replicates
- To be able to explain the evidence for DNA replication



# GCSE recap

1. What is a gene?
2. Where do you find one?
3. What is a gene made of?



# What is DNA's structure?

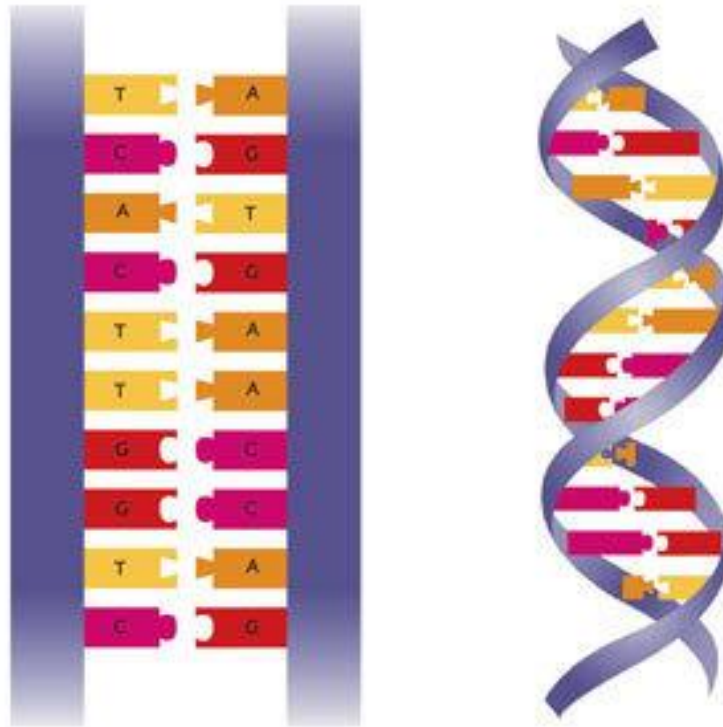


DNA is made from **4 bases**

- Adenine
- Thymine
- Cytosine
- Guanine

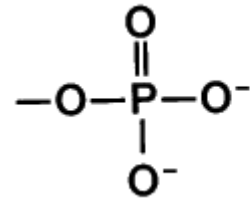
# Bonding between bases is complimentary

What do you think this means?



Added onto these bases is a ...

Phosphate group

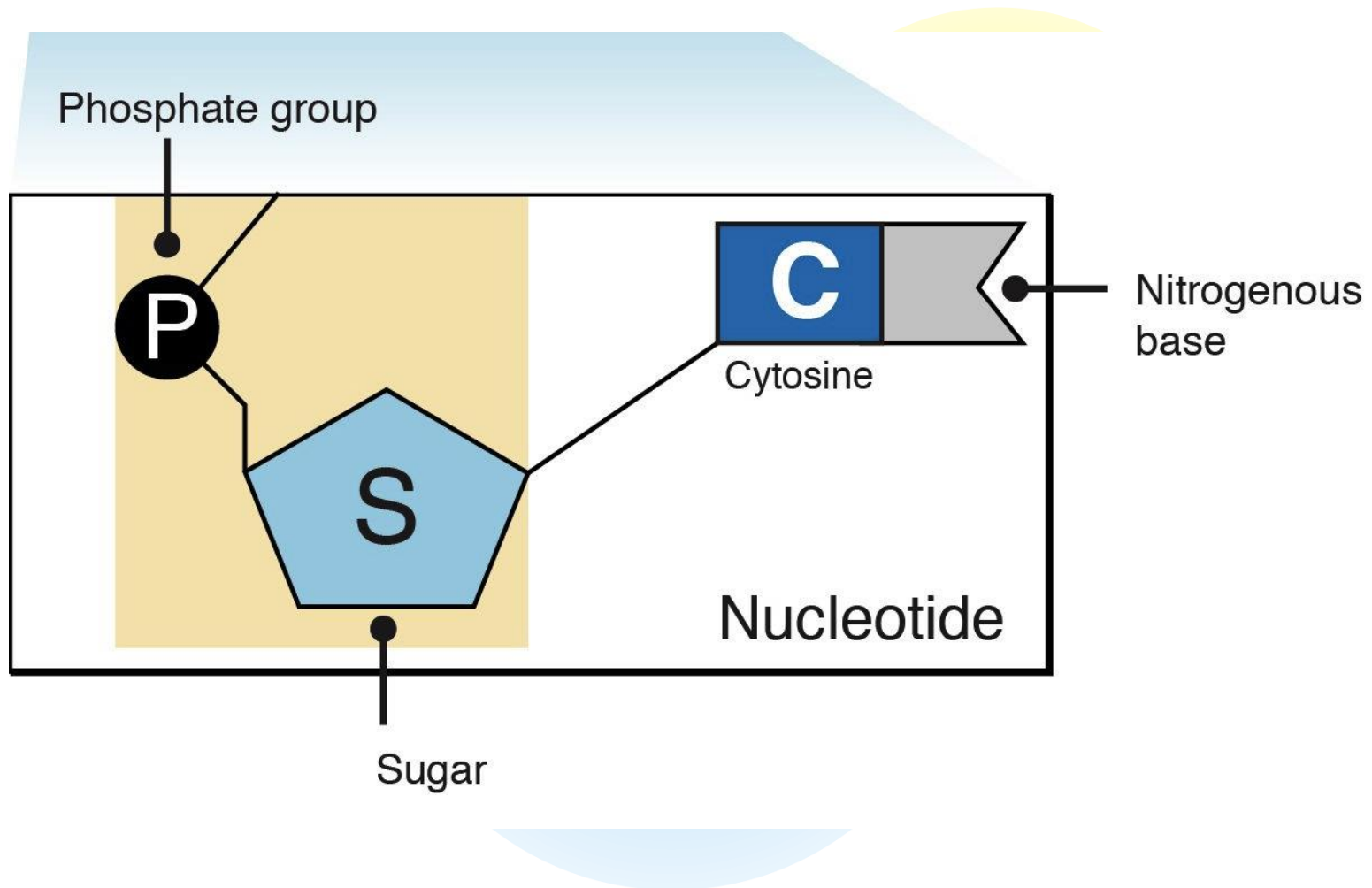


**Phosphate group**

And a sugar made of 5 carbons  
called .....

Deoxyribose

# Together all three make a nucleotide



# Task: Building DNA

Build a double ladder strand using your bases, hydrogen bonds, and phosphate backbone.

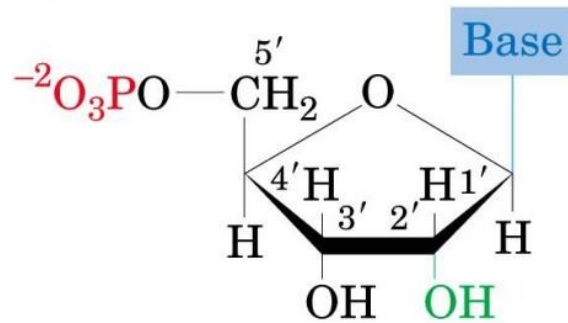
Make sure you complimentary base pair your bases

Extension:

Why does DNA not stay as a ladder shape? Why does it rotate into a double helix?

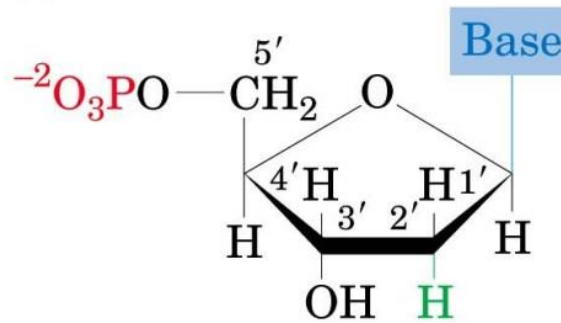
# There is another nucleic acid called RNA - spot the differences compared with DNA

(a)



**Ribonucleotides**

(b)



| DNA bases                 |                            | RNA bases                 |                            |
|---------------------------|----------------------------|---------------------------|----------------------------|
| Purines                   | Pyrimidines                | Purines                   | Pyrimidines                |
| <p><b>Adenine (A)</b></p> | <p><b>Thymine (T)</b></p>  | <p><b>Adenine (A)</b></p> | <p><b>Uracil (U)</b></p>   |
| <p><b>Guanine (G)</b></p> | <p><b>Cytosine (C)</b></p> | <p><b>Guanine (G)</b></p> | <p><b>Cytosine (C)</b></p> |

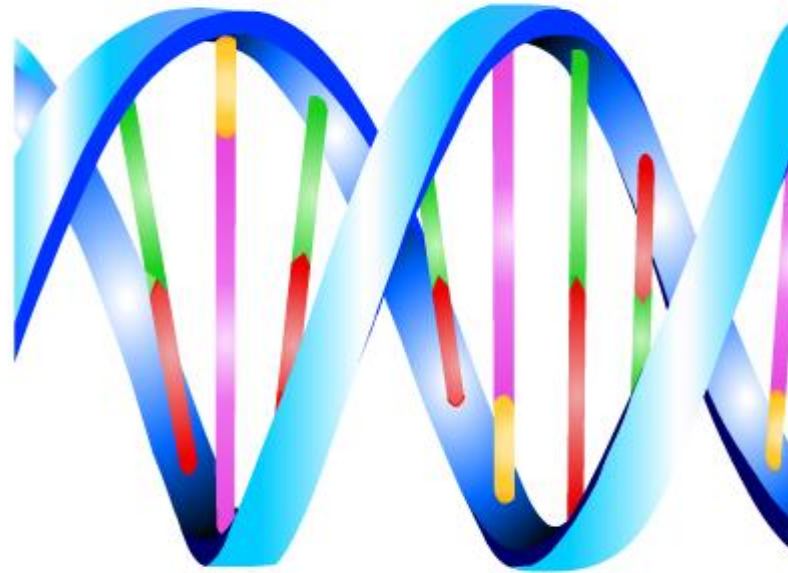
# How does DNA replicate?

- Think back to what you studied in B2, when was DNA replication discussed?



# The steps of DNA replication

Click play to unwind the DNA helix.



# The steps of DNA replication

1. DNA helix **unwinds**
2. **Hydrogen bonds break** via the enzyme helicase
3. Both strands act as **template** strands
4. Free (**mono**)**nucleotides** bind
5. Via **complimentary base pairing** to form hydrogen bonds via the enzyme DNA polymerase and DNA ligase
6. **Phosphodiester** bonds form between adjacent phosphate and deoxyribose sugar groups
7. The two strands wind back up.

# Replicating DNA

Using your cards from the last task model how DNA replicates - use plastercine to represent DNA helicase and DNA polymerase.

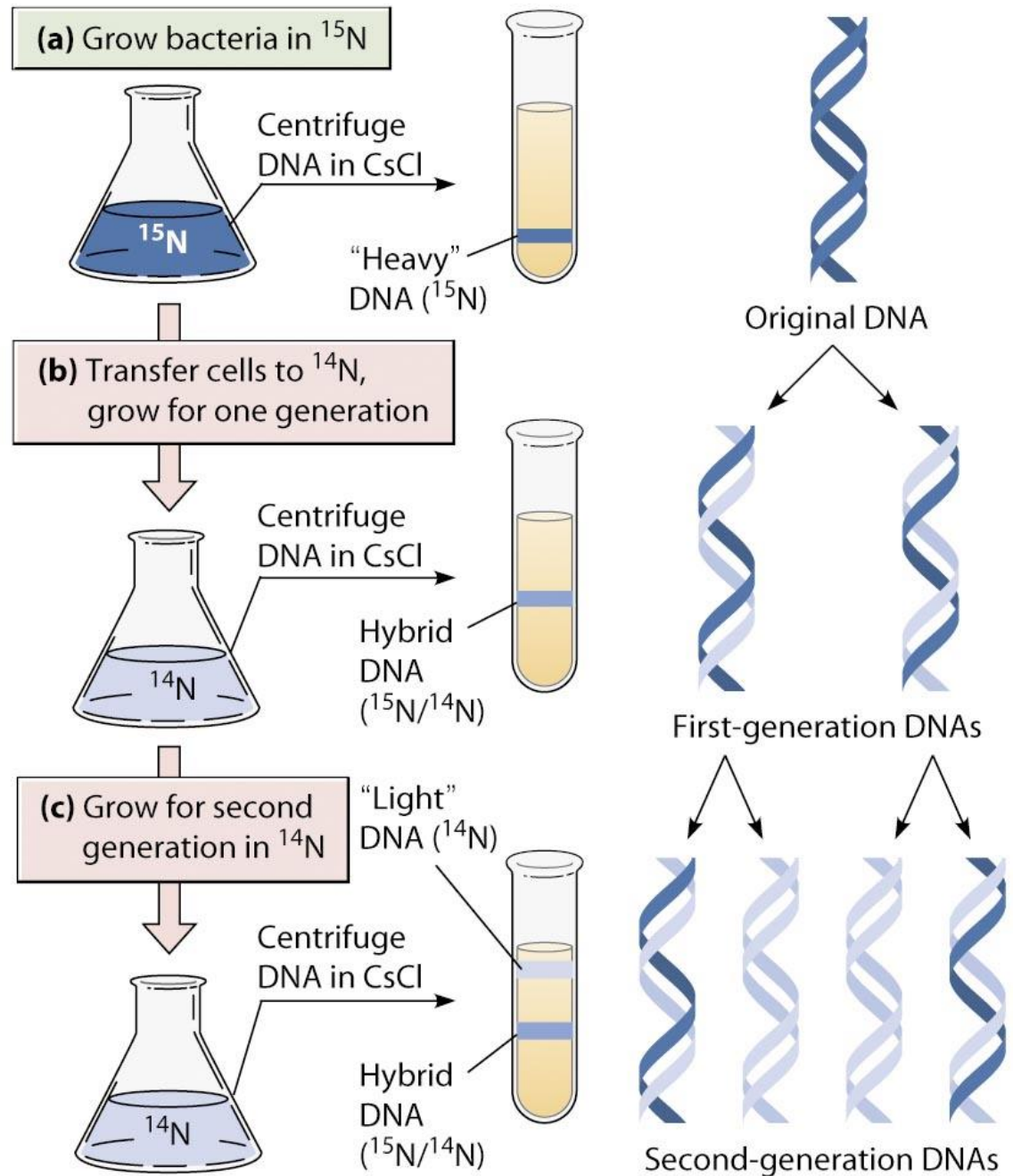
If you have time - film on stop motion

Extension:

Why does it rotate into a double helix? Can you research using your I pads?

# Proving replication is semi-conservative

- The  $^{15}\text{N}$  strand is heavy so makes a band low down the tube
- High density (heavy) sinks further down the tube.
- **After one generation**
- After one generation there was only one band
- This was the  $^{14}/^{15}$  hybrid
- **Second generation**
- After another generation there were 2 bands
- A light chain and a  $^{14}/^{15}$  level



4. (a) Name a component of DNA that contains nitrogen.

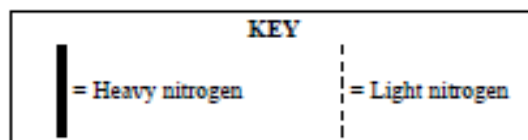
(1)

- (b) When bacteria are grown in conditions containing a heavy form of nitrogen, they will incorporate the heavy nitrogen into their DNA each time DNA replication occurs. After many replications in these conditions, all the nitrogen in the bacterial DNA will be of the heavy form.

If the bacteria are then switched to conditions containing a light form of nitrogen, this will become incorporated each time DNA replication occurs.

The diagram below shows the changes in the DNA composition, over two DNA replications, after the bacteria have been transferred from conditions containing heavy nitrogen to conditions containing light nitrogen.

Complete the diagram to show the DNA composition in the third generation.



DNA before  
replication in light  
nitrogen conditions



DNA after the first  
replication in light  
nitrogen conditions



DNA after the second  
replication in light  
nitrogen conditions



DNA after the third  
replication in light  
nitrogen conditions

(2)

| Question Number | Answer                                      | Mark |
|-----------------|---|------|
| 4 (a)           | (nitrogenous / organic) base / named base ; | 1    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 4 (b)           | <ol style="list-style-type: none"><li>1. 8 double strands drawn ;</li><li>2. 2 hybrid and rest all light DNA ;</li></ol> | 2    |

# What next?

Over summer complete the summary questions on DNA and complete your revision based upon the checklist.. We have taught you about one molecule out of many and these form the first part of the A level course.

Have a look at the spec on the edexcel pages and familiarise yourself with the A level content. Have a look at a past paper or two to see what you will actually be doing next year!

See you all at bridging the gap on Thursday 7<sup>th</sup> July (compulsory)

# Enjoy your summer and see you at induction

Shopping list for summer:

A4 note pad / pukka pad OR file and paper for biology.

If you want to get ahead AS revision guide Biology Edexcel ( these can be bought from school in September at a discounted rate)

[http://www.amazon.co.uk/AS-Level-Biology-Complete-Revision-Practice/dp/1847621201/ref=sr\\_1\\_7?ie=UTF8&qid=1402925726&sr=8-7&keywords=edexcel+as+revision+guide+biology](http://www.amazon.co.uk/AS-Level-Biology-Complete-Revision-Practice/dp/1847621201/ref=sr_1_7?ie=UTF8&qid=1402925726&sr=8-7&keywords=edexcel+as+revision+guide+biology)

You will need to bring a £5 deposit for you're a level text book.