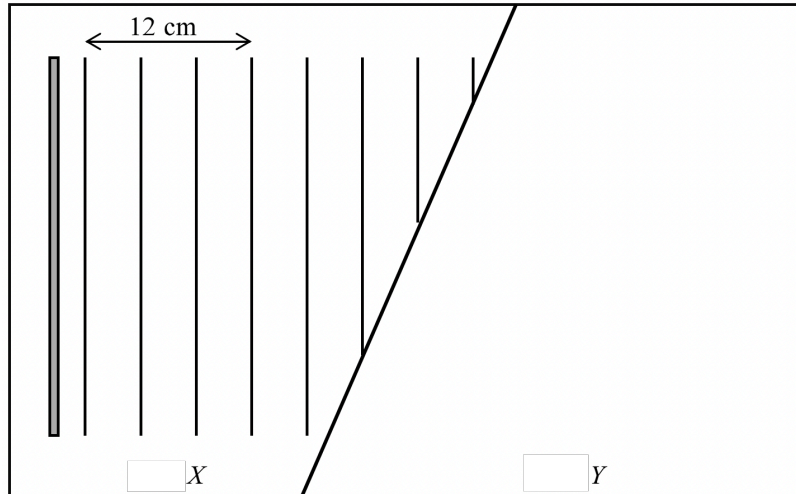


結構題 Structured Questions

1. 一個水波槽中有深水區和淺水區。一個波源以 20 Hz 產生一系列向右傳播的直線波，如圖中所示。

In a water tank, there are deep water and shallow water regions. A wave source generates a straight wave propagating to the right at a frequency of 20 Hz, as shown in the diagram.



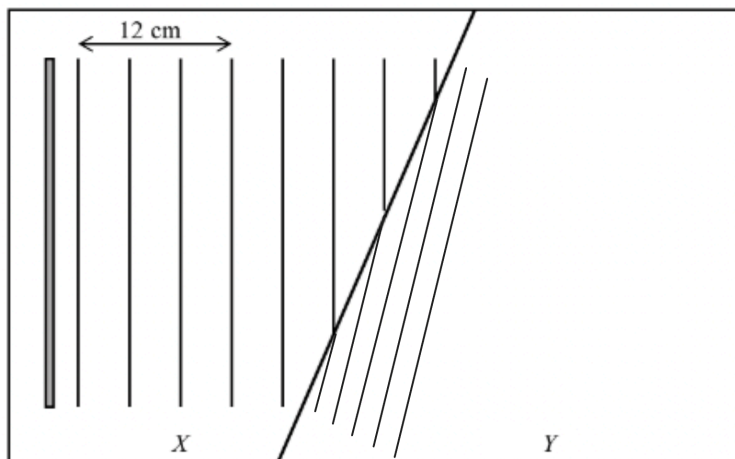
- (a) 計算水波在區域 X 中的波速。
Calculate the speed of water wave in region X. (2 marks)
- (b) 水波在區域 Y 中的波長是 2 cm。
Wavelength of water wave in region Y is 2 cm.
 - (i) 區域 X 和區域 Y 哪個區域較深水？寫出你的答案。
Which region (X or Y) is deeper? Write down your answer. (1 marks)
 - (ii) 在圖中畫出水波在區域 Y 的波陣面。
Draw the wavefront of water wave in region Y. (2 marks)
 - (iii) 寫出水波在區域 Y 的頻率。
Write down the frequency of water wave in region Y. (1 marks)
- (c) 若在水波槽中加水，描述波陣面在區域 X 或有的改變，並扼要解釋你的答案。
When water is added to the tank, describe the change of wavefront in region X, explain your answer briefly. (2 marks)
- (d) 若水波在水波槽的邊緣發生反射，或會影響觀察。寫出一項水波槽的改良設計以減輕水波反射造成的影響。
The observation can be affected when some water wave reflected at the edge of the water tank. Write down one modification design to the water tank to reduce this reflection. (1 marks)

Ans:

(a) $\lambda = 12/3 = 4 \text{ cm}$ (1M)
 $v = 4 \times 20 = 80 \text{ cm s}^{-1}$ (1A)

(b) (i) X (1A)

(ii) (1M+1A)



(iii) 20 Hz (1A)

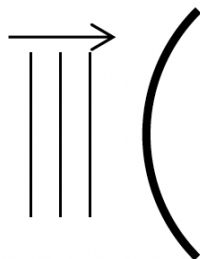
(c) 波速增加，
 speed of wave increases, (1M)
 根據 $v = f\lambda$ ，波長增加，波陣面間距增加。
 by $v = f\lambda$, wavelength increases, separation between neighbouring wavefront increases. (1A)

(d) 在水波槽內壁加上海綿。
 Add sponges to inner walls of water tank. (1A)

多項選擇題 Multiple choice questions

1. 一系列直線水波如圖射向圓弧形的障礙物。

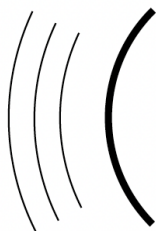
A series of wave is about to hit the obstacle as shown below.



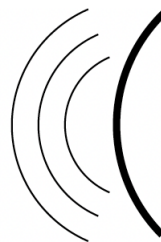
以下何者最能顯示反射後的水波？

Which of the following best indicates the reflected wave?

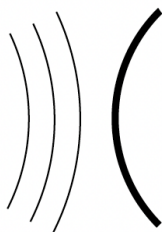
A.



B.



C.



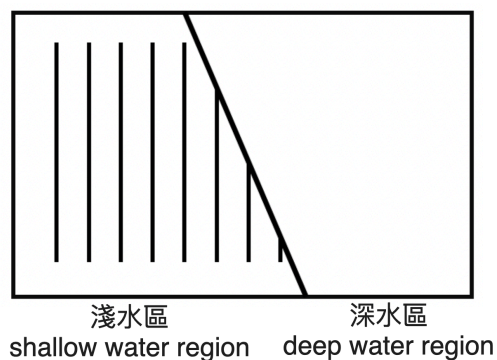
D.



Ans: B

2. 一列水波由淺水區進入深水區。

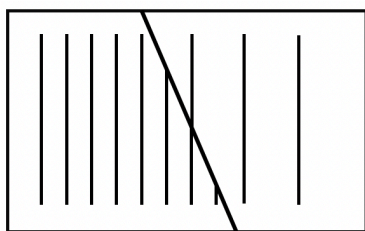
A series of water wave enters deep water region from shallow water region.



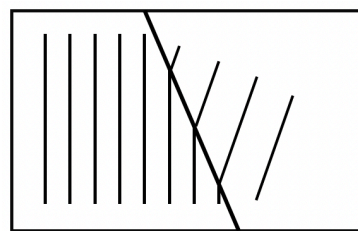
下列何者正確展示進入深水區後的波陣面？

Which of the following correctly shows the wavefront of water wave after entering deep water region?

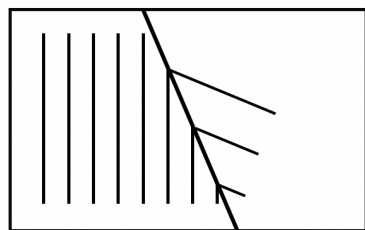
A.



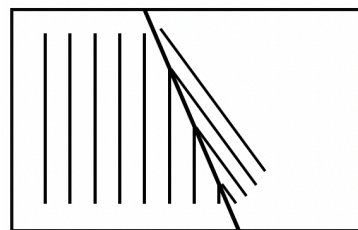
B.



C.



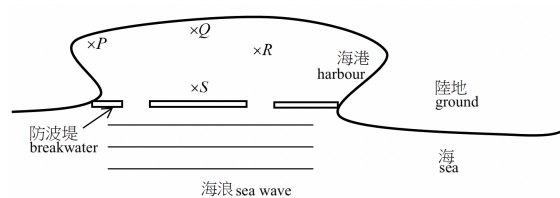
D.



Ans: B

3. 防波堤是海邊的一種人造結構，目的是抵擋海浪。

A breakwater is a man-made structure located at the seaside, designed to resist the impact of ocean waves.



一艘船停泊在海港中。圖中四個標示的位置中，何者受到海浪影響的可能性最小？

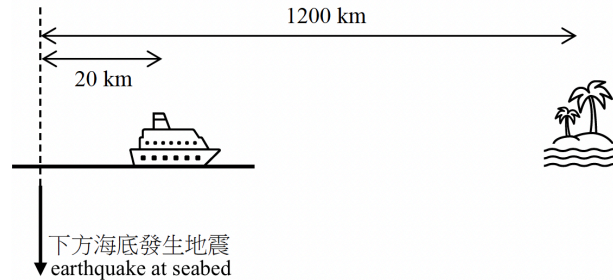
Among the four labeled positions shown in the diagram, which one is least likely to be affected by ocean waves?

- A. *P*
- B. *Q*
- C. *R*
- D. *S*

Ans: D

4. 某次海底地震產生了海嘯（海嘯可視為巨大的水波）。一艘船與發生地震的位置的水平距離是 20 km，這艘船上的船員幾乎感覺不到海嘯的經過，但這海嘯卻嚴重影響 1200 km 遠的小島。下列何者是最佳解釋？

The occurrence of an underwater earthquake generated a tsunami (which can be seen as a massive water wave). A ship is located 20 km horizontally away from the epicenter of the earthquake. The crew on the ship hardly feels the passage of the tsunami. However, this tsunami severely affects a small island located 1200 km away. Which of the following is the best explanation?

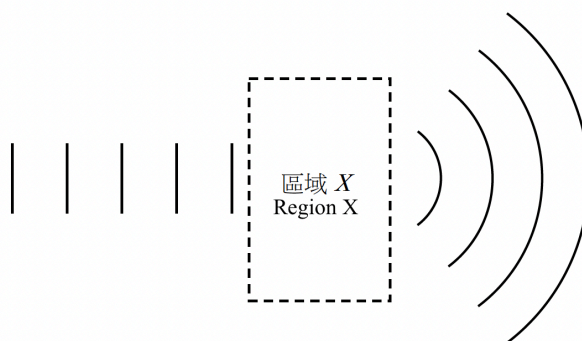


- A. 海嘯傳播期間，頻率持續下降。
During the propagation of a tsunami, the frequency continues to decrease.
- B. 海嘯傳播越遠，它的振幅越大。
The further a tsunami propagates, the greater its amplitude.
- C. 海嘯是一種機械波。
A tsunami is a mechanical wave.
- D. 船所在的位置水波波速遠高於抵達小島時的波速。
The wave speed at the location of the boat is much higher than the wave speed when it reaches the small island.

Ans: D

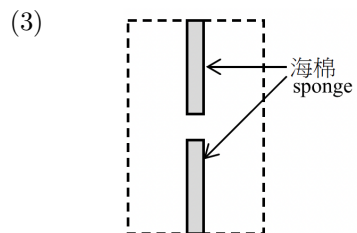
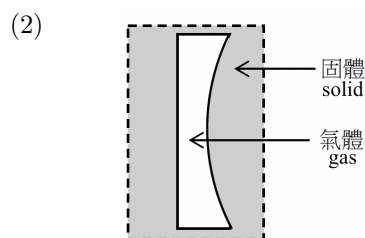
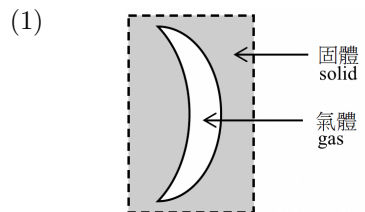
5. A straight sound wave propagates to the right. After passing through region X, the wavefront changes into an arc shape, as shown in the diagram.

一列直線聲波向右傳播，經過區域 X 後，波陣面變成圓弧形，如圖所示。



下列哪些可能是區域 X 中的設置？

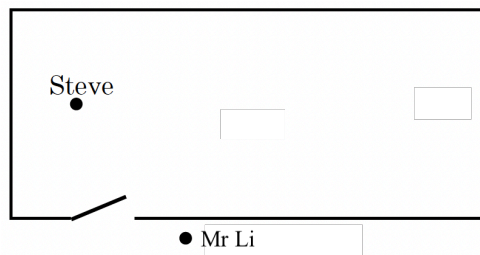
Which of the following can be the setup in X?



- | | | |
|----|--------------|------------------|
| A. | 只有 (1) | (1) only |
| B. | 只有 (2) | (2) only |
| C. | 只有 (1) 和 (3) | (1) and (3) only |
| D. | 只有 (2) 和 (3) | (2) and (3) only |

Ans: C

6. 在一個門敞開的教室中，Steve 打開嗓門在開罵。教室外的李同學在圖示位置聽到 Steve 的聲音。
In an open classroom with the door ajar, Steve starts shouting. Mr. Li, a student outside the classroom, hears Steve's voice at the indicated location in the diagram.



李同學與 Steve 之間雖然有門和牆壁遮擋，但仍然聽到他的聲音。下列哪個現象最能解釋這現象？
Despite the presence of doors and walls between Li and Steve, Li can still hear Steve's voice. Which phenomenon best explains the situation?

- A. 反射 reflection
- B. 折射 refraction
- C. 衍射 diffraction
- D. 以上都是 All of the above

Ans: C

7. 李同學雖聽到聲音但看不見 Steve。下列何者是最佳解釋？
Mr Li can hear the voice but can't see Steve, which of the following best explains the phenomenon?

- A. 光的速率遠比聲音高。
Speed of light is faster than speed of sound.
- B. 光的波長遠比聲音短。
Wavelength of light is shorter than wavelength of sound.
- C. 光是橫波但聲音是縱波。
Light is transverse wave but sound is longitudinal wave
- D. 只有波動才可繞過障礙物。
Only wave can diffract around obstacles.

Ans: B