

**GCSE Physics A (Gateway)**

**J249/04 Physics A P5-P8 and P9 (Higher Tier)**

**Question Set 25**

Multiple Choice Questions

P5: Waves in Matter

1 (a) (i) A sound wave travels from water into air.

Its wavelength in air is shorter than in water.

How do the frequency and speed of the wave in air compare with their values in water?

	Frequency in air	Speed in air
A	higher	slower
B	higher	same
C	same	slower
D	same	same

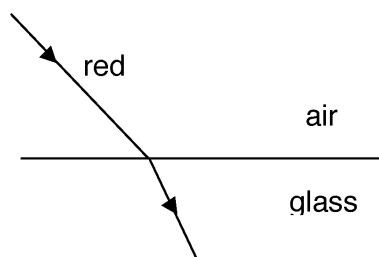
Frequency never changes.

Your answer

C

[1]

2 Red light refracts when it enters glass from air because its speed changes.



$$v = f\lambda$$

↓ ↓

The red light is replaced by blue light.

Which statement is correct about the refraction of blue light?

- A It refracts less than red because its speed in glass is greater than red.
- B It refracts less than red because its speed in glass is less than red.
- C It refracts more than red because its speed in glass is greater than red.
- D It refracts more than red because its speed in glass is less than red.

Your answer

D

[1]

wavelength of blue is shorter  
∴ travels slower in the medium  
and ∴ bends more.

3

A student measures the time it takes for the sound from a firework to reach the observer.

She takes 3 measurements of the time taken for four different distances, A, B, C and D.

Distance	Time taken (s)		
	1st measurement	2nd measurement	3rd measurement
A	2.16	2.19	2.17
B	1.99	2.02	1.97
C	1.80	1.81	1.89
D	1.69	1.68	1.71

B  
 $2.02 - 1.97$   
 $= 0.05$

D  
 $1.71 - 1.68$   
 $= 0.03$

A  
 $2.19 - 2.16$   
 $= 0.03$

C  
 $1.89 - 1.80$   
 $= 0.09$

Which distance A, B, C or D, has the largest range of values?

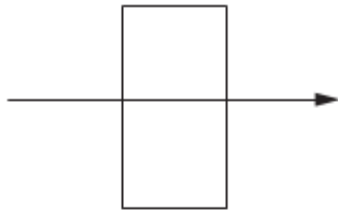
Your answer

C

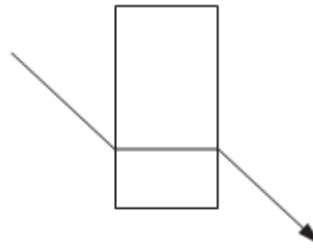
[1]

4

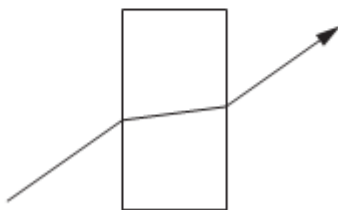
Look at the diagrams of a light ray as it passes from air through a glass block.



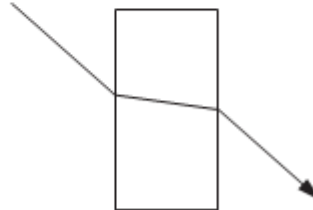
A



B



C



D

Which diagram shows an **incorrect** refraction?

Your answer

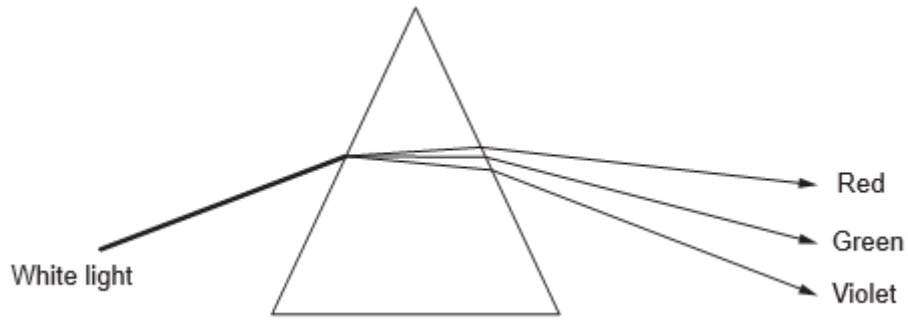
B

[1]

Travels through the 'normal'

5

Look at the diagram of white light as it passes through a prism.



A spectrum of colours is seen. It ranges from red to violet.

Why does the **violet** light refract **more** than the red light?

- A Violet light changes frequency more than red light.
- B Violet light has the largest change in speed.
- C Violet light has the smallest change in speed.
- D Violet light increases its speed in the glass prism.

← shortest  $\lambda$   $\therefore$  lowest speed.

Your answer

**B**

[1]

6

A sound wave travels in air and enters water.

What happens to the sound wave as it enters the water?

	Speed	Frequency	Wavelength
A	decreases	decreases	decreases
B	decreases	✓ stays the same	decreases
C	increases	increases	increases
D	increases	✓ stays the same	increases

Your answer

**D**

[1]

Sound wave travels faster in dense mediums

7

An electromagnetic wave transfers energy.

Which row in the table is correct?

	<b>Electromagnetic wave</b>	<b>Energy transfer</b>
<b>A</b>	Infra-red	From a heating element of a toaster to the bread inside
<b>B</b>	Radio	From a radio to a transmitter
<b>C</b>	Gamma rays	From a high voltage supply to heating water in food
<b>D</b>	X-rays	From bones in the body to an X-ray machine

Your answer

A

[1]

8

Which waves can damage cells and cause cancer?

- A** Radio, X-rays and infra-red.
- B** Sound, gamma-rays and microwaves.
- C** Sound, visible light and ultraviolet.
- D** Ultraviolet, gamma-rays and X-rays.

Your answer

D

[1]

9

The table contains descriptions of wavelength and frequency.

Which row in the table is correct?

	Wavelength	Frequency
A	Distance between a peak and its neighbouring trough. ✗	Number of waves that go past a point in a second. ✓
<b>B</b>	Distance between neighbouring peaks. ✓	Number of waves that go past a point in a second. ✓
C	Distance between neighbouring troughs. ✓	Time period in seconds.
D	Height of the wave. ✗	Number of waves produced.

Your answer

B

[1]

**Total Marks for Question Set 1: 9**

## Equations in physics

$$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$$

$$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{change in temperature}$$

$$\text{thermal energy for a change in state} = \text{mass} \times \text{specific latent heat}$$

$$\text{energy transferred in stretching} = 0.5 \times \text{spring constant} \times (\text{extension})^2$$

$$\text{potential difference across primary coil} \times \text{current in primary coil} = \text{potential difference across secondary coil} \times \text{current in secondary coil}$$

### Higher tier only –

$$\text{force on a conductor (at right angles to a magnetic field) carrying a current} = \text{magnetic flux density} \times \text{current} \times \text{length}$$

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