

Answer Form

Theoretical problem No. 2

DOPPLER LASER COOLING AND OPTICAL MOLASSES

PART I: BASICS OF LASER COOLING

1. Absorption.

1a		0.2
1b		0.2
1c		0.2

2. Spontaneous emission in the $-x$ direction.

2a		0.2
2b		0.2
2c		0.2
2d		0.2

3. Spontaneous emission in the $+x$ direction.

3a		0.2
3b		0.2

3c		0.2
3d		0.2

4. Average emission after absorption.

4a		0.2
4b		0.2
4c		0.2
4d		0.2

5. Energy and momentum transfer.

5a		0.2
5b		0.2

6. Energy and momentum transfer by a laser beam along the $+x$ direction.

6a		0.3
6b		0.3

PART II: DISSIPATION AND THE FUNDAMENTALS OF OPTICAL MOLASSES

7. Force on the atomic beam by the lasers.

7a		1.5
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8. Low velocity limit.

8a		1.5
8b		0.25
8c		0.25
8d		0.25
8e		0.25

9. Optical molasses

9a		1.5
9b		0.5