

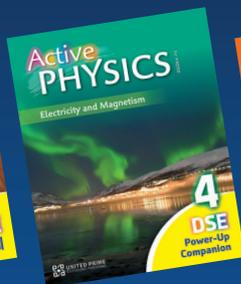
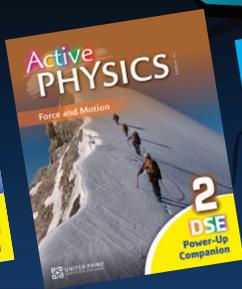
文憑試強力支援



DSE Power Package

教學考試

POWER UP

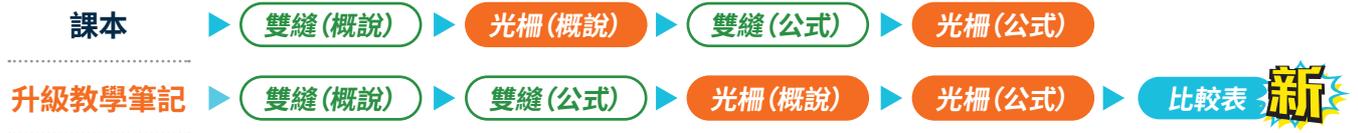


Power Teaching Notes 升級教學筆記

DSE Power-Up Companion 《DSE 升級特訓》*

Power Teaching Notes 升級教學筆記

- ★ 選取七大相對重要的課題，如作功與能量 (Work and Energy)、動量 (Momentum)、光波 (Light Waves) 及電路 (Circuits) 等，重新編排教學流程，令內容更歸一，層次更分明例：雙縫 (Double Slit) 及光柵 (Grating) 明確分成兩部分，並加入兩者的比較表，以便對照



- ★ 將內容拆細，以「小步子」方式，助學生循序漸進學習新概念；並於每個「小步子」後，提供堂課 (Classwork)，以確保學生掌握所學

講授內容

堂課

講授內容

堂課

- ★ 因應近年 DSE 考試趨勢，點出隱藏要點，一針見血例：混合波長的光柵圖案

課本

升級教學筆記

3.4 Analysis of white light

When white light is incident on a grating, due to the difference in wavelengths, spectra of coloured lights (bands) can be observed.

Notes:

- Since $\theta < 90^\circ$, all the colours overlap, forming a white fringe in the centre.
- For the same order n , red light diffracts more than violet light.
- The first band on the second hand does not overlap. The second band on the first hand overlaps.
- To determine the wavelengths of light in different bands that overlap, we use the following equation: $a \sin \theta = m\lambda_1 = m\lambda_2$

Classwork 7

When a certain monochromatic light is passed through a diffraction grating, a pattern of maxima and minima is observed. Which of the following combinations would produce the largest angle of grating (lines per mm)?

grating (lines per mm)	colour of light used
A. 300	red
B. 300	violet
C. 600	red
D. 600	violet

Solution:

From $a \sin \theta = m\lambda$, $\sin \theta = \frac{m\lambda}{a}$

More lines per mm = smaller a
red = longer λ

- ★ 突破教科書框架限制，突顯文憑試重點

例：雙縫公式的雙重假設，冠名「長程近似 $D \gg a$ 」、「小波長近似 $\lambda \ll a$ 」，以便記憶

Important

Therefore, under the long range approximation and the small wavelength approximation, the separation between successive bright fringes is given by

$$\Delta y = y_m - y_{m-1} = \frac{\lambda D}{a}$$

Classwork 4

Young's double slit. If $a = 0.25 \text{ mm}$, $D = 2.05 \text{ m}$, and the separation between the first and the second bright fringes is 4.2 mm .

(a) Find the wavelength of the light source.

(b) Find the angle for the first order bright fringe. Is the small angle approximation justified?

Solution:

(a) $\Delta y = \frac{\lambda D}{a} \Rightarrow \lambda = \frac{\Delta y a}{D} = \frac{4.2 \times 10^{-3} \times 0.25 \times 10^{-3}}{2.05} = 5.12 \times 10^{-7} \text{ m}$

(b) $\sin \theta = \frac{\lambda}{a} = \frac{5.12 \times 10^{-7}}{0.25 \times 10^{-3}} = 0.002048$

So, the small angle approximation is justified.

- ▲ 將近年在文憑試考核過的概念由原本藏於課本例題，改為獨立抽出來，特別開闢新章節來突顯此重點

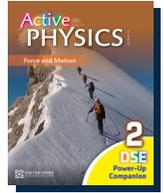
- ▲ 以色框效果突顯考試要點，確保學生不會遺留任何重點

DSE Power-Up Companion 《DSE 升級特訓》

★ 參考最新 DSE 試題及考試報告編寫，並提供兩大類型訓練

1. 重點題型特訓

針對特定 DSE 常見題型，透過習題方式，引導學生有系統地掌握解題關鍵及答題技巧，為學生注入滿滿的應試動力。



✓ 抽絲剝繭，針對 DSE 特定題型

✓ 點出解題關鍵，一針見血

✓ 以例題示範，具體解說

Multiple parallel layers

After being familiar with typical refraction through different media only, we have to proceed to handle multiple layers of medium. Don't worry! They Let's see.

1. Without total internal reflection

Based on DSE results and Report comments
2023-1A Q16, 2016-1A Q17, 2015-1B Q6, 2014-1A Q15, Practice Paper-1A Q20

DSE reference:
2014-1A Q15, Practice Paper-1A Q20

The general form of Snell's law states that $n_1 \sin \theta_1 = n_2 \sin \theta_2$. By applying it to situations with multiple layers of medium, we get

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$n_1 \sin \theta_1 = n_2 \sin \theta_2 = n_3 \sin \theta_3 = \dots = \text{const}$

Having the above equation, we can compare the refractive indexes n of all the layers at once ($\theta \uparrow \Leftrightarrow n \downarrow$). Together with the definition of refractive index

例題 1 一束光線從介質 1 傳播至介質 2，如圖所示。比較兩個介質的折射率 n ，以及光在兩個介質中的速率 v 。

■ 題解

從圖中可得 $\theta_1 > \theta_2$ 。

根據 $n_1 \sin \theta_1 = n_2 \sin \theta_2 = \text{常數}$ ， $\theta \uparrow \Rightarrow n \downarrow$ ，所以 $n_1 < n_2$ 。

由於 $n \propto \frac{1}{v}$ ， $n \uparrow \Rightarrow v \downarrow$ ，可得 $v_1 > v_2$ 。

✓ 反覆練習，精益求精

✓ 總結解題要點，速效吸收

(e) n_1 : _____
 v_1 : _____

(f) n_1 : _____
 v_1 : _____

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現在是時候動手練習。

在下列各題，標明角度 θ ，比較光在不同介質中的折射率 n 和速率 v 。

(a) θ : _____
 n : _____
 v : _____

(b) θ : _____
 n : _____
 v : _____

*In 2 and 4, light rays are \perp .

要點

- 根據

$$n_1 \sin \theta_1 = n_2 \sin \theta_2 = n_3 \sin \theta_3 = \dots = \text{常數}$$

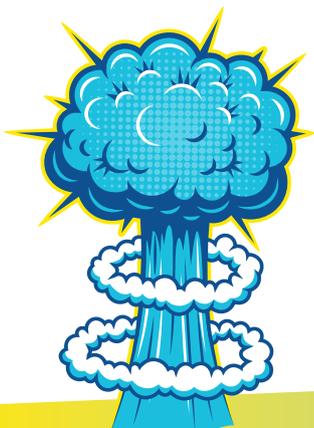
θ 較大的介質層，折射率 n 較小。

- 折射率 n 較小的介質層中，光的速率 v 較高 ($n \propto 1/v$)。
- 如果出現全內反射，光線無法進入的介質層，其 n 必定較小。

2. 模擬試題練習

✓ 緊扣由 2024 年起實行的最新試卷形式及近年試題趨勢

✓ 兼備三大題型：選擇題、**短題目**、**長題目**



DSE reference:
2023-1A Q10

Multiple-choice Questions

1. A block is sliding down along a rough incline as shown. The frictional force acting on the block is constant.

Which of the following graphs best represents how the kinetic energy (KE) and potential energy (PE) of the block changes with the distance travelled s ? Assume there is no air resistance.

A. B. C. D.

Reason: _____

相關 DSE 試題
2022-1B Q5

短題目

1. 兩束平行光線來自一遙遠物體 AB 的 A 點，它們穿過透鏡 L，如圖所示。

物體 AB 沒有顯示在圖中，而其末端 B 在主軸上。透鏡 L 是一塊凹透鏡，它的焦距為 6 cm。

(a) 繪畫光線 p 和 q 的完整路徑。 (1 分)

(b) 標繪物體 AB 的成像 A'B'。 (2 分)

(c) 成像是實像還是虛像？建議一實驗來驗證你的答案。 (3 分)

模擬試卷 (已上載到學科網站供用戶下載)

★ 依 2024 年起實行的最新試卷形式編寫，切合考試需要。

選擇題

DSE MOCK PAPER 1A/20

Section A

There are 33 questions. Questions marked with * involve knowledge of the extension component.

1. Convection is an important heat transfer process in a fluid. Which of the following statements about convection are correct?

- Convection involves the movement of fluid due to temperature difference.
- A lower heat capacity allows for more rapid temperature changes, leading to the rapid creation of convective currents.
- Convection is more significant in gases than in liquids because gases have lower heat capacities compared to liquids.

A. (1) and (2)
B. (1) and (3)
C. (2) and (3)
D. (1), (2) and (3)

2. Three tanks of water X, Y and Z of different temperatures and heat capacities are poured into a big well-insulated container.

	water in X	water in Y	water in Z
heat capacity / kJ °C ⁻¹	10	20	30
temperature / °C	30	20	10

What is the final temperature of water after mixing? Ignore the heat capacity of the big container.

A. 19 °C
B. 16.7 °C
C. 20 °C
D. 33.3 °C

短題目 **WOW!**

2. A skier of mass 80 kg is travelling down a slope of inclination angle 30° as shown. The friction between the skis and the snow can be neglected, but the air resistance on the skier is not negligible.

(a) On the figure below, indicate and label all the forces acting on the skier. (2 marks)

(b) The skier is travelling down the slope at a constant speed. Find the magnitude of the air resistance on the skier. (2 marks)

(c) After the skier moves onto level snow, he starts decelerating. Describe and explain his deceleration along the level snow. (2 marks)

長題目

11. The figure below is a stroboscopic photo of a tennis ball taken at 5.0 ms time intervals after the ball is struck by a racket. Assume the air resistance on the ball is negligible.

(a) State the energy change during the period the tennis ball is struck by the racket. (2 marks)

(b) The tennis ball is struck at an angle of 10° to the horizontal at a height of 1.5 m as shown.

- Estimate the horizontal speed of the ball. (2 marks)
- Find the time of flight of the ball before it reaches the ground. (3 marks)

(c) Suppose the ball is struck at an angle larger than 10° to the horizontal, and the force acting on the ball remains unchanged. Without doing any calculations, briefly explain how the time of flight of the ball would change. (2 marks)

DSE 短題目額外模擬試題 **WOW!**

★ 為協助老師應付 2024 年推行的新考試形式，新增短題目額外模擬試題供老師靈活使用。

Active Physics

DSE Mock Paper 1B SQ Extra Set (20/2/2024 6:23 PM)

DSE Mock Paper 1B Short Questions (Extra Set)

Heat and Gases

1. Heat capacity:

An electric kettle is switched on to heat up some water inside it. The mass and the initial temperature of water in the kettle are 2 kg and 25 °C respectively.

Given: specific heat capacity of water = 4200 J kg⁻¹ °C⁻¹

- It takes 5 minutes for the water to start boiling. Estimate the power of the kettle. Neglect the heat loss to the surroundings during heating. (3 marks)
- If the heat capacity of the kettle is about 500 J °C⁻¹, explain how this would affect the power calculated in (a). (2 marks)

Answer:

(a) Energy supplied by the kettle $E = Pt$
Energy gained by water $E = mc\Delta T$

$$Pt = mc\Delta T \Rightarrow P = \frac{mc\Delta T}{t} = \frac{(2)(4200)(100 - 25)}{5 \times 60} = 2100 \text{ W}$$

(b) More energy needs to be supplied to heat up the kettle. (1A)
So, the actual power should be higher than the calculated value. (1A)

活學物理

DSE 卷一乙部短題目 時間控制練習

答案

1. 熱學:

- 所需的热量
 $Q = mc\Delta T = (0.8)(4200)(20 - 0) = 67200 \text{ J}$
- 所需的功率
 $P = \frac{Q}{t} = \frac{67200}{60} = 1120 \text{ W}$

2. 守恒:

- 質量守恒定律
 $M = m_1 + m_2$
 $1.40 = m_1 + 0.15$
 $m_1 = 1.25 \text{ kg}$
- 動能守恒定律
 $\frac{1}{2}Mv^2 = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$
 $\frac{1}{2}(1.40)v^2 = \frac{1}{2}(1.25)v_1^2 + \frac{1}{2}(0.15)v_2^2$
 $1.40v^2 = 1.25v_1^2 + 0.15v_2^2$
 $v = 0.20 \text{ m s}^{-1}$

DSE 卷一乙部短題目時間控制練習

★ 新增「時間控制練習」，每題設有答題時間建議，以訓練學生作答短題目的步伐。

Active Physics

DSE Paper 1B SQ Time-Awareness Training

1A MC 20 min
1B SQ 10 min
1B LQ 40 min

Practice

Instruction: Complete the following short questions in 60 minutes. Spend about 1 minute for 1 mark and 20 minutes for every three questions.

指示：回答以下短題目，限於 1 小時，一分的題目，每一分鐘完成，餘此類推，每二十分鐘，完成三題。

00:00

1. A student carries out an experiment to find the specific latent heat of fusion of ice. He places 40 g of ice at 0 °C into a foam cup containing 100 g of water at 20 °C. Assume the foam cup has negligible heat capacity and with good insulation.

Given: specific heat capacity of water = 4200 J kg⁻¹ °C⁻¹
specific latent heat of fusion of ice = 336 000 J kg⁻¹ °C⁻¹

- Calculate the amount of energy
 - required for the ice to change into water at 0 °C. (2 marks)
 - supplied by the water in the foam cup as it is cooled from 20 °C to 0 °C. (2 marks)

2 + 2 = 4 min

必修部分試題庫更新 (Bk1-5)

★ 將於 2024-25 學年增加近 200 道新題目，全面涵蓋選擇題、短題目及長題目三大題型。

關於聯合培進教育出版



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聯絡我們