1. Which wave phenomenon is **not** needed to explain the pattern of observable fringes produced by a double slit experiment?

A coherence

B diffraction

C interference

D reflection

2. Monochromatic light passes through two narrow slits and produces an interference pattern on a screen some distance away. The interference fringes are very close together.

Which change would **increase** the distance between the fringes?

A Increase the brightness of the light source.

B Increase the distance between the slits and the screen.

C Increase the distance between the two slits.

D Increase the frequency of the light used.

3. Continuous water waves are diffracted through a gap in a barrier in a ripple tank.

Which change will cause the diffraction of the waves to increase?

A increasing the frequency of the waves

B increasing the width of the gap

C reducing the wavelength of the waves

D reducing the width of the gap

4. An organ pipe of length l is open at both ends. Notes are produced by the pipe when stationary waves are set up.

The speed of sound in the air column is v.

What is the lowest (fundamental) frequency of the note produced by the pipe?

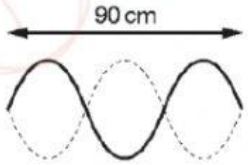
A $\frac{2v}{l}$ **B** $\frac{v}{l}$ **C** $\frac{v}{2l}$ **D** $\frac{v}{4l}$

5. 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

The diagram shows a stationary wave on a string at two instants of maximum vertical displacement.



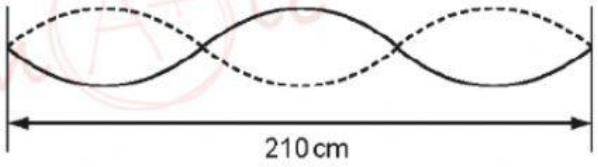
The frequency of the wave is 12 Hz.

What is the speed of the wave?

A $3.6\,ms^{-1}$ **B** $7.2\,ms^{-1}$ **C** $360\,ms^{-1}$ **D** $720\,ms^{-1}$

6.

A stationary wave of frequency 80.0 Hz is set up on a stretched string of length 210 cm.

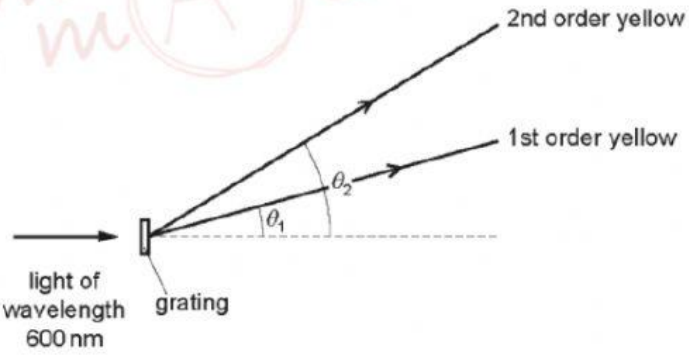


What is the speed of the waves that produce this stationary wave?

A $56.0\,ms^{-1}$ **B** $112\,ms^{-1}$ **C** $5600\,ms^{-1}$ **D** $11\,200\,ms^{-1}$

7.

A diffraction grating experiment is set up using yellow light of wavelength 600 nm. The grating has a slit separation of 2.00 μm.

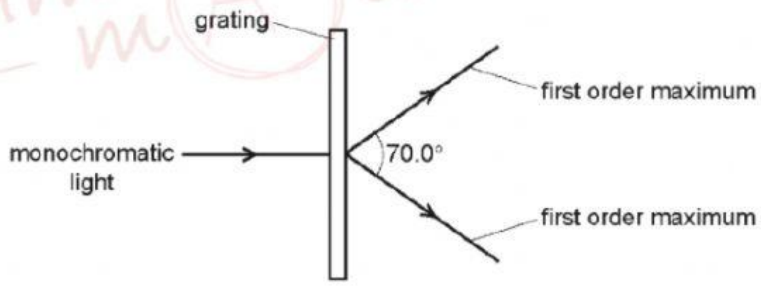


What is the angular separation $(\theta_2 - \theta_1)$ between the first and second order maxima of the yellow light?

A 17.5° **B** 19.4° **C** 36.9° **D** 54.3°

8.

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

9.

Water waves of wavelength λ are diffracted as they pass through a gap of width d in a barrier.

Which combination of wavelength and gap width would produce the greatest angle of diffraction?

	gap width	wavelength
A	$\frac{1}{2}d$	2λ
B	$\frac{1}{2}d$	$\frac{1}{2}\lambda$
C	$2d$	2λ
D	$2d$	$\frac{1}{2}\lambda$

10.

In a double-slit experiment the distance between the fringes, on a screen, was too small to measure.

What would increase the distance between the fringes?

A increasing the distance between the light source and the slits

B increasing the distance between the slits and the screen

C increasing the distance between the slits

D increasing the frequency of the light source

11.

Interference fringes are produced on a screen by double-slit interference using light of wavelength 600 nm. The fringe separation is 4.0 mm and the separation of the slits is 0.60 mm.

What is the distance between the double slit and the screen?

A 0.25 m **B** 0.40 m **C** 2.5 m **D** 4.0 m

12.

13. Which amount of charge, flowing in the given time, will produce the largest current?

	charge / C	time / s
A	4	$\frac{1}{4}$
B	4	1
C	1	4
D	$\frac{1}{4}$	4

14. A 12 V battery is charged for 20 minutes by connecting it to a source of electromotive force (e.m.f.). The battery is supplied with 7.2×10^4 J of energy in this time.

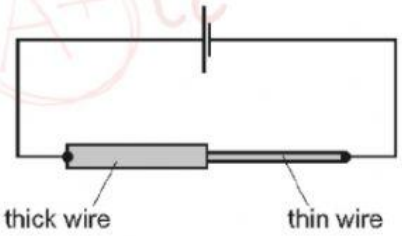
How much charge flows into the battery?

A 5.0 C **B** 60 C **C** 100 C **D** 6000 C

15. Which values of current and resistance will produce a rate of energy transfer of 16 Js^{-1}?

	current / A	resistance / Ω
A	1	4
B	2	8
C	4	1
D	16	1

16. A thick copper wire is connected to a thin copper wire in series with a cell, as shown.



What is significantly **less** in the thick wire **than** in the thin wire?

A the charge passing a point per unit time

B the drift speed of the electrons

C the number density of the free electrons

D the number of free electrons passing a point per unit time

17. An iron wire has length 8.0 m and diameter 0.50 mm. The wire has resistance R.

A second iron wire has length 2.0 m and diameter 1.0 mm.

What is the resistance of the second wire?

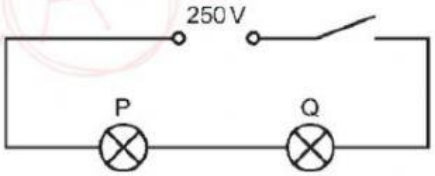
A $\frac{R}{16}$ **B** $\frac{R}{8}$ **C** $\frac{R}{2}$ **D** R

18. A cylindrical wire of length 10 m and diameter 2.0 mm has a resistance of 0.050 Ω.

From which material is the wire made?

	material	resistivity / Ωm
A	bronze	1.6×10^{-7}
B	nichrome	1.6×10^{-6}
C	silver	1.6×10^{-8}
D	zinc	6.3×10^{-8}

19. In the circuit shown, lamp P is rated 250 V, 50 W and lamp Q is rated 250 V, 200 W. The two lamps are connected in series to a 250 V power supply.



Assume that the resistance of each lamp remains constant.

Which statement most accurately describes what happens when the switch is closed?

A Lamp P emits four times as much power as lamp Q.

B Lamp P emits twice as much power as lamp Q.

C Lamp Q emits four times as much power as lamp P.

D Lamp Q emits twice as much power as lamp P.

20. A pedal bicycle is fitted with an electric motor. The rider switches on the motor for a time of 3.0 minutes. A constant current of 3.5 A in the electric motor is provided from a battery with a terminal voltage of 24 V.

What is the energy supplied by the battery?

A 84 J **B** 250 J **C** 630 J **D** 15 000 J

A battery is marked 9.0 V.

What does this mean?

A Each coulomb of charge from the battery supplies 9.0 J of electrical energy to the whole circuit.

B The battery supplies 9.0 J to an external circuit for each coulomb of charge.

C The potential difference across any component connected to the battery will be 9.0 V.

D There will always be 9.0 V across the battery terminals.

21.

What is the unit of resistivity?

A $\Omega\,m^{-2}$ **B** Ωm^{-1} **C** Ω **D** Ωm

22.

A filament lamp has a resistance of 180 Ω when the current in it is 500 mA.

What is the power transformed in the lamp?

A 45 W **B** 50 W **C** 90 W **D** 1400 W

23.

Which equation that links some of the following terms is correct?

potential difference (p.d.)	V
current	I
resistance	R
charge	Q
energy	E
power	P
time	t

A $P = \frac{Q^2R}{t}$

B $ER^2 = V^2t$

C $\frac{VI}{P} = t$

D $PQ = EI$

24.

A pedal bicycle is fitted with an electric motor. The rider switches on the motor for a time of 3.0 minutes. A constant current of 3.5 A in the electric motor is provided from a battery with a terminal voltage of 24 V.

What is the energy supplied by the battery?

A 84 J **B** 250 J **C** 630 J **D** 15 000 J

25.