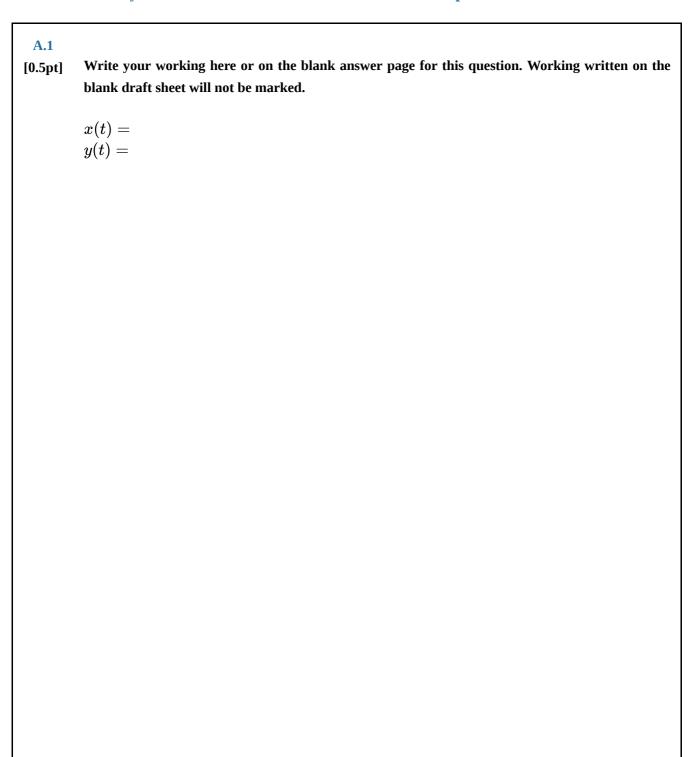


Geometry of Water Fountain

Part A: Uniformly Distributed Holes on the Surface of the Hemisphere



A.2 [1.0pt]	y(x, heta)=



A.3 [3.0pt]	y =



A.3 [cont.]	

A.4 [1.0pt]	R(heta) =



A.5 [0.5pt]	



Part B: Non-Uniformly Distributed Holes on the Surface of the Hemisphere

B.1 [1.0pt]	$dA_W =$

B.2 [2.0pt]	$ ho(heta)$ \propto

B.3 [1.0pt]	ho(heta)«



B.3 [cont.]		



Question 1 - Extra Answer Page
Additional working for question 1 included here will be marked. If you need more space for question 1, please ask an invigilator for a boxed sheet.
Clearly write which part of the question you are attempting.



Snell's Law

Part A: Light Propagation Through a Semi-Sphere

A.1 [0.5pt]	Write your working here or on the blank answer page for this question. Working written on the blank draft sheet will not be marked.
	Ray propagates faster in the semi-sphere.



A.2 [1.0pt]	The difference between refractive index of ray <i>a</i> and ray <i>b</i> in the semi-sphere is



Part B: Light Propagation Through a Cylindrical Rod

B.1 [2.0pt]	The incident angle, θ , where light is totally reflected back to the polymer is< θ <



When the other, open end of the rod is now coated with a thick layer of oil, with refractive index			



B.2 (ii)	When the setup is placed in water,
[0.9pt]	



Part C: Light Propagation Through an Optical Fibre

C.1 [2.0pt]	The relationship between the acceptance angle θ_a and refractive indices is
[=.vpt]	



C.1 [cont.]	



C.2 [2.6pt]	The new acceptance angle when the bending radius is 1 cm is



C.2 [cont.]	



C.3 [0.4pt]	The maximum acceptance angle for case C.1 is, and the maximum acceptance angle for case C.2 is



Question 2 - Extra Answer Page			
Additional working for question 2 included here will be marked. If you need more space for question 2, please ask an invigilator for a boxed sheet.			
Clearly write which part of the question you are attempting.			



The First Discovered Quasar: Unveiling the Mysteries of the Astrophysical Source 3C 273

Part A: Moon's Apparent Motion Against the Background Stars

A.1 [1.3pt]	Write your working here or on the blank answer page for this question. Working written on the blank draft sheet will not be marked.



A.2 [0.5pt]	



Part B: Using Lunar Occultations to Precisely Determine Radio Source Positions: The Case of 3C 273

B.1		
[0.6pt]		

B.2 [0.6pt]	
_	

В.3		
[0.6pt]		



Part C: The Breakthrough Discovery of 3C 273's True Nature

C.1		
[0.6pt]		



C.2 [0.6pt]		

C.3	
C.3 [0.6pt]	



Part D: The Intrinsic Luminosity of the Radio Source 3C 273

D.1 [0.6pt]		

D.2 [0.6pt]		

D.3		
[0.6pt]		



Part E: The Power Source of 3C 273

E.1	
[0.7pt]	



E.2 [0.7pt]			
E.2			
[0.7nt]			
[0.7 pt]			



Part F: Modern Observations and the Nature of 3C 273's Components

F.1		
[0.7pt]		



F.2		
[0.7pt]		
r. F.		



Question 3 - Extra Answer Page
Additional working for question 3 included here will be marked. If you need more space for question 3, please ask an invigilator for a boxed sheet.
Clearly write which part of the question you are attempting.