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Theoretical Question 1 **Particles and Waves**

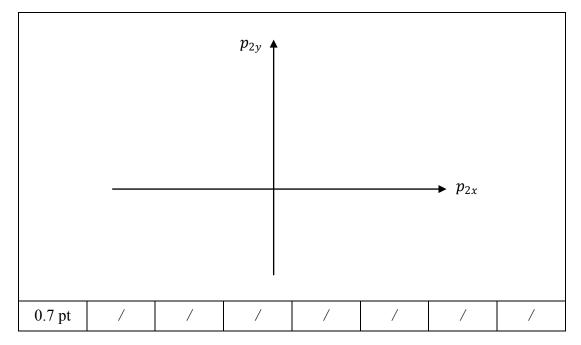
Do not write in any box marked with a solidus (oblique stroke, /).

Part A. Inelastic scattering and compositeness of particles

(a)(i) Q in terms of m, M, p_1 , p_{2x} , and p_{2y}

Expression	on of $Q =$						
0.2 pt	/	/	/	/	/	/	/

(ii) Plot of a condition relating p_1 , p_{2x} , and p_{2y} for an elementary target as a curve with p_{2x} -intercepts specified. Label regions with Q < 0, Q = 0, Q > 0.



Region(s) of Q allowed by a stationary composite target in its ground state before scattering.

Allowed	Q region(s):					
0.2 pt	/	/	/	/	/	/	/

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			ANSWE	SHEET			
(i) The equ	ation relati	$\log x$ to Q ,	θ, d_0, m, k	M, p_1 and	p_2 .		
0.7 pt	/	/	/	/	/	/	
(ii) Thresho	· ·	,	,	,	,	,	,
	oid value p	$\frac{c}{c}$ or p_2 .					
$p_c =$							
1.1 pt	/	/	/	/	/	/	/
Plot of σ v	versus p_2 fo	r given p_1	and $M = 3$	m with ran	ige of σ an	p_2 specif	fied.
			σ				
			Ī				
							→
							p_2
1.1 pt	/	/	/	/	/	/	/

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(c)	Period of v	vibration <i>T</i>		t B. Wave	es on a st	ring			
	T =								
	0.5 pt	/	/	/	/	/	/	/	
Š	Shape of th	e string at	t = T/8	specify imp	portant leng	gths and an	gles).		
	1.7 pt	/	/	/	/	/	/	/	
,			_						J
(d)	The total n	nechanical	energy of t	the vibratin	ng string.				1
	0.8 pt	/	/	/	/	/	/	/	

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Distance (ir	n units of l		The expo		niverse		
$L(t_{\rm e}) =$							
2.2 pt	/	/	/	/	/	/	/
The recedin	g velocity	(in units o	of c) of the s	star.			
$v(t_0) =$							
0.8 pt	/	/	/	/	/	/	/