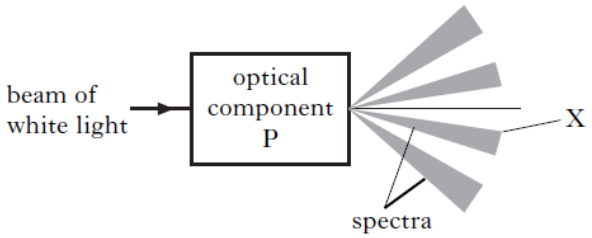
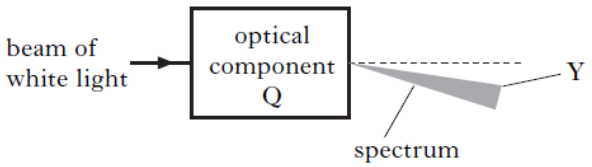
Unit 2 – Particles & Waves
Section 6 – Interference

2007 **16.** A beam of white light is passed through two optical components P and Q. Component P produces a number of spectra and component Q produces a spectrum as shown.





Which row in the table identifies the optical components and the colour of light seen at position X and position Y?

	Optical component P	*Colour seen at X*	*Optical component Q*	*Colour seen at Y*
A	grating	red	triangular prism	red
B	grating	red	triangular prism	violet
C	grating	violet	triangular prism	red
D	triangular prism	red	grating	violet
E	triangular prism	violet	grating	red

2008 **13.** Which of the following proves that light is transmitted as waves?

A Light has a high velocity.

B Light can be reflected.

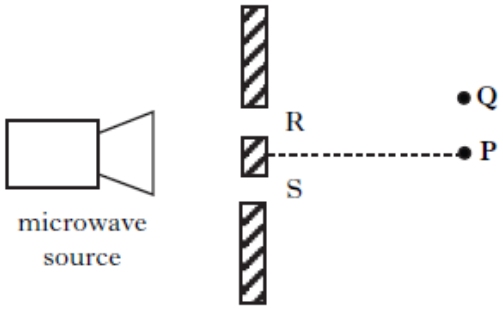
C Light irradiance reduces with distance.

D Light can be refracted.

E Light can produce interference patterns.

2008 **14.** A source of microwaves of wavelength λ is placed behind two slits, R and S.

A microwave detector records a maximum when it is placed at P.



The detector is moved and the **next** maximum is recorded at Q.

The path difference (SQ – RQ) is

A 0

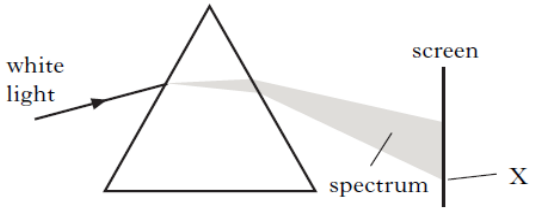
B $\frac{\lambda}{2}$

C λ

D $\frac{3\lambda}{2}$

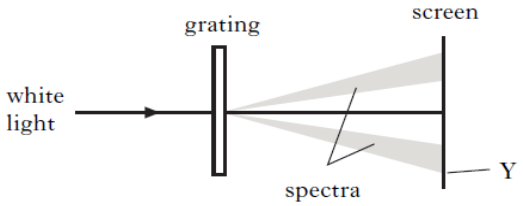
E 2λ.

2009 **14.** A prism is used to produce a spectrum from a source of white light as shown.



The colour observed at X is noted.

The prism is then replaced by a grating to produce spectra as shown.

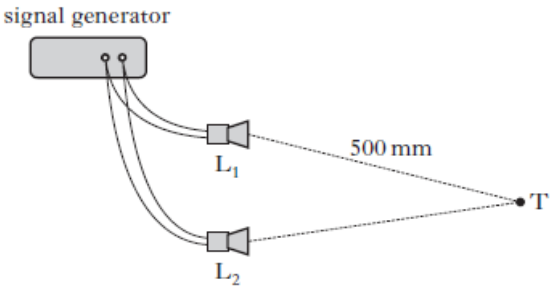


The colour observed at Y is noted.

Which row in the table gives the colour and wavelength of the light observed at X and the light observed at Y?

	Colour of light at X	Wavelength of light at X/nm	Colour of light at Y	Wavelength of light at Y/nm
A	Red	450	Red	450
B	Blue	450	Blue	450
C	Blue	650	Red	450
D	Blue	450	Red	650
E	Red	650	Blue	450

2011 **15.** Two identical loudspeakers, L_1 and L_2, are connected to a signal generator as shown.



An interference pattern is produced.

A minimum is detected at point T.

The wavelength of the sound is 40 mm.

The distance from L_1 to T is 500 mm.

The distance from L_2 to T is

A 450 mm

B 460 mm

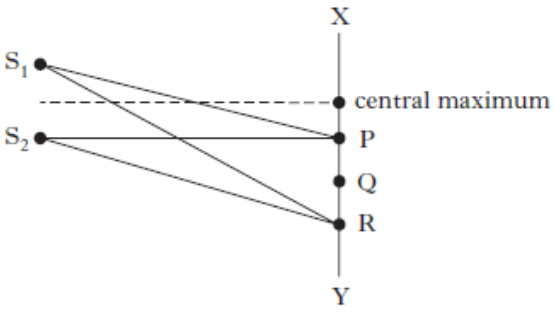
C 470 mm

D 480 mm

E 490 mm.

2012 **14.** S_1 and S_2 are sources of coherent waves.

An interference pattern is obtained between X and Y.



The first order maximum occurs at P, where $S_1P = 200$ mm and $S_2P = 180$ mm.

For the third order maximum, at R, the path difference ($S_1R - S_2R$) is

A 20 mm

B 30 mm

C 40 mm

D 50 mm

E 60 mm.

2014 **14.** The spectrum of white light from a filament lamp may be viewed using a prism or a grating.

A student, asked to compare the spectra formed by the two methods, makes the following statements.

I The prism produces a spectrum by refraction and the grating produces a spectrum by interference.

II The spectrum formed by the prism consists of all the wavelengths present in the white light and the spectrum formed by the grating consists of only a few specific wavelengths.

III The prism produces a single spectrum and the grating produces more than one spectrum.

Which of the statements is/are correct?

A I only

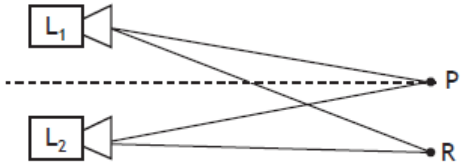
B II only

C I and II only

D I and III only

E I, II and III

2015 13. Two identical loudspeakers, L_1 and L_2, are operated at the same frequency and in phase with each other. An interference pattern is produced.



At position P, which is the same distance from both loudspeakers, there is a maximum.

The next maximum is at position R, where $L_1R = 5{\cdot}6\,m$ and $L_2R = 5{\cdot}3\,m$.

The speed of sound in air is $340\,m\,s^{-1}$.

The frequency of the sound emitted by the loudspeakers is

A $8{\cdot}8 \times 10^{-4}\,Hz$

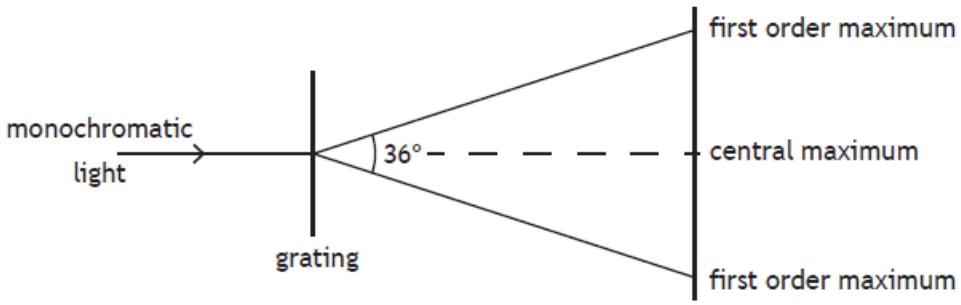
B $3{\cdot}1 \times 10^{1}\,Hz$

C $1{\cdot}0 \times 10^{2}\,Hz$

D $1{\cdot}1 \times 10^{3}\,Hz$

E $3{\cdot}7 \times 10^{3}\,Hz$.

2016 13. A ray of monochromatic light is incident on a grating as shown.



The wavelength of the light is 633 nm.

The separation of the slits on the grating is

A $1{\cdot}96 \times 10^{-7}\,m$

B $1{\cdot}08 \times 10^{-6}\,m$

C $2{\cdot}05 \times 10^{-6}\,m$

D $2{\cdot}15 \times 10^{-6}\,m$

E $4{\cdot}10 \times 10^{-6}\,m$.

2017 11. A student makes the following statements about waves from coherent sources.

I Waves from coherent sources have the same velocity.

II Waves from coherent sources have the same wavelength.

III Waves from coherent sources have a constant phase relationship.

Which of these statements is/are correct?

A I only

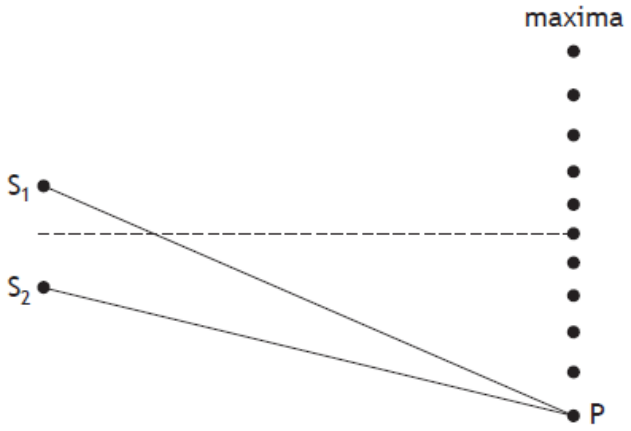
B II only

C I and II only

D I and III only

E I, II and III

2018 13. Waves from two coherent sources, S_1 and S_2, produce an interference pattern. Maxima are detected at the positions shown below.



The path difference $S_1P - S_2P$ is 154 mm.

The wavelength of the waves is

A 15·4 mm

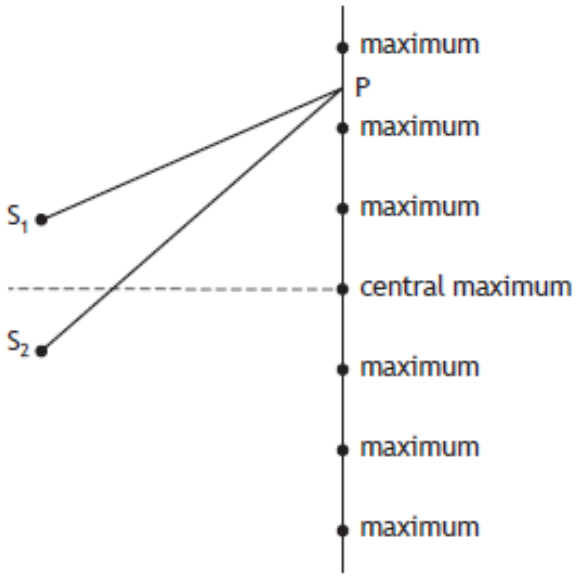
B 25·7 mm

C 28·0 mm

D 30·8 mm

E 34·2 mm.

2019 17. Waves from two coherent sources, S_1 and S_2, produce an interference pattern. Maxima are detected at the positions shown.



The wavelength of the waves is 28 mm.

For the third minimum at P the path difference ($S_2P - S_1P$) is

A 42 mm

B 56 mm

C 70 mm

D 84 mm

E 98 mm.