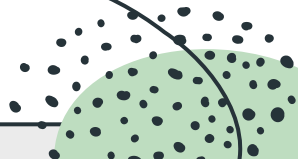




Movement of Substances

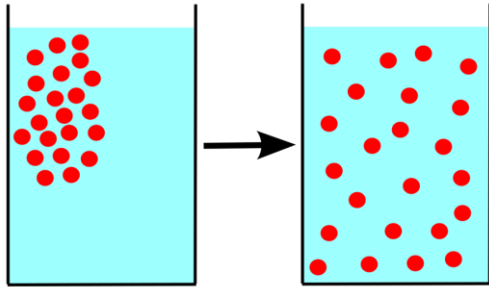




(a) Define diffusion and describe its role in nutrient uptake and gaseous exchange in plants and humans



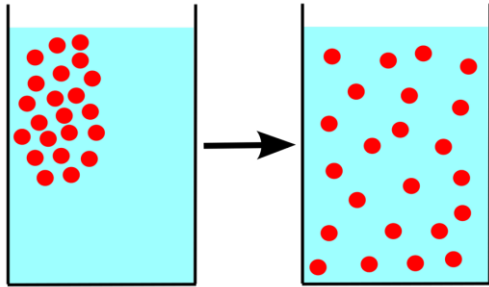
DIFFUSION



- Diffusion is the **net movement of molecules** from a **region of higher concentration** to a region of **lower concentration**, down a concentration gradient.
- It is a **passive process** as energy is not required
- When the molecules have reached **equilibrium** between the two regions, the concentrations are the same and there will be **no net movement** of molecules.



DIFFUSION



ROLE OF DIFFUSION IN NUTRIENT UPTAKE

exchange of nutrients such as glucose, amino acid and fats, and waste substances such as urea occur via diffusion

ROLE OF DIFFUSION IN GASEOUS EXCHANGE

Photosynthesis: <in plants> carbon dioxide diffuses into the leaf when concentration of carbon dioxide is higher in air than in the leaf. Oxygen diffuses out of the leaf when concentration of oxygen is higher in the leaf than air.

Respiration: <in the lungs> oxygen diffuses into blood when concentration of oxygen is higher in the air sac than blood. Carbon dioxide diffuses out of blood into the air sacs for expiration when concentration of carbon dioxide is higher in blood than in air sac.

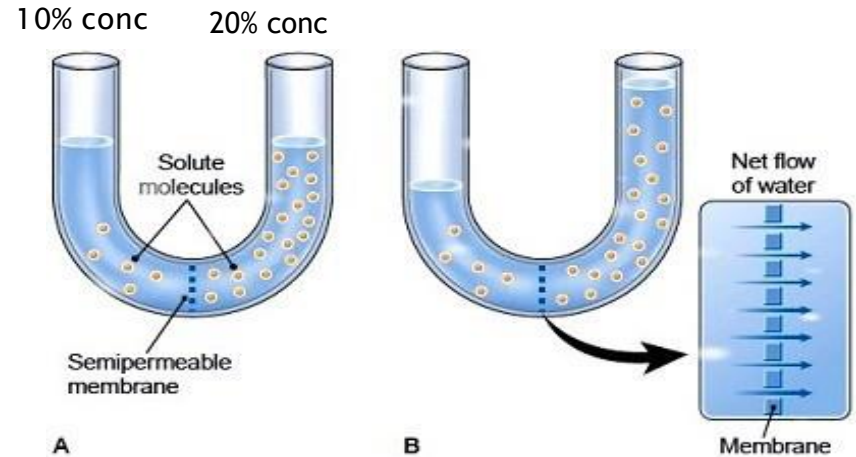


(b) Define osmosis, investigate and describe the effects of osmosis on plant and animal tissues



OSMOSIS

- Osmosis is the net movement of water molecules from a region of higher water potential to a region of lower water potential, through a partially permeable membrane
- Water potential refers to the tendency of water to move from one area to another
- Plasma membrane or visking tubing are examples of partially permeable membranes that only allow some substances such as water, gases like oxygen and carbon dioxide to pass through freely but not some other substances

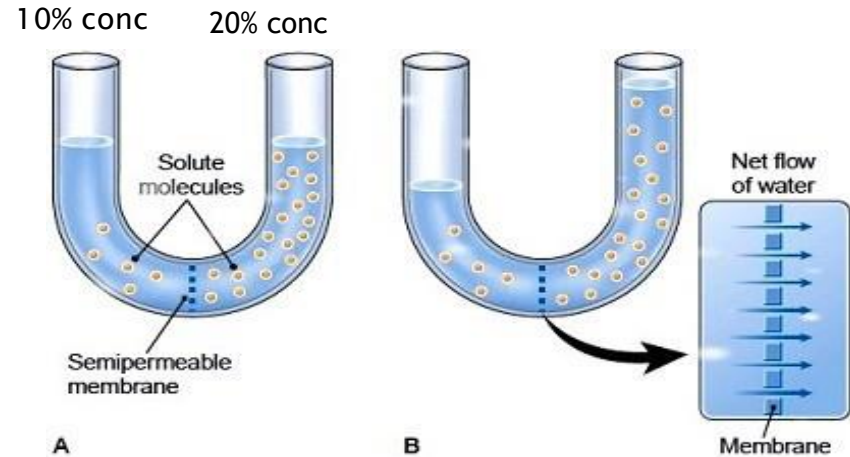




OSMOSIS

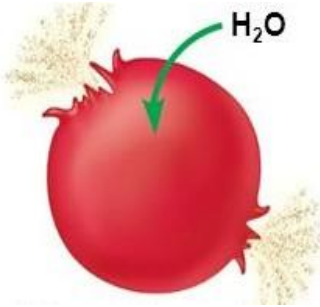
Examples:

- The 20% solution is more concentrated than the 10% solution. Hence, 10% solution has a higher water potential than 20% solution. The partially permeable membrane does not allow solute molecules to pass through as it is too big.
- As a result, water molecules will move from the arm with the 10% solution which has a higher water potential to the arm with the 20% solution which has a lower water potential, passing through semi permeable membrane via osmosis.



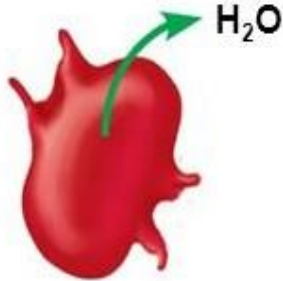


OSMOSIS IN ANIMAL CELLS



When an animal cells is immersed in a solution with a **higher water potential** relative to its cytoplasm,

- Water moves into the cell by osmosis.
- Animal cells **do not have cell walls** to protect the cells from overexpansion. As more water enters the cell, it swells to such an extent that it **bursts**.
- The cell is lysed / **CYTOLYSIS**

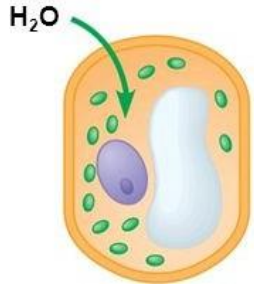


When an animal cell is immersed in a solution **with a lower water potential**, relative to its cytoplasm,

- Water moves out of the cell by osmosis.
- The cell shrinks and become dehydrated. In red blood cells, little spikes appear on the cell surface membrane.
- The cell is crenated/ **CRENATION**

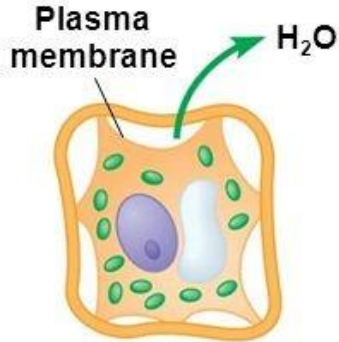


OSMOSIS IN PLANT CELLS



When a plant cell is immersed in a solution of **higher water potential** relative to its cell sap,

- Water molecules enter the cell by osmosis.
- The vacuole increases in size
- The cellulose cell wall of a plant cell is rigid and exerts an opposing pressure on the cell contents, preventing the entry of more water. This prevents the cell from over expanding and bursting
- At this point, the plant cell is **TURGID**.
- Turgor pressure provides mechanical support for many non-woody plants

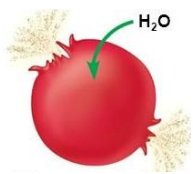
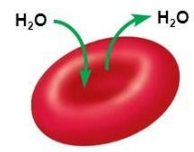
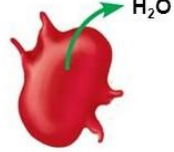
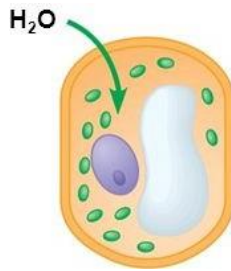
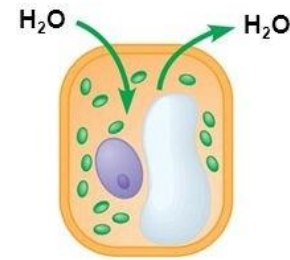
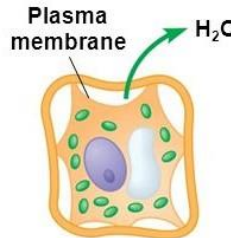


When a plant cell is immersed in a solution with a **lower water potential** relative to its cell sap,

- Water moves out of the cell into the solution by osmosis.
- The vacuole decreases in size and the cell is flaccid
- If more water leaves the cell, the vacuole and cytoplasm shrink to such an extent that the cell surface membrane pulls away from the cell wall
- the cell is plasmolysed/ **PLASMOLYSIS**



SUMMARY: EFFECTS OF OSMOSIS

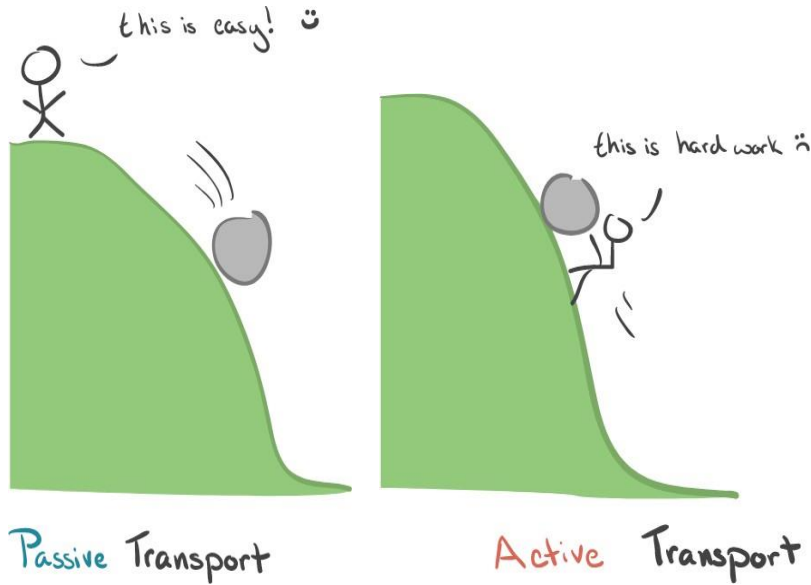
	Hypotonic solution (water potential is higher than cell content)	Isotonic solution (water potential is same as cell content)	Hypertonic solution (water potential is lower than cell content)
Animal Cells	Lysed 	Normal 	Crenated 
Plant Cells	Turgid 	Normal 	Plasmolysed 



(c) Define active transport and discuss its importance as an energy-consuming process by which substances are transported against a concentration gradient, as in ion uptake by root hairs and uptake of glucose by cells in the villi



ACTIVE TRANSPORT



- Both diffusion and osmosis is passive transport where energy is not required
- Active transport is the process where energy is used to move substances, across a cell membrane, from a region of **lower concentration** to a region of **higher concentration**, against concentration gradient.
- Since energy is required, mitochondria is needed to carry out aerobic respiration and availability of oxygen is important
- Example: Uptake of dissolved mineral salts by root hair cells and glucose uptake by cells in the villi of the small intestine

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SOME STATS

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6,214 subscribers



OVERMUGGED, 'A' Levels Channel
2,778 subscribers

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LEADERS IN THE CHANGING EDUCATION LANDSCAPE

FEATURED ON STRAITS TIMES


Our efforts to go out of our way to support our students were captured by local new publications.

OVERMUGGED was SG first tuition center to host **large scale mock exam!**

Our **student's needs come first!**

TODAY June 16 at 5:49 PM · 🌐

One Primary 6 student who is sitting mock exams told TODAY: "I feel stress didn't do any exams all the way until prelims and PSLE... I'll be unfamiliar w/ environment and I cannot concentrate."



TODAYONLINE.COM

Hundreds sign up for tuition centre mock exams costing up to \$1000, scrapping of all mid-year school exams

👍❤️😬 53

👍 Like




P6 and Sec 4 students flock to tuition centres for mock exams after scrapping of school midterms



Vulcan Post 12h · 🌐

Overmugged launched a tuition subscription plan for 'O' Levels subjects to make education more affordable and accessible, and has achieved a six-figure revenue in its first year.



VULCANPOST.COM

OVERMUGGED: This 28-year-old built S'pore's first online tuition subscription service

You and 8 others

👍 Like

💬 Comment

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With midterms scrapped, students take mock exams at tuition centres



Many in Primary 6 and Secondary 4 seek to build experience ahead of national exams

More than 100 students from 10 different schools gathered at a tuition centre in Singapore on Tuesday to take mock exams for their Primary 6 and Secondary 4 students. The students, who are currently in their final year of primary school, are preparing for the upcoming national exams. The tuition centre, Overmugged, has become a popular destination for students looking for a quiet environment to study and practice their exam-taking skills.

Wong Shyh Ying, the founder of Overmugged, said that the centre has seen a significant increase in enrollment since the scrapping of school midterms. He noted that many students are looking for a supportive environment where they can receive personalized feedback and guidance from experienced teachers. Overmugged provides a range of services, including one-on-one tutoring, group classes, and mock exams, all designed to help students build confidence and improve their performance in national exams.

The centre's success is attributed to its focus on student needs and its commitment to providing high-quality education. Overmugged has achieved a six-figure revenue in its first year, a testament to the trust and support of its students and parents. The centre's mission is to make education more accessible and affordable, ensuring that every student has the opportunity to succeed.

Spring national exams involves some degree of exam-taking skills, with an emphasis on problem-solving

Overmugged's tuition centre has become a hub for students preparing for the national exams. The centre's teachers, who are experienced in the field, provide detailed explanations and practice problems to help students understand the exam format and content. The mock exams are designed to simulate the real exam environment, allowing students to practice their time management and exam-taking strategies.

Overmugged's success is a result of its innovative approach to education and its focus on student needs. The centre has established itself as a leader in the tuition industry, providing a high-quality learning experience for students across Singapore. Overmugged's commitment to excellence and its dedication to helping students achieve their goals have made it a trusted name in the education community.

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because we know that when it comes time for
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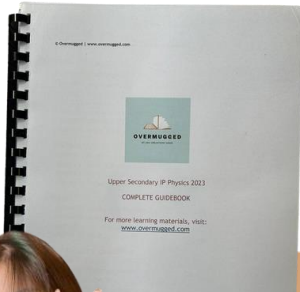
WEEKLY WORKSHEETS

Topical, Thematic, Mock Test, Mock Exam,
Prelim Prep, Practical Prep



EXCLUSIVE CHEATSHEETS

Revision booklets, extra cheatsheets,
Practical Assessment booklet



TOPIC: KINEMATICS			
Type	Definition	Formula	Remarks
Linear Motion	Object that is moving in a straight line. 1-D motion	$v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$	<ul style="list-style-type: none"> Motion can be represented (upwards or right) or -ve (down or left) sign. Equations can only be used if acceleration is constant.
2-D Motion	Object that is moving in a plane. Acceleration is experienced in both axes. Vertical and horizontal motion are independent of each other.	Horizontal motion (acceleration = 0) $v_x = u_x$ $s_x = u_x t$ Vertical motion (uniform vertical acceleration = g) $v_y = u_y + at$ $s_y = u_y t + \frac{1}{2}at^2$ $v_y^2 = u_y^2 + 2as$	<ul style="list-style-type: none"> Acceleration always acts down. Parabola will fall and go parabolic if resistance is negligible.
v Vectors	Analyse the horizontal and vertical motion separately.	For a vector \vec{v} pointing at an angle θ from the horizontal: $v_x = v \cos(\theta)$ (horizontal) $v_y = v \sin(\theta)$ (vertical) $v = \sqrt{v_x^2 + v_y^2}$ $\tan \theta = \frac{v_y}{v_x} = \tan^{-1} \left(\frac{v_y}{v_x} \right)$	

MARCH PRACTICE QUESTIONS 2021
SECONDARY 4 EXPRESS
SECONDARY 3 NORMAL ACADEMIC

ELEMENTARY MATHEMATICS 408081

Specimen Paper
Date: 8 March 2021
Candidates answer on separate writing paper.

READ THESE INSTRUCTIONS FIRST

Answer all questions.
A scientific calculator is permitted for this session.
You are expected to use a scientific calculator to evaluate lengthy numerical expressions, if the degree of accuracy is not specified in the question, use 4 for the answer to your calculation.
Give answers to 3 significant figures.
Give answers to degrees to one decimal place.
For a question your observed score of 4 out of 4, unless the question requires the answer to be in terms of π .

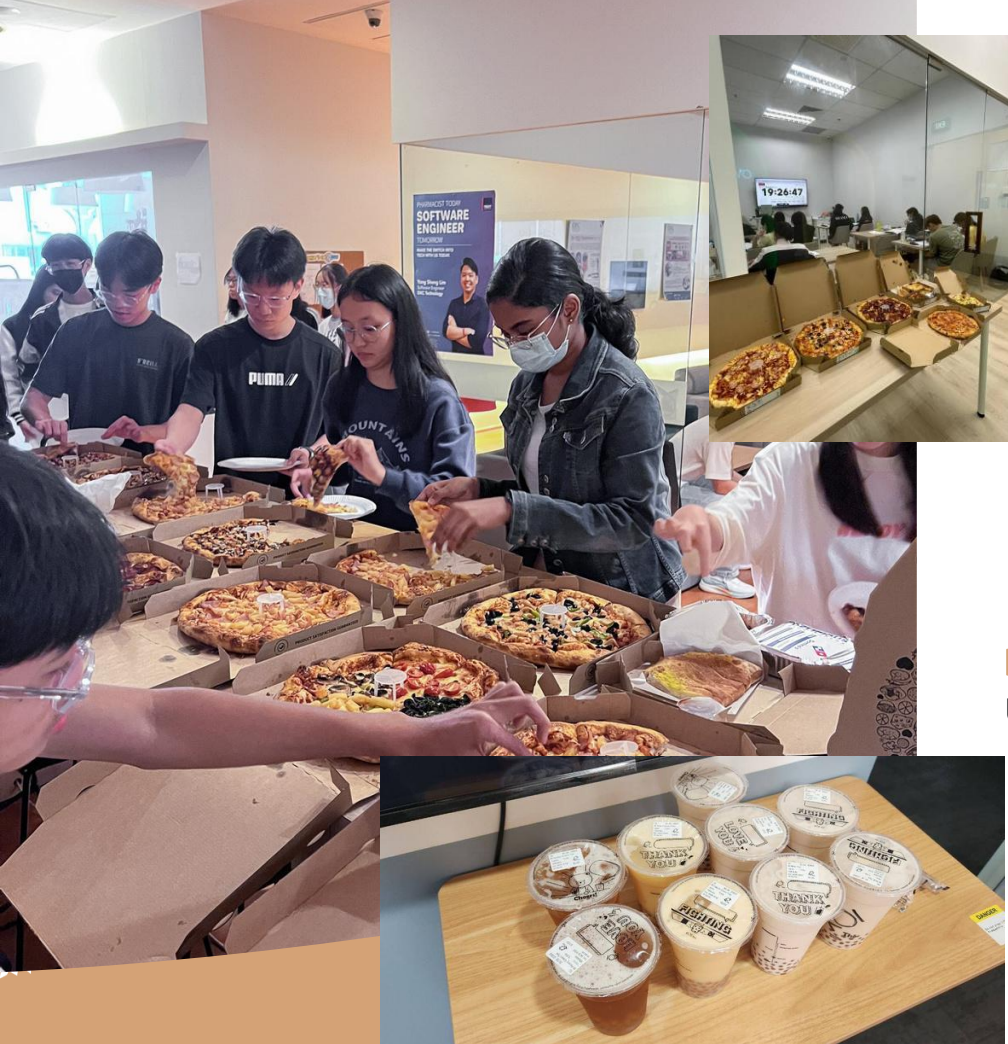
Topic names will be listed above each question for your benefit and reference.

Upon completion of solutions:
Each candidate must identify 2 marks to submit their solution.
Take a picture or use the digital camera of your solution to use (submit) via Telegram channels, WhatsApp or Wechat: **MOE197576**.
Ensure that all writings are clear and legible.
Candidates will be marked based on your presentation, accuracy and completeness of your solution.
A 'merit' stamp and the full solution will be provided at the end of the month.

Series: Ding Kai Sun
This question paper consists of 6 printed pages including the cover page.

it reached in a time t or $v_y = 0$	$v^2 = (u \sin \theta)^2 - 2gh$ $\therefore H = \frac{u^2 \sin^2 \theta}{2g}$	With air resistance, <ul style="list-style-type: none"> Drag force acts in the same direction as the weight of object. Net acceleration $>> g$ Maximum height reached lower.
or $v_y = 0$	$v_y = u \sin \theta - gt_{up}$ $t_{up} = \frac{u \sin \theta}{g}$	With air resistance, <ul style="list-style-type: none"> Drag force acts in the same direction as the weight of object. Net acceleration $>> g$ Final vertical speed smaller than vertical speed. Average speed upwards $>$

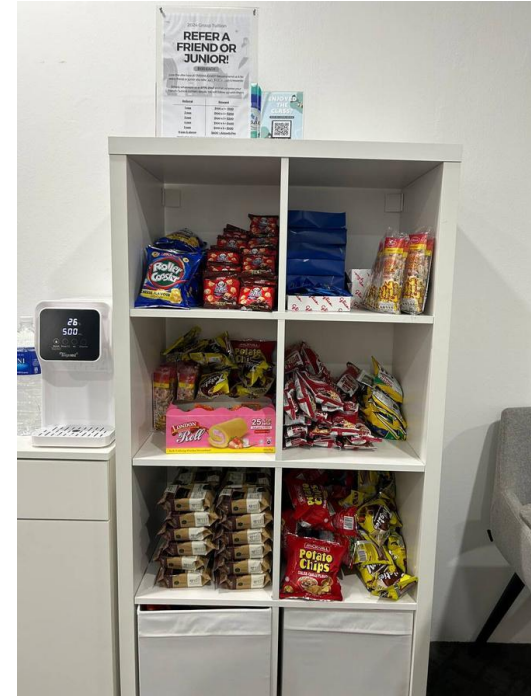




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\$105/lesson (weekend)

10% if signing up for 2 'A' Levels subject & above

**Fees are collected at the start of the term
(every 3 months).**

ACADEMIC YEAR

TERM 1: NOV – JAN

Topical Recaps

Key highlight: Christmas Party

TERM 2: FEB – APR

Topical Mastery

Key highlight: March Holiday Cohesion Program

TERM 3: MAY – JUL

Prelim/EOY Preparation

Key highlight: Mock Prelim/EOY

TERM 4: AUG – OCT

'O' Levels / 'A' Levels Preparation

Key highlight: Mock Exams, Science Practical Assessment





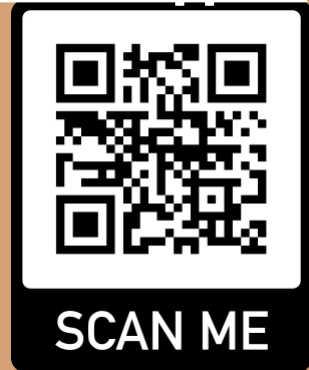
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