IGCSE Physics Worksheet

Pressure in Solids, Liquids, and Gases

Reading Passage / 閱讀文章

壓力是作用在單位面積上的力，用來表示力的集中程度。小面積承受相同的力會產生較高的壓力，而較大的面積則會產生較低的壓力。

固體中的壓力：當固體物體對表面施加力時，壓力取決於力的大小和接觸面積。刀刃的面積很小，因此能產生高壓力，容易切割。雪鞋的面積很大，因此能減低壓力，防止人在雪地中下陷。

液體中的壓力：液體會向各個方向施加壓力。壓力會隨深度增加，因為越深位置上方的液體重量越大。液體壓力也取決於液體的密度。

氣體中的壓力：氣體壓力是由氣體粒子撞擊容器壁產生的。當氣體受熱時，粒子運動加快，碰撞更頻繁且更用力，因此壓力上升。當容器體積減少時，氣體粒子有更少空間，碰撞次數增加，壓力也會上升。

Pressure is the force acting on a surface per unit area. A small force acting on a small area produces high pressure, while the same force spread over a larger area produces lower pressure.

Pressure in solids: When a solid object exerts a force on a surface, the pressure depends on both the force and the area of contact. A sharp knife has a small surface area, producing high pressure. Snowshoes have a large area, reducing pressure and preventing sinking.

Pressure in liquids: Liquids exert pressure in all directions. This pressure increases with depth because the deeper you go, the greater the weight of liquid above. Liquid pressure also depends on the density of the liquid.

Pressure in gases: Gas pressure is caused by gas particles colliding with container walls. When heated, particles move faster and collide more often, increasing pressure. Reducing the volume increases collision frequency and pressure.

Diagram / 示意圖

固體：小面積 → 高壓力
液體：深度越深 → 壓力越大
氣體：粒子撞擊容器壁 → 產生氣壓

Pressure in Solids, Liquids, and Gases

Solid:
Force ↓
[■■■■] Small area → High pressure

Liquid:
Increasing depth ↓
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~~~~~~~~ Pressure increases with depth

Gas:
Particles → ● ● ●
Collisions with container walls → Pressure

Multiple Choice / 選擇題

1. 什麼是壓力？ A. 力乘以面積 B. 單位面積上的力 C. 面積除以力 D. 單位體積的重量
2. 為何鋒利的刀較容易切割？ A. 力較大 B. 面積較大 C. 產生較高壓力 D. 材料較硬
3. 液體壓力隨深度增加是因為： A. 液體變冷 B. 上方液體重量增加 C. 密度減少 D. 液體流速增加
4. 下列哪一項不會影響液體壓力？ A. 深度 B. 密度 C. 溫度 D. 重力
5. 氣體壓力是由什麼造成的？ A. 粒子互相黏著 B. 粒子撞擊容器壁 C. 粒子在固定位置振動 D. 粒子失去能量
6. 氣體受熱時壓力會如何變化？ A. 減少 B. 不變 C. 增加 D. 變為零

1. What is pressure? A. Force multiplied by area B. Force per unit area C. Area divided by force D. Weight per unit volume
2. Why does a sharp knife cut more easily? A. It has more force B. It has a larger area C. It produces higher pressure D. It is made of metal
3. Liquid pressure increases with depth because: A. The liquid becomes colder B. There is more liquid above C. The density decreases D. The liquid moves faster
4. Which factor does not affect liquid pressure? A. Depth B. Density C. Temperature D. Gravity
5. Gas pressure is caused by: A. Gas particles sticking together B. Gas particles colliding with container walls C. Gas particles vibrating in fixed positions D. Gas particles losing energy
6. What happens to gas pressure when a
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gas is heated? A. It decreases B. It stays the same C. It increases D. It becomes zero

Structured Questions / 開放題

7. 解釋雪鞋如何減低在雪地上的壓力。
8. 為何水壩底部比頂部更厚？
9. 密封氣體容器被壓縮時，為何壓力會上升？
10. 比較固體、液體和氣體中壓力的產生方式。

7. Explain how snowshoes reduce pressure on snow.
8. Why are dams built thicker at the bottom?
9. A sealed gas container is squeezed to reduce its volume. Explain why the pressure increases.
10. Compare how pressure is produced in solids, liquids, and gases.

Answers / 答案

1. B 2. C 3. B 4. C 5. B 6. C
7. 雪鞋面積大，能把重量分散到更大的面積上，從而減低壓力。
8. 液體壓力隨深度增加，因此水壩底部承受最大壓力，需要更厚。
9. 體積減少後，氣體粒子活動空間變小，與容器壁碰撞更頻繁，因此壓力上升。
10. 固體：壓力取決於力和接觸面積；液體：壓力向各方向作用並隨深度和密度增加；氣體：壓力由粒子撞擊容器壁產生並受溫度和體積影響。

1. B 2. C 3. B 4. C 5. B 6. C
7. Snowshoes have a large surface area, spreading weight over a larger area and reducing pressure.
8. Liquid pressure increases with depth, so the bottom of a dam experiences the greatest pressure and must be thicker.
9. Reducing the volume gives gas particles less space, causing more frequent collisions with the container walls, increasing pressure.
10. Solids: pressure depends on force and contact area. Liquids: pressure acts in all directions and increases with depth and density. Gases: pressure is caused by particle collisions and changes with temperature and volume.