

A: Paul Trap

A.1	(a) $\vec{E}(x, y, z) =$	(b)	1.5 pt
-----	--------------------------	-----	--------

A.2	$k =$	$a =$	0.4 pt
-----	-------	-------	--------

A.3	(a)	(b)	1.8 pt
-----	-----	-----	--------

A.4	(a)	(b)	1.5 pt
-----	-----	-----	--------

A.5	$k =$ rad/s	$\Omega_{\min} \simeq$ rad/s	0.4 pt
-----	-------------	------------------------------	--------

B: Doppler Cooling

B.1	$\Gamma =$	0.5 pt
-----	------------	--------

B.2	$s_- =$	$\pi_- =$	1.7 pt
	$s_+ =$	$\pi_+ =$	
	$F =$		

B.3	$P_{\text{in}} =$	1.0 pt
-----	-------------------	--------

B.4	$P_{\text{out}} =$	$\overline{v^2} =$	$T =$	0.8 pt
-----	--------------------	--------------------	-------	--------

B.5	$T =$ K	0.4 pt
-----	---------	--------