1)

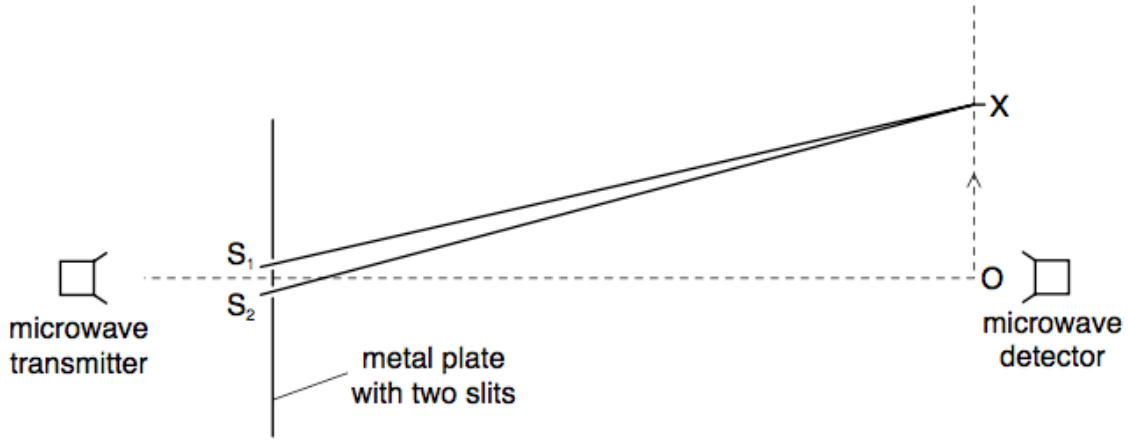
Two progressive waves of frequency 300 Hz are superimposed to produce a stationary wave in which adjacent nodes are 1.5 m apart.

What is the speed of the progressive waves?

A $100\,m\,s^{-1}$ **B** $200\,m\,s^{-1}$ **C** $450\,m\,s^{-1}$ **D** $900\,m\,s^{-1}$

2)

The diagram shows an experiment which has been set up to demonstrate two-source interference, using microwaves of wavelength λ.



The detector is moved from O in the direction of the arrow. The signal detected decreases until the detector reaches the point X, and then starts to increase again as the detector moves beyond X.

Which equation correctly determines the position of X?

A $OX = \lambda/2$ **B** $OX = \lambda$ **C** $S_2X - S_1X = \lambda/2$ **D** $S_2X - S_1X = \lambda$

3)

Coherent monochromatic light illuminates two narrow parallel slits and the interference pattern that results is observed on a screen some distance beyond the slits.

Which change increases the separation between the dark lines of the interference pattern?

A using monochromatic light of higher frequency

B using monochromatic light of a longer wavelength

C decreasing the distance between the screen and the slits

D increasing the distance between the slits

4)

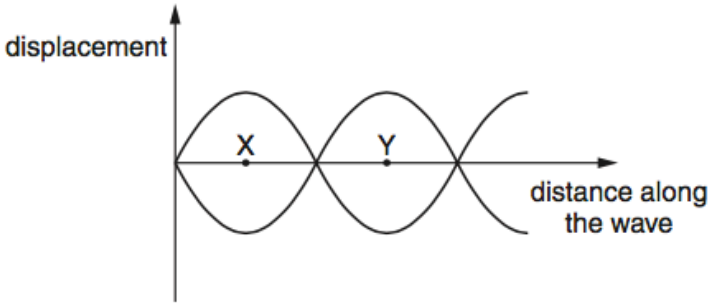
Monochromatic light of wavelength 590 nm is incident normally on a diffraction grating. The angle between the two second-order diffracted beams is 43°.

What is the spacing of the lines on the grating?

A 0.87 μm **B** 1.6 μm **C** 1.7 μm **D** 3.2 μm

5)

The graph represents a stationary wave at two different times.



What does the distance XY represent?

A half the amplitude

B half the frequency

C half the period

D half the wavelength

6)

When the light from two lamps falls on a screen, no interference pattern can be obtained.

Why is this?

A The lamps are not point sources.

B The lamps emit light of different amplitudes.

C The light from the lamps is not coherent.

D The light from the lamps is white.

7)

A stationary sound wave has a series of nodes. The distance between the first and the sixth node is 30.0 cm.

What is the wavelength of the sound wave?

A 5.0 cm **B** 6.0 cm **C** 10.0 cm **D** 12.0 cm

8)

Which of the following may be used to produce stationary waves?

A blowing air over the top of an empty bottle

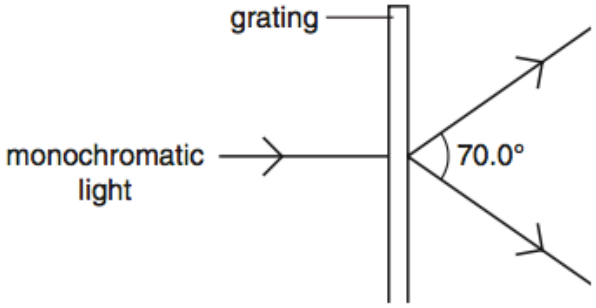
B making a loud sound near a mountain

C passing monochromatic light through a double slit

D passing water waves through a narrow slit

9)

A diffraction grating is used to measure the wavelength of monochromatic light, as shown in the diagram.



The spacing of the slits in the grating is 1.00×10^{-6} m. The angle between the first order diffraction maxima is 70.0°.

What is the wavelength of the light?

A 287 nm **B** 470 nm **C** 574 nm **D** 940 nm

10)

Microwaves of wavelength 3.00 cm are incident normally on a row of parallel metal rods. The separation of the rods is 8.00 cm. The first order diffraction maximum is observed at an angle of 22.0° to the direction of the incident waves.

What is the angle between the first and second order diffraction maxima?

A 22.0° **B** 26.6° **C** 44.0° **D** 48.6°

11)

The lines of a diffraction grating have a spacing of 1.6×10^{-6} m. A beam of light is incident normally on the grating. The first order maximum makes an angle of 20 ° with the undeviated beam.

What is the wavelength of the incident light?

A 210 nm **B** 270 nm **C** 420 nm **D** 550 nm

12)

In an interference experiment, two slits are illuminated with white light.

What is seen on the screen?

A The central fringe is black with black and white fringes on each side.

B The central fringe is black with coloured fringes on each side.

C The central fringe is white with black and white fringes on each side.

D The central fringe is white with coloured fringes on each side.

13)

A stationary sound wave is set up along the line joining two loudspeakers.

Which measurement is sufficient on its own to enable you to deduce the wavelength of the wave?

A the amplitude of the sound wave

B the distance between the two loudspeakers

C the distance between two adjacent antinodes

D the frequency of the sound wave

14)

Fringes of separation *y* are observed on a screen 1.00 m from a Young's slit arrangement that is illuminated by yellow light of wavelength 600 nm.

At which distance from the slits would fringes of the same separation *y* be observed when using blue light of wavelength 400 nm?

A 0.33 m **B** 0.67 m **C** 0.75 m **D** 1.50 m

15)

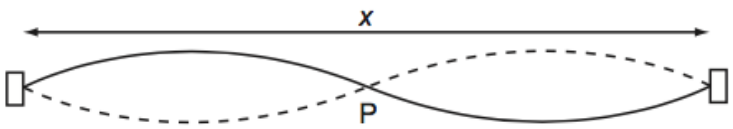
A parallel beam of white light is incident normally on a diffraction grating. It is noted that the second-order and third-order spectra partially overlap.

Which wavelength in the third-order spectrum appears at the same angle as the wavelength of 600 nm in the second-order spectrum?

A 300 nm **B** 400 nm **C** 600 nm **D** 900 nm

16)

The diagram represents a stationary wave on a stretched string.



What is represented by point P and by the length *x*?

	point P	length *x*
A	antinode	one wavelength
B	antinode	two wavelengths
C	node	one wavelength
D	node	two wavelengths

17)

A sound wave is set up in a long tube, closed at one end. The length of the tube is adjusted until the sound from the tube is loudest.

What is the nature of the sound wave in the tube?

A longitudinal and progressive

B longitudinal and stationary

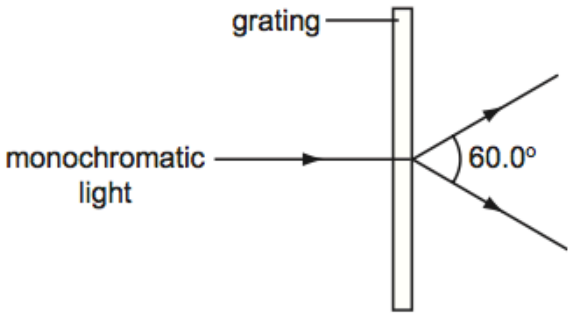
C transverse and progressive

D transverse and stationary

18)

A diffraction grating is used to measure the wavelength of monochromatic light.

The spacing of the slits in the grating is 1.15×10^{-6} m. The angle between the first order diffraction maxima is 60.0°, as shown in the diagram.



What is the wavelength of the light?

A 287 nm **B** 498 nm **C** 575 nm **D** 996 nm

19)

T is a microwave transmitter placed at a fixed distance from a flat reflecting surface S.

A small microwave receiver is moved steadily from T towards S and receives signals of alternate maxima and minima of intensity.

The distance between successive maxima is 15 mm.

What is the frequency of the microwaves?

A 1.0×10^7 Hz

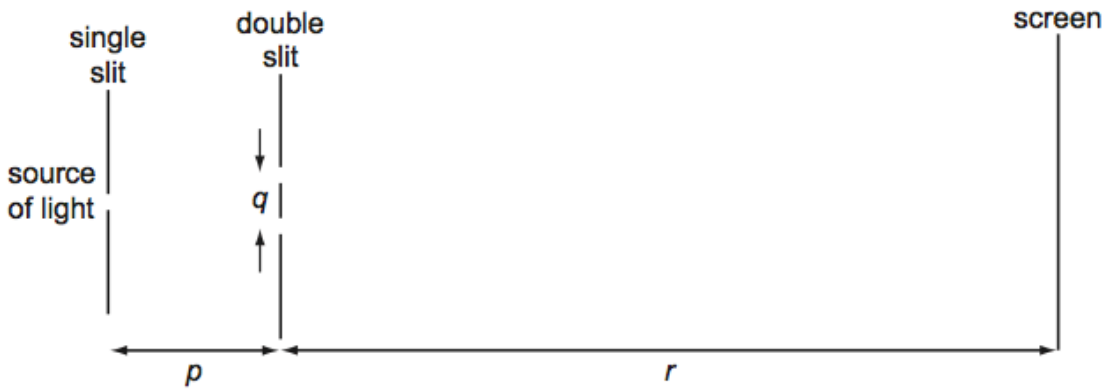
B 2.0×10^7 Hz

C 1.0×10^{10} Hz

D 2.0×10^{10} Hz

20)

A teacher sets up the apparatus shown to demonstrate a two-slit interference pattern on the screen.



Which change to the apparatus will increase the fringe spacing?

A decreasing the distance *p*

B decreasing the distance *q*

C decreasing the distance *r*

D decreasing the wavelength of the light