National 5 Biology Assignment

Candidate Guidance

What are you being asked to do?

- You are being asked to research a current topic in biology and present your findings in the form of a report.

Introduction

- This is the assessment task for NAT 5 Biology
- The assessment task is set and externally marked by SQA and conducted in centres under the conditions specified by SQA. EXAM CONDITIONS!!!
- This assignment is worth 20 marks out of the total of 100 marks. This is 20 for the assessment and 80 marks for exam. This will give you your grade.

Title and Aim

1. Title- Cholera and dehydration or treatment of Cholera.

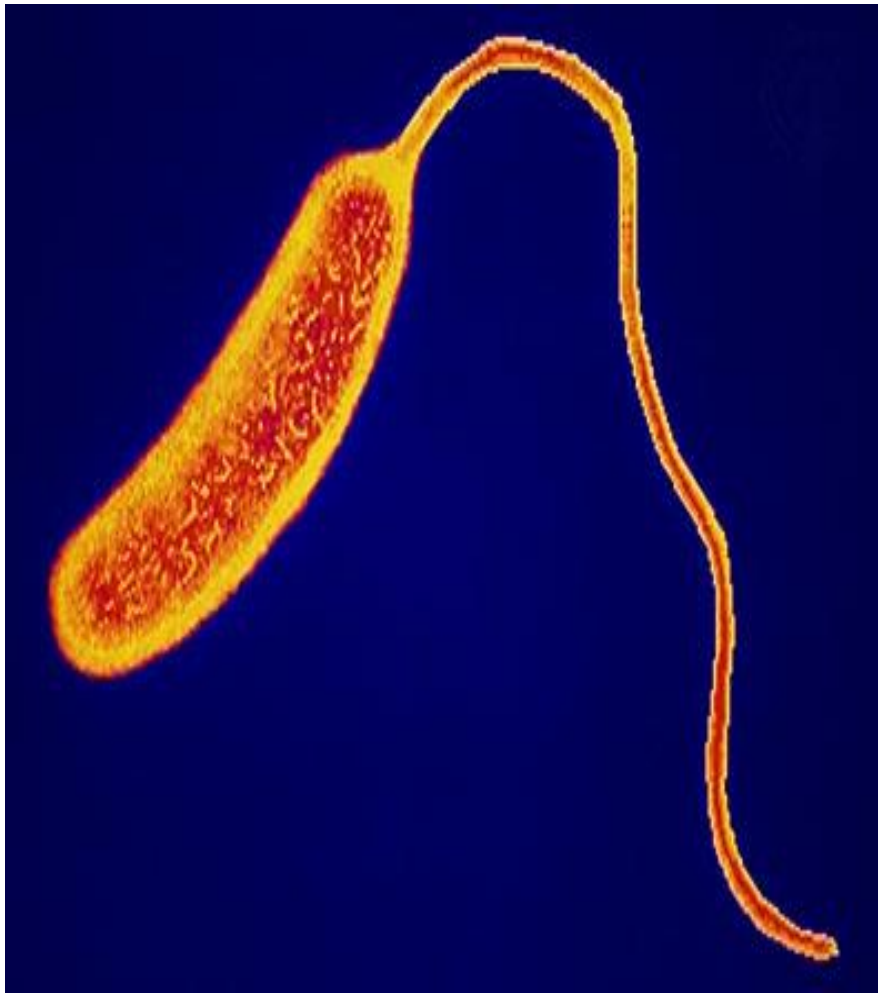
AIM: To investigate the effect of different environmental solute concentrations has on the water concentration in cells.

Application and Effect

- This has to describe the use humans are making of biology and the effect it has on the population or environment.
- Problem- Cholera kills hundreds of people. Application- Understanding how the salt concentration of solutions affects osmosis and the water content of cells. This has led to developing effective rehydration solutions for treatment of cholera.
- Effect- cheep effective treatment and people live.

CHOLERA

- Disease caused by bacteria.
- Spread in areas that do not have access to toilets and clean water.
- A problem in refugee camps.



CHOLERA

Disease caused by infection with cholera bacterium

Symptoms = Diarrhoea leading to dehydration

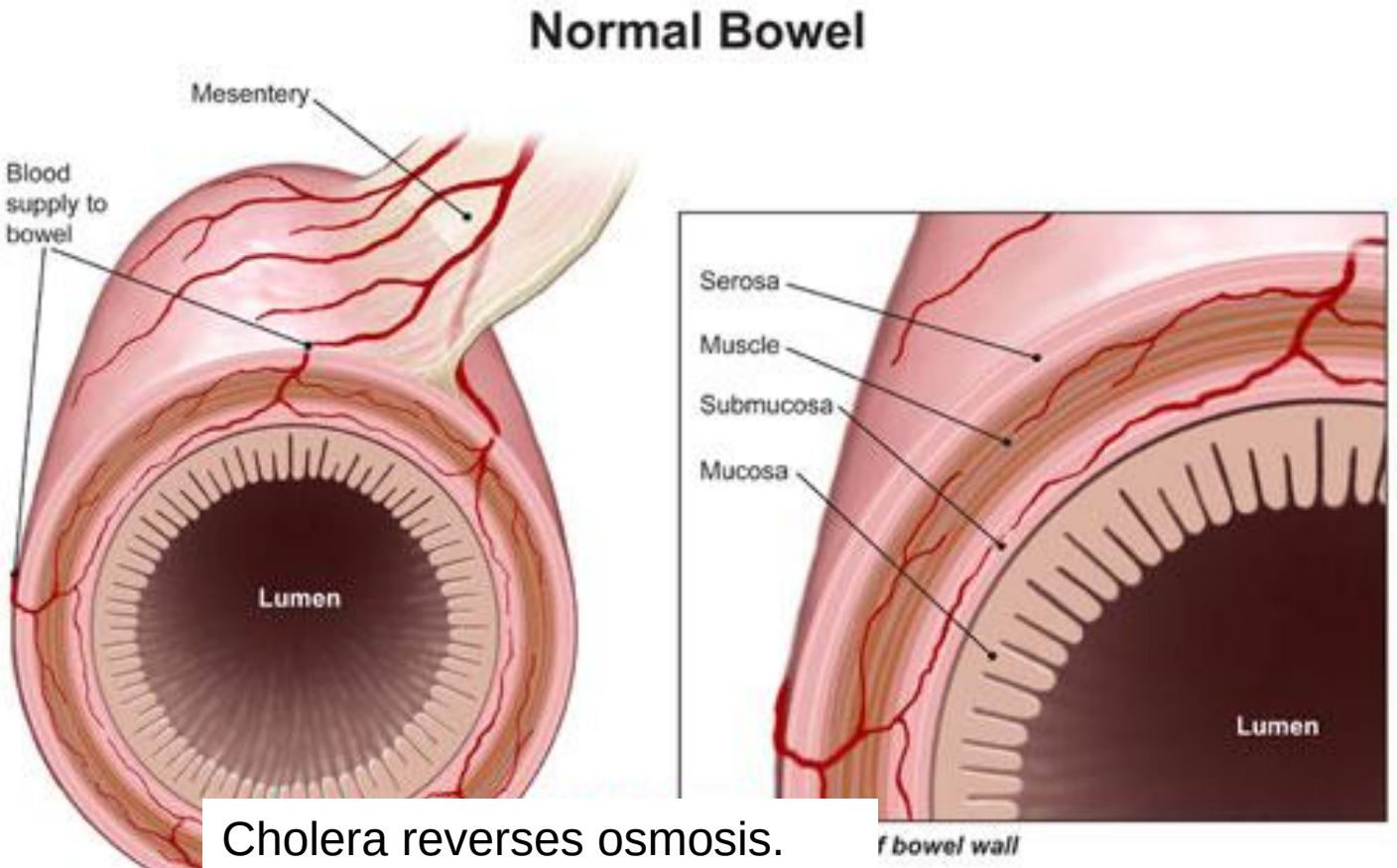
How the Cholera bacteria causes the disease

1. The bacteria get into the intestine wall.
2. The bacteria then produce a toxin which opens ion (salt)channels in the intestine cells.
3. ions flow out of the cells into the lumen (hollow) of the intestine.
4. This increases the salt content of the intestine lumen (lower than the intestine cells). Water then moves by **osmosis** from the intestine cells into the lumen. Causing diarrhoea.

Extra

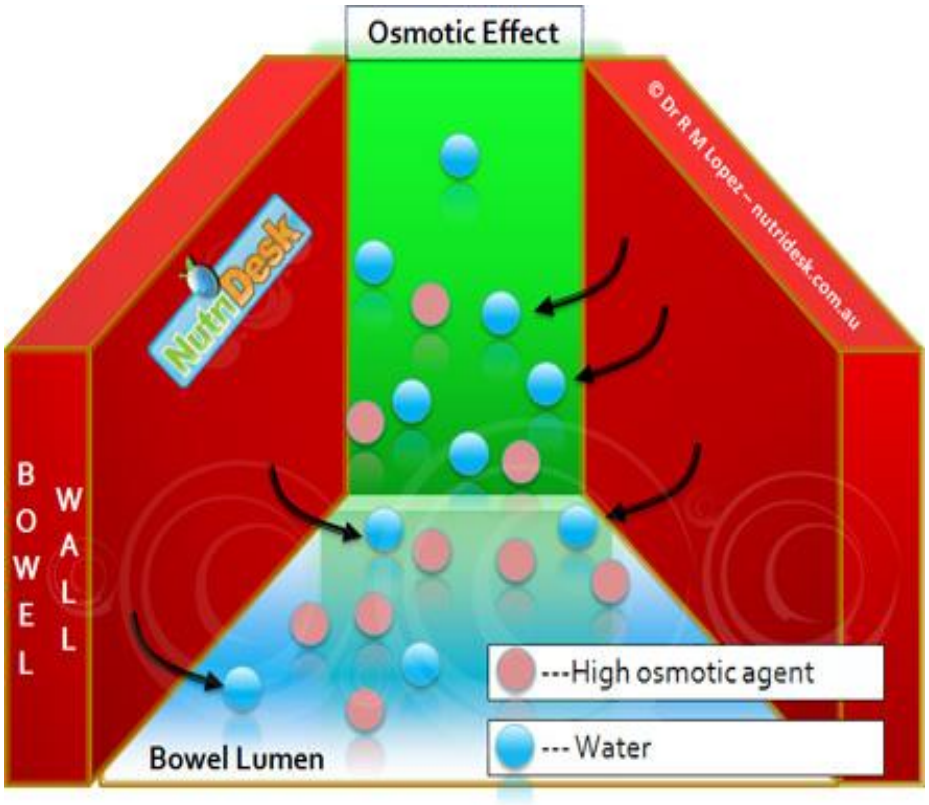
7. The loss of ions from the intestine cells creates a concentration gradient causing water to move from the blood and tissues into the intestine – this leads to severe diarrhoea and dehydration.
8. Six litres of water can be lost per day into the intestine lumen.

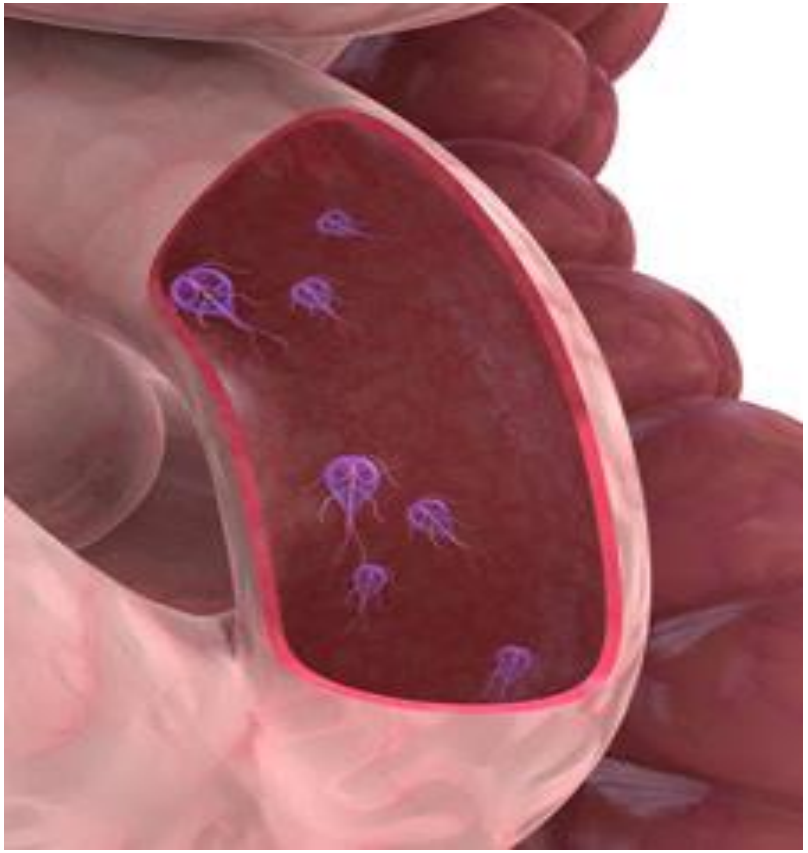
Water is usually absorbed from lumen into cells



Cholera reverses osmosis. Water moves from cells into lumen

Salt leeks into lumen, water follows due to osmosis. Dehydration and death.





Diarrhoea and Oral Rehydration Solutions (ORS)

Diarrhoea is the production of watery faeces (frequently).

CAUSES

1. Damage to the intestine wall.
2. Excessive loss of water .

MAIN PROBLEM = excessive water loss from body and insufficient taken in can lead to dehydration, which can be fatal.

TREATMENT

Rehydration with **Oral Rehydration Solutions** (ORS) - not just water.

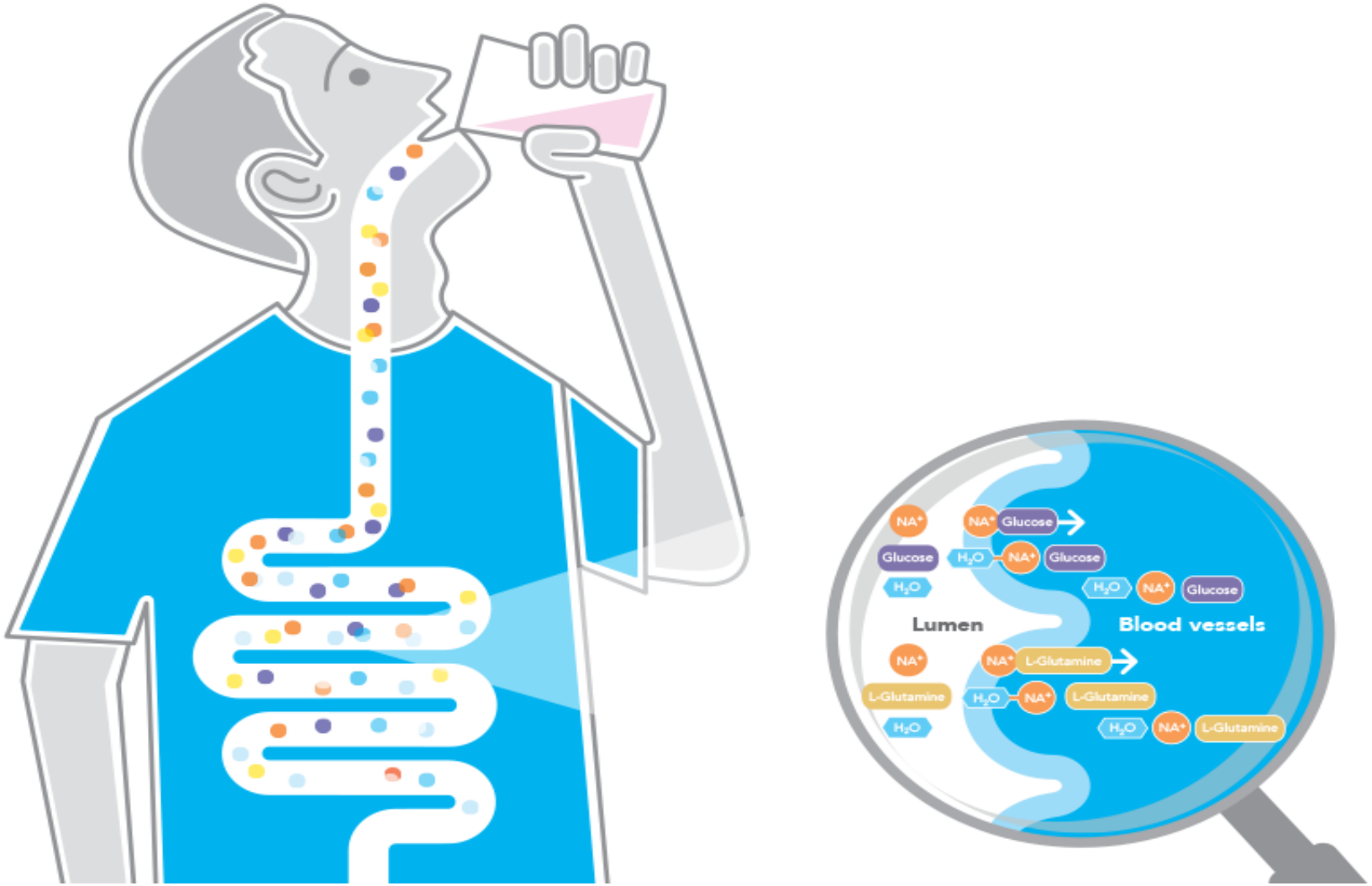
These contain:

1. Water
2. Ions such as sodium, potassium and chloride
3. Glucose

ORSs are often sold as a powder to be mixed with boiled water and taken regularly. There is usually a 1:1 ratio of glucose to sodium ions (Na^+) to give optimum conditions for the glucose/Na^+ co-transport.

Once the glucose/Na^+ enter the epithelial cells of the intestine, water follows from the lumen by osmosis.

Increase salt concentration in cells.
Water moves back out of lumen into cells.



- Starting point for your research should be the world Health organisation web site. http://www.who.int/cholera/
- The school shared area: -Subjects. Biology. Nat 4.5- osmosis Assignment/ has some resources you can use

Source 1

- Your raw data from your osmosis practical on potato cells.
- Put in your title, your aim and your table of results.
- A brief description of method

Source 2

- Your own research of a table, paragraph or graph to show results of:-
- effective use of rehydration solutions to save lives.
- Or some other relevant research data that shows water movement in to cells/ gut epithelial cells using different concentrations of rehydration solution.
- Full reference under data.

Why did you use these sources?

- **Relevant-** why were your sources relevant to your topic of research?
- **Reliable-** Name the source, it can only be reliable if its findings are back up by others. In your reading did you find this? Name the reference that back it up.
- Where did you find your references, science journals?
- Did you repeat the experiment to get reliable results?
- **Valid-** Did you only change one variable in your experiment.

Processing

- Put in your line graph of your own results.
- Put in your researched data as a changed format. E.g. a table changed to a bar graph. You must not change it to line graph- must be a different format.

- You must make sure it is accurate and has labels and unit.

Comparison of Data

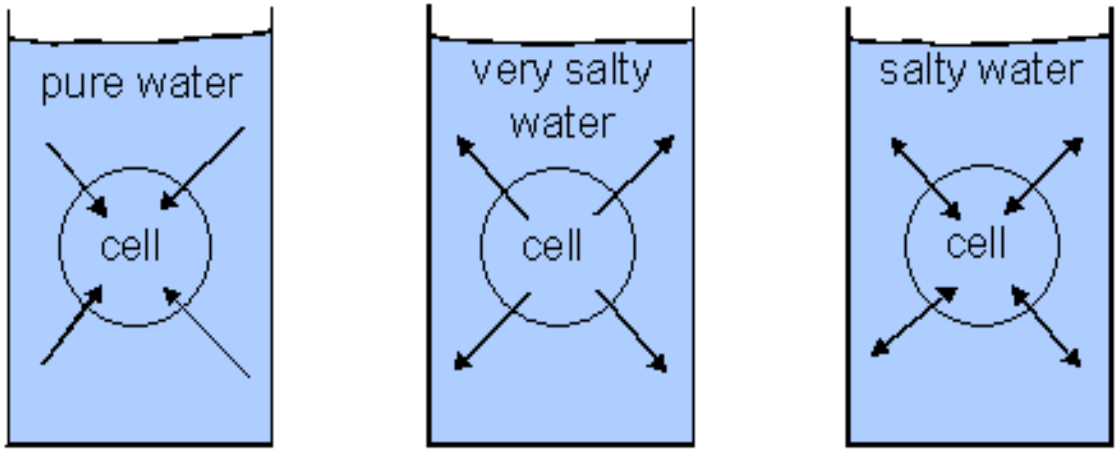
- What does source 1 tell you about osmosis and its effect on cells? Quote your data.
- What does source 2 tell you about how rehydration salts can be used to affect the osmosis of cells. Quote data.
- Comparing both sources. What does this tell you about how the dehydrate caused by cholera can be stopped and lives saved.

Conclusion

- Look at your aim and your data.
- Quote results of data to back up your conclusion.
- You must relate your conclusion back to your aim.

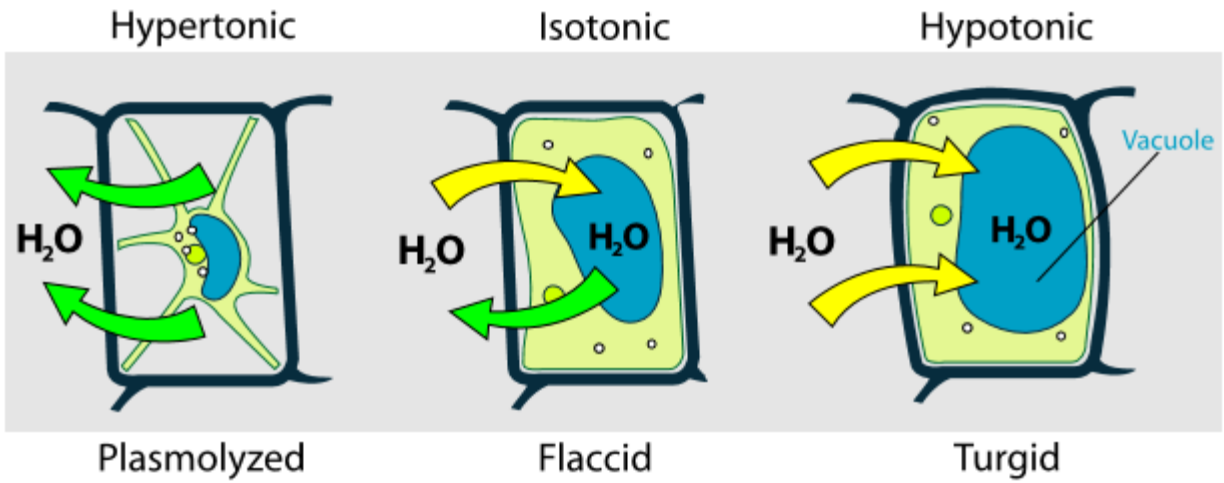
Underlying Biology

- Osmosis- The movement of water from an area of high concentration to low concentration through a semi permeable membrane.

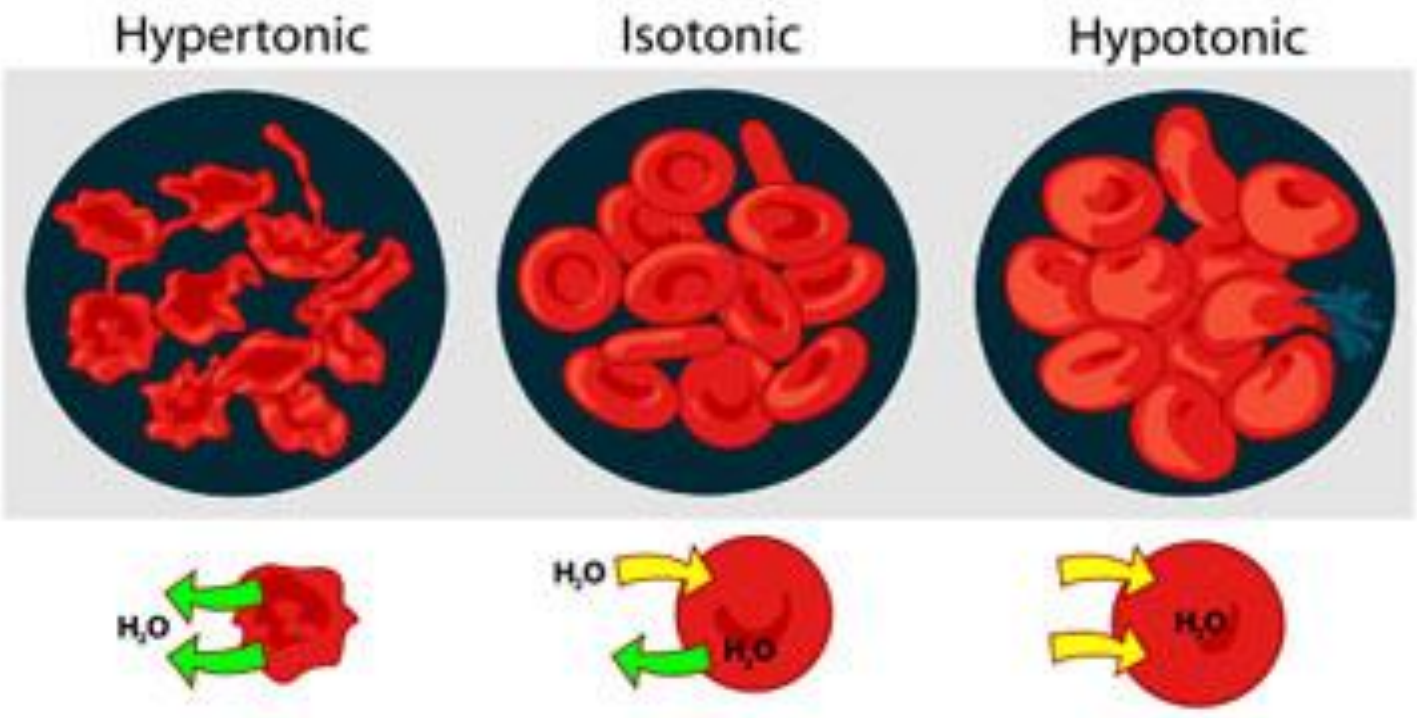


Hypotonic Hypertonic Isotonic

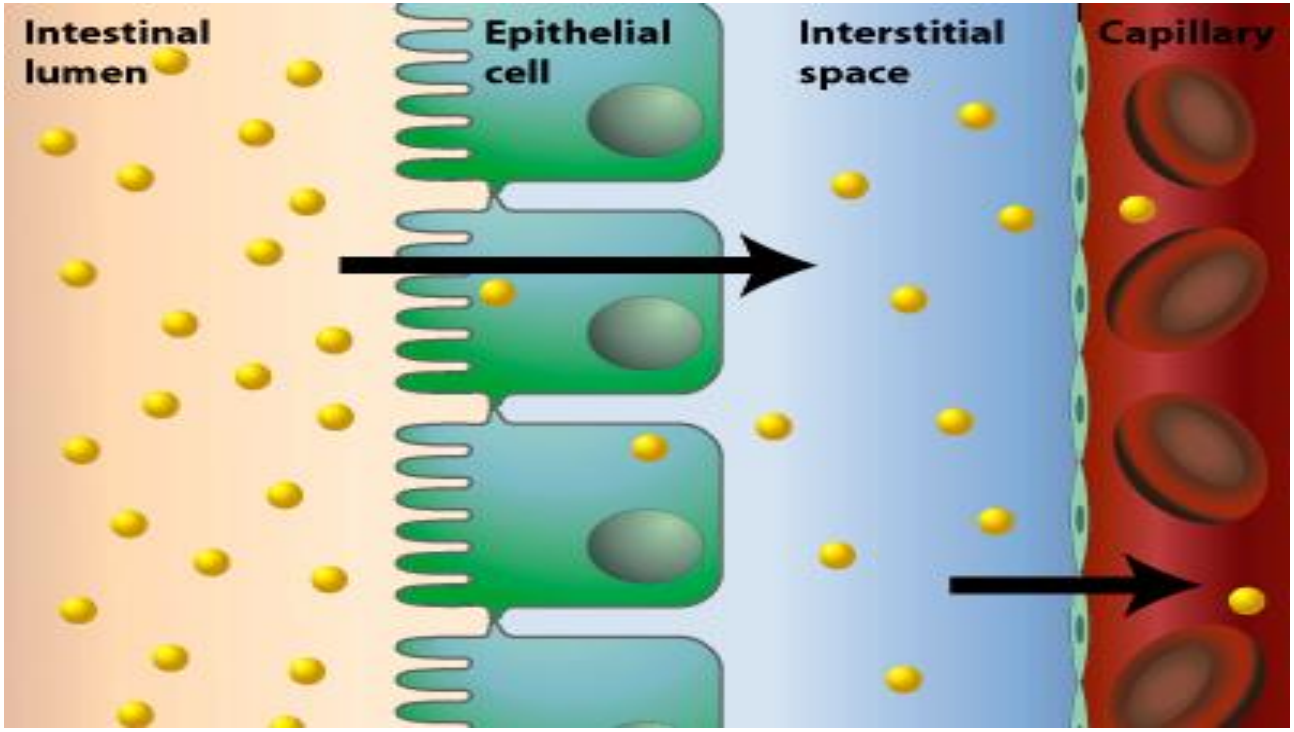
Plant cells- effect



Animal cells- effect



Normal osmosis in gut- water moves from lumen into epithelia cells and into blood stream.



This process is reversed in cholera leading to dehydration and death. It can be returned to normal with use of rehydration solutions.

References

- References should be **listed in alphabetical order** and written in a standard form **exactly** as follows:
  - ***Books***
    - Author(s), (surname followed by initials), (year of publication) *Title,* Publisher, Place of publication, Page number(s)
  - ***Journals/Scientific periodicals***
    - Author(s), (surname followed by initials), (year of publication) *Title of Article, Name of Journal,* Volume number, Page number(s)
  - ***Websites***
    - As many of the following items as available must be given, Author, Date, Title, Publisher, the URL, and **the date you accessed the material**

- As a guide, your report should be 500-800 words, excluding tables, charts and diagrams. There is no penalty for being out with this range.
- We have provided a help sheet that summarises each stage that you can use when you are writing your report under **exam conditions**.