- 1 This question is about measuring the wavelength of the yellow light from a sodium lamp.
 - (a) A beam of light from a sodium lamp passes through a pair of narrow slits **S**₁ and **S**₂ producing a pattern on a screen. See Fig. 6.1. The pattern on the screen consists of regularly spaced bright and dark lines, called fringes. See Fig. 6.2.

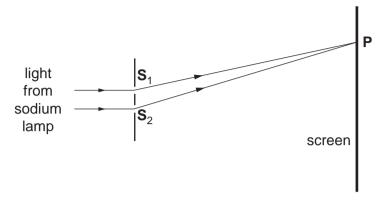


Fig. 6.1

State and explain the conditions necessary for the light from the two slits \mathbf{S}_1 and \mathbf{S}_2 to

	produce a visible pattern on the screen.					
	[3]					
(ii)	Using the ideas of wave superposition, explain the existence of the bright and the darl fringes. In your answer state the condition for a bright fringe to appear on the screen at F in Fig. 6.1 and the condition for a dark fringe to appear at P .					

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(b) Fig. 6.2 shows the central part of the fringe pattern on the screen at 1.5 m from the slits S₁ and **S**₂ which are 0.60 mm apart. 7.4 mm Fig. 6.2 Calculate (i) the fringe separation, that is, the separation x between adjacent dark lines $x = \dots m[1]$ (ii) the wavelength λ of the yellow light. (c) One of the two slits is covered up. Describe and explain how the pattern of light on the screen is different from that of Fig. 6.2.

[Total: 14]

2 (a)	Describe a plane polarised wave.				
	[2]				
(b)	Light reflected from the surface of water is partially plane polarised in the horizontal direction. The reflected light is totally plane polarised when the angle of reflection is about 53°.				
	incident light polarising filter (edge on) eye				
	angle of reflection				
	water surface				
	Fig. 7.1				
	Describe, referring to Fig. 7.1, the experiment that you would perform using a polarising filter (a sheet of Polaroid) to determine whether this statement is correct. Describe what you expect to observe.				
	In your answer you should make clear how you would use any apparatus to make observations or take suitable measurements.				

(c)	State Malus' law for the intensity I of a beam of plane polarised light transmitted through a polarising sheet with its transmission axis at an angle θ to the plane of polarisation. Explain the meaning of any other symbols that you use. Use Malus' law to explain the observations in the experiment of part (b) .
	[4]
	[Total: 10]

3	(a)	Name one	common property of	electron	nagnetic wa	aves not shared by o	ther waves	<u>.</u>	
								[1]	
	(b)	Fig. 5.1 sho A to G .	ws a block diagram c	of the se	ven regions	s of the electromagne	etic spectru	m, labelled	
					visible				
		Α	В	С	D E	F	G	_	
				5	× 10 ⁻⁷	wavelength/m	•	-	
		Name the p	orincipal radiation in e	each of t	he regions	A, C and F.			
		Α			С				
		F						[3]	
	(c)	An aerial mounted vertically transmits vertically polarised radio waves of frequency 1.0×10^9 Hz. The waves are detected by a receiving aerial some distance away. Initially the receiving aerial is also mounted vertically as shown in Fig. 5.2.							
		transmit aeria	al	avis		receiving aerial	to		
				axis			detector		
		Fig. 5.2							
		The length of each aerial is half the wavelength of the radio waves.							
		(i) Calculate the wavelength of the waves.							
	wavelength =							m [2]	
		(ii) Calcula	ate the length of an a	erial.					

	(iii)	The receiving aerial is rotated through 180° about the axis joining the centres of the two aerials. See Fig. 5.2. Describe and explain how the output signal from the receiving aerial changes with the angle of rotation.					
		[3]					
(d)	Ultra	a-violet radiation from the Sun is often divided into three regions UV-A, UV-B and UV-C.					
	(i)	Describe the characteristics and dangers of UV-A, UV-B and UV-C radiations.					
		[3]					
	(ii)	Explain how sunscreen protects the human skin.					
		[1]					
(e)		lain why electrons can be emitted from a clean metal surface illuminated with bright a-violet light but never when infra-red light is used, however intense.					
		[2]					

[Total: 16]