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

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