Problem 1

a) This is a pure specific-factors model.

(i) If labor is fixed, nothing happens to employment or output.

(ii) China will export toys. If prices are determined on world markets, then the US price of toys will go up by the same amount as the tariff. The US price on computers is unchanged.

(iii) Real wages for workers in the toy industry will benefit, real wages for workers in the computer industry are hurt.

- The student should argue that the nominal wage is determined by the value of the marginal product of labor.

- The toy industry wage is going up by the same amount as the tariff. Since the price of computers is unchanged, they will have a higher real wage.

- The computer industry wage is unchanged, but toys are more expensive, so the real wage for computer workers is declining.

b) This is a Heckscher-Ohlin model.

An increase in the price of toys will lead to an increase in the real wages of unskilled workers and a decrease for skilled workers.

The impact is the same in the toy and computer industry (because of free mobility).

The student should be able to explain the Stopler-Samuelson theorem, e.g. using a figure such as on slide 25 in Lecture 5.

Short vs long run comparison:

In the short run, unskilled (and skilled) workers in the computer industry get lower real wages. In the long run, workers will therefore move to the toys industry, where wages are higher. The (change in) demand for unskilled workers will be higher than the (change in) demand for skilled workers, because the toys industry is growing and toys are unskilled labor intensive. This will push up the wage more for unskilled than skilled workers.

Problem 2

a) $y = AK^{\alpha}h^{1-\alpha}(L)^{-\alpha} = Ah^{1-\alpha}k^{\alpha}$

b) 2000-2010: y: 0.10, k: 0.10, h: 0.10

2010-2020: y: 0.10, k: 0.20, h=0.20

c) The student should derive the growth accounting formulas: $\hat{y} = \hat{A} + (1-\alpha)\hat{h} + \alpha\hat{k}$ or $\hat{A} = \hat{y} - (1-\alpha)\hat{h} - \alpha\hat{k}$.

This gives

2000-2010: $\hat{A} = 0.10 - 0.5 \times 0.10 - 0.5 \times 0.10 = 0$.

2010-2020: $\hat{A} = 0.10 - 0.5 \times 0.20 - 0.5 \times 0.20 = -0.10$.

d) This is true between 2000-2010 because productivity growth was zero. And also true between 2010-2020 because productivity growth was negative.

e) 2000-2010: $\hat{A} = 0.10 - 0.5 \times 0.10 - 0.5 \times 0.10 = 0$.

2010-2020: $\hat{A} = 0.10 - 0.5 \times 0.20 + 0.5 \times 0.10 = 0.05$.

Now we observe that half of the growth in output per capita between 2010-2020 can be explained by productivity growth.

Problem 3

Denote α the share of R&D workers: $L_A = \alpha L$.

Productivity growth is: $\hat{A} = L_A/\mu = \alpha L/\mu$.

GDP is $Y = A(1-\alpha)L$. GDP per capita: $y = A(1-\alpha)$. Growth in GDP per capita is $\hat{y} = \hat{A} = \alpha L/\mu$.

Short run: Yes, GDP per capita will increase (and grow faster) because L is higher, see equation above.

Long run: Yes, GDP per capita will increase (and grow faster) because L is higher, see equation above.

Note: In the lecture notes (Lecture 11, slide 16), GDP per capita declined in the short run when the share of R&D workers increased. This is not happening here, because it is L that is increasing, not α.

Bonus points if the students discuss whether we can have GDP growth "forever". In class, we discussed the (i) fishing out effect and (ii) decreasing returns in the long run (slide 39-41).