Q1. Two points on a progressive wave are one-eighth of a wavelength apart. The distance between them is 0.5 m, and the frequency of the oscillation is 10 Hz. What is the minimum speed of the wave?

A 0.2 m s^{-1} ⬭

B 10 m s^{-1} ⬭

C 20 m s^{-1} ⬭

D 40 m s^{-1} ⬭

(Total 1 mark)

Q2. In a Young's double slits interference arrangement the fringe separation is s when the wavelength of the radiation is λ, the slit separation w and the distance between the slits and the plane of the observed fringes D. In which one of the following cases would the fringe separation also be s?

	wavelength	slit separation	distance between slits and fringes
A	2λ	$2w$	$2D$
B	2λ	$4w$	$2D$
C	2λ	$2w$	$4D$
D	4λ	$2w$	$2D$

(Total 1 mark)

Q3. Which of the following waves **cannot** be polarised?

A radio ⬭

B ultrasonic ⬭

C microwave ⬭

D ultraviolet ⬭

(Total 1 mark)

Q4. The sound quality of a portable radio is improved by adjusting the orientation of the aerial. Which statement is a correct explanation of this improvement?

A The radio waves from the transmitter are polarised.

B The radio waves from the transmitter are unpolarised.

C The radio waves become polarised as a result of adjusting the aerial.

D The radio waves become unpolarised as a result of adjusting the aerial.

(Total 1 mark)

Q5. Figures **1** and **2** each show a ray of light incident on a water-air boundary. **A, B, C** and **D** show ray directions at the interface.

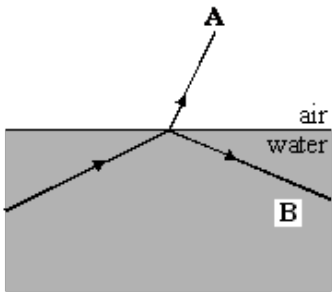


Figure 1

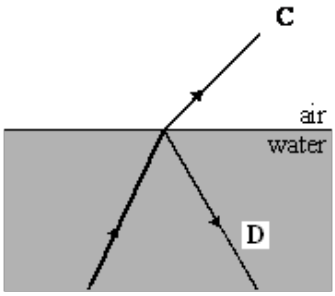


Figure 2

(a) Circle the letter below that corresponds to a direction in which a ray **cannot** occur.

A **B** **C** **D**

(1)

(b) Circle the letter below that corresponds to the direction of the faintest ray.

A **B** **C** **D**

(1)

(Total 2 marks)

Q6. The least distance between two points of a progressive transverse wave which have a phase difference of $\frac{\pi}{3}$ rad is 0.050 m. If the frequency of the wave is 500 Hz, what is the speed of the wave?

A 25 m s^{-1}

B 75 m s^{-1}

C 150 m s^{-1}

D 1666 m s^{-1}

(Total 1 mark)

Q7. Young's two slit interference pattern with red light of wavelength 7.0×10^{-7} m gives a fringe separation of 2.0 mm.

What separation, in mm, would be observed at the same place using blue light of wavelength 45×10^{-7} m?

A 0.65

B 1.3

C 2.6

D 3.1

(Total 1 mark)

Q8. Which one of the following statements about stationary waves is true?

A Particles between adjacent nodes all have the same amplitude.

B Particles between adjacent nodes are out of phase with each other.

C Particles immediately on either side of a node are moving in opposite directions.

D There is a minimum disturbance of the medium at an antinode.

(Total 1 mark)

Q9. In a double slit interference arrangement the fringe spacing is w when the wavelength of the radiation is λ, the distance between the double slits is s and the distance between the slits and the plane of the observed fringes is D. In which one of the following cases would the fringe spacing also be w?

	wave length	distance between slits	distance between slits and fringes
A	2λ	$2s$	$2D$
B	2λ	$4s$	$2D$
C	2λ	$2s$	$4D$
D	4λ	$2s$	$2D$

(Total 1 mark)

Q10. A progressive wave in a stretched string has a speed of 20 m s^{-1} and a frequency of 100 Hz.
What is the phase difference between two points 25 mm apart?

A zero

B $\frac{\pi}{4}$ rad

C $\frac{\pi}{2}$ rad

D π rad

(Total 1 mark)

Q11. Two waves with amplitudes a and $3a$ interfere.

The ratio $\frac{\text{amplitude at an interference maximum}}{\text{amplitude at an interference minimum}}$ is

A 2

B 3

C 4

D infinity

(Total 1 mark)

Q12. A stationary wave is formed by two identical waves of frequency 300 Hz travelling in opposite directions along the same line. If the distance between adjacent nodes is 0.60 m, what is the speed of each wave?

A 180 m s^{-1}

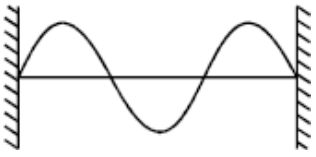
B 250 m s^{-1+}

C 360 m s^{-1}

D 500 m s^{-1}

(Total 1 mark)

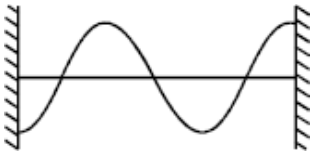
Q13.



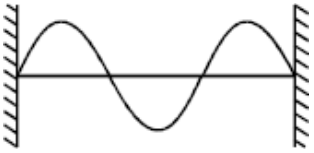
frequency of vibration = 50 Hz

The diagram above shows a stationary wave on a stretched string at a time t = 0. Which one of the diagrams, **A** to **D**, correctly shows the position of the string at a time t = 0.010 s?

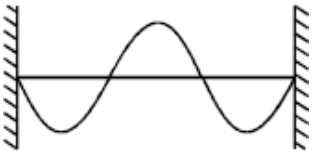
A



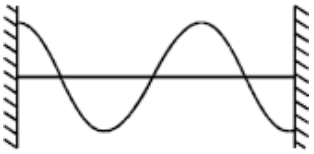
B



C



D



(Total 1 mark)

Q14. A wave motion has period T, frequency f, wavelength λ and speed v. Which one of the following equations is **incorrect**?

A $1 = Tf$

B $T = \frac{v}{\lambda}$

C $\lambda = \frac{v}{f}$

D $Tv = \lambda$

(Total 1 mark)

Q15. Light of wavelength λ is incident normally on a diffraction grating of slit separation 4λ. What is the angle between the second order maximum and third order maximum?

A 14.5°

B 18.6°

C 48.6°

D 71.4°

(Total 1 mark)

Q16. Interference maxima produced by a double source are observed at a distance of 1.0 m from the sources. In which one of the following cases are the maxima closest together?

A red light of wavelength 700 nm from sources 4.0 mm apart

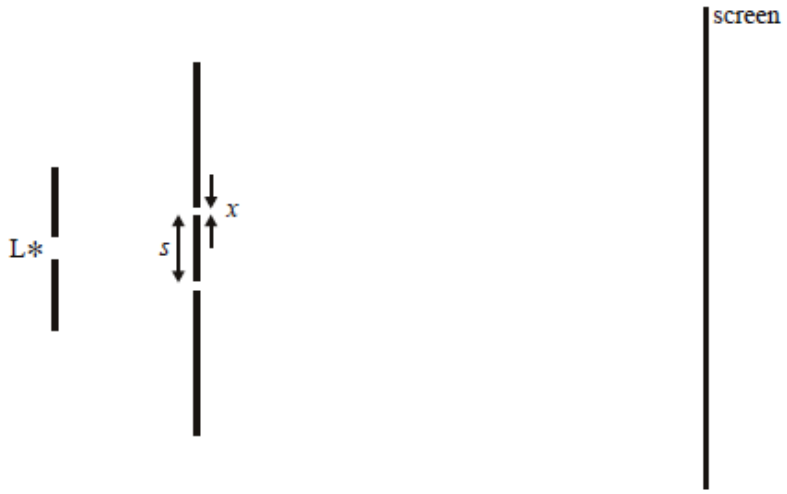
B sound waves of wavelength 20 mm from sources 50 mm apart

C blue light of wavelength 450 nm from sources 2.0 mm apart

D surface water waves of wavelength 10 mm from sources 200 mm apart

(Total 1 mark)

Q17.



In a double slit system used to produce interference fringes, the separation of the slits is s and the width of each slit is x. L is a source of monochromatic light. Which one of the following changes would **decrease** the separation of the fringes seen on the screen?

A moving the screen closer to the double slits

B decreasing the width, x, of each slit, but keeping s constant

C decreasing the separation, s, of the slits

D exchanging L for a monochromatic source of longer wavelength

(Total 1 mark)

Q18. In a Young's double slit interference experiment, monochromatic light placed behind a single slit illuminates two narrow slits and the interference pattern is observed on a screen placed some distance away from the slits. Which one of the following **decreases** the separation of the fringes?

A increasing the width of the single slit

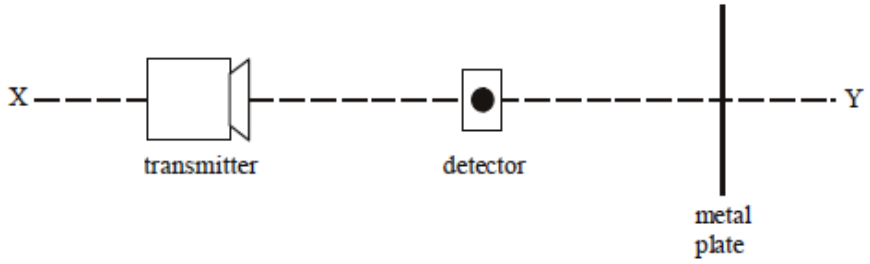
B decreasing the separation of the double slits

C increasing the distance between the double slits and the screen

D using monochromatic light of higher frequency

(Total 1 mark)

Q19. A microwave transmitter is used to direct microwaves of wavelength 30 mm along a line XY. A metal plate is positioned at right angles to XY with its mid-point on the line, as shown.



When a detector is moved gradually along XY, its reading alternates between maxima and minima. Which one of the following statements is **not** correct?

A The distance between two minima could be 15 mm.

B The distance between two maxima could be 30 mm.

C The distance between a minimum and a maximum could be 30 mm.

D The distance between a minimum and a maximum could be 37.5 mm.

(Total 1 mark)

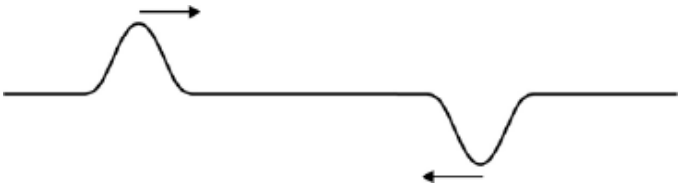
Q20. Electrons and protons in two beams are travelling at the same speed. The beams are diffracted by objects of the same size.

Which correctly compares the de Broglie wavelength λ_e of the electrons with the de Broglie wavelength λ_p of the protons and the width of the diffraction patterns that are produced by these beams?

	comparison of de Broglie wavelength	diffraction pattern	
A	$\lambda_e > \lambda_p$	electron beam width > proton beam width	⬭
B	$\lambda_e < \lambda_p$	electron beam width > proton beam width	⬭
C	$\lambda_e > \lambda_p$	electron beam width < proton beam width	⬭
D	$\lambda_e < \lambda_p$	electron beam width < proton beam width	⬭

(Total 1 mark)

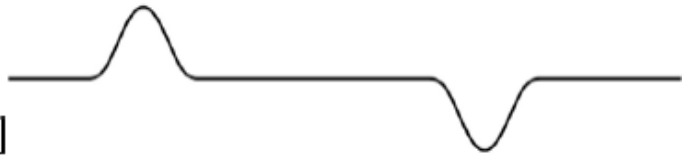
Q21. The diagram shows two pulses on a string travelling towards each other.



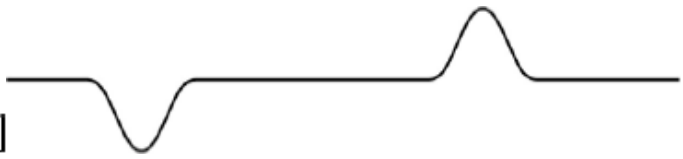
Which of the following diagrams shows the shape of the string when the pulses have passed through each other?

A ⬭

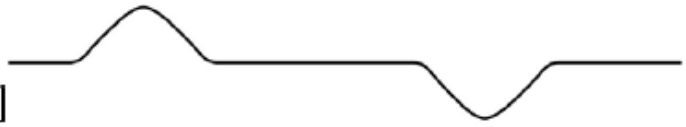
B ⬭



C ⬭



D ⬭



(Total 1 mark)

Q22. Monochromatic light may be characterised by its speed, frequency and wavelength. Which of the following quantities change when monochromatic light passes from air into glass?

A Speed only. ⬭

B Speed and wavelength only. ⬭

C Speed and frequency only. ⬭

D Wavelength and frequency only. ⬭

(Total 1 mark)

Q23. A light source emits light which is a mixture of two wavelength, λ_1 and λ_2. When the light is incident on a diffraction grating it is found that the fifth order of light of wavelength λ_1 occurs at the same angle as the fourth order for light of wavelength λ_2. If λ_1 is 480 nm what is λ_2?

A 400 nm ⬭

B 480 nm ⬭

C 600 nm ⬭

D 750 nm ⬭

(Total 1 mark)

Q24. Monochromatic light of wavelength 490 nm falls normally on a diffraction grating that has 6×10^5 lines per metre. Which one of the following is correct?

A The first order is observed at angle of diffraction of 17°. ⬭

B The second order is observed at angle of diffraction of 34°. ⬭

C The third and higher orders are not produced. ⬭

D A grating with more lines per metre could produce more orders. ⬭

(Total 1 mark)

Q25. Sound waves cross a boundary between two media X and Y. The frequency of the waves in X is 400 Hz. The speed of the waves in X is 330 m s^{-1} and the speed of the waves in Y is 1320 m s^{-1}. What are the correct frequency and wavelength in Y?

	Frequency / Hz	Wavelength / m	
A	100	0.82	⬭
B	400	0.82	⬭
C	400	3.3	⬭
D	1600	3.3	⬭

(Total 1 mark)

Q26. A light source emits light which is a mixture of two wavelength, λ_1 and λ_2. When the light is incident on a diffraction grating it is found that the fifth order of light of wavelength λ_1 occurs at the same angle as the fourth order for light of wavelength λ_2. If λ_1 is 480 nm what is λ_2?

A 400 nm ⬭

B 480 nm ⬭

C 600 nm ⬭

D 750 nm ⬭

(Total 1 mark)

Q27. Which one of the following provides direct experimental evidence that light is a transverse wave motion rather than a longitudinal wave motion?

A Two light waves that are coherent can be made to interfere. ⬭

B Light can be diffracted. ⬭

C Light can be polarised. ⬭

D The intensity of light from a point source falls off inversely as the square of the distance from the source. ⬭

(Total 1 mark)

M1. D

[1]

M2. B

[1]

M3. B

[1]

M4. A

[1]

M5. (a) A

B1

(b) D

B1

[2]

M6. C

[1]

M7. B

[1]

M8. C

[1]

M9. B

[1]

M10. B

[1]

M11. A

[1]

M12. C

[1]

M13. C

[1]

M14. B

[1]

M15. B

[1]

M16. A

[1]

M17. A

[1]

M18. D

[1]

M19. C

[1]

M20. A

[1]

M21. C

[1]

M22. B

[1]

M23. C

[1]

M24. A

[1]

M25. C

[1]

M26. C

[1]

M27. C

[1]