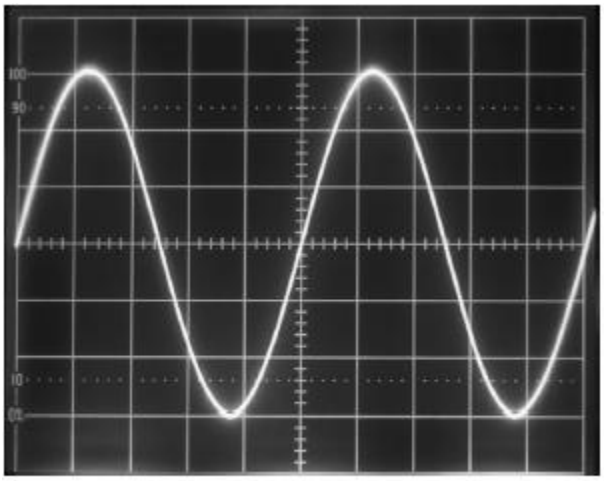
Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A 2-beam oscilloscope is used to determine the speed of sound in air. The oscilloscope screen shown displays the signal used to produce the sound wave.



(Source: © Dorling Kindersley/UIG/SCIENCE PHOTO LIBRARY)

The time-base is set to 50 μs / division.

Which of the following gives the frequency, in Hz, of the signal?

☐ **A** $5 \times 50 \times 10^{-6}$

☐ **B** $2.5 \times 50 \times 10^{-6}$

☐ **C** $\dfrac{1}{5 \times 50 \times 10^{-6}}$

☐ **D** $\dfrac{1}{2.5 \times 50 \times 10^{-6}}$

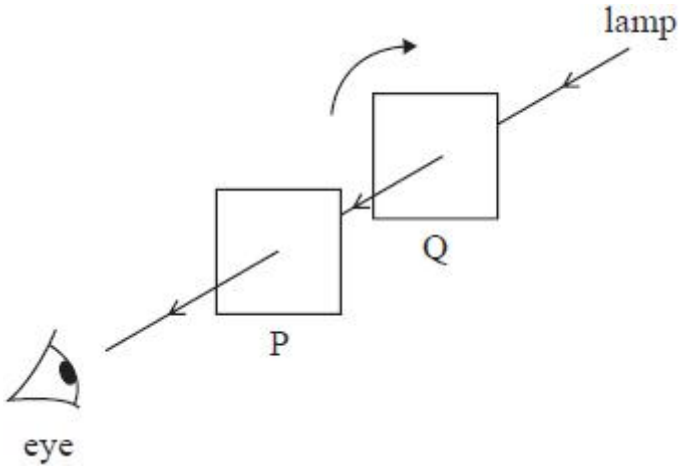
(Total for question = 1 mark)

Q2.

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Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A lamp is switched on and viewed through two polarising filters P and Q, as shown.



The lamp appears dark when viewed through P and Q.
Q is rotated through 180°.

Which row of the table gives the appearance of the lamp after Q has rotated by 90° from its original position and by 180° from its original position?

		Angle of rotation of 90°	Angle of rotation of 180°
☐	**A**	dark	dark
☐	**B**	dark	bright
☐	**C**	bright	dark
☐	**D**	bright	bright

(Total for question = 1 mark)

Q3.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

The image formed by a lens can be described as real or virtual.

Which row of the table describes a real image and a virtual image?

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	Real image	Virtual image
☒ **A**	Formed on the same side of the lens as the object	Formed on the same side of the lens as the object
☒ **B**	Can be produced on a screen	Formed on the same side of the lens as the object
☒ **C**	Formed on the same side of the lens as the object	Can be produced on a screen
☒ **D**	Can be produced on a screen	Can be produced on a screen

(Total for question = 1 mark)

Q4.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

In an electron diffraction experiment, electrons are accelerated by a potential difference between a hot filament and an anode. The electron beam produced strikes a sample of crystalline material causing a diffraction pattern.

Which of the following would cause the angle of diffraction to increase?

☒ **A** decreasing the distance between the filament and the anode

☒ **B** decreasing the potential difference

☒ **C** increasing the filament temperature

☒ **D** using a crystalline material with a larger lattice spacing

(Total for question = 1 mark)

Q5.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Light travelling in glass of refractive index n_g is incident at a boundary with water of refractive index n_w. The critical angle for the boundary is C.

Which of the following expressions is correct for this boundary?

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☒ **A** $\sin C = \frac{1}{n_g}$

☒ **B** $\sin C = \frac{n_w}{n_g}$

☒ **C** $\sin C = \frac{n_g}{n_w}$

☒ **D** $\sin C = \frac{1}{n_w}$

(Total for question = 1 mark)

Q6.

In an experiment to determine the wavelength of light, a diffraction grating is illuminated with light from a monochromatic source. A series of bright spots is observed.

The experiment is repeated and the distance between consecutive bright spots increases.

Select the row of the table that gives two changes to the experimental set up which would both cause the distance between consecutive bright spots to increase.

(1)

	Number of slits per mm in the diffraction grating	Wavelength of the light source
☒ **A**	Increased	Increased
☒ **B**	Increased	Decreased
☒ **C**	Decreased	Increased
☒ **D**	Decreased	Decreased

(Total for question = 1 mark)

Q7.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Which row of the table shows a base quantity and its base SI unit?

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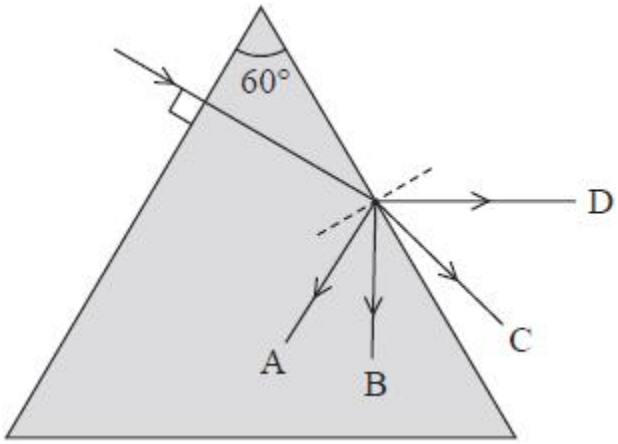
	Quantity	Unit
☒ **A**	charge	C
☒ **B**	length	m
☒ **C**	mass	g
☒ **D**	temperature	°C

(Total for question = 1 mark)

Q8.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A ray of light, in air, is incident on the edge of a triangular glass prism as shown. The critical angle for a light ray meeting a glass to air boundary is 35°.



Which of the following gives the value of the refractive index of the glass?

☒ **A** $\sin 35$

☒ **B** $\frac{1}{\sin 35}$

☒ **C** $\sin^{-1}\left(\frac{1}{35}\right)$

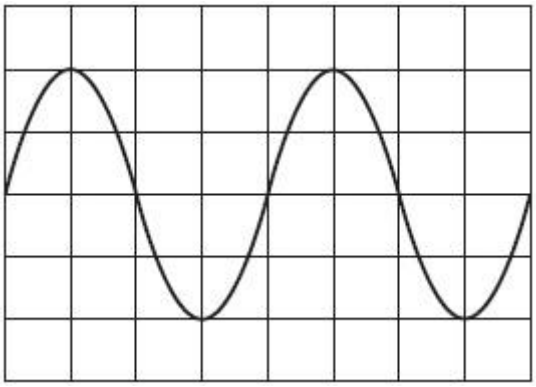
☒ **D** $\frac{1}{\sin^{-1}\left(\frac{1}{35}\right)}$

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(Total for question = 1 mark)

Q9.

A particular sound is investigated by connecting a microphone to an oscilloscope. The diagram shows the trace of a sound wave on the oscilloscope. The screen of the oscilloscope has a grid on it. On the x-axis 1 division represents 5 ms.



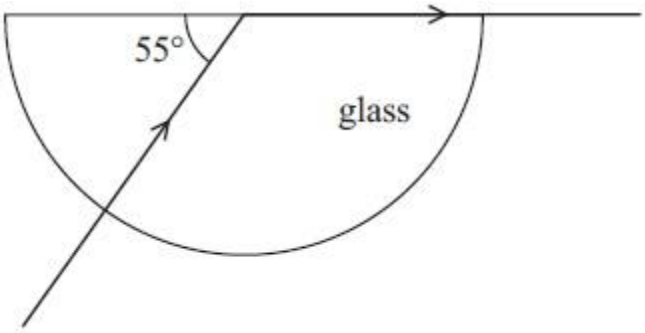
The frequency of the sound wave is

- ☒ **A** 0.05 Hz
- ☒ **B** 0.1 Hz
- ☒ **C** 50 Hz
- ☒ **D** 100 Hz

(Total for question = 1 marks)

Q10.

A ray of monochromatic light passes into a glass block as shown.



The refractive index of the glass for this light is

- ☒ **A** 0.57
- ☒ **B** 0.81
- ☒ **C** 1.22
- ☒ **D** 1.74

(Total for question = 1 marks)

Q11.

The length of the string is 4 m.
What is the wavelength of the stationary wave?

- ☒ **A** 1 m

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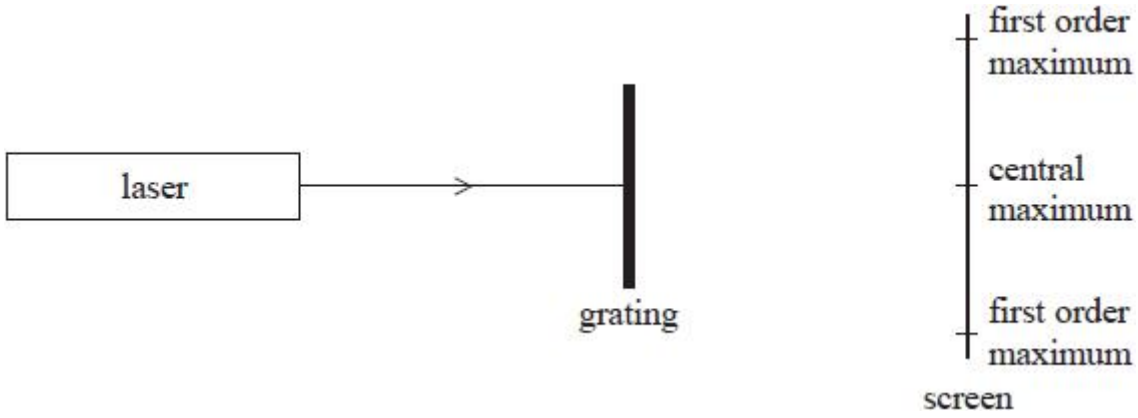
- ☒ **B** 2 m
- ☒ **C** 4 m
- ☒ **D** 8 m

(Total for question = 1 mark)

Q12.

A beam of light from a laser is directed at a diffraction grating.

The diagram shows the positions of the central maximum and the first order maxima on a screen.



Which of the following would cause the first order maxima to be closer to the central maximum on the screen?

(1)

- ☒ **A** moving the laser closer to the grating
- ☒ **B** moving the screen further from the grating
- ☒ **C** using a grating with more lines per metre
- ☒ **D** using laser light with a higher frequency

(Total for question = 1 mark)

Q13.

For two waves of light to be coherent the waves must

(1)

- ☒ **A** always have a phase difference equal to 0.
- ☒ **B** oscillate in the same plane.
- ☒ **C** have a similar amplitude.
- ☒ **D** originate from one source.

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(Total for question = 1 mark)

Q14.

Which variables are linked in the de Broglie equation?

- **A** frequency and wavelength of a photon
- **B** wavelength and momentum of a moving electron
- **C** energy and frequency of a photon
- **D** work function and threshold frequency of a metal

(Total for question = 1 mark)

Q15.

The effect of diffraction is more noticeable, in everyday life, with sound than with light. This is because

- **A** sound has a much longer wavelength than light.
- **B** sound is a longitudinal wave, light is a transverse wave.
- **C** sound is a mechanical wave, light is an electromagnetic wave.
- **D** sound travels more slowly in air than light does.

(Total for question = 1 marks)

Q16.

The de Broglie wavelength for neutrons used to study crystal structure is 1.2 nm. mass of a neutron = 1.67×10^{-27} kg

The speed of these neutrons would be

- **A** 3.0×10^{6} m s^{-1}
- **B** 3.3×10^{2} m s^{-1}
- **C** 3.0×10^{-3} m s^{-1}
- **D** 3.3×10^{-7} m s^{-1}

(Total for Question = 1 mark)

Q17.

The de Broglie wavelength associated with electrons moving at 2.5×10^{6} m s^{-1} is

- **A** 2.9×10^{-4} m
- **B** 2.4×10^{-8} m

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☒ **C** 2.9×10^{-10} m

☒ **D** 2.4×10^{-39} m

(Total for Question = 1 mark)

Q18.

The distance travelled by a wave during one oscillation may be described as

☒ **A** frequency.

☒ **B** period.

☒ **C** wavelength.

☒ **D** wave speed.

(Total for question = 1 mark)

Q19.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A string is held under tension. When it is plucked it vibrates with a frequency *f*.

Which of the following would result in a lower value for *f* ?

☒ **A** decreasing the cross-sectional area of the string

☒ **B** decreasing the density of the material of the string

☒ **C** increasing the length of the string

☒ **D** increasing the tension

(Total for question = 1 mark)

Q20.

A beam of electrons spreads out into several distinct beams after passing through a crystalline material.

This demonstrates that

☒ **A** electrons behave as particles.

☒ **B** electrons behave as waves.

☒ **C** electrons exist in energy levels.

☒ **D** electrons have negative charge.

(Total for question = 1 mark)

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