ملازمنا

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ملزمة

Physics

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الفيزياء

الاول متميزين

باللغتين
العربية والانكليزية
ثنائي اللغة

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CHAPTER 1

الفصل الاول

HISTORY OF PYHISCS

الاستاذ وليد خالد الفتلاوي

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CHAPTER 1 HISTORY OF PYHISCS

الفصل الاول (1) تأريخ الفيزياء

PHYSICS is a branch of science that developed out of philosophy and was thus referred to as natural philosophy until the late 19th century – a term describing a field of study concerned with "the workings of nature".

الفيزياء هي فرع من العلوم التي تطورت من الفلسفة، ومن ثم كان يشار إليها بالفلسفة الطبيعية حتى أواخر القرن التاسع عشر – وهو مصطلح يصف مجال الدراسة المعنية "علم الطبيعة "

PHYSICS is traditionally defined as the study of matter, energy, and the relation between them.

وتعرف **الفيزياء** تقليديا بأنها دراسة المادة، والطاقة، والعلاقة بينهما.

PHYSICS is, in some senses, the oldest and most basic pure science; its discoveries find applications throughout the **NATURAL SCIENCES** since **MATTER AND ENERGY** are the basic constituents of the natural world. The other sciences are generally more limited in their scope and may be considered branches that have split off from physics to become sciences in their own right.

الفيزياء هي، في بعض الحواس، أقدم وأهم العلوم البحتة الأساسية؛ واكتشافاتها تجد التطبيقات في جميع أنحاء العلوم الطبيعية، لأن **المادة والطاقة** هي المكونات الأساسية للعالم الطبيعي. وعادة ما تكون العلوم الأخرى محدودة في نطاقها، ويمكن اعتبارها فروع انفصلت عن الفيزياء لتصبح علوم في

Physics today may be divided loosely into CLASSICAL PHYSICS and حد ذاتها. MODERN PHYSICS.

Elements of what became physics were drawn primarily from the fields of astronomy, optics, and mechanics, which were methodologically united through the study of geometry. These mathematical disciplines began in Antiquity with the Babylonians and with Hellenistic writers such as ARCHIMEDES and PTOLEMY.

Meanwhile, philosophy, including what was called "physics", focused on explanatory (rather than descriptive) schemes, largely developed around the Aristotelian idea of the four types of "CAUSES".

الفيزياء اليوم يمكن تقسيمها فضفاضة في الفيزياء الكلاسيكية والفيزياء الحديثة.

تم رسم عناصر ما أصبح الفيزياء في المقام الأول من مجالات علم الفلك والبصريات والميكانيكا، والتي تم توحيدها منهجيا من خلال دراسة الهندسة. بدأت هذه التخصصات الرياضية في العصور القديمة مع البابليين والكتاب الهلنستية مثل أرخميدس وبطليموس. وفي الوقت نفسه، ركزت الفلسفة، بما في ذلك ما يسمى ب "الفيزياء"، على مخططات توضيحية (وليس وصفية)، تطورت إلى حد كبير حول فكرة أرسطو عن الأنواع الأربعة من الأسباب.

ARAB AND MUSLIM SCIENTISTS

During the period of time known as the Dark Ages (5th to 15th centuries), much scientific progress occurred in the Muslim world. The scientific research of the Islamic scientists is often overlooked due to the conflict of the Crusades and "it's possible, too, that many scholars in the Renaissance later downplayed or even disguised their connection to the Middle East for both political and religious reasons." The Islamic Abbasid caliphs gathered many classic works of antiquity and had them translated into Arabic within the House of Wisdom

in Baghdad, Iraq. Islamic philosophers such as Al-Kindi (Alkindus), Al-Farabi (Alpharabius), and Averroes (Ibn Rushd) reinterpreted Greek thought in the context of their religion. Ibn Sina (980 – 1037), known by the Latin name Avicenna, was a medical researcher from Bukhara, Uzbekistan responsible for important contributions to the disciplines of physics, optics, philosophy and medicine. He is most famous for writing The Canon of Medicine, a text used to teach student doctors in Europe until the 1600s.

علماء العرب والمسلمين

خلال الفترة الزمنية المعروفة باسم العصور المظلمة (القرون الخامس إلى الخامس عشر)، حدث الكثير من التقدم العلمي في العالم الإسلامي. غالبا ما يتم تجاهل البحث العلمي للعلماء الإسلاميين بسبب صراع الحروب الصليبية و "من الممكن أيضا أن العديد من العلماء في عصر النهضة قلصوا أو حتى تنكروا صلتهم بالشرق الأوسط لأسباب سياسية ودينية". جمع الخلفاء العباسيون الإسلاميون العديد من الأعمال الكلاسيكية في العصور القديمة، وترجموها إلى اللغة العربية داخل بيت الحكمة في بغداد، العراق. فلاسفة الإسلاميين مثل الكندي (الكندوس) والفارابي (ألفارابيوس)، وابن رشد (ابن رشد) أعادوا تفسير الفكر اليوناني في سياق دينهم. ابن سينا (980 – 1037)، المعروف باسم اللاتينية ابن سينا، كان باحثا طبيا من بخارى، أوزبكستان مسؤولا عن مساهمات هامة في تخصصات الفيزياء والبصريات والفلسفة والطب. هو الأكثر شهرة لكتابة كانون الطب، وهو نص يستخدم لتعليم الأطباء الطلاب في أوروبا حتى 1600s.

Important contributions were made by Ibn AL Haytham (965 – 1040), a mathematician from Basra, Iraq considered one of the founders of modern optics.

Ptolemy and Aristotle theorised that light either shone from the eye to illuminate objects or that light emanated from objects themselves, whereas Ibn AL Haytham Cknown by the Latin name Alhazen) suggested that light travels to the eye in rays from different points on an object.

وقد قدم ابن الهيثم (965 – 1040)، وهو عالم رياضيات من البصرة، مساهمات هامة من مؤسسي البصريات الحديثة. وبطليموس وأرسطو نظروا أن الضوء إما أشرق من العين لإلقاء الضوء على الأشياء أو أن الضوء المنبعث من الكائنات نفسها، في حين أن ابن الهيثم (المعروف بالاسم اللاتيني الحزين) اقترح أن يفسر الضوء إلى العين في أشعة من نقاط مختلفة على الاجسام.

The works of Ibn AL Haytham and Abu Rayhan Biruni eventually passed on to Western Europe where they were studied by scholars such as Roger Bacon and Witelo. Omar Khayyam C1048–1131), a Persian scientist, calculated the length of a solar year to 10 decimal places and was only out by a fraction of a second when compared to our modern-day calculations. He used this to compose a calendar considered more accurate than the Gregorian calendar that came along 500 years later. He is classified as one of the world's first great science communicators – he is said to have convinced a Sufi theologist that the world turns on an axis. Muhammad ibn Jabir Al-Harranl Al-Battanl C858 – 929), from Harran, Turkey, further developed trigonometry Cfirst conceptualised in Ancient Greece) as an independent branch of mathematics, developing relationships such as tanΘ = sinΘ / cosΘ. His driving force was to obtain the ability to locate Mecca from any given geographical point – aiding in Muslim rituals such as burial and prayer, which require participants to face the holy city, as well as making the pilgrimage to Mecca Cknown as the hajj).

انتقلت أعمال ابن الهيثم وأبو ريحان بتروني في نهاية المطاف إلى أوروبا الغربية حيث درسها علماء مثل روجر بيكون ويتول .عمرالخيام (1048–1131)، عالم فارسي، حسب طول سنة شمسية إلى 10 عشري الأماكن وكان فقط من قبل جزء صغير من

الثانية بالمقارنة مع حساباتنا الحديثة اليوم. كان يستخدم هذا لإنشاء تقويم اعتبر أكثر دقة من التقويم الغريغوري الذي جاء على طول 500 سنة في وقت لاحق. وهو مصنف كواحدة من أوائل الاتصالات العلمية الكبرى في العالم - ويقال إنه أقنع عالم الصوفي أن العالم يتحول على محور. محمد بن جابر الحراني البطانل (858 - 929)، من حران، تركيا، طور علم المثلثات (أول تصور في اليونان القديمة) كفرع مستقل من الرياضيات، وتطوير علاقات مثل tan9 = sin9 / cos9. وكانت القوة الدافعة له هي الحصول على القدرة على تحديد مكان مكة من أي نقطة جغرافية معينة - المساعدة في الطقوس الإسلامية مثل الدفن والصلاة، والتي تتطلب المشاركين لمواجهة المدينة المقدسة، وكذلك جعل الحج إلى مكة المكرمة (المعروفة باسم الحج).

Furthermore, Nasir al-Din al-Tusi (1201-1274), an astronomer and mathematician from Baghdad, authored the Treasury of Astronomy, a remarkably accurate table of planetary movements that reformed the existing planetary model of Roman astronomer Ptolemy by describing a uniform circular motion of all planets in their orbits. This work led to the later discovery, by one of his students, that planets actually have an elliptical orbit. Copernicus later drew heavily on the work of al-Din al-Tusi and his students, but without acknowledgment. The gradual chipping a way of the Ptolemaic system paved the way for the revolutionary idea that the Earth actually orbited the Sun (heliocentrism). Jabir ibn Hayyan (721 - 815) was a chemist and alchemist from Iran who, in his quest to make gold from other metals, discovered strong acids such as sulphuric, hydrochloric and nitric acids. He was the also first person to identify the only substance that can dissolve gold - aqua Regis (royal water) - a volatile mix of hydrochloric and nitric acid. It is disputed whether Jabir was the first to use or describe distillation, but he was definitely the first to perform it in the lab using an alembic (from 'Al-Inbiq'). The most famous Arabic mathematician is considered to be Muhammad ibn Musa al-Khwarizmi (780 - 850), who produced a comprehensive guide to the numbering system developed from the Brahmi system in India, using only 10 digits (0-9, the so-called "Arabic numerals"). Al-Khwarizmi also used the word

algebra ('Al-Jabr') to describe the mathematical operations he introduced, such as balancing equations, which helped in several problems.

وعلاوة على ذلك، كتب ناصر الدين الطوسي (1201–1274)، عالم الفلك والرياضيات من بغداد، الخزانة الفلكية، وهو جدول دقيق بشكل ملحوظ من حركات الكواكب التي أصلحت النموذج الكوكبي الحالي من عالم الفلك الروماني بطليموس عن طريق وصف تعميم دائري حركة جميع الكواكب في مداراتها. أدى هذا العمل إلى اكتشاف لاحق، من قبل أحد تلاميذه، أن الكواكب في الواقع لديها مدار بيضوي الشكل(اهليليجي). كوبرنيكوس استند في وقت لاحق بشكل كبير على عمل الدين الطوسي وطلابه، ولكن من دون اعتراف. إن التقطيع التدريجي بعيدا عن النظام البطلمي مهدت الطريق للفكرة الثورية بأن الأرض تدور في الواقع الشمس (الهليو سنتر). كان جابر بن حيان (721 – 815) الكيميائي والكيميائي من إيران الذي اكتشف، في سعيه لجعل الذهب من المعادن الأخرى، الأحماض القوية مثل الأحماض الكبريتيك والهيدروكلوريك والنتريك. وكان أيضا أول شخص يعرف المادة الوحيدة التي يمكن أن تذوب الذهب (الماء الملكي) وهو مزيج متقلب من حمض الهيدروكلوريك والنيتريك. ومن المتنازع عليه ما إذا كان جابر أول من استخدم أو وصف التقطير، لكنه كان بالتأكيد أول من يقوم بها في المختبر باستخدام النعيمي (من 'إنبيك'). ويعتبر عالم الرياضيات العربي الأكثر شهرة هو محمد بن موسى الخوارزمي (780 – 850)، الذي أصدر دليلا شاملا لنظام الترقيم الذي تم تطويره من نظام براهمي في الهند، باستخدام 10 أرقام فقط (0–9، تسمى "الأرقام العربية"). كما استخدم الخوارزمي كلمة الجبر لوصف العمليات الرياضية التي قدمها، مثل موازنة المعادلات التي ساعدت في العديد من المشاكل.

History of Physics: Smart & Comprehensive Questions

تأريخ الفيزياء: أسئلة ذكية وشاملة

✅ Section 1: Definition and Development of Physics

Question:
Why is physics considered the foundation of all other natural sciences, and what was its early relationship with philosophy?

Answer:
Physics is considered foundational because matter and energy are the core elements of the natural world, and all other sciences deal with various aspects of matter and energy. In its beginnings, physics was part of philosophy and was known as "natural philosophy" because it sought to understand *how* the universe works through interpretive reasoning rather than descriptive observation.

✅ Section 2: The Birth of Physics from Astronomy and Geometry

Question:
How did disciplines like astronomy, optics, mechanics, and geometry contribute to the rise of physics, and who were the key scientists of that era?

Answer:
These disciplines helped form the fundamental concepts upon which physics was later built, through reliance on calculation and observation. Key figures included Archimedes and Ptolemy, as geometry served as a tool to unify the study of natural phenomena under a common methodology.

✅ Section 3: Aristotelian Philosophy and Its Influence

Question:
What is the difference between the explanatory method used by philosophers like Aristotle and the descriptive method used by modern physicists?

Answer:
Aristotle's method relied on intellectual explanation of phenomena using the "four causes," without experimentation or precise observation. In contrast, modern physics uses observation, experimentation, and mathematical verification to describe and understand phenomena.

✅ Section 4: The Islamic Role in the Development of Physics

Question:
What factors led to the emergence of Muslim scientists during the Middle Ages, and how did they face the challenge of later under-recognition?

Answer:
Muslim scientists rose to prominence due to the support of Abbasid caliphs for knowledge and translation movements, particularly through institutions like the House of Wisdom in Baghdad. However, their work was later overlooked during the Renaissance due to religious and political biases, and some European scholars concealed their influence.

✅ Section 5: The Contribution of Ibn Sina (Avicenna)

Question:
What was the significance of Ibn Sina's *Canon of Medicine* in the development of science, and what other fields did he contribute to?

Answer:
The *Canon of Medicine* was a primary medical reference in Europe until the 17th century. Ibn Sina also contributed to physics, optics, and philosophy, making him a polymath who successfully combined scientific inquiry with religious thought.

✅ Section 6: Ibn al-Haytham and the Foundation of Optics

Question:
How did Ibn al-Haytham's theory of light differ from those of Ptolemy and Aristotle, and why is it considered revolutionary?

Answer:
Unlike Aristotle and Ptolemy—who believed either the eye emitted light or that light emanated from objects—Ibn al-Haytham proposed that light travels in straight lines from objects to the eye. His theory was based on experimentation and laid the groundwork for modern optics.

✅ Section 7: European Scholars Influenced by Muslims

Question:
Name two European scientists influenced by Muslim scholars and give evidence of that influence.

Answer:
Roger Bacon and Witelo studied Ibn al-Haytham's works, which had been translated into Latin. Copernicus also incorporated Nasir al-Din al-Tusi's planetary models without crediting him—clear evidence of direct influence.

✅ Section 8: Omar Khayyam and the Solar Calendar

Question:
What astronomical achievement did Omar Khayyam make, and how does it compare to the Gregorian calendar?

Answer:
He calculated the solar year with a precision of up to 10 decimal places, with an error margin of less than one second compared to modern calculations—making it even more accurate than the Gregorian calendar introduced five centuries later.

✅ Section 9: Al-Khwarizmi and Mathematics

Question:
What was Al-Khwarizmi's achievement in mathematics, and what term did he introduce to describe algebra?

Answer:
Al-Khwarizmi established the decimal numeral system (0–9) and coined the term *al-jabr* (algebra) to describe the process of equation balancing, thus laying the foundations of modern algebra.

✅ الفقرة 1: تعريف الفيزياء وتطورها

السؤال:
لماذا تُعد الفيزياء أساسًا لجميع العلوم الطبيعية الأخرى، وما العلاقة التي تربطها بالفلسفة في بداياتها؟

الجواب:
الفيزياء تُعد الأساس لأن المادة والطاقة هما العنصران الأساسيان في العالم الطبيعي، وكل العلوم الأخرى تتعامل مع مظاهر من المادة والطاقة. كما أن الفيزياء بدأت كجزء من الفلسفة، وكانت تُعرف بالفلسفة الطبيعية لأنها كانت تهتم بفهم "كيف يعمل" الكون بطريقة تفسيرية أكثر منها وصفية.

✅ الفقرة 2: نشأة الفيزياء من الرياضيات والهندسة

السؤال:
كيف ساهمت تخصصات مثل الفلك والبصريات والميكانيك والهندسة في نشوء علم الفيزياء، ومن هم أبرز العلماء في تلك المرحلة؟

الجواب:
ساهمت هذه التخصصات في تطوير المفاهيم الأساسية التي بُني عليها علم الفيزياء لاحقًا، من خلال الاعتماد على الحسابات والملاحظة. من أبرز العلماء في تلك الفترة أرخميدس وبطليموس، حيث استُخدمت الهندسة كأداة لتوحيد منهجية دراسة الظواهر.

✅ الفقرة 3: الفلسفة الأرسطية وتأثيرها

السؤال:
ما الفرق بين المنهج التفسيري الذي استخدمه الفلاسفة كأرسطو، والمنهج الوصفي الذي يستخدمه الفيزيائيون المعاصرون؟

الجواب:
المنهج الأرسطي كان يعتمد على التفسير العقلي للظواهر من خلال "الأسباب الأربعة"، دون الاعتماد على التجربة أو الملاحظة الدقيقة، بينما المنهج الحديث يعتمد على الرصد والتجريب والتحقق الرياضي.

✅ الفقرة 4: الدور الإسلامي في تطور الفيزياء

السؤال:
ما العوامل التي أدت إلى بروز العلماء المسلمين في العصور الوسطى، وكيف واجهوا تحديات عدم الاعتراف بهم لاحقًا؟

الجواب:
العلماء المسلمون برزوا بسبب دعم الخلفاء العباسيين للترجمة والعلم، خاصة من خلال بيت الحكمة في بغداد. لكن أعمالهم لم يُعترف بها دائمًا بسبب التحيز الديني والسياسي في عصر النهضة، حيث أخفى بعض الأوروبيين تأثير هؤلاء العلماء.

✅ الفقرة 5: مساهمة ابن سينا

السؤال:
ما أهمية كتاب "القانون في الطب" لابن سينا في تطور العلوم، وما المجالات الأخرى التي أسهم فيها؟

الجواب:
كان كتاب "القانون في الطب" مرجعًا طبيًا في أوروبا حتى القرن السابع عشر. كما أسهم ابن سينا في الفيزياء والبصريات والفلسفة، ما يجعله من العلماء الموسوعيين الذين مزجوا بين العلم والدين.

✅ الفقرة 6: ابن الهيثم وتأسيس البصريات

السؤال:
فيما تختلف نظرية ابن الهيثم عن الضوء عن نظريتي بطليموس وأرسطو، ولماذا تُعد ثورية؟

الجواب:
خلافًا لما زعمه أرسطو وبطليموس بأن العين تبعث الضوء أو أن الضوء يصدر من الأشياء، قال ابن الهيثم إن الضوء ينتقل من الجسم إلى العين في خطوط مستقيمة، وهي فكرة تجريبية شكلت الأساس للبصريات الحديثة.

✅ الفقرة 7: العلماء الذين تأثروا بالمسلمين

السؤال:
اذكر مثالين لعلماء أوروبيين استفادوا من أعمال علماء المسلمين، وما الذي يدل على ذلك؟

الجواب:
روجر بيكون وويتلو درسا أعمال ابن الهيثم، وتُرجمت مؤلفاته إلى اللاتينية. كما أن كوبرنيكوس اعتمد على نظرية ناصر الدين الطوسي عن حركة الكواكب دون الإشارة إليه، مما يُظهر تأثيرًا مباشرًا.

✅ الفقرة 8: عمر الخيام والتقويم

السؤال:
ما الإنجاز الفلكي الذي حققه عمر الخيام، وما أهميته مقارنة بالتقويم الغريغوري؟

الجواب:
حسب طول السنة الشمسية بدقة تصل إلى 10 منازل عشرية، وكان خطأه أقل من ثانية مقارنة بحساباتنا الحديثة، ما يجعله أكثر دقة من التقويم الغريغوري الذي جاء بعده بخمسة قرون.

✅ الفقرة 9: الخوارزمي والرياضيات

السؤال:
ما إنجاز الخوارزمي في تطوير الرياضيات، وما المصطلح الذي أطلقه ليصف علم الجبر؟

الجواب:

الخوارزمي وضع أساس النظام العددي العشري (0–9)، وابتكر مصطلح "الجبر" لوصف العمليات التي أدخلها مثل موازنة المعادلات، ما جعله مؤسس علم الجبر الحديث.

2

CHAPTER 2 الفصل الثاني

MATTER AND MEASUREMENT

الاستاذ وليد خالد الفتلاوي

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CHAPTER 2 MATTER AND MEASUREMENT

الفصل الثاني (2) المادة والقياس

Matter is as anything which has **mass** and **volume**.

المادة: كل شيء حولنا يملك كتلة وحجم.

Everything around us (such as air, water, plants, animals and the earth) is all matter.

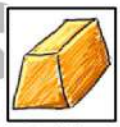
كل شيء حولنا مثل الهواء، الماء، النباتات، الحيوانات، والارض

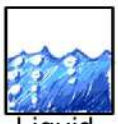
Why don't we consider  Light,  sound and heat as examples of matter?

لماذا لا نتعبر الضوء، الصوت والحرارة مادة.

because they have no mass and volume.

بسبب انهم لا يملكون كتلة ولا حجم.


Solids


Liquid


Gas


Plasma

What is Matter states? **solid**, **liquid** and **gas**

Solid الصلبة	Liquid السائلة	Gas الغازية
has a fixed shape لها شكل ثابت	has **no** definite shape ليس لها شكل ثابت	has **no** definite shape ليس لها شكل ثابت
has a definite volume لها حجم ثابت	has definite volume لها حجم ثابت	has **no** definite volume ليس لها حجم ثابت

For example, glass, spoon, wood, paper, pencil, and ice are all solids. على سبيل المثال الزجاج، ملعقة الطعام، الخشب، الورق، القلم والثلج جميعها مادة صلبة	it takes the shape of its bowl. Water, oil, and alcohol are examples of liquids. تأخذ شكل الاناء الذي تحتويه. الماء، الزيت والكحول جميعها امثلة على الحالة السائلة.	For example, a small amount of perfume can be smelt everywhere in a room. Air, oxygen, hydrogen, water vapor and exhaust fumes are examples of gases علي سبيل المثال رائحة عطر صغيرة يمكننا شمها في جميع انحاء الغرفة. الهواء، الاوكسجين، الهيدروجين، بخار الماء ودخان العادم جميعها امثلة على الحالة الغازية.

it fills up the contain يحتويه

ACTIVITY 1

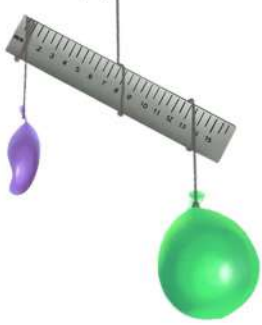
Q. Explain by activity that the gas has a volume?

Tools:

Two balloons and a ruler

steps:

- Take two balloons and a ruler inflate the balloons.
- a Set up a simple lever balance.
- when the lever is in equilibrium burst one of the balloons and see what happens.



conclusion:

- when the balloon bursts the equilibrium position of the ruler is lost.
- the inflated balloon falls while to the burst one rises.
- this shows that the gas inside the balloon has amass.

ACTIVITY 2

Q. Explain by activity the melting of ice has same mass (that solids and liquids have mass)

Tools:

a simple lever balances, a glass and some ice.

steps:

- Place the glass with ice on one side of the lever.
- balance it with masses on the other side.
- Wait until all the ice melts in the glass and see if there is any change in balance.

conclusion:

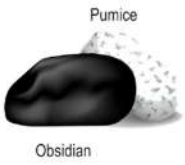
the balance is not disturbed after the ice melts **because** there is no decrease in the amount of matter. This also shows that solids and liquids have mass.

ACTIVITY 3

Q. Explain by activity that the matter has a volume?

Tools:

Glass, Water, stone, and alcohol.



steps:

- take a glass half filled with water and put a stone on it.
- take the stone out and pour in some alcohol.

conclusion:

- the matter (stone) has a volume.
- alcohol has a volume, so when is placed in the glass it increases the level of water.

ACTIVITY 4

Q. Explain by activity the air has a volume?

Tools:

an empty bottle, some oil and a funnel

steps:

- Put the funnel into the mouth of the bottle.
- pour oil into the funnel to fill the bottle.
- the air in the bottle has a **volume**, it does not allow the oil to fill in.
- the funnel must be raised a little, so that there is a gap for air to go out.
- Then the oil entering the bottle forces air out through this gap and fills up the bottle.

ACTIVITY 5

Q. Explain by activity all matter has mass and volume?

Tools:

Bowl, water, empty glass and piece of paper.

steps:

- Get a bowl and fill it with water.
- Take an empty glass and place a crunched-up piece of paper in it.
- Turn the glass upside down and immerse it in the water.
- Then take out the glass, keeping it inverted and observe if the paper is wet or not.
- Since the glass contains air, water cannot enter it, therefore the paper should remain dry.

conclusion:

We can say that all matter has mass and volume.

Mass is the amount of matter in an object

volume is the space occupied by that matter.

PROPERTIES OF MATTER خصائص المادة

Every substance has two kinds of properties. اي مادة لها نوعان من الخصائص

1. Chemical Properties **الخصائص الكيميائية**

2. Physical Properties **الخصائص الفيزيائية**

CHEMICAL PROPERTIES الخصائص الكيميائية

Chemical properties are properties that change the nature of matter.

الخصائص الكيميائية هي الخصائص التي تغير خصائص المادة الطبيعية.

When the chemical properties of a substance are altered تغير, it means a chemical change occurred (new substance formed).

عندما يطرأ تغير كيميائي على المادة فأنها تعني يحدث تغير كيميائي (تتكون مادة جديدة)

For example: Flammability **القابلية على الاشتعال**, acidity **الحامضية**, basicity **القاعدية**, and reactivity **التفاعل** with water etc.

Physical properties الخصائص الفيزيائية

are the properties of a substance that can be observed and measured without altering the substance. Physical properties can be organized as extensive and intensive.

هي خصائص مادة يمكن ملاحظتها وقياسها دون تغيير المادة. يمكن تنظيم الخصائص الفيزيائية على أنها شاملة ومكثفة.

Extensive Properties الخصائص الشاملة

Extensive properties of matter depend on the amount of matter involved

تعتمد الخصائص الشاملة للمادة على مقدار المادة المعنية

Intensive Properties الخصائص المكثفة

Intensive properties matter does not depend on the amount of matter given.

لا تعتمد المادة ذات الخصائص المكثفة على كمية المادة المعطاة

EXTENSIVE PROPERTIES COMMON	INTENSIVE PROPERTIES DISTINCTIVE, OR CHARACTERISTIC	
mass	Color	boiling point نقطة الغليان
weight وزن	odor رائحة	density الكثافة
volume	Solubility قابلية الذوبان	luster بريق
length طول	hardness الصلابة	ductility ليونة
charge شحنة	heat/electrical conductivity التوصيل	Malleability قابلية الطرق
	melting انصهار/freezing point	

MOLECULER PROPERTIES الخصائص الجزيئية

atoms: are tiny particles دقائق that made up the Matter.

الذرة: هي جزئيات صغيرة جدا التي تشكل المادة.

Atoms are building blocks of matter. الذرة وحدة بناء المادة

molecule: are groups of atoms held together. جزيء: هي مجموعات من الذرات متراصة معا

Matter	Distance between Matter المسافات البينية	Motion of Molecules الحركة الجزيئية	Force between molecules القوى الجزيئية
Lead (solid) الحالة الصلبة	Very close صغيرة جداً	Vibrate about a fixed position اهتزازية حول مواضع استقرارها	Very strong قوية جداً
Lemonade (liquid) الحالة السائلة	Close اكبر مما هي على الحالة الصلبة	Move around each other تتحرك حول بعضها	Strong less than solid state اقل مما هي على الحالة الصلبة
Air (gas) الحالة الغازية	Far apart كبيرة جداً	Move quickly in all directions تتحرك بسرعة وحرية في جميع الاتجاهات	Negligible (no forces) ضعيفة يمكن ان اهمالها

PLASMA is the 4th state of matter. and it has neither definite volume nor shape and contains electrically charged particles. are collections of freely moving particles.

Example: Florescent light and high – intensity arc lamps and the exhausted fire.

البلازما: هي الحالة الرابعة للمادة. لا تمتلك حجم ثابت ولا شكل ثابت ويحتوي على جزيئات مشحونة كهربائيًا. هي مجموعات من الجسيمات المتحركة بحرية.

مثال: ضوء الفلورسنت ومصابيح القوس ذات الكثافة العالية ولهب مؤخرة الصاروخ.

Nanotechnology النانو تكنلوجي

Nanotechnology is the area of science trying to understand and control of matter at dimensions of nanoscale which is about 1 to 100 nanometers. The aim of nanotechnology is to control individual atoms and molecules to build computer chips, motors, robot arms, machines, and other devices that are much smaller than a human cell! Nanotechnology has a very wide range of study field from microbiology to space researches. The thickness of a strand of human hair is between 50000 and 100000 nanometres.

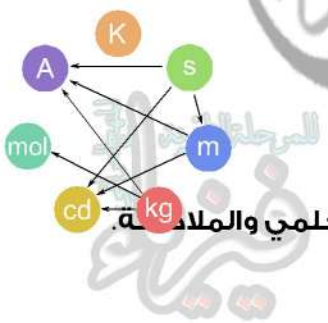
النانوتكنولوجي هو مجال العلم الذي يحاول فهم المادة والتحكم بها في أبعاد المقياس النانوي الذي يتراوح من 1 إلى 100 نانومتر. الهدف من تكنولوجيا النانو هو التحكم في الذرات الفردية والجزيئات لبناء رقاقات الكمبيوتر، والمحركات، وأسلحة الروبوت، والآلات وغيرها من الأجهزة التي تكون أصغر بكثير من خلية بشرية! تمتلك تقنية النانو مجالًا واسعًا جدًا من مجال الدراسة من علم الأحياء الدقيقة إلى الأبحاث الفضائية. سمك خيوط الشعر البشري يتراوح بين 50000 و 100000 نانومتر

MEASUREMENT القياس

A scientific study can only be useful if we use accurate measurements.

Measurement is one of the three methods used in science, the others are experimentation and observation.

An amount or quantity used as a standard of measurement is called a **unit**.



1.4 metre

number unit

يمكن أن تكون الدراسة العلمية مفيدة فقط إذا استخدمنا قياسات دقيقة.

القياس هو أحد الأساليب الثلاثة المستخدمة في العلم، والبعض الآخر هو الاختبار العلمي والملاحظة.

تسمى الكمية أو الكمية المستخدمة كمعيار لقياس وحدة

SI (Kg ,m ,s) Scientists use a standard system of units to measure the various properties of matter. This system of units is called international system of units (SI-System International).

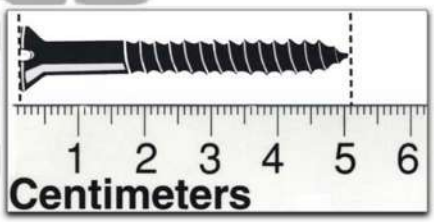
SI (Kg ,m ,s) يستخدم العلماء نظامًا قياسيًا من الوحدات لقياس الخواص المختلفة للمادة. يسمى نظام الوحدات هذا النظام الدولي للوحدات.(SI-System International)

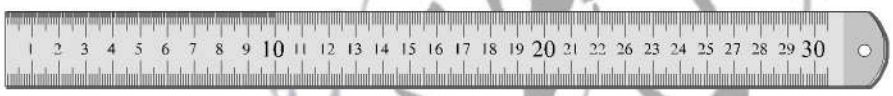
Base Quantity		Base Unit	
Name	Symbol	Name	Symbol
Mass	M	Kilogram	Kg
Length	D	Metre	m
Time	T	Second	s
temperature	T	Kelvin	K
current	I	Ampere	A
Amount of substance	N	Mole	Mol
Luminous intensity	ϕ	Candela	cd

Length: the distance from end to end of an object

Tools: Meter Stick, Metric Ruler

Units: Meter (m), Centimeter (cm)





الطول: المسافة من نقطة إلى اخرى للجسم

Area is the size of the surface enclosed by its boundary lines.

المساحة هي قياس لمنطقة محصورة في نطاق معين على سطح.

Area =Length x Width	In symbols, A = L x W

The area of irregular objects مساحة الاجسام غير المنتظمة

The area of irregular objects can be found with. The object is placed on the paper. The area is calculated by counting the enclosed square centimetres and square millimetres drawn around it on the paper.

مساحة الاجسام غير منتظمة يمكن ايجادها باستخدام الورق البياني بواسطة حساب السنتمتر المربع او الملمتر المربع بواسطة رسم حدود الجسم على الورقة البياني.

Volume: The amount of space occupied by an object.

الحجم: ما تشغله المادة في الفراغ.

Volume= Base area x High	In symbols, V=Axh

Table of conversion of length جدول تحويلات وحدة الطول	
Abbreviation	Length in metres
1 km	1000 miters
1 hm	100 metres
1 dam	10 metres
1 m	1 metre
1 dm	0.1 metres
1 cm	0.01 metres
1 mm	0.001 metres

Table of conversion of Area جدول تحويلات وحدة المساحة	
Abbreviation	Metres
1 km^2	1 000 000 m^2
1 hm^2	10 000 m^2
1 dam^2	1 00 m^2
1 m^2	1 m^2
1 dm^2	0.01 m^2
1 cm^2	0.000 1 m^2
1 mm^2	0.000 001 m^2

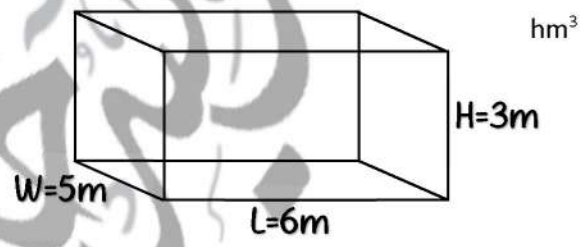
Table of conversion of volume جدول تحويلات وحدة الحجم	
Abbreviation	Volume in cubic metres
1 km^3	1 000 000 000 m^3
1 hm^3	1 000 000 m^3
1 dam^3	1 000 m^3

1 m^3	1 m^3
1 dm^3	0.001 m^3
1 cm^3	0.000 001 m^3
1 mm^3	0.000 000 001 m

Example 2.1

A classroom has dimensions of 5 m, 6 m and 3 m. What is the volume of air in the room? Convert the result into Cm^3 and hm^3.

صف دراسي ابعاده 5m,6m,3m ما حجم الهواء الذي يشغل غرفة الصف الدراسي؟ حول ناتج الحجم الى Cm^3 و hm^3



V = L x W x H

V = 6m x 5m x 3m = $90m^3$ the volume of the air

Now, let us convert the unit,

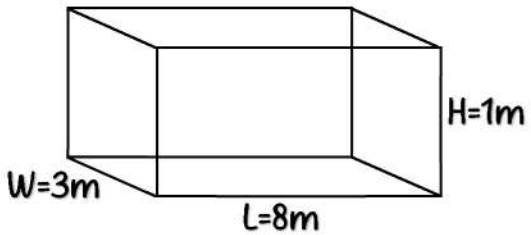
1 m^3= 1 000 000 cm^3, then 90 m^3= 90 X1 000 000 cm^3= 90 000 000 cm^3

1 m^3 = 0. 000 001 hm^3, then 90 m^3= 90 X 0. 000 001 Hm^3= 0. 000 09 cm^3

Exercise 2.1

A pool has dimensions of 3 m width, 8 m length and 1 m depth and is full of water. How many dm^3 of water is there in this pool?

حوض سباحة ابعاده العرض 3m الطول 8m العمق 1m مليء بالماء كم كمية الماء مقدرة dm^3؟



V = L x W x H

V = 8m x 3m x 1m = $24m^3$ the volume of the water

Now, let us convert the unit,

1 m^3= 1000 dm^3, then

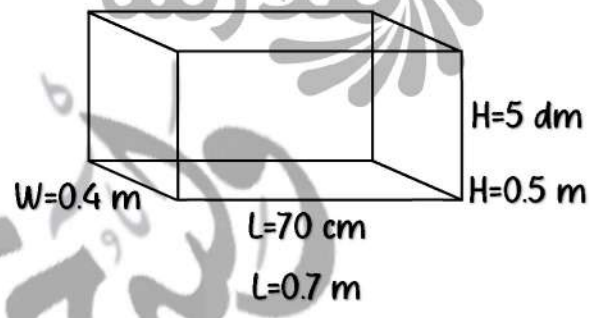
24 m^3= 24 X 1000 dm^3= 24000 dm^3

Example 2.2

An aquarium having dimensions of 5 dm height, 70 cm length and 0.4 m width is half filled with water. Find the volume of water in m^3, dm^3 and cm^3.

حوض سمك ابعاده الارتفاع 5dm والطول 70cm والعرض 0.4m مليء نصفه بالماء احسب حجم الماء بوحدات m^3, dm^3, cm^3

First, we have to convert the lengths and then find the volume of the water in the aquarium.



$V_{aquarium}$ = L X W X H

$V_{aquarium}$ = 0.5 m X 0.7 m x 0.4 m

$V_{aquarium}$ =0.14 m^3, because the aquarium is half filled, then

L=0.7 m

1 m = 10 dm

1 m = 100 cm

$V_{water} = \frac{0.14\ m3}{2} = 0.07 m^3$

V_{water} =? dm3 $1m^3 = 1\,000\ dm^3$, then $V_{water} = 0.07\ m^3 = 0.07 \times 1000\ dm^3 = 70\ dm^3$

V_{water} =? cm3 $1m^3 = 1\,000\ cm^3$, then $V_{water} = 0.07\ m^3 = 0.07 \times 1\,000\,000\ cm^3 = 70\,000\ cm^3$

1. **A storage box has dimensions of 8 dm height, 90 cm length, and 0.5 m width. If it is filled to 3/4 of its capacity, calculate the volume of the contents in m^3, dm^3, and cm^3.**
2. **A rectangular water tank measures 6 dm in height, 1.2 m in length, and 50 cm in width. If it is 2/3 filled with water, find the volume of water in m^3, dm^3, and cm^3.**
3. **A fish tank has dimensions of 7 dm in height, 1 m in length, and 40 cm in width. If the tank is 1/2 filled, calculate the volume of water it contains in m^3, dm^3, and cm^3.**
4. **A planter box has dimensions of 9 dm in height, 1.5 m in length, and 60 cm in width. If it is filled to 1/3 of its height with soil, find the volume of soil in m^3, dm^3, and cm^3.**
5. **A rectangular prism has dimensions of 4 dm height, 80 cm length, and 0.3 m width. If it is completely filled, determine the volume in m^3, dm^3, and cm^3.**

VOLUME OF LIQUIDS حجم السائل

Unite	Abb.	Volume in litres
Kiloliter	kL	1000 L
hectolitre	hL	100 L
decalitre	daL	10 L
litre	L	1 L
decilitre	dL	0.1 L
centilitre	cL	0.01 L
millilitre	mL	0.001 L

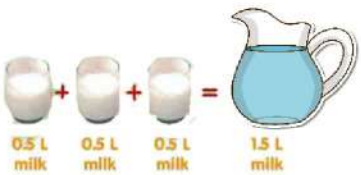
EXAMPLE 2.3

A large glass can hold 0.5 litres of milk and a jug can hold three glasses of milk. Find the volume of milk in the jug in dm^3, dL and mL

زجاجة كبيرة يمكنه تحمل كمية 0.5L من الحليب وابريق يمكنه تحمل كمية ثلاث زجاجات حليب احسب حجم الحليب للأبريق بوحدات L, dm^3 وmL

V_{milk}= 0.5 L + 0.5 L+ 0.5 L= 1.5 L volume of milk in the jug

V_{milk}= 1.5 L =1.5 dm^3



1 L =1 dm^3, so

V_{milk} = 1.5 X 1 dm^3 = 1.5 dm^3,

1 L =10 d^3, so

V_{milk}=1.5 X 10dL= 15 dL

1 L =1000 mL, so

V_{milk}=1.5 X 1000 mL= 1500 mL

Exercise 2.2

A water tank can hold 5 m^3 of water, convert this value into dm^3, dL and mL

برميل ماء يمكنه تحمل كمية ماء $5m^3$ حول حجم هذه الكمية من الماء الى dm^3, dL and mL

V_{water}= 5 m^3 = 5000L

1 L =1 dm^3, so

V_{milk} = 5000 X 1 dm^3 = 5000 dm^3,

1 L =10 dL, so V_{milk}=5000 X 10dL= 50 000 dL

1 L =1000 mL, so

V_{milk}= 5000 X 1000 mL= 5000 000 mL

1. **A gas cylinder contains 0.75 m^3 of air. Convert this volume into dm^3, L, and mL**
2. **A swimming pool holds 25 m^3 of water. Convert this volume to cm^3, L, and mL**
3. **A storage container has a volume of 12.5 m^3. Convert this value into dm^3, L, and cL**
4. **A fish tank has a capacity of 0.2 m^3. Convert this volume into dm^3, dL, and mL**

   V_{water}= 0.2 m^3 = 200L

   1 L =1 dm^3, so V_{milk} = 200 X 1 dm^3 = 200 dm^3,

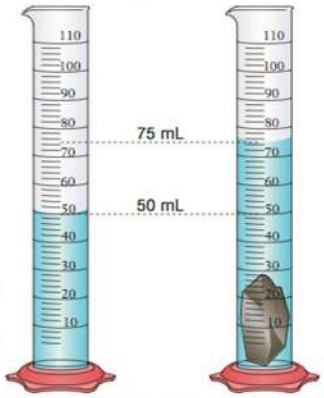
   1 L =10 dL, so V_{milk}=200 X 10dL= 2000 dL

   1 L =1000 mL, so V_{milk}= 200 X 1000 mL= 200 000 mL
5. **A large water reservoir holds 500 m^3 of water. Convert this value into dm^3, L, and kL**

Measuring the Volume of Liquids قياس حجم السائل

The volume of a small amount of liquid is found by pouring it into a measuring (graduated) cylinder

يمكن قياس حجم السائل بواسطة سكبه في الاسطوانة المدرجة



Example 2.4

A graduated cylinder is filled by colored water and level shows 80 cm^3. If a stone is immersed to water, level rises to 110 cm^3. Find volume of stone.

اسطوانة مدرجة ملأت بماء ملون وسجلة القراءة الاولى $80cm^3$ إذا غطس حجر في الماء ارتفع الماء في الاسطوانة المدرجة لتصبح القراءة الثانية $110cm^3$ احسب حجم الحجر

$V_{stone}=V_2-V_1$ $V_{stone}=110-80=30\ cm^3$

GAS LAWS قانون الغاز

T

a. **BOYLE S LAW**, states that "By keeping **TEMPERATURE** constant. The product of volume and pressure of a fixed amount of gas is constant."

قانون بويل : بالحفاظ على درجة الحرارة ثابتة . فأن نتيجة الحجم والضغط لكمية المادة مقدار ثابت ".

P

volume x pressure = constant

b. **CHARLES LAW**, states that, "At constant **PRESSURE**, the volume of a certain amount of gas is directly proportional to the absolute temperature".

قانون شارل: عند ثبوت الضغط فأن الحجم لكمية محددة من الغاز يتناسب طرديا مع درجة الحرارة المطلقة.

c. **GAY LUSSAC S LAW**, states that, "At constant **VOLUME**, the pressure of a certain amount of gas is proportional to the absolute temperature".

V

قانون غاي لوساك: عند ثبوت الحجم يكون ضغط كمية معينة من الغاز يتناسب مع درجة الحرارة المطلقة

QUESTIONS of CHAPTER 2

Q.1 Choose the correct answer from the following

1. Which one of the following is a property of **liquids**?

a) they have a definite shape but do not have definite volume

b) they have definite volume but do not have definite

d) all of above

2. Number of positive charges in the matter that is in the plasma state

a) more than negative charges

b) less than negative charges

c) equals negative charges

d)all of above

3. The exhausting fire of the missile is in_____ state of matter

a) solid b) liquid c) gaseous **d) plasma**

4. iron rusts in a moist and hot places. Because of its

a) physical property **b) chemical property** c) iron does not rust d) both physical and chemical property

5. Which one of the following is not the chemical property

a) flammability b) acidity c) reactivity **d) solubility**

6. What can be said for molecules in solids

a) closer to each other and move freely b) far away from each other and move freely

c) closer to each other and fixed d) far away from each other and fixed.

7. Liter is unit of_____

d) they have definite shape and definite volume

a) length b) area b) volume d)all of them

8. Aluminum molecules are

a) closer to each other and move freely

b) far away from each other and move fi-eely

c) closer to each other and fixed

d) far away from each other and fixed

9. 1 liter = _____dm^3

a)0.1 b) 1 c) 10 d) 100

10. This fact, known as Boyle's Law, states that; the product of volume and pressure of a fixed amount of gas is constant by_____.

a) increasing temperature

b) decreasing temperature

c) keeping temperature constant

d) all of above

Q.2 Fill in the blanks

a) When two substances are mixed without changing their natures, this change is called physical property.

b) When two substances are mixed, new substance formed. This change is called chemical property.

c) Volume is space occupied by object.

d) States of matter depends on shape and volume.

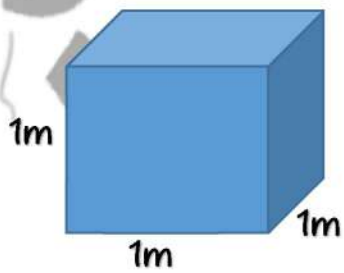
Q.3 the sentences below are True or false

a) The oil has definite shape and volume. F

b) Iron has a definite shape and volume. T

c) Air is a liquid. F

Q.4 A cube container has length of 1m is filled by water. Calculate the volume of water in the container in liter.



Solution

$V = a^3$

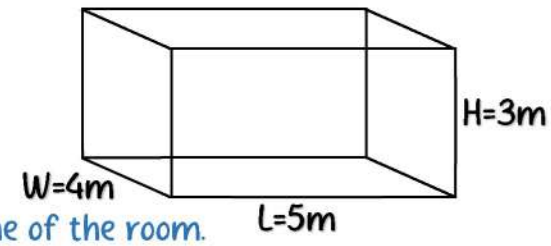
$V=1x1x1 =1\ m^3$ the volume of water

Now, let us convert the unit, $1\ m^3 = 1000\ L$

Q.5 A graduated cylinder is filled by colored water and level shows 60 cm^3. If a piece of iron is immersed to water, level rises to 100 cm^3 Find volume of iron.

$V_{piece\ of\ iron} = V_2 - V_1$

$V_{piece\ of\ iron} = 100\ cm^3 - 60\ cm^3 = 40\ cm^3$



Q.6 A room has dimensions of 5m, 4m, 3m. Calculate volume of the room.

$V = L \times W \times H$

$V = 5m \times 4m \times 3m = 60m^3$ the volume of the room

Q.7 Draw the table below on your notebook. Then compare piece of lead, lemonade and air according to given conditions.

*Force between molecules

*Distance between molecules

*Motion of molecule

Matter	Distance between Matter	Motion of molecules	Force between molecules
Lead (solid)رصاص	Very close	Vibrate about a fixed position	Very strong
Lemonade (liquid)	Close	Move around each other	Strong less than solid state
Air (gas)	Far apart	love quickly in all directions	Negligible (No forces)

أسئلة اضافية

Fills in The Blanks with Appropriate Word(s):

1. Light is not an example of matter because _____.

2. Matter exists in three states. These are_____.

3. _____is an example for states of solid matter.

Fill in the correct missing words: Matter in a.....has .....volume and ..... shape.

a.) solid state_____no definite_____no definite

b.) gaseous state_____definite_____no definite

c.) liquid state_____a definite _____no definite

Which Statement is True (T) or False (F):

6. (.....)There is very little Space between the molecules of a liquid. There is a lot of space between the molecules of a gas.

7. (.....) Gas and vapor means the same.

8. (.....) The states of matter are the following: solids, liquids, gases, plastics.

Choose the right statement below:

9. States are also known as?

A) phases

B) phrases

C) frases

10. Which phase of matter takes the shape of the container it is in?

A) solid

B) gas

11. Which phase of matter does not take the shape of the container it is in?

A) solid B) liquid

12. How many states of matter exist?

A) 1 B)2 C)3 D)4

13. What state of matter are the particles the far the apart?

A) Solid B) Liquid C) Gas

14. What state of matter is rain?

A) Solid B) Liquid C) Gas

15. What state of matter are the particles moving in one direction?

A) Solid B) Liquid C) Gas

Answer the following questions.

16. How many states of matter do you learn? Write their names and their properties.

17. Air around us exists in which state of matter?

18. This state of matter does not have definite shape or size; it takes the shape of the container. that is that?

19. In which state are the distances between the particles greatest?

20. Write the condition of particles for each state of matter

Mass is the amount of matter in an object

volume is the space occupied by that matter.

Here are the fill-in-the-blanks questions and their answers:

1. Fill in the Blanks with Appropriate Word(s):

- Light is not an example of matter because it has no mass.
- Matter exists in three states. These are solid, liquid, and gas.
- Ice is an example of a solid state of matter.

2. Fill in the Correct Missing Words: Matter in a _____ has _____ volume and _____ shape.

- a) Solid state: definite volume, definite shape
- b) Gaseous state: no definite volume, no definite shape
- c) Liquid state: definite volume, no definite shape

3. True (T) or False (F):

- (T) There is very little space between the molecules of a liquid. There is a lot of space between the molecules of a gas.
- (F) Gas and vapor mean the same.
- (F) The states of matter are the following: solids, liquids, gases, plastics.

4. Choose the Right Statement Below:

- States are also known as?
  - A) phases
- Which phase of matter takes the shape of the container it is in?
  - B) gas
- Which phase of matter does not take the shape of the container it is in?
  - A) solid
- How many states of matter exist?
  - C) 3
- In what state of matter are the particles the farthest apart?
  - C) gas
- What state of matter is rain?

- B) liquid

- In which state are particles moving in one direction?

- B) liquid

5. Answer the Following Questions:

- How many states of matter do you learn? Write their names and their properties.

- Three states of matter are learned: solid (definite shape and volume), liquid (definite volume but no definite shape), and gas (no definite shape or volume).

- Air around us exists in which state of matter?

- Air exists in the gaseous state of matter.

- This state of matter does not have definite shape or size; it takes the shape of the container. What is that?

- Liquid

- In which state are the distances between particles the greatest?

- Gas

- Write the condition of particles for each state of matter.

- Solid: Particles are tightly packed with very little movement.

- Liquid: Particles are close but can move around each other.

- Gas: Particles are far apart and move freely in all directions.

CHAPTER 3

الفصل الثالث

MASS AND DENSITY

الاستاذ وليد خالد الفتلاوي

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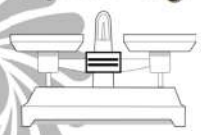
CHAPTER 3 MASS AND DENSITY

Mass is the amount of matter in an object.

الكتلة : ما يحتويه الجسم من مادة.

The SI unit of mass is the kilogram (kg) تقاس بوحدة Kg حسب النظام الدولي للوحدات



Mass is measured with a balance يستخدم الميزان لقياس كتل الاجسام

Abbreviation الاختصار	mass in g الكتلة بوحدة الغرام
1 kg	1000 g
1 hg	100 g
1 dag	10 g
1 g	1 g
1 dg	0.1 g
1 cg	0.01 g
1 mg	0.001 g

Example 3.1

A 10 cm^3 block has a mass of 89 grams. If you take 100 cm^3 of copper, find it's mass in mg, dg and kg.

$10cm^3$ بلوك كتلتها 89g اذا اخذنا $100cm^3$ من النحاس احسب كتلتها بوحدة mg, dg, kg

First, we should find the mass of copper in 100 cm^3.

As 10 cm^3 of copper makes up 89 g, then 100 cm^3 copper makes up 89 X 10 = 980g.

m_1=89g

v_1=10 cm^3

m_2=?

v_2=100 cm^3

$$\frac{m_1}{v_1} = \frac{m_2}{v_2}$$

$$\frac{89}{10} = \frac{m_2}{100}$$

$$m_2 = 890g$$

1 g = 1000 mg, then 890 g = 890 X 1000 mg. m= 890 000mg.

1 g = 10 dg, then 890 g = 890 X 10 dg. m= 8900 dg.

1 g = 0.001 Kg, then 890 g = 890 X 0.001 Kg. m= 0.89 Kg.

Exercise 3.1

How many milligrams are there in?

a. 1 kg b. 30 g c. 45 hg d. 5 dg

Ans: a. 1 000 000 b. 30 000 c. 4 500 000 d. 500

a. 1 kg = 1000 g ➔ 1 g = 1000 mg then 1 kg = 1000 000 mg

b. 1 g = 1000 mg ➔ 30 g = 30 x 1000 = 30 000 mg

c. 1 hg = 100 g ➔ 1g = 1000 mg ➔ 1 hg = 100 g x 1000 mg = 100 000 mg then 45

hg = 45x100 000 mg

d. 1 dg = 0.1 g ➔ 1 g = 1000 mg ➔ 1 dg = 0.1 x 1000 = 100 mg then 5 dg= 5 x 100 mg = 500 mg

Density is defined as the mass in unit of volume.

الكثافة : وحدة كتلة الحجم من المادة.

$$density = \frac{mass}{volume} \quad \text{in symbols,} \quad d = \frac{m}{V}$$

the unit of density is Kg/m^3

But this is inconvenient for most substances, therefore, g/cm^3 (gram per cubic centimeter) is a more common unit of density.

ولكن هذا غير ملائم لمعظم المواد ، لذلك ، g/cm^3 (جرام لكل سنتيمتر مكعب) هو وحدة كثافة أكثر شيوعاً

How can we calculate the density of an object? كيف يمكن حساب كثافة الاجسام

In order to calculate the density of an object, **لأجل حساب كثافة جسم ما**

if it has A **REGULAR SHAPE** **اذا كان الجسم منتظم الشكل**

- we measure its **MASS** with an **EQUAL ARM BALANCE**. **نحن نقيس كتلة الجسم باستخدام ميزان ذو الكفتين**
- then we find its **VOLUME** by measuring it with a **RULER**. **وايجاد حجم الجسم باستخدام المسطرة**

Otherwise, method for **IRREGULAR OBJECTS** we use the **GRADUATED CYLINDER** to find **VOLUME**

Then, by dividing mass by volume, we find the density of the object.

طريقة أخرى الجسم غير منتظم الشكل نستخدم الأسطوانة المدرجة لإيجاد الحجم. ثم، من خلال قسمة الكتلة على الحجم ، نجد كثافة الجسم.

RELATIVE DENSITY: is the ratio of the density of the substance to the density of water at 4° Celsius, we take the relative density of water as one.

الكثافة النسبية: هي نسبة بين كثافة المادة الى كثافة الماء عند درجة حرارة 4°C باعتبار الكثافة النسبية للماء 1.

$$\rho_r = \frac{\rho}{\rho'}$$

The objects whose relative density is **less than one** will **float** تطفو in water and those **greater than one** will **sink** تغرق in water.

الاجسام التي كثافتها النسبية اقل من واحد تطفو في الماء

والاجسام التي كثافتها النسبية اكبر من واحد تغطس في الماء.

$$\text{relative density} < 1 \rightarrow \text{float in water}$$

$$\text{relative density} > 1 \rightarrow \text{sink in water}$$

Example 3.2

A piece of iron has a mass of 395 g. Find the volume of the piece of iron density of iron, d= 7.9 g/cm^3.

Mass of iron, m = 395 g; density of iron, d= 7.9 g/cm^3 ; using the data in the formula,

$$v_{iron} = \frac{m_{iron}}{d_{iron}}$$

$$v_{iron} = \frac{395\ g}{7.9\ g/cm^3} = 50 cm^3$$

Result: The volume of the place of iron is 50 cm^3

Exercise 3.2

What is the volume of 24 tons of cement? (d_{cement}= 3000 kg/m^3) ans:8m^3

Sol.

mass of cement, v = 24 tone = 24000 Kg; density of cement,

d= 3000 Kg/m^3; using the data in the formula,

$$v_{cement} = \frac{m_{cement}}{d_{cement}}$$

$$v_{cement} = \frac{24000}{3000}$$

$v_{cement} = 8\ m^3$ Result: The volume of the place of iron is 8 m^3

Example 3.3

A 0.5 m^3 tank is filled with a liquid of mass 460 kg. What is the density of the liquid?

Calculation

m_{oil} = 460 kg and V =0.5 m^3, then

$$d_{liquid} = \frac{m_{liquid}}{V_{liquid}} = \frac{460}{0.5m^3} = 920\frac{kg}{m^3}$$

Result: The density of the liquid is 920 kg/m^3

Exercise 3.3

Calculate the mass of copper having the same volume as 31.5 g of silver. Use Table 3.2.

Ans :26.7 g

	Sliver	copper
D	10.5g/cm^3	8.9g/cm^3
M	31.5g	?
V	Same volume	Same volume

$$v_{sliver} = \frac{m_{sliver}}{d_{sliver}} = \frac{31.5}{10.5} = 3cm^3$$

$$v_{sliver} = v_{copper}$$

$$m_{copper} = d_{copper} \times v_{copper}$$

$$m_{copper} = 8.9 \times 3 = 26.7g$$

Example 3.4

An oil can contains 20 L of oil. If the density of oil is 0.9 g/cm^3 calculate how many kg of oil, there is in the can

1 L = 1000 cm^3, then V_{oil} = 20 L= 20 x 1000 cm^3 = 20 000 cm^3,

$$m_{oil} = d_{oil} \times v_{oil}$$

$$m_{oil} = 0.9 \frac{\text{g}}{\text{cm}^3} \text{x } 20\,000 \text{ cm}^3 = 18\,000\ g$$

1 g = 0.001 kg , then m_{oil} = 18 000 x 0.001 kg m_{oil} = 18 kg

Exercise 3.4

A bottle has a mass of 70 g when it is empty, 90 g when it is full of water and 96 g when it is full of a liquid. What is the density of the liquid in g/cm^3 and kg/m^3? (d_{water}= 1 g/cm^3)

Ans: 1.3 g/cm^3 and 1 300 kg/m^3

sol.

$$m_{bottle\ empty} = 70g$$

$$m_{bottle+water} = 90g$$

$$m_{bottle+liquid} = 96g$$

$$m_{water} = m_{bottle+water} - m_{bottle\ empty}$$

$$m_{water} = 90 - 70 = 20g$$

$$v_{water} = \frac{m_{water}}{d_{water}} = \frac{20}{1} = 20cm^3$$

$$m_{water} = m_{bottle+liquid} - m_{bottle\ empty}$$

$$m_{liquid} = 96 - 70 = 26g$$

$$v_{bottle} = v_{water} = v_{liquid}$$

$$d_{liquid} = \frac{m_{liliquid}}{v_{liquid}} = \frac{26}{20} = 1.3g/cm^3$$

$$d_{liquid} = 1.3\frac{g}{cm^3} = 1.3 \times 1000\frac{kg}{m^3} = 1300kg/m^3$$

Puzzle

1. The amount of surface enclosed by its boundary lines.

2. A state of matter which has neither a definite shape nor a volume.

3. The mass of an object divided by its volume.

4. A unit of measurement for distance from the SI system.

5. A substance which has a density of 1 g/cm^3.

6. A group of atoms.

7. tiny particles.

8. A state of matter which has a definite shape and volume.

9. A unit of time.

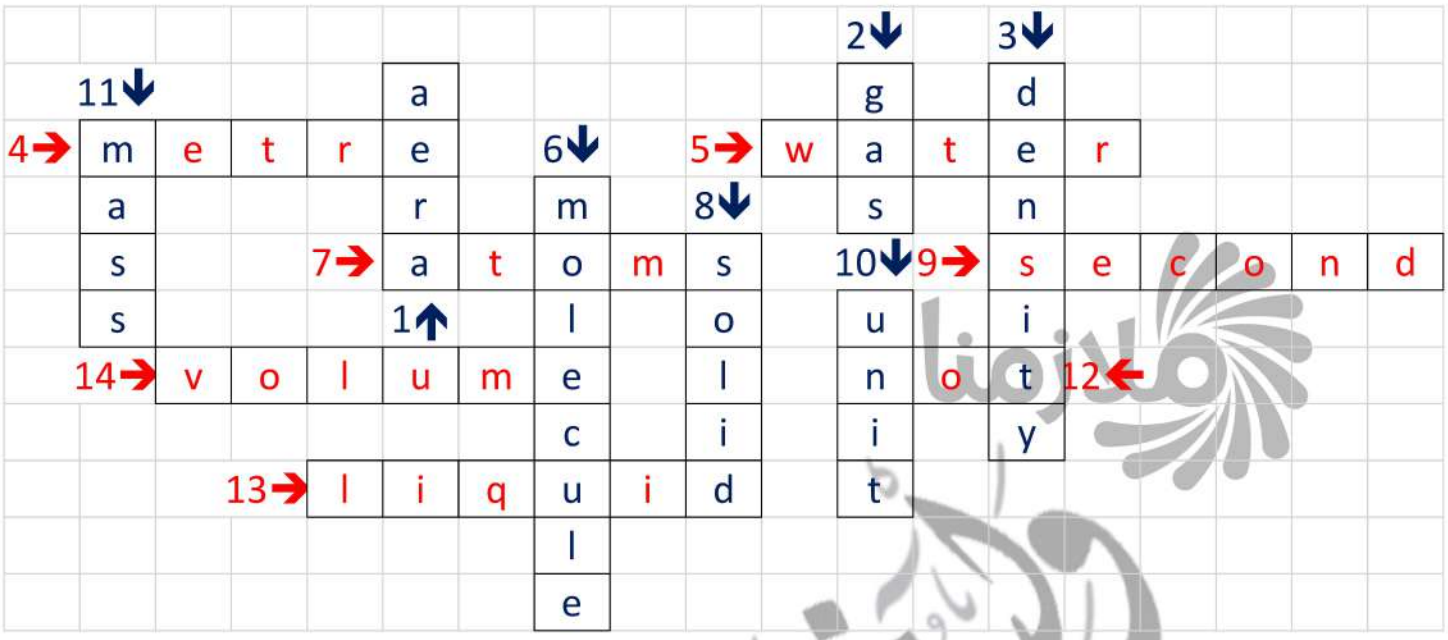
10. An amount or quantity used as a standard of measurement.

11 The amount of matter in an object.

12. A unit of mass equal to 1000 kg.

13. A state of matter which has a definite volume but no definite shape.

14.The amount of space occupied by an object.



QUESTIONS of CHAPTER 3

Q.1. Choose the correct answer from the followings.

1. Which one of the followings is not unit of mass?

a) g b) kg **c) m^3** d) mg

2. An ice cube has mass of 3640 kg and its density is 910kg/m^3 Find volume of the ice cube.

a) 6m^3 **c) 4 m^3** b) 5 m^3 c) 3 m^3

3. A thermo stone has dimensions of 0.5 mx 0.2 mx 0.4m and its density is 800kg/m^3. Calculate mass of the stone.

a) 30kg **b) 32kg** c) 34kg d) 35kg

4. Relative density of fuel is 0.68 . Find mass of 1 liter fuel.

a) 380kg b) 480kg c) 580kg **d) 680kg**

5. What is density of water?

a)1000kg/m^3 b)10000kg/m^3 c)400kg/m^3 d)4000kg/m^3

6. Relative density of rock is 4. Calculate density of the rock.

a) 4kg/m^3 b) 40kg/m^3 c) 400kg/m^3 d) 4000kg/m^3

7. When a piece of sponge is pressed, which one of the following quantities does not change.

a) volume b) mass c) density d) shape

Q.2. Fill in the blanks.

a) Digital scale is used to measure_____mass_____.

b) g/cm^3 is unit of density, g is unit of___mass___ and cm^3 is unit of ___volume____.

c) Substances which are float in water has relative densities are___less___ than density of water.

d) Relative density of solid objects is ratio of their densities and density of_water_.

Q.3. fill in the blanks

object	Density (kg/m^3)	Mass (kg)	Volume (m^3)
A	2000	4000	2
B	8000	32000	4
C	2000	1000	0.5
D	500	2000	4

According to table:

Which substance has the greatest mass? Object B

Which substance has the smallest mass? Object C

Which substance float in water? Object D

Which substances are made by same material? Object A and C

Q.4. The sentences below are True or False. If False correct the sentence.

a) Density is defined as amount mass in unit time. F, Density is defined as amount mass in unit of volume.

b) In SI unit system unit of mass is gram. T

c) In SI unit system unit of relative density is kg/m^3.

F , In SI unit system unit of relative density has no unit.

d) Mass of an object determines its weight and does not depend on its amount.

F, Mass of an object determines it depend on its amount and does not weight.

Q.5. if you have a bottle of milk and you want to find its density. How can you find density of the milk by using graduated cylinder and digital scale?

- we measure its mass of milk with an equal-arm balance.

$$m_{milk} = m_{bottle+milk} - m_{bottle\ empty}$$

- then we find its volume of milk by measuring it with the graduated cylinder

Then, by dividing mass by volume, we find the density of the object

Q.6. If two substances have equal volume, it can be said that they have equal mass. Why?

No, not necessarily have equal mass because the mass is the amount of matter in an object, the iron and wood same volume but not has same mass.

Q.7. A steel plate has mass of 156 kg and density of $7800kg/m^3$. If width of plate is 0.8mm and height is 50 mm, find its length.

Sol.

a) $v = \frac{m}{d}$

$$v = \frac{156\ Kg}{7800\ Kg/m^3} = 0.02\ m^3$$

1mm = 0.001 m then 0.8mm =0.8x0.001m = 0.0008m
1mm = 0.001 m then 50 mm = 50 x 0.001m = 0.05 m

Another solutions

$v = a \times b \times c$

$0.02\ m^3 = 0.0008\ m \times 0.05m \times c$

$$c = \frac{0.02}{0.0008 \times 0.05} = 500m$$

$1m^3 = 1\,000\,000\,000\ mm^3$ then $0.02m^3 = 0.02 \times 1000\,000\,000 = 20\,000\,000\ mm^3$

$$v = a \times b \times c$$

$$20\,000\,000\ mm^3 = 0.8\ mm \times 50mm \times c$$

$$c = \frac{20\,000\,000}{0.8 \times 50} = 500\,000mm$$

Q.8. Density of mammals approximately equals density of water. According to given information find volume of followings. ($1m^3$ = 1000 liter)

a) 150kg cow b) 1400kg whale

sol.

b)

$$v = \frac{m}{d}$$

$$v = \frac{150\ Kg}{1000\ Kg/m^3} = 0.15\ m^3 = 150L$$

c) $v = \frac{m}{d}$

$$v = \frac{1400\ Kg}{1000\ Kg/m^3} = 1.4\ m^3 = 1400L$$

Q.9. A water tank has 1m height, 2m width and 3m length is filled by water. Calculate mass of water in the tank.

Sol.

$$v = a \times b \times c$$

$$v = 1m \times 2m \times 3m = 6m^3\ volume\ of\ water\ in\ the\ tank$$

$$m = d \times v$$

$$m = 1000\frac{kg}{m^3} \times 6m^3 = 6000\ kg = 6\ tons\ mass\ of\ water\ in\ the\ tank$$

Q.10. A room has dimensions of 5mx4mx3m is filled by air which density is 3kg/m^3. Find mass of the air.

$$v = 5m \times 4m \times 3m = 60m^3\ volume\ of\ air\ in\ the\ room$$

$$m = d \times v$$

$$m = 3\frac{kg}{m^3} \times 60m^3 = 180\ kg \quad mass\ of\ water\ in\ the\ tank$$

Q.11. An object has 180kg mass and 0.3 m^3 volume. Calculate:

a) density of object

b) relative density of object.

a)

$$density = \frac{mass}{volume} \text{ in symbols , d} = \frac{m}{V}$$

$$\text{d} = \frac{180\ kg}{0.3\ m^3} = 600kg/m^3 \text{ density of object}$$

b)

$$\rho_r = \frac{\rho}{\rho'}$$

$$\rho_r = \frac{600kg/m^3}{1000kg/m^3} = 0.6 \quad \text{relative density of object}$$

Q.12 400g wooden cube has length of 20 cm. What is the density of cube?

Sol.

$$v = a^3$$

$$v = 20cm \times 20\ cm \times 20\ cm = 8000\ cm^3$$

$$\mathrm{d} = \frac{m}{V}$$

$$\mathrm{d} = \frac{400\ g}{8000\ cm^3} = 0.05\ g/cm^3 \text{ density of object}$$

Q.13 Match the following object with given estimated masses.

Q.14 density of mercury is 13.6 g/cm^3. Calculate mass of mercury, if its volume is:

a) 1cm^3

b) 10cm^3

a) $m = d \times v$

$$m = 13.6\frac{g}{cm^3} \times 1\ cm^3 = 13.6\ g \quad mass\ of \text{ mercury}$$

b) $m = d \times v$

$$m = 13.6\frac{g}{cm^3} \times 10\ cm^3 = 136\ g \quad mass\ of \text{ mercury}$$

CHAPTER 4 الفصل الرابع

FORCE

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CHAPTER 4 FORCE

الفصل الرابع (4) القوة

Force is either a push or a pull that acts on an object.

القوة : هي كل سحب او دفع تؤثر في الجسم.

» Force is represented by the symbol F

» measured in units called Newtons (N)

» Has a magnitude (size) and direction تمتلك قيمة واتجاه.

» The pull on a 100 g mass is mass is about 1 N on earth

measure a force is by using it to stretch a spring (A spring with a scale attached to it is called a spring balance or dynamometer (or Newtonmeter))

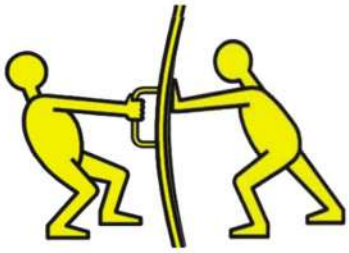
قياس قوة باستخدامها النابض الحلزوني (يسمى نابض مع مقياس معلق به نابض أو دينامومتر (أو نيوتنميتر))

For examples: Lifting a hammer, stretching a spring, opening a door, lifting weights, pushing a diskette into a driver and kicking a football.

على سبيل المثال: الطرق بالمطرقة، سحب نابض ، وفتح الباب ، ورفع الأثقال ، ودفع قرص مرن إلى سائق وركل كرة القدم.

A force cannot be seen and described like an object, but the effects of it on different objects can be seen. We cannot see the wind but we can see a windmill turning, a yacht sailing, a tree bending or a kite flying. Thus, we can define it as follows:

لا يمكن رؤية القوة ووصفها للجسم ، ولكن يمكن رؤية آثارها على اجسام مختلفة. لا يمكننا رؤية الريح ولكن يمكننا رؤية دوران طواحين الهواء أو الإبحار باليخت أو انحناء الشجرة أو تحليق طائرة ورقية. وبالتالي ، يمكننا تعريفه على النحو التالي:



Force is an effect which can, تأثير القوة يمكن ان يكون

a) Start motion, بداية الحركة

b) Stop motion, توقف الحركة

c) Change the speed or direction of motion, تغيير السرعة والاتجاه في الحركة

d) Change the shape or size of a body. تغيير شكل او حجم الجسم

Action and Reaction

Forces always occur in pairs acting in opposite directions. For every action force, there is always an equal but opposite reaction force.

If a man pulls a rope tied to a wall, the rope also pulls the man with an equal but opposite force? this is because the rope reacts to the man's action.

الفعل ورد الفعل القوة تؤثر دائماً في اتجاهين متعاكسين. لكل قوة فعل، هناك دائما قوة رد فعل متساوية بالمقدار ولكن معاكسة بالاتجاه.

إذا سحب رجل حبلًا مربوطًا بجدار ، فسحب الحبل أيضًا الرجل بقوة متساوية ولكن معاكسة؟ هذا لأن الحبل يؤثر مع رد فعل الرجل.

TYPES of FORCES انواع القوة

In fact, all known forces (or interactions) in the universe can be grouped into four basic types. Below list these forces in the order of decreasing strength.

في الواقع ، يمكن تجميع جميع القوى المعروفة (أو التفاعلات) في الكون في أربعة أنواع أساسية. أدناه قائمة هذه القوة في ترتيب تناقص القوة.

(1) The Strong Force (2) The Electromagnetic Farce (3)The Weak Force (4)The Gravitational Force

(1) القوة النووية القوية (2) القوة الكهرومغناطيسية (3) القوة النووية الضعيفة (4) قوة الجاذبية

The Strong Force القوة النووية القوية

This force is responsible for binding of nucleus. It is the dominant one in reactions and decays of most of the fundamental particles. This force is so strong that it binds and stabilize the protons of similar charges within nucleus. However, it is very strong range. No such force will be felt beyond the order of 1Fm(Femtometer)

هذه القوة مسؤولة عن ربط نواة الذرة. هو واحد المهيمن في ردود الفعل والتحلل لمعظم الجسيمات الأساسية. هذه القوة قوية لدرجة أنها تربط وتثبت بروتونات الشحنات المماثلة داخل النواة. ومع ذلك، فهي مجموعة قوية جدا. لن يشعر أي قوة من هذا القبيل خارج حدود 1Fm مقياس (Femtometer)

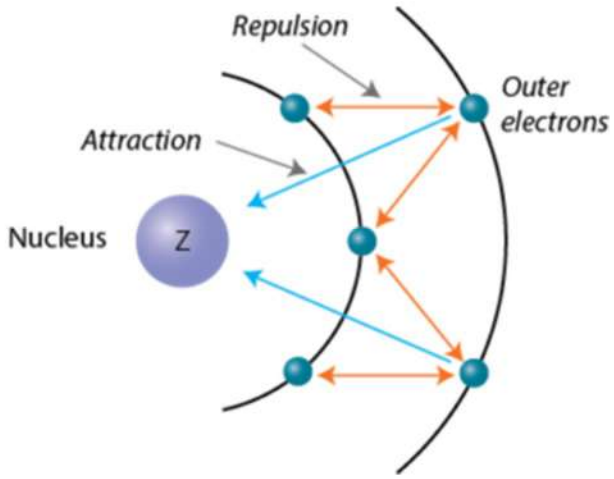
Quark : is an elementary particle and a fundamental constituent of matter.

الكوارك: هو جسيم أولي ومكون أساسي من المادة.

Atomic nucleus: the very dense central region of an atom.

النواة الذرية: المنطقة المركزية الكثيفة للذرة.

The Electromagnetic Force القوة الكهرومغناطيسية



This is the force that exist between all particles which have an electric charge. For example; electrons bind with nuclei of atom, due to the presence of protons. This force is long range, in principle extending over infinite distance. However, the strength can quickly diminish due to **shielding effect**. Many everyday experiences such as friction and air resistance due to this force. This is also the resistant force that we feel, for example, when pressing our palm against wall. This is originated from the fact that no two atoms can atoms can occupy the same space. However, its strength is about 100 times weaker within the range of 1Fm, where the strong force

dominates. But because there is no shielding with in nucleus, the force can be commutative and can compete with strong force, this competition determines the stability structure of nuclei.

هذه هي القوة الموجودة بين جميع الجسيمات التي لها شحنة كهربائية. فمثلا؛ ترتبط الإلكترونات بنواة الذرة، بسبب وجود البروتونات. هذه القوة طويلة المدى، تمتد من حيث المبدأ على مسافة غير محدودة. ومع ذلك، يمكن أن تتقلص قوة بسرعة بسبب تأثير الحجب. العديد من التجارب اليومية مثل الاحتكاك ومقاومة الهواء بسبب هذه القوة. هذه أيضاً هي القوة المقاومة التي نشعر بها، على سبيل المثال، عند الضغط على كفنا على الجدار. نشأ هذا من حقيقة أنه لا يمكن لذرتين ان تشغل نفس المكان. ومع ذلك، فإن قوتها أضعف بنحو 100 مرة في نطاق Fm1 ، حيث تهيمن القوة القوية. ولكن بسبب عدم وجود تأثير الحجب في النواة، يمكن للقوة أن تكون تبادلية ويمكنها التنافس بقوة قوية، تحدد هذه المنافسة بنية استقرار النوى.

The Weak Force القوة النووية القوية

This force is responsible for nuclear beta decay and other similar decay processes involving fundamental particles. The range of this force is smaller than 1Fm and it is very smaller than strong force. Nevertheless, it is important in understanding the behavior of fundamental particles.

هذه القوة مسؤولة عن تحلل بيتا النووي وغيرها من عمليات الاضمحلال المشابهة التي تتضمن الجسيمات الأساسية. نطاق هذه القوة أصغر من Fm1 وهو أصغر من القوة القوية. ومع ذلك ، من المهم في فهم سلوك الجسيمات الأساسية.

The Gravitational Force القوة الجاذبية

An object released from a height falls to the ground. This downward force is called the gravitational force. It is not a force that exists only between the earth and objects. It exists between all objects. In other words, gravitational force is the force of attraction between any two objects.

يسقط الجسم (سقوط حر) من ارتفاع على الأرض. هذه القوة الى الاسفل تسمى قوة الجاذبية. إنها ليست قوة موجودة فقط بين الأرض والاجسام. توجد بين كل الاجسام. بعبارة أخرى ، قوة الجاذبية هي قوة الجذب بين أي جسمين.

Gravitational force depends on: تعتمد القوة الجاذبية على

$$F = G\frac{m_1 m_2}{r^2}$$

a) The masses of the objects. كتلة الجسم

b) The distance between them. المسافة بين مركز ثقلي الجسمين

Familiar forces which are the electromagnetic and gravitational forces

القوى المألوفة وهي القوى الكهرومغناطيسية والجاذبية

Unfamiliar forces which are the strong force and the weak force

القوى غير المألوفة التي هي القوة القوية والقوة الضعيفة

Here is a **Question and Answer (Q&A)** format in English based on your topic about the **Types of Forces**:

Q1: What are the four basic types of forces in nature?

A1: The four basic types of forces, listed in order of decreasing strength, are:

1. The Strong Force
2. The Electromagnetic Force
3. The Weak Force
4. The Gravitational Force

Q2: What is the strong force responsible for?

A2: The strong force is responsible for binding protons and neutrons together inside the atomic nucleus. It is the strongest force in nature but acts only over very short distances (less than 1 femtometer).

Q3: What is a quark?

A3: A quark is an elementary particle and a fundamental building block of matter. Protons and neutrons are made up of quarks.

Q4: What is the electromagnetic force?

A4: The electromagnetic force acts between particles with electric charge. It is responsible for everyday phenomena such as friction, air resistance, and the repulsion or attraction between charged particles.

Q5: How does the electromagnetic force compare with the strong force at short distances?

A5: At very short distances (about 1 femtometer), the electromagnetic force is around 100 times weaker than the strong force.

Q6: Why can't two atoms occupy the same space?

A6: Because of the electromagnetic force, atoms resist being pushed into each other. This is why we feel resistance when pressing against solid surfaces.

Q7: What does the weak force do?

A7: The weak force is responsible for certain types of nuclear decay, such as beta decay. It acts over a very short range and is much weaker than the strong force.

Q8: What is the gravitational force?

A8: The gravitational force is the attraction between any two objects that have mass. It is the weakest of the four forces but has an infinite range.

Q9: On what factors does gravitational force depend?

A9: Gravitational force depends on:

- The masses of the two objects
- The distance between their centers of mass

Q10: Which forces are considered familiar and unfamiliar?

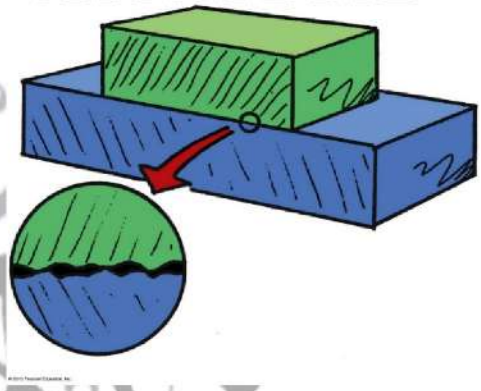
A10:

- **Familiar forces**: Electromagnetic force and gravitational force (we experience them in daily life)
- **Unfamiliar forces**: Strong force and weak force (they operate inside the nucleus and on a subatomic scale)

Friction is the force resisting the relative motion of solid surfaces, fluid layers, and material elements sliding against each other.

الاحتكاك هو القوة التي تقاوم الحركة النسبية للأسطح الصلبة ، والطبقات السائلة ، والعناصر المادية تنزلق في مواجهة بعضها البعض.

Examples of friction being useful: امثلة عن الاحتكاك مفيدة



- It is a force that slows down moveتقليل الحركة
- walking on the earthالمشي على الارض
- the braking system in the wheels of bicycles or other vehicles نظام المكابح في الدراجات الهوائية واي مركبة ذات عجلات
- the ability to pick up and hold objects with our fingers.مسك الاشياء
- The treads on tyres increase the friction of the wheels on the road تثبيت عجلات المركبات على الطرقات وتقليل الاحتكاك
- Climbing is also possible due to friction التسلق
- eat the foodاكل الطعام

The frictional force between the object and the table depends on two factors: يعتمد الاحتكاك بين الاجسام على

a. The weight of the object.وزن الجسم

b. The roughness of the surfaces rubbing together.طبيعة مادة سطح الاجسام

What is air and water drag?

Air applies frictional force on the objects moving through It, this force is called air resistance air drag Water also applies Friction to the objects moving through it. This force is called water resistance or water drag.

ما هو مقاومة الهواء والماء؟

يطبق الهواء قوة احتكاكية على الأجسام المتحركة من خلاله ، هذه القوة تسمى مقاومة الهواء المقاوم للماء. تنطبق المياه أيضًا على الاحتكاك بالأجسام المتحركة من خلالها. تسمى هذه القوة مقاومة الماء أو السحب المائي.

Note that the magnitude of the frictional force does not depend on the contact area of the surfaces.

لاحظ أن مقدار قوة الاحتكاك لا تعتمد على مند

Birds ...nic design to decrease air drag. Their bodies are streamlined to enable them to fly as effectively and quickly as possible through air.

تتمتع الطيور بتصميم هوائي ممتاز لتقليل السحب الجوي. يتم تبسيط أجسامهم لتمكينهم من الطيران بشكل فعال وبأسرع وقت ممكن من خلال الهواء

Fish also have well designed body structure for swimming in water. Their bodies are elongated which decreases water drag and allows them to move stably and efficiently through water.

السمك أيضا له هيكل جسم مصمم بشكل جيد للسباحة في الماء. يتم إطالة أجسامهم مما يقلل من سحب المياه ويسمح لهم بالتحرك بثبات وكفاءة من خلال الماء.

It is also important to note that friction does not depend on the area of the rubbing surfaces. For example, if all surfaces of an object have the same roughness, it is not important onto which of its sides the object is placed, the fictional force will always be the same

من المهم أيضًا ملاحظة أن الاحتكاك لا يعتمد على مساحة الأسطح المحتكة. على سبيل المثال ، إذا كانت جميع أسطح الجسم لها نفس الخشونة ، فليس من المهم أن يتم وضع الكائن على جانبيه ، وستظل قوة الاحتكاك هي نفسها

Represent Force تمثيل القوة

In science, quantities are divided into types: Vector quantity and scalar quantity.

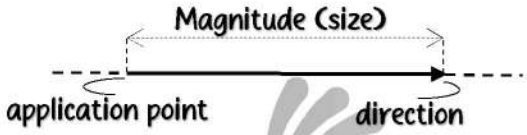
في العلوم ، تنقسم الكميات إلى أنواع: كمية المتجه وكمية العددية (مقدارية).

A vector quantity is a quantity which has both magnitude and direction.

Force is a vector quantity; therefore, it is represented with a vector.

كمية المتجه هي كمية لها مقدار واتجاه.

القوة هي كمية مقدارية ؛ لذلك ، يتم تمثيل مع متجه.



a vector an arrow drawn to scale. يمثل المتجه بسهم

A vector has following properties: خصائص المتجه

a) An application point (where it is applied) نقطة تاثير القوة (

b) A magnitude (or size) (how large it is) مقدار او حجم او كم يكون قياسه

c) A direction اتجاهه

A scalar quantity is a quantity which has only magnitude.

الكمية العددية هي الكمية التي لها مقدار فقط.

A vector quantity الكمية المتجهه	A scalar quantity الكمية المقدارية
Displacement (m) الازاحة	Distance (m) المسافة
Speed (m/s) السرعة	Velocity (m/s) الانطلاق
Acceleration (m/s2) التعجيل	Time (s) الزمن
Force (N) القوة	Mass (Kg) الكتلة
Weight (N) الوزن	Temperature (K) درجة الحرارة

Example 4.1

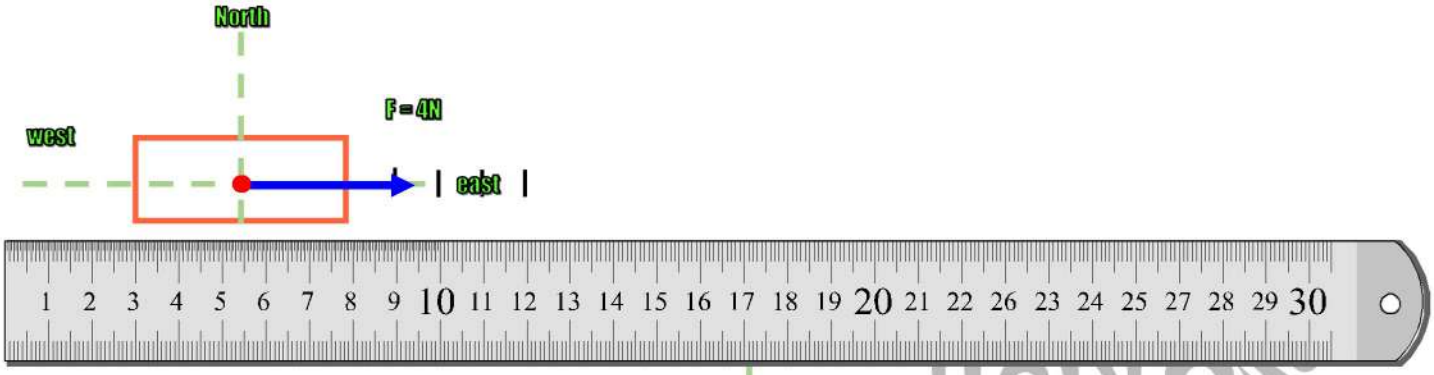
Show the following forces using vectors.

Solution

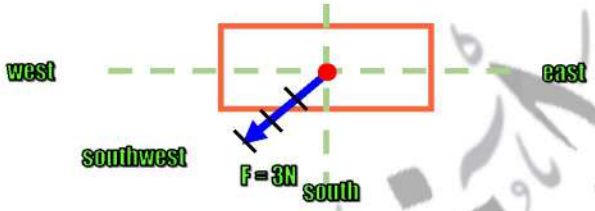
First of all, we have to decide on a scale to represent the force. To make drawing simpler, let 1cm represent 1 Newton.

Then, we take an application point and draw the vector.

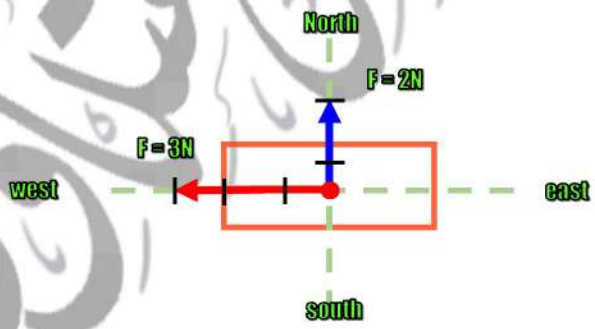
a) A block is pulled to the east with a force of 4 N.



b) A chest is pulled to the southwest with a force of 3 N. let 1cm represent 1 Newton.



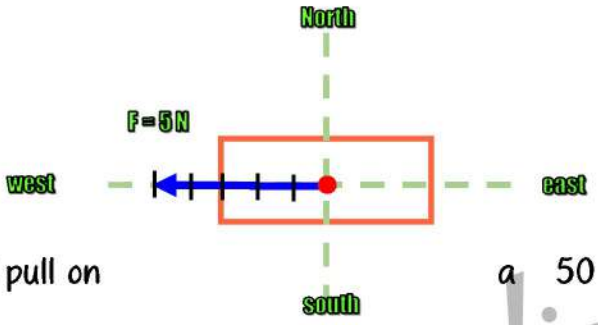
c) Three forces act on a block to move it, one with 2 N due north, one with 3 N due east and one with 3 N due west let 1cm represent 1 Newton.



Exercise 4.1

Represent each of the following forces using a vector diagram:

a)A force of 5 N applied upon a box in a direction towards the west. let 1cm represent 1 Newton.

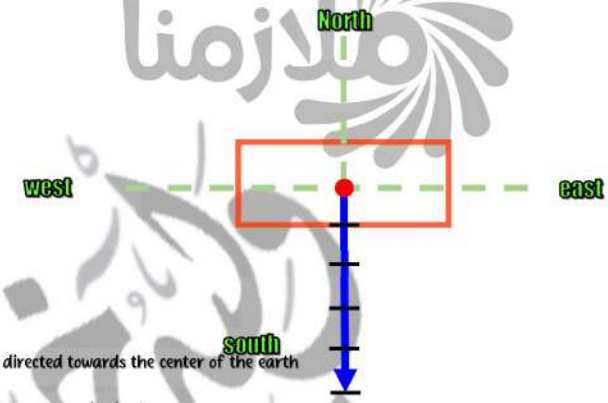


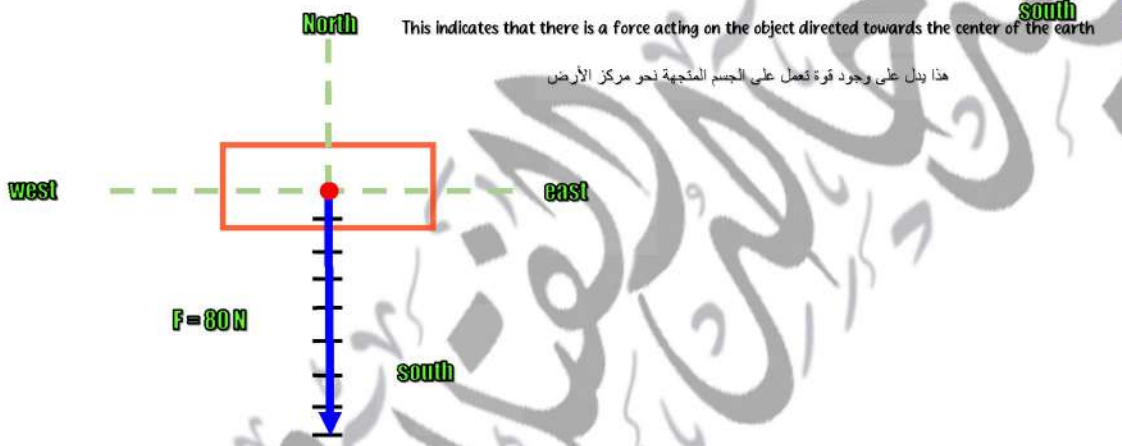
b) The earth's gravitational pull on a 50 kg cement bag.

100g = 1N → 50Kg = 50000 g = 500 N

50Kg = 500N

let 1cm represent 10 Newton.





c)A man applying an 80 N force on a block in a direction towards the south. let 1cm represent 10 Newton

COMBINING FORCES القوى المحصلة

resultant force (R): a single force which has the same effect as two or more forces acting together.

القوة المحصلة (R): قوة منفردة لها نفس التأثير الذي تحدثه قوتين أو أكثر تعملان معاً.

component forces: The forces which form a resultant force.

The arrowhead (➔) over each letter shows that it is a vector quantity, which means the quantity also has a direction.

يظهر رأس السهم (➔) على كل كمية فيزيائية أنه عبارة عن كمية متجهة ، مما يعني أن الكمية لها أيضاً متجهه

a) Forces Acting in on a single Directions القوة المؤثرة بنفس الاتجاه

The magnitude of the resultant force R is found using;

$$\vec{R} = \overrightarrow{F_1} + \overrightarrow{F_2} + \overrightarrow{F_3} \ldots$$

if two forces on the same direction we will add them but if they are on opposite direction we will subtract them

Example 4.2

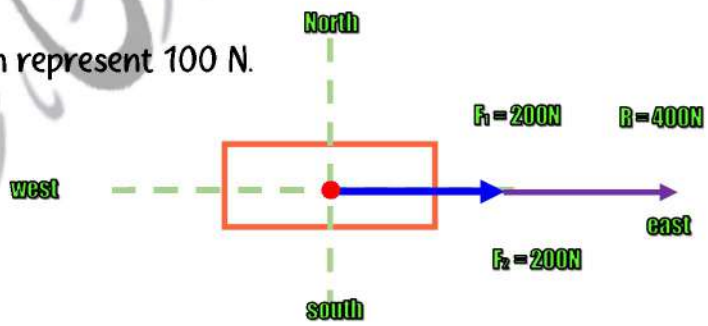
Assume that two boys pull a chest to the right, each with a force of 200 N. Find the resultant force acting on the chest.

Solution

Let F_1 and F_2 be the boys' forces and let 1 cm represent 100 N.

$$\vec{R} = \overrightarrow{F_1} + \overrightarrow{F_2}$$

R =200N+200N = 400N



Exercise 4.2

The forces acting on a box in the same direction are F1= 200 N and F2 = 150 N, what is the resultant force? Represent it by a vector. Ans :350 N

$$\vec{R} = \overrightarrow{F_1} + \overrightarrow{F_2}$$

R =200N + 150N = 350N

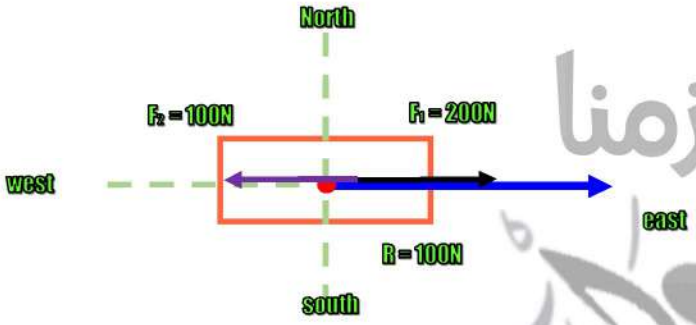
b) Forces Acting in Opposite Directions القوة المؤثرة بعكس الاتجاه

Then the magnitude of the resultant is

$$\vec{R} = \vec{F_1} - \vec{F_2}$$

The minus sign shows that the second force is in the opposite direction to the first one.

The direction of the resultant force is in the direction of the greater force.



CHAPTER QUESTIONS 4

Q.1. Fill in the blanks

a) A scalar quantity is a quantity which has only_____magnitude_____.

b) A falling apple from a tree is applied by_____gravitational_____ force, in direction of_____center of the earth_____.

c) A horse that pulls wagon applies_____action_____ force on wagon.

d) Friction force always acts in the____opposite____ direction to the direction of motion of the object.

Q.2. The sentences below are True or False.

a) Earth applies gravitational force on moon. True

b) We can decrease magnitude of friction force between our shoes and surface. True

Q.3. When a book is thrown on the table, it stops after a period of time. Explain, why?

As explained, when a book is pulled on a table, a frictional force opposes it in a direction opposite to its motion. The frictional force between the book and the table depends on two factors: a. The weight of the object. b. The roughness of the surfaces rubbing together.

Q.4. Represent each of the following forces using a vector diagram:

a) A force of 10N applied upon a box in a direction towards the East.

b) A chest is pulled to the south-east with a force of 6N.

Q.5. Calculate

a) net force on object which pulled by 8N and 2N forces which are in same direction.

$$\vec{R} = \overrightarrow{F_1} + \overrightarrow{F_2}$$

$$\vec{R} = 8N + 2N = 10\ N$$

b) net force on object which pulled by 8N and 2N forces which are in opposite direction.

$$\vec{R} = \overrightarrow{F_1} - \overrightarrow{F_2}$$

$$\vec{R} = 8N - 2N = 6N$$

Q.6. Two forces are applied to an object which are 5N and 10N. calculate net force on the object represent all forces, if:

a) forces are in same direction

$$\vec{R} = \overrightarrow{F_2} + \overrightarrow{F_1}$$

$$\vec{R} = 10 + 5 = 15\ N$$

b) forces are in opposite directions

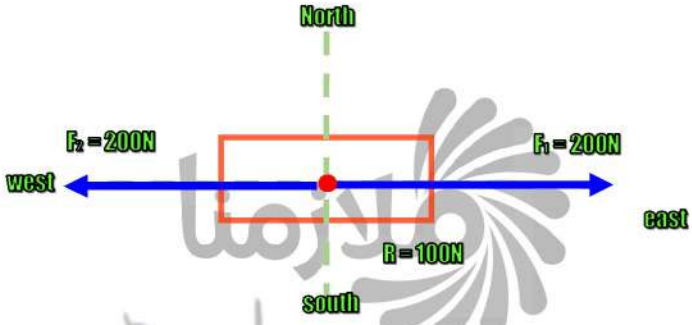
$$\vec{R} = \overrightarrow{F_2} - \overrightarrow{F_1}$$

$\vec{R} = 10 - 5 = 5\ N$ the direction to F_2

Q.7. An object is pulled to north by 200 N and pulled to south by 200N :

a) represent the forces on the objects.

let 1cm represent 100 Newton



b) calculate net force on the object

$$\vec{R} = \overrightarrow{F_1} - \overrightarrow{F_2}$$

$$\vec{R} = 200N - 200N = 0\ N$$

c) The object is in equilibrium or not? Why?

Yes, because the resultant force is 0 N

Force

A force is either a push or a pull that acts on an object

- Force is an effect which can,
- Start motion,
- Stop motion,
- Change the speed or direction of motion.
- Change the shape or size of a body.

Force is represented by the symbol 'F' and is measured in units called Newtons (N)

TYPES OF FORCES

- The Strong Force
- The Weak Force
- The Electromagnetic Force

- The Gravitational Force
- Frictional Force

What is a vector?

An arrow drawn to scale is called a vector as shown on the right. A vector has the following properties:

→ An application point (where it is applied)

→ A magnitude (or size) (how large it is)

→ A direction

Combination of Forces

If there are more than one or two forces acting on the same object, there we be resultant force.

If two forces on the same direction we will add them, but if they are on opposite direction, we will subtract them

Fill in the blanks with appropriate words

1. A scalar quantity is a quantity which has only_____.

2. A falling apple from a tree is applied by_____ force, in direction of_____.

3. A horse that pulls wagon applies _____ force on wagon.

4. Friction force always acts in the _____ direction to the direction of motion of the object.

Choose the correct answer

5. What is the push or pull on an object that can cause it to accelerate called?

A) Mass C) Density B) Force D) Speed

6. What is the unit of measure for force?

A) Amp B) Seconds C) Newton D) Erg

7. What is the sum of all forces acting on an object called?

A) Gravity B) Reaction force C) Acceleration D) Net force

8. In a tug of war, when one team is pulling with a force of 100 N and the other 80 N, what is the net force?

A. 20N B. 80 N C. 100 N D. 180 N

9. What is the push or pull on an object that can cause it to accelerate called?

A) mass B) force C) density D) speed

Which Statement Is True (T) or False (F):

10. ( ) Earth applies gravitational force on moon.

11. ( ) We can decrease magnitude of friction force between our shoes and surface.

answer the Followings Questions

12. When a book is thrown on the table, it stops after a period of time. Explain, why?

13. Represent each of the following forces using a vector diagram:

a) A force of 10 applied upon a box in a direction towards the East.

b) A chest is pulled to the south-east with a force of 6N.

14. Calculate

a) Net force on object which pulled by 8N and 2N forces which are in same direction.

b) Net force on object which pulled by 8N and 2N forces which are in opposite direction.

which are in opposite direction.

5

CHAPTER 5 الفصل الخامس

PRESSURE

الاستاذ وليد خالد الفتلاوي

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CHAPTER 5 PRESSURE

الفصل الخامس (5) الضغط

PRESSURE: The perpendicular force acting on a unit area. الضغط: القوة العمودية المسلطة على وحدة المساحة

In an equation, we can state pressure as;

$\text{Pressure} = \frac{Force}{Area}$ in symbols, $P = \frac{F}{A}$

From the definition, pressure has the units of force(N) and area(m^2). Therefore, pressure is measured in Newton/metre^2(N/m^2). The unit N/m^2 has a special name: Pascal(Pa).

1 Pa = 1 N/m^2

Multiples of Pascal are used to express higher pressures. 1000 Pa is called 1 kilopascal(kPa).

1kPa=1000 Pa

Pressure depends on: الضغط يعتمد على

1) The Vertical force. يتناسب مع القوة العمودية

2) The surface area. يتناسب مع المساحة

PRESSURE = FORCE / AREA

Why do horses sink into snow?

because the area of its feet is smaller

لماذا يغطس الحصان في الثلج؟ وذلك بسبب صغر مساحة قدميه.

A duck has webbed feet therefore it does not sink into soft snow, but a rooster of the same weight will sink?

Because the area of its feet is smaller than that of the duck's

البطة تمتلك اقدام شبكية لذا لا تغطس في الثلج بينما الديك له نفس الوزن يغطس في الثلج؟ وذلك بسبب مساحة اقدام الديك أصغر من مساحة اقدام البطة

Pressure in use

We can apply a greater pressure when the area over which the force acts is small.

For example, we use the sharp edge of a knife to cut, **because** the force acts over a much smaller area than the blunt end. In the same way nails, pins, drills and needles have sharp points, so they can go into materials easily.

Sometimes we need low pressure therefore we enlarge the contact area. Skies and snowshoes have large areas, they help us to move on snow without sinking in. Tractors and large lorries use large tyres, heavy machines such as bulldozers and excavators use large pallets to move easily on soft ground without sinking in.

rollers have a large mass, but act over a small area so that it applies a very large pressure on asphalt to squeeze it into shape.

استخدامات الضغط

يمكننا تطبيق ضغط أكبر عندما تكون المساحة التي تعمل فيها القوة صغيرة.

على سبيل المثال ، نستخدم الحافة الحادة للسكين للتقطيع ، لأن القوة تعمل على مساحة أصغر بكثير من النهاية الحادة. بنفس الطريقة ، المسامير والدبابيس والمثقاب الكهربائي والإبر لديها نهاية حادة ، حتى تخترق المواد بسهولة.

في بعض الأحيان نحتاج إلى ضغط منخفض لذلك فإننا نزيد مساحة الاتصال. تحتوي أحذية التزلج على مساحات كبيرة ، تساعدنا على التحرك على الثلج دون غرق. تستخدم

الجرارات والشاحنات الكبيرة إطارات كبيرة ، والآلات الثقيلة مثل الجرافات والحفارات تستخدم منصات كبيرة للتحرك بسهولة على الأرض الناعمة دون الغرق فيها.

تحتوي البكرات على كتلة كبيرة ، ولكنها تعمل على مساحة صغيرة بحيث تطبق ضغطًا كبيرًا جدًا على الأسفلت لضغطها في شكلها.

» Increasing the number of tyres, lowers the pressure applied on each tyre. Thus, the deformation of roads is prevented.

زيادة عدد الإطارات ، يخفض الضغط المسلط على كل إطار. وبالتالي ، يتم منع تشوه الطرق .

» To prevent skidding, we use a chain which lowers the contact area and enlarges the pressure.

لمنع الانزلاق ، نستخدم سلسلة تقلل من مساحة التلامس وتوسع الضغط.

Some examples of the use of pressure by living things

Big animals, such as elephants, bears and camels have large feet, thus, they apply less pressure on the ground.

Animals have sharp teeth to break food into pieces.

Woodpeckers have sharp beaks to make holes in the trees.

Dogs, cats and birds have sharp claws to help them to easily grasp things.

The pointed beaks of birds help them to cut through the air when they fly.

بعض الأمثلة على استخدام الضغط بواسطة الكائنات الحية

الحيوانات الكبيرة، مثل الفيلة والدببة والجمال لها أقدام كبيرة، وبالتالي فهي تطبق ضغطًا أقل على الأرض.

الحيوانات لديها أسنان حادة لكسر الطعام إلى قطع.

نقار الخشب لديهم مناقير حادة لعمل ثقوب في الأشجار.

الكلاب والقطط والطيور لديها مخالب حادة لمساعدتهم على مسك الأشياء بسهولة.

تساعد مناقير الطيور المدببة على قطع الهواء خلال الطيران.

Example 5.1

A book weighing 18 N has a 0.06 m^2 cover surface and lies on a table. Calculate the pressure of the book on the table? If we place an encyclopedia of 42N on the book, what will the final pressure be?

كتاب يزن 18 N له سطح تغطية 0.06 m^2 يؤثرعلى الطاولة. احسب ضغط الكتاب على الطاولة؟ إذا وضعنا موسوعة 42N فوق الكتاب الاول ، ماذا سيكون الضغط النهائي؟

$$P = \frac{18N}{0.06m^2} = \frac{1800}{6} = 300\ Pa$$

When the encyclopedia is placed on the book, the weight increases but the area remains the same. The weight is;

$$W_{total} = W_1 + W_2$$

$$W_{total} = 18N + 42N = 60N$$

$$P = \frac{W_{total}}{A}$$

$$P = \frac{60N}{0.06m^2} = 1000Pa = 1KPa$$

Result: As the force increases keeping the contact area constant, the pressure also increases.

Exercise 5.1 page #53

A 400 N girl whose total shoe area is 0.05m^2 stands on the floor. What is the pressure exerted by the girl on the floor? Ans :8000Pa

400 N لفتاة تبلغ مساحتها الإجمالية للأحذية $0.05m^2$ تقف على الأرض. ما هو الضغط الذي تسلطه الفتاة على الأرض؟

$$P = \frac{F}{A}$$

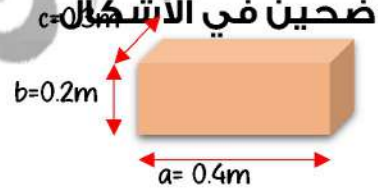
$$P = \frac{400N}{0.05m^2}$$

$$P = \frac{40\ 000}{5} = 8000Pa$$ the pressure exerted by the girl on the floor

Example 5.2 page # 53

Find the pressure exerted on the table by a 48 N box for the two different positions shown in the figures.

جد الضغط الذي يسلط على الطاولة بواسطة صندوق 48 N للوضعين المختلفين الموضحين في الأشكال



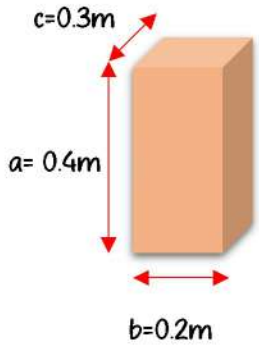
Calculation

a) In the first case the area is

A_a= a X c

A_a= 0.4 m X 0.3 m = 0.12 m^2 and the pressure P_1,

$$P = \frac{F}{A} = \frac{48N}{0.12m^2} = 400\frac{N}{m^2} = 400Pa$$



b) The area in the second case is,

A_c= c X b

A_c= 0.3 m X 0.2 m = $0.06m^2$ and the pressure Pa

$$P = \frac{F}{A} = \frac{48N}{0.06m^2} = 800\frac{N}{m^2} = 800Pa$$

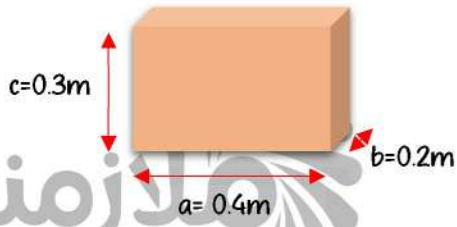
Result: The box applies greater force in the second position

Exercise 5.2

Find the pressure of the block in Example 5.2 when it lies on its third side.

Ans:600Pa

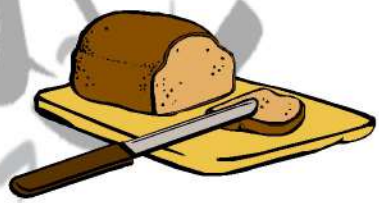
A_c= 0.2 m X 0.4 m = 0.08 m^2 and the pressure P_1,



$$P = \frac{F}{A} = \frac{48N}{0.08m^2} = 600\frac{N}{m^2} = 600Pa$$

Example 5.4

A loaf of bread of width 10 cm is to be cut with a knife. Compare the pressures exerted on the bread when,



a) It is cut with the blunt edge of the knife.

b) It is cut with the sharp edge of the knife.

The force applied is 10 N and the blunt edge has a thickness of 2 mm and the sharp edge 0.1mm.

يجب قطع رغيف من الخبز بعرض 10 cm بسكين. مقارنة الضغط الذي يسلط على الخبز عندما ،

أ) يتم قطع مع الحافة العمياء من السكين.

ب) يتم قطع مع الحافة الحادة للسكين.

القوة المطبقة هي 10 N والحافة غير الحادة لها سمك 2 mm والحافة الحادة 0.1mm.

Calculation

a) A_1 = 0.1 m X 0.002 m = 0.0002 m^2 and Pa is;

$$P_1 = \frac{F}{A_1} = \frac{10N}{0.0002m^2} = \frac{100\ 000N}{2m^2} = 50\ 000\frac{N}{m^2} = 50\ 000Pa$$

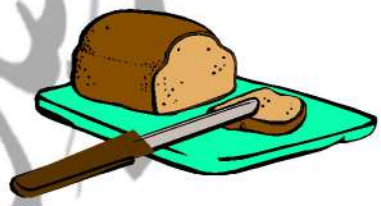
b) A_2 = 0.1 m X 0.0001 m = 0.0 0001 m^2 and Pa is;

$$P_2 = \frac{F}{A_2} = \frac{10N}{0.0\ 0001m^2} = \frac{100\ 000N}{1m^2} = 1000\ 000\frac{N}{m^2} = 1000\ 000Pa$$

Result: The blunt edge exerts a very high pressure on the bread so that we cannot cut it. Blunt edges are not used for cutting, since they spread out the cutting force and lower the pressure.

Exercise 5.4

Repeat Example 4.3 with a force of 8 N.



Ans :40 000 Pa and 800 000 Pa

a) A_1 = 0.1 m X 0.002 m = 0.0 002 m^2 and Pa is;

$$P_1 = \frac{F}{A_1} = \frac{8N}{0.0002m^2} = \frac{80\ 000N}{2m^2} = 40\ 000\frac{N}{m^2} = 40\ 000Pa$$

b) A_2 = 0.1 m X 0.0001 m = 0.0 0001 m^2 and Pa is;

$$P_2 = \frac{F}{A_2} = \frac{8N}{0.0\ 0001m^2} = \frac{800\ 000N}{1m^2} = 800\ 000\frac{N}{m^2} =$$

Pressure and transmission of force by solids:

Solids transmit forces only in one direction: In the direction of application without changing its magnitude.

For example, while hammering a nail, only the force is transmitted, however the ends of the nail have different surface areas, so the Pressures at the two ends are different.

الضغط وتوزيع القوة في المواد الصلبة:

تسلط المواد الصلبة قوى في اتجاه واحد فقط: في اتجاه تأثير القوة دون تغيير مقدارها.

على سبيل المثال ، أثناء دق المسامير ، تنتقل القوة فقط ، لكن نهايات المسمار لها مساحات سطح مختلفة ، لذلك تختلف الضغوط في الطرفين.

Example 5.5

The force applied on a nail by a hammer is 20 N. The ends of the nail are 1 cm^2 and 0.1cm^2. What are the force and pressure at the tip of the nail?

القوة المسلطة على مسمار بواسطة المطرقة هي 20 N. نهايات الظفر هي 1 cm^2 و 0.1cm^2. ما هي القوة والضغط على طرف المسمار؟

$$P_1 = \frac{F}{A_1} = \frac{20N}{1cm^2} = \frac{20N}{0.0001m^2} = \frac{200\ 000N}{1m^2} = 200\ 000\frac{N}{m^2} = 200\ 000Pa$$

$$P_2 = \frac{F}{A_2} = \frac{20N}{0.1cm^2} = \frac{20N}{0.00001m^2} = \frac{2000\ 000N}{1m^2} = 2000\ 000\frac{N}{m^2} = 2000\ 000Pa$$

Result: The pressure at the tip is 10 times greater than the pressure at the head, because the smaller the area the larger the pressure for the same force.

Exercise 5.5

You are pushing a needle into paper with a force of 0.02 N. If the areas of the ends of the needle are 1 mm^2 and 0.1 mm^2 find the pressures at both ends. Ans: 20KPa and 200KPa

تقوم بدفع إبرة في ورقة بقوة 0.02 N. إذا كانت مساحة نهايات الإبرة هي 1 mm^2 و 0.1 mm^2 احسب الضغط على نهايتي الابرة

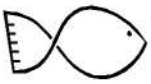
$$P_1 = \frac{F}{A_1} = \frac{0.02N}{1mm^2} = \frac{0.02N}{0.000\ 001m^2} = \frac{20\ 000N}{1m^2} = 20\ 000Pa = 20KPa$$

$$P_2 = \frac{F}{A_2} = \frac{0.02N}{0.1mm^2} = \frac{0.02N}{0.000\ 000\ 1m^2} = \frac{200\ 000N}{1m^2} = 200\ 000Pa = 200KPa$$

Liquid pressure:

A liquid has a weight, it too exerts a downward pressure but it also exerts pressure in every direction.

Liquid pressure increases as we go down from the surface to the bottom of the liquid.

 Fish and  divers at the bottom of the sea feel greater pressure, which is due to the weight of water above them. The water presses in all directions on the bodies. Therefore, divers wear very special suits to protect themselves from the effects of pressure.

liquid pressure properties:

» A liquid exerts pressure in all directions.

» The pressure of a liquid is directly proportional to the depth of the liquid.

» The liquid pressure depends on the density of the liquid.

ضغط السائل:

فالسائل له وزن ، كما أنه يسلط ضغطًا للأسفل ، ولكنه أيضًا يسلط ضغطًا في كل الاتجاهات.

يزداد ضغط السائل كلما هبطنا من السطح إلى قاع السائل.

الأسماك والغواصين في قاع البحر يشعرون بمزيد من الضغط، بسبب وزن الماء فوقهم. تسلط المياه ضغطاً في جميع الاتجاهات على الأجسام. لذلك ، يرتدي الغواصون بدلات خاصة لحماية أنفسهم من آثار الضغط.

خصائص ضغط السائل:

»سائل يسلط ضغط في كل الاتجاهات.

»إن ضغط السائل يتناسب طرديا مع عمق السائل.

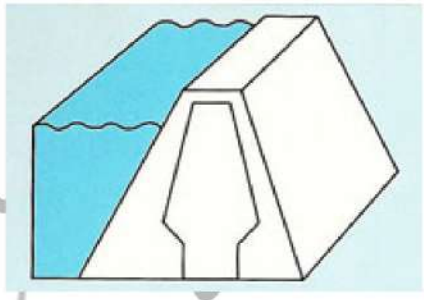
»يعتمد ضغط السائل على كثافة السائل.

Dams are thicker at the bottom, because water pressure increases as its depth from the surface of the liquid increases.

Because the liquid pressure increases with depth, the patient feeder is hung on a stand.

تكون السدود أكثر سمكًا في القاع ، لأن ضغط الماء يزداد كلما زاد عمقها من سطح السائل.

لأن ضغط السائل يزيد مع العمق ، يتم تعليق وحدة تغذية المريض على حامل.



Water Supply System

A town's water-supply comes from a reservoir on higher ground or a water storage tank, called a stand pipe or water tower, at the top of a tower.

Water coming from a higher-level causes larger pressures at the lower levels of the places supplied.

Standpipe (water tower)

Reservoir on high ground and a standpipe

نظام التزويد بالمياه

تأتي إمدادات المياه في المدينة من خزان على أرض مرتفعة أو خزان لتخزين المياه ، يسمى أنبوبًا أو برج مياه ، في أعلى البرج.

المياه القادمة من مستوى أعلى تسبب ضغط أكبر في المستويات الدنيا من الأماكن الموردة.

انبوبية (برج الماء)

خزان على أرض مرتفعة ومزدوجة

Calculation of Liquid Pressure

As we saw before, pressure is the perpendicular force acting on unit area Now, we will derive a new equation for liquid pressure.

Consider a liquid column having a base area A and height h. To find the pressure at the bottom we have to know the weight of the liquid column. First, we will find the mass of the liquid, then its weight. Mass is found by multiplying density by volume;

حساب ضغط السائل

وكما رأينا من قبل ، فإن الضغط هو القوة العمودية المسلطة على وحدة المساحة ، وسوف نشتق معادلة جديدة لضغط السائل.

فكر في عمود سائل يحتوي على مساحة A و ارتفاع h . للعثور على الضغط في القاع يجب علينا معرفة وزن عمود السائل. أولا ، سوف نجد كتلة السائل ، ثم وزنه. تم العثور على الكتلة بضرب الكثافة حسب الحجم ؛

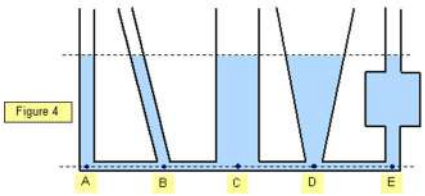
$m = V \times d$

Volume is found by multiplying base area (A) with height (h),

$V = A \times h$

Thus, we obtain,

$m = d \times A \times h$



Remember that weight is the pulling force acting on an object, and calculated by multiplying mass with g,

$weight = m \times g = d \times A \times h \times g$

Now, after replacing force with weight, we can rewrite the pressure formula as,

$P = weight/Area$ so that, $P = (d \times A \times h \times g)/A = d \times h \times g$

Then we obtain;

$P = h X d X g$

From this formula, we can see that the liquid pressure depends on both height and density of the liquid and is independent of the area and shape of the container; This can be understood.

من هذه المعادلة ، يمكننا أن نرى أن ضغط السائل يعتمد على كل من ارتفاع وكثافة السائل ولايعتمد عن المساحة وشكل الحاوية.

Gas pressure:

Do you know that we are always supporting a weight of about 200 000N acting on our bodies?

Why do some people's noses bleed when they climb to high attitudes?

How can we drink through a straw?

The answer to these questions depends on air pressure.

ضغط الغاز:

هل تعرف أننا نتحمل دائمًا وزن حوالي 200 000N يعمل على أجسادنا؟

لماذا تنزف أنوف بعض الناس عندما يصعدون إلى الاماكن عالية؟

كيف يمكننا أن نشرب من خلال القشة (قصبة)؟

الجواب على هذه الأسئلة يعتمد على ضغط الهواء.

a) Gas Pressure

Like liquids, gases also exert pressure on the walls of a container. Tiny particles in the gas strike the walls with a force and cause a pressure. A gas can be compressed easily into a small volume, causing an increase in its pressure. Inflation of a ball or a car tire is a good example of the compressibility property of gases.

أ) ضغط الغاز

مثل السوائل ، والغازات أيضا تسلط ضغط على جدران الحاوية. جسيمات صغيرة في الغاز تضرب الجدران بقوة وتسبب ضغطًا. يمكن ضغط الغاز بسهولة إلى حجم صغير ، مما يؤدي إلى زيادة في ضغطه. يعد النفخ في الكرة أو إطار السيارة مثالًا جيدًا على خاصية انضغاط الغازات.

b) Air (Atmospheric) Pressure

atmosphere: The gas layer surrounding the earth.

The atmosphere is composed of nitrogen, oxygen and very small amounts of other gases such as hydrogen and carbon dioxide. It is about 900 km deep and we live at the bottom of this huge ocean of air.

The molecules in the air have weight. Therefore, they exert force on the earth surface. The force exerted per unit area on a surface by the weight of air is called air pressure. As the weight of the air in the column decreases the pressure also decreases. The air pressure is at its greatest at sea level, since there are so many molecules present, and it decreases as height increases

Atmospheric pressure at sea level is about the same as a weight of 1 kg mass per cm^2 area. An ordinary man has a surface area of about 2 m^2; this means that the total force on a man at sea level is about 200 000 N, which is about the weight of a 20 ton-mass acting on our bodies. However, we do not feel this huge pressure exerted on us since the blood pressure of our body balances it. At high altitudes, the air pressure decreases, and the blood-air pressure balance of our body is disturbed. This is why a mountain climber's nose bleeds.

ب) الضغط الجوي (الجوي)

الجو: طبقة الغاز المحيطة بالأرض.

يتكون الغلاف الجوي من النيتروجين والأكسجين وكميات صغيرة جدًا من الغازات الأخرى مثل الهيدروجين وثاني أكسيد الكربون. يبلغ قطرها حوالي 900Km ونحن نعيش في قاع هذا المحيط الهائل من الهواء.

الجزيئات في الهواء لها وزن. لذلك ، فإنهم يسلطون القوة على سطح الأرض. وتسمى القوة المبذولة لكل وحدة مساحة على سطح من وزن الهواء "ضغط الهواء". ومع انخفاض وزن الهواء في العمود ، ينخفض الضغط أيضًا. يكون ضغط الهواء في أعظم مستوياته في مستوى سطح البحر ، حيث يوجد الكثير من الجزيئات ، وينخفض كلما زاد الارتفاع

يكون الضغط الجوي عند مستوى سطح البحر مماثلًا لوزن كتلة 1Kg لكل $1\ cm^2$. رجل عادي لديه مساحة سطح حوالي $2m^2$. وهذا يعني أن القوة الكلية على رجل عند مستوى البحر تبلغ حوالي 200000 نيوتن ، وهو ما يعادل وزن كتلة 20 طنًا على أجسامنا. ومع ذلك ، فإننا لا نشعر بهذا الضغط الهائل الذي تسلطه وهذا يعادل ضغط دم جسمنا. وعلى ارتفاعات عالية ، ينخفض ضغط الهواء ، ويضطرب توازن ضغط الهواء والدم في أجسامنا. لهذا السبب ينزف أنف متسلق الجبال.

c) Evidence of Air Pressure

Air pressure cannot be felt, but if we take air out or remove it from a given space, the effect of air pressure can be seen. Vacuum is the special name given to volumes where almost all the air has been taken away. The following activities will help us to understand air pressure.

ج) دليل على ضغط الهواء

لا يمكن الشعور بضغط الهواء ، ولكن إذا أخرجنا الهواء أو أزلناه من مكان معين ، يمكن ملاحظة تأثير ضغط الهواء. الفراغ هو الاسم الخاص المعطى للأحجام حيث تم سحب كل الهواء تقريبا. سوف تساعدنا الأنشطة التالية على فهم ضغط الهواء.

Activity Evidence of Air Pressure

Holding the paper on glass, turn the glass water upside down. Does water spill out? why?

No, because the pressure exerted by the water on the paper does not exceed the pressure applied by the air, thus the paper does not fall and the water remains in glass.

نشاط دليل على ضغط الهواء

مسك ورقة على الزجاج ، وقلب المياه الزجاج رأسا على عقب. هل تسرب الماء؟ لماذا ؟!

لا، لأن الضغط الذي تسلطه المياه على الورق لا يتجاوز الضغط الذي يطبقه الهواء، وبالتالي لا يسقط الورق ويبقى الماء في الزجاج.

Drinking Through a Straw

When you suck, you lower the pressure at the top end of the straw. The air pressure on the drink pushes down the drink and causes high pressure at the bottom of the straw. Due to this pressure difference between the ends of the straw, the liquid moves from the bottom of the glass to your mouth.

شرب من خلال القش (القصبة)

عندما تشرب من خلال القصبة ، تخفض الضغط في الطرف العلوي من القصبة. ضغط الهواء على الشراب يدفع أسفل الشراب ويسبب ضغطًا مرتفعًا في قعر القصبة. بسبب اختلاف الضغط بين نهايات القصبة ، يتحرك السائل من قاع الزجاج إلى فمك.

APPLICATIONS of AIR PRESSURE

تطبيقات الضغط الجوي

Siphoning

Siphoning is a way to remove a liquid from a tank. To remove the liquid, the tube must be filled and the open end of the tube must be below the level of the tube in the tank. At point B, the pressure in the tube exceeds the atmospheric pressure because of the liquid in the tube, and the liquid moves through the tube from the container to the outside.

In daily life people use siphoning to remove water from an aquarium without disturbing fish or plants, or to empty the gas tank of a car.

السيفون

السيفون هو طريقة لإزالة سائل من خزان. لإزالة السائل ، يجب ملء الأنبوب ويجب أن يكون الطرف المفتوح للأنبوب أقل من مستوى الأنبوب الموجود في الخزان. عند النقطة B ، يتجاوز الضغط في الأنبوب الضغط الجوي بسبب السائل في الأنبوب ، ويتحرك السائل عبر الأنبوب من الحاوية إلى الخارج.

في الحياة اليومية يستخدم الناس السيفون الماء لإزالة الماء من حوض السمك دون إزعاج الأسماك أو النباتات ، أو إفراغ خزان الغاز للسيارة.

Vacuum Cleaner

Vacuum Cleaner applies the principle of atmospheric pressure to remove dust particles. When it is switched on, the fan sucks out the air from space inside the vacuum.

The atmospheric pressure outside, which is greater than forces air and dust particles into the filter bag.

مكنسة كهربائية

المكنسة الكهربائية تطبق مبدأ الضغط الجوي لإزالة جزيئات الغبار. عندما يتم تشغيله ، تقوم المروحة بسحب الهواء من الفضاء داخل الفراغ.

الضغط الجوي الخارجي ، والذي هو أكبر من جزيئات الهواء والغبار في كيس الترشيح.

Syringe

When the piston is pulled up, the atmospheric pressure inside the cylinder will decrease. The atmospheric pressure outside pushes the liquid up into the syringe

محقنة

عندما يتم سحب المكبس لأعلى ، ينخفض الضغط الجوي داخل الاسطوانة. يدفع الضغط الجوي الخارجي السائل إلى داخل المحقنة

Buoyancy (up thrust)

When the object sink in a liquid that liquid apply the force to the up direction which is called up thrust or buoyancy.

الطفو (قوة دفع السائل نحو الاعلى)

عندما يغرق الكائن في سائل يقوم السائل بتسليط القوة على الاتجاه الصاعد الذي يدعى قوة الدفع أو الطفو.

a) Archimedes' Principle

A body sink in a liquid is pushed up by a force equal to that of the weight of the liquid displaced.

أ) مبدأ أرخميدس

يتم دفع الجسم الغاطس في السائل بواسطة قوة تساوي وزن وزن السائل المزاح.

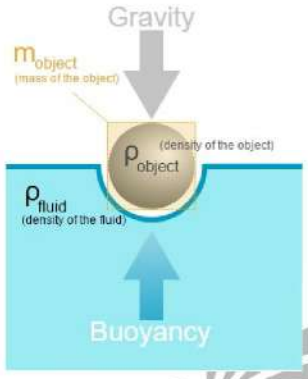
b) How do objects float in water?

An object in a liquid does not experience only the liquid's upward push, it also experiences the downward force of gravity. If these forces balance each other, the object floats in water. But if the force of gravity is greater than the up thrust, the object sinks.

ب) كيف تطفو الأجسام في الماء؟

لا يتعرض جسم ما في سائل إلا للدفع الأعلى نحو السائل ، كما أنه يواجه قوة الجاذبية المتجهلة نحو الأسفل. إذا كانت هذه القوى توازن بعضها البعض ، فإن الجسم يطفو في الماء. ولكن إذا كانت قوة الجاذبية أكبر من قوة الدفع ، فإن الجسم يغوص.

weight = up thrust Weight



a. Floating: Up thrust balances weight

weight > up thrust Weight

b. Sinking: Weight is greater than the up thrust.

weight < up thrust Weight

In case of floating the weight of water displaced is equal to the weight of the object.

Floating is a special case; The up thrust of the liquid is equal to the weight of the object. Ships, boats and all things moving on water experience up thrust equal to their weights. And also, they displace water equal to their weights.

في حالة الطفو وزن المياه المزاحة يساوي وزن الجسم.

الطفو هو حالة خاصة. القوة الدافعة نحو الأعلى للسائل تساوي وزن الجسم. فالسفن والقوارب وكل الأشياء التي تتحرك على الماء تواجه قوة دفع تساوي أوزانها. وأيضا ، يحل محل الماء المزاح يساوي أوزانهم.

QUESTIONS OF CHAPTER 5

Q.1 choose the correct answer

1. Pressure of liquid in a container does not depend on;

a) gravitational acceleration

b) density of water

c) height of water

d) liquid surface area

2. Pressure of container which is filled by liquid depends on;

a) base are of the container

b) surface area of the liquid

c) height of the liquid

d) mass of the liquid regarded its shape

3. Agricultural machineries and military tanks have a broad chain. Why?

a) to increase pressure on surface

b) to increase speed

c) to decrease pressure on surface

d) to prevent rotation of wheels

4. Tire of car can explode on the move, why?

a) number of air molecules in the tire increases

b) atmospheric pressure increases compare to pressure inside the tire

c) air pressure inside tire increases because of increase in temperature

d)tire expands

5. Volume of displaced water by immersed object equals;

a) volume of immersed object

b) greater than volume of immersed object

c) smaller than volume of immersed object

d) position of immersed object in water

6. If density of object that floats in liquid equals density of liquid, volume of displaced liquid is;

a) greater than volume of float object

b) smaller than volume of float object

c) equal to volume of float object

d) zero

7. Some amount of snow is added into graduated cylinder which half of it is filled by water. When the snow melts, height of the water inside cylinder

a) increases

b) decreases

c) does not change

d) increases by volume of snow that is added into cylinder

8. An equal arm balance is balanced by a piece of wood and some water inside container on the same arm. If wood is placed in water (wood floats in water)?

ميزان ذو الكفتين متوازن، في احدى كفتيه قطعة من الخشب واناء فيه ماء، فإذا وضعت قطعة الخشب في الماء (تطفو على سطح ماء) فإن كفتي الميزان

c) balance does not change. لا تتغير (لا تتأثر)

9. There are three metal pieces (gold, silver, copper) which have equal masses. Density of gold is 19300 kg/m^3 silver is 10500 kg/m^3 and copper is 8900 kg/m^3 If these three metal pieces are immersed to same container respectively:

a) displaced water by gold is greater than silver and copper

b) displaced water by silver is less than gold

c) displaced water by silver is greater than gold and copper

d) none of them

10. A piece of metal is placed on the object that floats in the swimming pool. Displaced water by float object;

a) equals volume of float object

b) equals volume of float object and piece of metallic equals volume of immersed part of object

d) depends on distance between center of floating object and base of the pool

Q.2 The sentences below are True or False.

a) A balloon which is filled by helium rise in air **steadily**. F It stops to be equal to atmospheric pressure

b) Pressure of liquid on base of container depends on only **mass** of the liquid. F

c) Weight of sink object in liquid is **greater** than up thrust force of the liquid. T

d) An object floats in water and petroleum. Immersed part of object in water is greater than petroleum, because density of petroleum is greater than density of water. F

e) Displaced water by an object that floats in water with whole amount equals volume of the object. T

f) Under same pressure height of petroleum is greater than height of water, because density of petroleum is greater than water. F

Q.3 Think

a) Methods of calculating atmospheric pressure and liquid pressure are different.

Because

(1) Rising air column Unknown.

(2) A

ir density variable less than higher we go upwards.

b) If we want to drain a container, we must drill two holes.

To overcome the external pressure on the internal and exit liquid.

c) Explain phenomenon of drinking juice by pipette.

When you suck, you lower the pressure at the top end of the pipette, the air pressure on the drink pushes down the drink and causes high pressure at the bottom of the pipette.

d) Fish can change their position at any depth of sea.

because existence of airbag and water drag

e) Amateur swimmers use pneumatic tire, why?

Help him float above the surface of the water (Up thrust balances weight)

f) Even if density of iron greater than density of water, ships float in water but iron ball sinks, why?

Because of that up thrust of the liquid depend on volume of object.

Iron: Displaced water weight less than Iron.

ships: Displaced water weight = ships weight.

g) Elephants can drink water by their trunk.

When Elephants suck, it lowers the pressure at the top end of the trunk, the air pressure on the drink (surface of the water) pushes down the drink and causes high pressure at the bottom of the trunk.

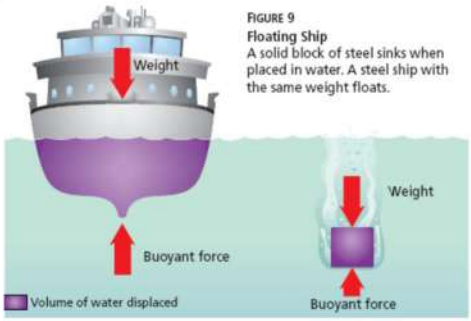


FIGURE 9
Floating Ship
A solid block of steel sinks when placed in water. A steel ship with the same weight floats.

h) People can swim in clam sea better than in river, why?

Because, Seawater density greater than the density of river water shall be seawater upthrust higher than upthrust of the river's water.

Q.4 How does siphon can draw water in toilet?

the pressure in the tube exceeds the atmospheric pressure because of the liquid in the tube, and the liquid moves through the tube from the container to the outside.

Q.5. Which effect determines level of balloon in air?

The effect determines level of balloon in air is **density**.

Q.6. What happens, if an inflated balloon is affected by followings at room temperature;

a) under sunlight: **Inflation of a ball** because high temperature the Tiny particles in the gas strike the walls with a force and cause a pressure causing an increase in its pressure.

b) in the fridge: **Shrinking of a ball** because low temperature

Q.7. What is the working principle of syringe?

When the piston is pulled up, the atmospheric pressure inside the cylinder will decrease. The atmospheric pressure outside pushes the liquid up into the syringe

ANOTHER QUESTION

Fills in The Blanks with Appropriate Words

1. Woodpeckers have __sharp____ beaks to make holes in the trees.

2. A town's water-supply comes from a reservoir on higher ground or a water storage tank, called ___a stand pipe or water tower___

3. A___stand pipe_____ or a tower, at the top of a tower.

4. The gas layer surrounding the earth is called the Air (Atmospheric) Pressure

5. If the area of contact is increased, the pressure decreases

7. The force exerted per unit area on a surface by the weight of air is called (Atmospheric) Pressure

8.Pressure is the ratio of to (force and area) Which Statement is True (T) or False (F):

9.(F) Vacuum Cleaner a way to remove a liquid from a tank.

10.(T) The atmosphere is about 900 km thick.

11.(F) Pressure of liquid on base of container depends on only mass of the liquid- -

12. (T) The air pressure is at its greatest at sea level, since there are so many molecules present, and it decreases as height increases

13. (F) Like liquids, gases also don't exert pressure on the walls of a container

15. A 500 N boy whose total, shoes area is 0.5m^2 stands on the floor. What is the pressure exerted by the boy on the floor?

$$P = \frac{F}{A} = \frac{450N}{1.5\,m^2} = \frac{4500N}{15m^2} = 300Pa$$

16. The bottom side of the sea's depth is the 50 m, Find the water pressure of the bottom side of the sea. (d_{water}=1.00x10^{3}kg/m^3; g=10 N/kg)

P = h X d X g

P = 50m X 1.00x10^{3}kg/m^3 X 10 N/kg =5 x 10^5 Pa

17.The rectangular block shown in the figure has a mass of 3600 kg and the area of the base is 9 m^2. What is the pressure exerted on the ground? sea. (d_{water}= 1.00 x 103kg/m^3; g= 10 N/kg)

18. Explain why we don't feel the atmospheric sure?

19. How do objects float in water?

20. Calculate the pressure for the following situation

21. The bottom side of the sea's depth is the 50 m. Find the water pressure of the bottom side of the

6

CHAPTER 6 الفصل السادس

HEAT AND TEMPERATIRE

الاستاذ وليد خالد الفتلاوي

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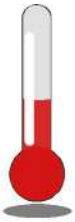


CHAPTER 6 HEAT AND TEMPERATIRE

الحرارة ودرجة الحرارة

HEAT: as a form of energy flowing between two bodies in contact when they are at different temperatures.

الحرارة: هي شكل من أشكال الطاقة المنسابة بين جسمين متماسين عندما يكونان في درجات حرارة مختلفة.

Temperature: is a measure of average kinetic energy of each particle of an object.

The Kinetic Theory of Matter.

درجة الحرارة: هي مقياس لمعدل الطاقة الحركية لكل جسيم من الجسم.

النظرية الحركية للمادة.

Thermal equilibrium when the transfer of heat between objects in thermal contact ceases.

What are some ways that we use heat?

, Warm buildings and Dry clothes

الاتزان الحراري عندما يتوقف انتقال الحرارة بين الأشياء في الاتصال الحراري.

ما هي بعض الطرق التي نستخدم بها الحرارة؟

والمباني الدافئة والملابس الجافة

Heat exchange

If two substances at different temperatures are brought into contact, heat energy starts to flow from the **hotter** object to the **cooler** one as illustrated. When they reach the same final temperature, heat flow stops.

التبادل الحراري

إذا كان هناك تماس بين مادتين عند درجات حرارة مختلفة ، تبدأ الطاقة الحرارية بالتدفق من الكائن الأكثر حرارة إلى العنصر الأكثر برودة. عندما يصلون إلى نفس درجة الحرارة النهائية ، يتوقف تدفق الحرارة.

The principle of conservation of heat energy the heat lost by the hot object is equal to the heat gained by the cold object.

مبدأ الحفاظ على الطاقة الحرارية الحرارة المفقودة من الجسم الساخن يساوي الحرارة المكتسبة من الجسم البارد.

We can state this in a formula as;

$$\text{Heat lost}_{\text{by hot object}} = \text{Heat gained}_{\text{by cold object}}$$

$$Q_{\text{lost}} = Q_{\text{gained}}$$

thermal expansion: is the tendency of matter to change in shape, area, and volume in response to a change in temperature.

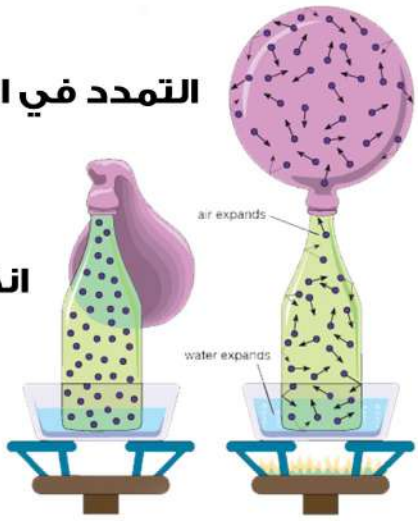
التمدد الحراري: هو ميل المادة إلى التغيير في الشكل والمساحة والحجم استجابة لتغير في درجة الحرارة.

Expands an object gets larger without gaining any matter.

التمدد في الاجسام تصبح اكثبر حجما دون اضافة مادة جديدة.

contracts an object gets smaller without losing any matter.

انكماش الجسم يصبح اصغر دون فقدان اي مادة.



The amount of expansion or contraction depends upon three factors:

1.The size of the object

2. The type of substance it is made of

3. The temperature change of the substance

يعتمد مقدار التمدد أو الانكماش على ثلاثة عوامل:

1. حجم الجسم

2. نوع المادة التي يتكون منها

3. تغير درجة حرارة المادة

Why are there gaps between railway bars and at the ends of bridges?

How do balloons float in air?

Why does a glass crack when hot water is poured into it?

Because thermal expansion.

لماذا توجد فجوات بين قضبان السكك الحديدية وعند أطراف الجسور؟

كيف تطفو البالونات في الهواء؟

لماذا يكسر الزجاج عندما تسكب المياه الساخنة فيه؟

كل ذلك بسبب التمدد الحراري.

Expansion of gas: When a gas is heated in a container, molecules move faster, collide with each other, and move farther apart. As a result, the volume increases and the gas expands.

تمدد الغاز: عندما يتم تسخين الغاز في حاوية ، تتحرك الجزيئات بشكل أسرع وتتصادم مع بعضها البعض ، وتتحرك أبعد. ونتيجة لذلك ، يزداد الحجم ويتمدد الغاز.

Expansion of Liquids: When a liquid is heated the motion of the molecules increases and they spread farther apart so that the liquid occupies a greater volume.

تمدد السوائل: عند تسخين السائل ، تزداد حركة الجزيئات وينتشر بعضها بعيدًا بحيث يحتل السائل حجمًا أكبر.

Expansion of Solids: Solids expand for the same reasons as gases and liquids; heated particles in a solid vibrate faster and move farther apart, and thus occupy a larger volume.

تمدد المواد الصلبة: تتوسع المواد الصلبة للأسباب نفسها مثل الغازات والسوائل. الجسيمات الساخنة في المواد الصلبة تهتز بشكل أسرع وتتحرك مبتعدة ، وبالتالي تحتل حجم أكبر.

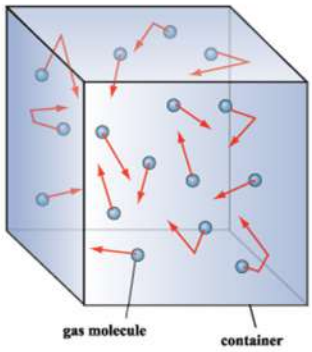
All of the particles that make up matter are constantly in motion

Solid= vibrating atoms

Liquid= flowing atoms

Gas= move freely

Plasma= move incredibly fast and freely



A thermometer: is a narrow glass tube with a bulb filled liquid with mercury or alcohol.

المحرار: هو أنبوب زجاجي ضيق به سائل مملوء ببصلة (شكل الدورق) يحتوي على زئبق أو كحول.

The Celsius scale:	The Fahrenheit scale:	The Kelvin scale:
Water freezes at 0° Celsius.	Water freezes at 32° Fahrenheit.	Water freezes at 273 Kelvin.
Water boils at 100° Celsius.	Water boils at 212° Fahrenheit.	Water boils at 373 Kelvin.
التدريج السيليزي	تدريج فهرنهايت:	تدريج كلفن:
نقطة انجماد الماء عند 0 درجة سيليزية.	نقطة انجماد الماء في 32 درجة فهرنهايت.	نقطة انجماد الماء في 273 كلفن.
نقطة غليان الماء عند 100 درجة سيليزية.	نقطة غليان الماء في 212 درجة فهرنهايت.	نقطة غليان الماء في 373 كلفن.

Constructing a thermometer in practice the freezing and boiling points of water are used as reference points for thermometers, because pure water is readily obtainable and easy to freeze and boil. When the bulb of a thermometer is inserted into boiling water, the liquid rises in the tube and remains at a constant level during boiling. This point is called **the upper fixed point** and the level of the liquid is assigned **100** on the thermometer. When the water is cooled down, the liquid level drops until ice forms in the water. This point is called **the lower fixed point**, it is assigned **0** on the thermometer.

بناء مقياس حرارة من الناحية العملية يتم استخدام نقاط الانجماد وغليان الماء كنقاط مرجعية لمقاييس الحرارة ، لأن المياه النقية يمكن الحصول عليها بسهولة وسهلة الانجماد والغليان. عندما يتم إدخال محرار في ماء مغلي ، يرتفع السائل في الأنبوب ويبقى على مستوى ثابت أثناء الغليان. وتسمى هذه النقطة النقطة الثابتة العليا ويتم تعيين مستوى السائل 100 على المحرار. عندما يتم تبريد الماء ، ينخفض مستوى السائل حتى يتشكل الجليد في الماء. وتسمى هذه النقطة بالنقطة السفلية الثابتة ، ويتم تعيينها على المحرار.

the Celsius scale by dividing the distance between **upper** and **lower fixed points** into **100** equal parts, we obtain a thermometer scale which indicates small changes in temperature.

التدريج السيليزي :عن طريق قسمة المسافة بين النقاط الثابتة العلوية والسفلية إلى 100 جزء متساوٍ ، نحصل على مقياس المحرار يشير إلى تغيرات طفيفة في درجة الحرارة.

absolute zero (The Kelvin scale) is the lowest possible kinetic energy at this point of particles in a substance.

الصفر المطلق (مقياس كلفن) هو أدنى طاقة حركية ممكنة عند هذه النقطة من الجسيمات في المادة.

Absolute zero = 0 K = −273 °C

K=273+°C

F=1.8 x °C + 32

Example 6.1 page # 71

If the temperature on a summer's day is 30°C, what is the temperature in terms of degrees Fahrenheit?

Calculations:

Use the given data in the formula:

F=1.8 x °C +32

F=1.8 x 30 + 32

F= 54 + 32 = 86 F

Result: The *temperature is 86 F*

Exercise 6.1

Liquid nitrogen boils at 77 °C, what is this temperature in terms of degrees Kelvin?

Ans: 350 K

Calculations:

Use the given data in the formula:

K=273+°C

K=273+77°C

K=350K

QUESTIONS of CHAPTER 6

Q.1. Fill in the blanks

a) When a substance is heated, its molecules move_faster__.

b) Heat flows form____hotter _____ object to____cooler_____ object.

c) ___Temperature____is measure of average kinetic energy of each particle in the object.

d) If objects are in thermal equilibrium, their__temperature_____ are same,

e) Freezing point of water at sea level is____0°___ C

f) boiling point of water at sea level is ____373____k.

g) 0K equals__-273°___ C

h) Scales of thermometer at our homes starts from___0°C___ to__100°C____ .

Q.2 Choose the correct answer.

1. A device that measure temperature is:

a) thermometer b) microscope c) barometer d) calorimeter

2. the boiling point of liquid hydrogen is -252.87°C,

What is the value of this temperature on the Fahrenheit scale?

a.20.28°F b.-220.87°F c.-423.2°F d.0°F $F=1.8 \times °C + 32 \Rightarrow F=1.8 \times -252.87°C + 32 = -423.2°F$

3. Which one of the following effect changes scale of thermometer which is placed in substance?

a) changing size of substance b) charging temperature of substance c) charging chemical property of substance d) changing color of substance

4. What is freezing point of water at sea level in Kelvin?

a) 237 b) 273 c) 0 d)-273

5. If we want to get two objects in thermal equilibrium:

a) objects are made by insulated material b) objects are painted with different colors c) one of them is immersed to hot water and the other is immersed to cold water. d) objects are getting into contact

(2)Which one of the following affects to kinetic energy of an object?

a) mass of object b) shape of object c) temperature of object d) heat of object

Q.3 What is freezing point of water at sea level?

a) in Celsius 0°C b) in Kelvin 273K

Q.4 What does substance gain if it is heated?

the substance particles gain kinetic energy (thermal energy) and move faster

Q.5 Why part of medical thermometers that contains mercury is designed as narrow?

because a noticeable change in the height of the liquid

Q.6 What is the type of thermometer which is used in industry?

Thermocouples

Q.7 Which substances radiate electromagnetic energy, hot substances or cool substances?

hot substances radiate electromagnetic energy

Q.8 Convert the following temperature scales to each other:

a) 86 °C =_____ K ⇒ K=273+°C ⇒ K=273+86 °C = 359 K

b) 20 °C=_____ F ⇒ F=1.8 x °C +32 ⇒ F=1.8 x 20°C +32 = 68 F

c) 373 K =_____ F ⇒ °C=373-273 =100°C ⇒F=1.8 x 100 +32= 212F

d)40 °C=_____ K ⇒ K=273+°C ⇒ K=273+40 °C = 313 K

OTHER QUESTIONS

Fills in The Blanks with Appropriate Words:

(1) **thermal equilibrium** transferred from an object at higher temperature to an object at lower temperature.

(2) If the particles of object A have greater **kinetic energy** of object B, object A is at a higher temperature than object B.

(3) **expansion of solid** same reasons as gases and liquids; heated particles in a **solid** vibrate faster and move farther apart, and thus occupy a larger volume.

(4) **thermometer** a narrow glass tube with a liquid placed inside it.

Which Statement is True (T) or False (F):

(5) (F) The amount of expansion or contraction depends upon two factors.

(6) (T) When a liquid is heated, the motion of the molecules increases and they spread farther apart so that the liquid occupies a greater volume.

(7) (F) Heat flows cold to hot. (T, hot to cold)

(8) (T) Kelvin, Celsius and Fahrenheit are all measures of temperature. (T)

(9)(F) 100 Kelvin is the temperature of absolute zero. (F, 0 Kelvin)

(10) (T) Heat is a form of energy. (T)

(11) (F) The boiling point of water is 90 degrees Celsius(F,100 degrees Celsius)

(12) (T) Temperature is the measurement of this particle movement. (T)

Choose the right statement below:

(13) Solids will _____ when heated.

A) Become denser

B) Contract

C) Get heavier

D) Expand

(14) Celsius scale has 100 divisions between standard points. Each division on this scale is equal to:

A) 4°C

B) 2°C

C)1.8°C

D)1°C

(15) In the Fahrenheit scale, water boils at:

A)32° F

B)180°F

C)212°F

D)100°F

(16) What is freezing point of water at sea level in Kelvin?

A)237

B)273

C) 0

D) -273

(17) Which of the following can be measured with a thermometer?

A) Heat

B) Radiation

C) Temperature

D) All of the above

Answer the Following Questions

(18) What does substance gain if it is heated? Explain.

The substance gains kinetic energy (thermal energy)

(19) How does a thermometer work to measure the heat of an object?

When the bulb of a thermometer is inserted into boiling water, the liquid rises in the tube and remains at a constant level during boiling.

(20) When iron is heated does it expand or contract?

It expands

(21) What is the different between heat and temperature?

CHAPTER 7

الفصل السادس

HEAT TRANSFER

الاستاذ وليد خالد الفتلاوي

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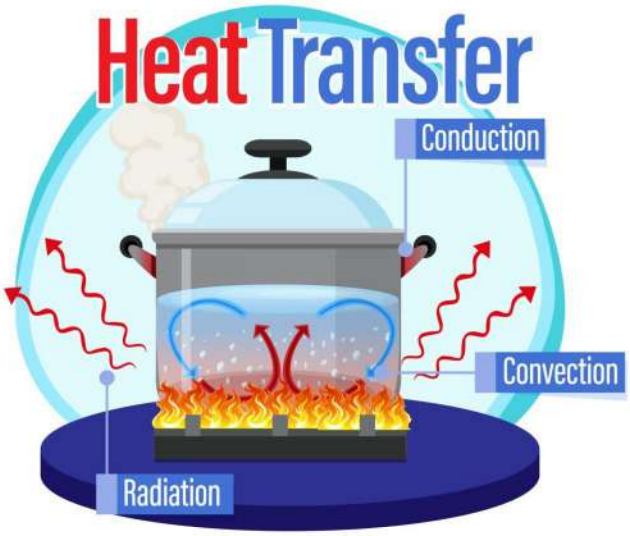
CHAPTER 7 HEAT TRANSFER

انتقال الحرارة

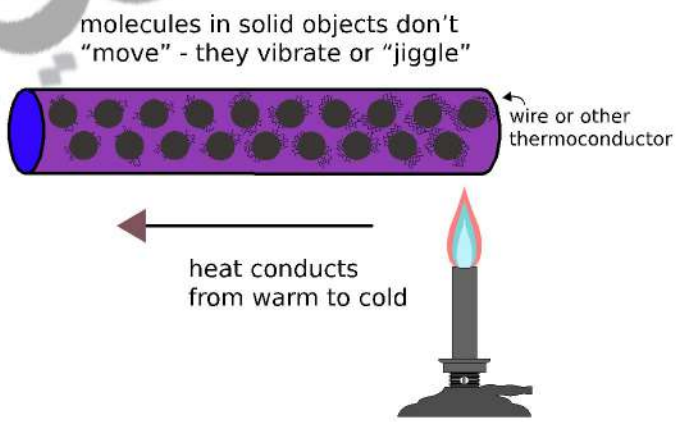


There are three ways for heat to travel:هنالك ثلاث طرق لانتقال الحرارة

(1) conduction (2) convection (3) radiation

(1)التوصيل (2) الحمل (3) الاشعاع

(1) Conduction is the flow of heat through matter by the collision of particles from the places of higher temperature to the places of lower temperature.



Most metals are good **conductors** of heat; e.g.: iron, copper, aluminum and silver.

(1) التوصيل هو تدفق الحرارة من خلال المادة عن طريق تصادم الجسيمات من أماكن درجة الحرارة العالية إلى أماكن درجة الحرارة المنخفضة.

معظم المعادن هي الموصلات الجيدة للحرارة. على سبيل المثال: الحديد والنحاس والألومنيوم والفضة

Insulators Some materials such as wood, glass, cork, paper and plastic are poor conductors of heat.

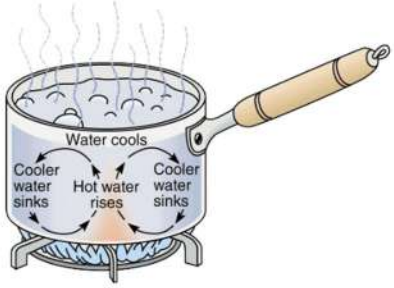
العوازل بعض المواد مثل الخشب والزجاج والفلين والورق والبلاستيك هي موصلات ضعيفة للحرارة.

Insulators are used to prevent heat transfer between hot and cold places, such as water pipes, ovens, refrigerators and the grooves and walls of buildings. For instance, the handles of saucepans and kettles are made from insulators to prevent our hands from burning

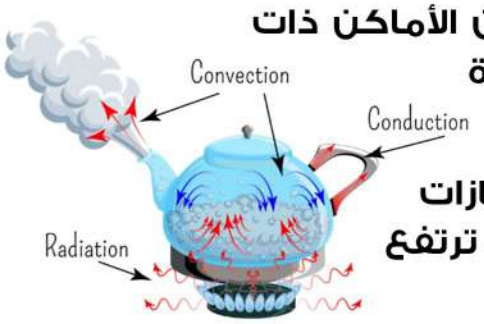
تستخدم العوازل لمنع انتقال الحرارة بين الأماكن الساخنة والباردة ، مثل أنابيب المياه والأفران والثلاجات والقفازات وجدران المباني. على سبيل المثال ، تصنع مقابض القدور والغلايات من العوازل لمنع أيدينا من الاحتراق.

(2) Convection is the flow of heat through a fluid from places of higher temperature to the places of lower temperature by the movement of the fluid itself.

is the movement of groups of molecules within fluids such as gases and liquids, molecules expand on base and molecules which have lower density moves up?



Cold molecules which have Heavier density takes place of them.



2) الحمل الحراري هو تدفق الحرارة من خلال السائل من الأماكن ذات درجة الحرارة المرتفعة إلى الأماكن ذات درجة الحرارة المنخفضة عن طريق حركة السائل نفسه.

حركة مجموعات الجزيئات داخل السوائل مثل الغازات والسوائل ، تتوسع الجزيئات على القاعدة والجزيئات التي ترتفع الكثافة؟

الجزيئات ذات الكثافة الاثقل (الاكثر برودة) تحتل مكان الجزيئات ذات الكثافة الاصغر (الاكثر سخونة).

(3) Radiation is the" flow of heat from one place to another by means of electromagnetic waves.

the heat from the sun reaches us through space although there is no matter. When radiation falls on an object, it is partly reflected, partly transmitted and partly absorbed. Absorbed heat causes the molecules of the object to vibrate more, and so the object becomes hot.

(3) الإشعاع هو "تدفق الحرارة من مكان إلى آخر بواسطة الموجات الكهرومغناطيسية.

الحرارة من الشمس تصل إلينا عبر الفضاء بالرغم من عدم وجود أي شيء (الفراغ). عندما يسقط الإشعاع على جسم ما ، ينعكس جزئيا وينتقل جزئيا ويتم امتصاصه جزئيا. تؤدي الحرارة الممتصة إلى اهتزاز جزيئات الكائن أكثر ، وبالتالي يصبح الجسم ساخناً.

Good emitters and bad emitters) Bright shiny surfaces are good emitters of heatC.

بواعث جيدة و بواعث سيئة(الأسطح اللامعة المشرقة هي من بواعث الحرارة الجيدة).

Good absorbers and bad absorbers (للحرارة) الافضل امتصاص والاسوء امتصاص

Dull black surfaces are better absorbers of radiation than white shiny surfaces. Because of this, the insides of solar collector panels are painted black colour.

الأسطح السوداء الباهتة هي أفضل امتصاص للأشعة من السطوح البيضاء اللامعة.

وبسبب هذا ، تم طلاء الدواخل من ألواح تجميع الطاقة الشمسية باللون الأسود.

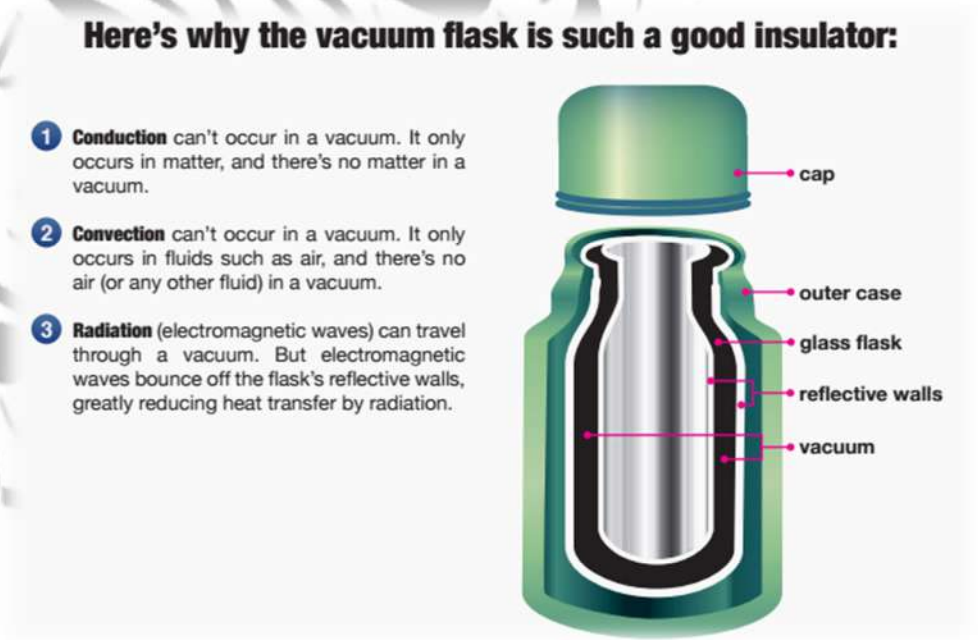
Vacuum flasks

A vacuum or thermos flask keeps hot liquids hot or cold liquids cold.

It is very difficult for heat to travel into or out of a vacuum flask because it is designed to minimize conduction, convection and radiation. Vacuum flask is a double walled glass bottle with a vacuum between the walls. Radiation is reduced by silvering both walls on the vacuum side. The vacuum prevents energy transfer by stopping conduction and convection.

الترموس

الترمس او اناء حافظ الحرارة (اناء عازل للحرارة) تحافظ على السوائل الساخنة الباردة أو السوائل الباردة. من الصعب جدًا أن تنتقل الحرارة إلى أو خارج الترموس لأنها مصممة لتقليل التوصيل والحمل الحراري والإشعاع.



إن الترموس عبارة عن قنينة زجاجية مزدوجة الجدران مع فراغ بين الجدران. يتم تقليل الإشعاع عن طريق تلبيس الجدران على جانب الفراغ. الفراغ يمنع نقل الطاقة عن طريق وقف التوصيل والحمل الحراري.

Home heating systems Heating systems include set, warm air, hot-water and solar heating. systems which depend upon convection currents to distribute heat.

أنظمة التدفئة المنزلية تشمل والهواء الدافئ ، والماء الساخن والتسخين الشمسي. الأنظمة التي تعتمد على التيارات الحمل لتوزيع الحرارة.

Solar heating system

The sunlight entering through, the glass warms the sunspace during the day. Then the air ventilation al- lows the heat to circulate into the room.

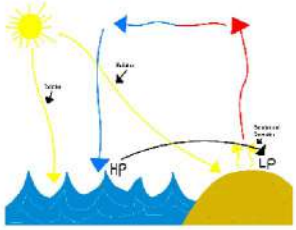
نظام التدفئة الشمسية

ضوء الشمس يدخل من خلال الزجاج يدفئ خلال النهار. ثم تيارات الحمل الهواء تسخن الحرارة لتتدور في الغرفة.

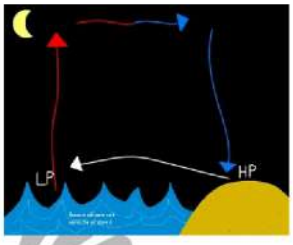
chapter questions

Q.1 Fill in the blanks

1. _Hair, lint, wool, fur and feathers_ Keep animals warm.
2. Heat is transferred from Sun to Earth by _Radiation__
3. Windows with double glasses keep room ___warm_____
4. In __Winter (cold day)_ days thick clothes, in _SummerChot day)__ days thin clothes are worn.
5. When ____night____ land breeze occurs, when ____day____ sea breeze occurs.



6.___A vacuum (thermos flask) _____ prevents cooling of hot drinks and overheating of cold drinks.



7. Heat is transferred by ___Conduction____ in solid and transferred by __Convection_____ in liquid.

8. When a container that is filled by liquid is heated, molecules expand on base and molecules which have _____low_____ density moves up. Cold molecules which have _____high_____ density takes place of them.

Q.2 Choose the correct answer.

1. Which one of the followings is the best thermal conductor?

a) glass b) aluminum **c) copper** d) iron

2. Which one of the following is heat insulator?

a) wool b) iron c) silver d) aluminum

3. Air inside the balloon is heated, because:

a) air constructs, its density increases and balloon rises

b) air expands, its density decreases and balloon rises

c) in order the keep molecules a medium is generated ability of heat transfer of air increases

Q.3 Explain

a) heat is placed at the base of cattle

When cattle that is filled by liquid is heated, molecules expand on base and molecules which have **low** density moves up. Cold molecules which have **high** density takes place of them this call Convection thermal.

b) Freezing compartment places to upper part.

Because freezer is the source for the refrigerator's coldness. When the freezer is placed on top, the cold air produced from it is denser than the warmer air in the bottom. So, cold air being dense sinks down and the warm air is forced to rise up so when the warm air rises up it and gets cold in the freezer.

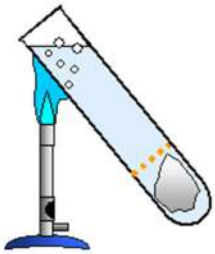
Q.4 Compare conduction, convection and radiation

ASIS FOR OMPARISON	ONDUCTION	ONVECTION	ADIATION
Meaning	Conduction is a process in which transfer of heat takes place between objects by direct contact.	Convection refers to the form of heat transfer in which energy transition occurs within the fluid.	Radiation alludes to the mechanism in which heat is transmitted without any physical contact between objects.
Represent	How heat travels between objects in direct contact.	How heat passes through fluids.	How heat flows through empty spaces.

Q.5 Explain water is bad but copper is good thermal conductor by activities.

Work Tools:

Test tube, water, Wire gauze, ice cube and Bunsen burner



The method of work:

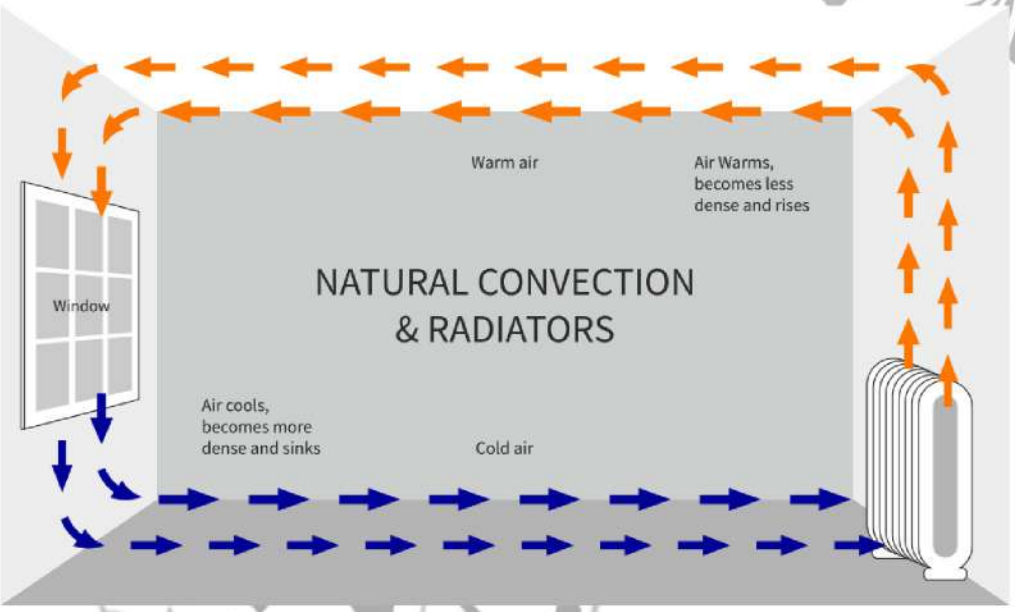
- If you fix an ice cube at the bottom of a test tube of water (you need to use a weight (Wire gauze) to do this otherwise it will float to the surface as ice is less than water)
- and then heat the water at the top of the Tube.
- you will find that the water will boil at the top of the tube and yet the ice cube will remain frozen.
- This is because water is a poor conductor of heat.

Summary:

Conduction is the method of heat travel through a solid, unlike what happens during convection, no net movement of matter takes place.

Q.6 Show convection currents in the room that a heater is placed in it.

The hot air from the hot radiator raises upwards and the cool air from the windows enters the room and the cycle continues until the room reaches a final constant temperature.



OTHER QUESTIONS

Fill in The Blanks with Appropriate Words

1. Metals are generally _____conductors of heat.
2. _____keeps animals warmer in winter.
3. Firemen wear _____suits.
4. _____keeps hot liquid hot for a long time.
5. In space, matter does not exist so convection and _____do not occur.
6. Shiny surfaces are _____emitters.

Choose the Correct answer

1. How is air heated in our atmosphere?

A) Radiation

B) Conduction

C) Convection

2. The transfer of heat between substances that are in direct contact with each other is called what?

A) Radiation

B) Convection

C) Conduction

D) Heat Transfer

3. You walk barefoot on the hot street and it bums your toes. This is an example of...

A) Conduction

B) Convection

C) Radiation

Which Statement is True(T) or False (F)

4. (.....)Heat can travel in three ways: conduction, convection and radiation.

5. (.....) Clothes do not prevent our body from losing heat they just heat us.

6. (.....) An electric fire heats the room by convection.

Answer the Questions

7. What is the difference between conduction and convection? Explain with examples.

8.Why do we wear thick clothes in winter and bright clothes in summer?

9. What are good and bad absorbers emitters of radiation? give example

10. Explain how home heating systems work.

8

CHAPTER 8 الفصل السادس

STATES OF MATTER

الاستاذ وليد خالد الفتلاوي

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CHAPTER 8 STATES OF MATTER

الفصل الثامن (8) حالات المادة

States of matter

Matter is found in three states; solid, liquid and gas.

SOLID

particles are closely packed and they can only vibrate back and forth about fixed positions

LIQUID

the particles are close to each other but not in a fixed position. They can slide over each other

GAS

particles are far apart from each other. They have very high kinetic energy and they can fill the empty space around them completely

Melting: is the change of state from solid to liquid by heating.

- The melting point of a solid is a characteristic property of matter, every solid has a different melting point.

Specific latent heat fusion (L_f) is the quantity of heat energy needed to change 1 kg mass of a solid into a liquid without any change in temperature.

الحرارة الكامة للانصهار (L_f): هي كمية الحرارة التي تحتاجها 1Kg من المادة للتتحول من حالتها الصلبة الى السائلة دون ان تتغير درجة حرارتها.

- Different solids have different values of specific latent heat of fusion. It is also a characteristic property of matter.
- In the SI unit system, it is measured in J/kg, and in thermal units it is measured in cal/g.

❖ The specific latent heat of fusion of ice is 335 000 J/kg, or 80 cal/g.

❖ المواد الصلبة المختلفة لها قيم مختلفة للحرارة الكامنة للانصهار. بل هو أيضا خاصية مميزة للمادة.

❖ في نظام وحدة النظام الدولي للوحدات، يتم قياسه بوحدة J / kg ، وفي الوحدات الحرارية يتم قياسه cal/g.

❖ الحرارة الكامنة للانصهار الجليد هي 335 000 J/kg, or 80 cal/g.

Freezing: is the change in state of matter from the liquid state into the solid state, without any change in temperature by cooling.

الانجماد: هو التغير في حالة المادة من الحالة السائلة الى الصلبة دون تغير في درجة الحرارة بواسطة التبريد.

❖ It is the reverse process of melting. انها معاكسة لعملية الانصهار

or any substance the specific latent heat of freezing is equal to the specific latent heat of fusion

$$L_{fusion} = L_{freezing}$$

❖ The specific latent heat of freezing of ice is 335 000 J/kg, or 80 cal/g.

Why the freezing point is the same as the melting point for matter?

because the process of freezing is the opposite process to melting.

لماذا تكون نقطة الانجماد هي نفس نقطة الانصهار للمادة؟

لأن عملية التجميد هي العملية المعاكسة للذوبان.

Evaporation: is the change of state from liquid into gas by heating.

التبخر : هي عملية تحول المادة من حالتها السائل الى حالتها الغازية بالتسخين.

- At all temperatures, some evaporation occurs at the surface of the liquid.
- Heat increases evaporation.

في جميع درجات الحرارة ، يحدث بعض التبخر على سطح السائل.

- الحرارة تزيد من التبخر.

Boiling: is Evaporation of a liquid. **الغليان : هي تبخر السائل**

The boiling point: Evaporation of a liquid, which boiling occurs. **نقطة الغليان هي تبخر السائل**

Specific latent heat of vaporization: is the quantity of heat required to change 1 kg of a liquid into its gaseous state without a change in temperature.

حرارة كامنة محددة للتبخر: هي كمية الحرارة اللازمة لتغيير 1 kg من السائل إلى حالته الغازية دون تغير في درجة الحرارة.

- In the SI unit system, it is measured in J/kg, and in thermal units it is measured in cal/g.The specific latent heat of vaporization of water is 2 260 000 J/kg, or in thermal units 540 cal/g.

Condensation: is the change of state from gas into liquid by cooling. (is the reverse process of vaporization)

التكثيف: هو تغير الحالة من الغاز إلى السائل عن طريق التبريد. (هي عملية معاكسة لعملية التبخر)

$$L_{vaporisation} = L_{condensation}$$

Sublimation: is the process by which a solid change directly into a gas.

For example, mothballs, iodine and dry ice (solid carbon dioxide) are some substances that sublimate at room temperature.

التسامي: هي العملية التي يتم من خلالها تغيير الحالة الصلبة مباشرة الى الحالة الغازية.

على سبيل المثال ، مثل الكرات النفثالين واليود والثلج الجاف (ثاني أوكسيد الكربون الصلب) هي بعض المواد التي تتسامى عند درجة حرارة الغرفة.

Factors affecting the boiling point liquids

The important effect on boiling point is **pressure** and **heat energy**

The effect of pressure can be explained by the kinetic theory

The particles, having **gained** enough kinetic energy to **escape** from the liquid must also overcome the air pressure above the liquid.

If the air pressure is **high**, the particles **leaving** the liquid can be **condensed** back into the liquid form.

Only liquid particles with very high energy can change into the gaseous state. By **lowering** the gas pressure over the liquid, the particles **escape** more easily from the liquid.

Thus, we can say that **increasing** the air pressure **increases** the boiling point, and **decreasing** the pressure **decreases** the boiling point of the liquid.

At higher altitudes, for **example** at the top of mountains, the air pressure is lower so the boiling point of water decreases. For example, water boils at 88 °C at the top of Uludao in Bursa and at 70 °C at the top of mount Everest.

العوامل التي تؤثر على نقطة غليان السوائل

التأثير المهم على نقطة الغليان هو الضغط والطاقة الحرارية

يمكن تفسير تأثير الضغط من خلال النظرية الحركية

يجب على الجزيئات ، بعد أن اكتسبت طاقة حركية كافية للهروب من السائل ، أن تتغلب أيضًا على ضغط الهواء فوق السائل.

إذا كان ضغط الهواء عاليًا ،فيمكن للجزيئات التي تترك السائل تعود لتتكثف.

يمكن فقط للجزيئات السائلة ذات الطاقة العالية أن تتغير إلى الحالة الغازية. عن طريق خفض ضغط الغاز على سطح السائل ، تهرب الجزيئات بسهولة أكبر من السائل.

وبالتالي ، يمكننا القول أن زيادة ضغط الهواء يزيد من نقطة الغليان ، ويقلل الضغط من انخفاض درجة غليان السائل.

على ارتفاعات أعلى ، على سبيل المثال في الجزء العلوي من الجبال ، يكون ضغط الهواء منخفضًا حتى تنخفض نقطة غليان الماء. على سبيل المثال ، يغلي الماء عند 88 °C في الجزء العلوي من Uludao في مدينة بورصة وعند 70 ° في قمة جبل ايفرست.

Lowering the freezing points

If a solid is dissolved in a liquid, the liquid freezes at a lower temperature

This is because the substance added to the liquid causes it to form a regular arrangement of its molecules at a lower temperature.

For example, if we dissolve some salt in water, it freezes below 0°C, and also if ice is not pure, it melts at a temperature lower than 0 °C.

- This is why salt is scattered on icy roads in winter
- Another example of lowering the freezing point of a substance is to add a special liquid to the car motors in winter to decrease the freezing point, this liquid is called anti-freeze.

خفض نقطة الانجماد

إذا تمت إذابة مادة صلبة في سائل، يتجمد السائل عند درجة حرارة أقل

وذلك لأن المادة المضافة إلى السائل تتسبب في تكوين ترتيب منتظم لجزيئاتها عند درجة حرارة منخفضة.

على سبيل المثال، إذا قمنا بحل بعض الملح في الماء، فإنه يتجمد إلى ما دون الصفر، وكذلك إذا لم يكن الثلج نقيًا، فإنه يذوب عند درجة حرارة أقل من 0 °C.

- هذا هو السبب في انتشار الملح على الطرق الجليدية في فصل الشتاء

- مثال آخر على خفض نقطة تجمد مادة ما هو إضافة سائل خاص لمحركات السيارات في فصل الشتاء لخفض نقطة التجمد، ويسمى هذا السائل مانع التجمد.

Pressure decreases melting point

Regelation (re-freezing): is the process of melting by pressure.

The ice block stands on two supports. A thin copper wire is placed around the block with a weight suspended from it. The high pressure of the copper wire lowers the melting point, so the ice melts, and the wire slowly falls through. As the wire moves down, the water above it will freeze again, and the ice will be just as solid as it was before. This process of melting by pressure and **re-freezing** is called **Regelation**.

يقلل الضغط نقطة الانصهار

الوصية (إعادة التجميد): هي عملية الذوبان بالضغط.

كتلة الجليد تقف على دعامتين. يتم وضع سلك نحاسي رفيع حول الكتلة مع تعليق وزنه منه. يخفض الضغط العالي للسلك النحاسي نقطة الانصهار، لذا يذوب الجليد، ويسقط السلك ببطء. عندما يتحرك السلك، فإن الماء فوقه سوف يتجمد مرة

أخرى، وسوف يكون الثلج صامدا كما كان من قبل. تسمى عملية الذوبان هذه بواسطة الضغط وإعادة التجميد بـ Regelation.

Cooling produced by evaporation

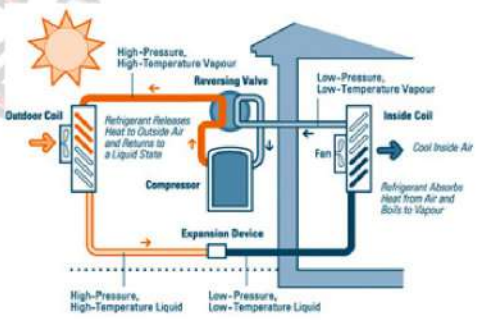
When a liquid evaporates, it absorbs energy from its surroundings: as a result, the surroundings cool

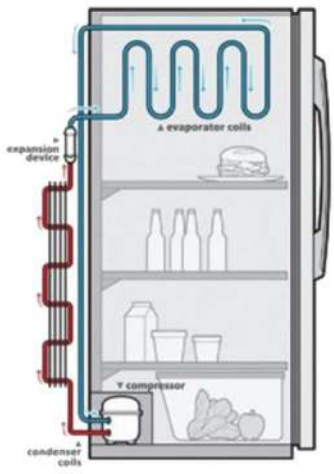
This is why people feel cool after swimming or having a bath. Some liquids have low boiling points; therefore, they can change into the vapour state more easily. Methylated spirits and ether are two examples. If a little ether is poured onto a hand, it evaporates rapidly by absorbing heat from the hand, making the hand feel cooler.

Refrigerators and air conditioners work with liquids that have low boiling points. Usually, **Freon** gas is used in 

refrigerators to carry heat from the cooling unit to the outside. **Pipes** inside and outside the refrigerator are used to pump the Freon around the fridge. An **electric pump** removes the Freon vapour inside the cooling unit and reduces the pressure.

Thus, the boiling point of the Freon is lowered. Evaporating Freon, absorbs latent heat from the freezing unit. The pump compresses the vapour into the condensing unit outside the refrigerator. This unit is a high-pressure area and Freon vapour changes into liquid, losing the latent heat of vaporisation to the surrounding air. The continuous recycling of Freon in the pipes keeps the inside of the refrigerator cool. Air conditioning systems also work using the same principle.





QUESTIONS of CHAPTER 8

Q.1 Choose the correct answer

1. Sublimation is:

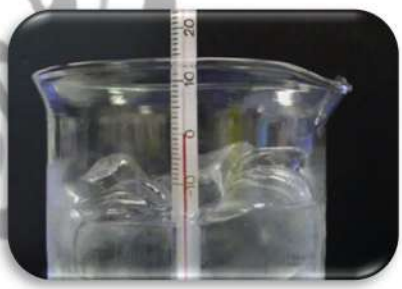
a) change of state of matter from solid state to liquid state

b) change of state of matter firstly from solid state to liquid state, then to gaseous state

c) change of state of matter from liquid state to solid state

d) change of state of matter directly from solid state to gaseous state

2. Melting point of ice is 0 °C at:



a) At standard atmospheric pressure

b) Pressure that greater than atmospheric pressure

c) Pressure that less than atmospheric pressure

d) Pressure does not affect

3. Boiling point of water is:

a) 0°C

b) less than 0°C

c) greater than 0°C

d) water boils at any temperature

Q.2 The sentences below are **True** or **False**. If False correct sentences without changing underlined words.

1. **Melting** is change in state of matter from **liquid** state to **solid** state. **False** **solid state to liquid**

2. Ice at 0°C melts by heating and applying pressure. True

3. Specific latent heat of fusion is the quantity of heat energy needed to change 1kg mass of a solid into a liquid without any change in temperature. True

4. The specific latent heat of **vaporization** of water is 336kj. False 2 260 Kj

5. Condensation is change in state of matter from gaseous state to liquid state. True

6. Water loses heat without **increasing** its temperature. False decrease

7. Evaporation speeds of substances are **same**. False different

8. People in Basra have trouble in summer because of dry. False wet

9. Evaporation speed of liquids increase when they are exposed to drafts. True

Q.3. Fill in the blanks

1. Specific latent heat of fusion of water at 0°C is 335 JK/kg, or 80 cal/g

2. Water freezes under 0°C by increase pressure.

3. Cold water boils by decrease pressure.

4. Evaporation is the change of state from liquid into gas by heating.

5. When salt is added to water, freezing point of mixture low

6. Vapor lose heat when it condenses.

Q.4. How does a refrigerator work?

Q.5. Sometimes we observe that cold fizzy drinks freeze after opening cap. Why?

This is because increased pressure reduces the point of freezing inside fizzy drinks,

Thus, releasing the pressure over fizzy drinks and the same temperature on which it freezes.

Q.6. Water loses heat during?

a) Evaporation

b) Condensation

c) Freezing

Q.7. In cold winter days, glass water bottles blow up. Why?

Because the water increases in volume (expand) when it is freezing.

Q.8. Explain why people tend to feel cold after having bath.

This is because evaporation is a cooling process

Q.9. Mud caps freeze when they are exposed to drafts. However, if glass caps are used instead of mud caps, they do not freeze. Explain, why?

Because of the pores in the Mud caps that allow the evaporation of water through which takes the heat necessary to evaporate from the Mud caps and cooled and thus cool the water inside, but the glass container does not have pores.