1. (6) As long as you list and explain three of each, you should get full credit.
2. (9) The amount of labor decreases, the amount of capital increases, and total cost decreases. This makes intuitive sense because the cost of an input has decreased. If you are allowed to adjust by changing both labor and capital, you will increase the use of the relatively cheaper input and less of the relatively more expensive input. In addition, when the price of an input falls, we would expect total cost to decrease. See the graph below.

3. (5) The long run average cost curve is a collection of the lowest short run average total costs for any given quantity. The theoretical smooth shape depends on the ability to place an infinite number of short run average total cost curves. If only two firm sizes are available the graph will include several points from each short run average total cost curve rather than a single point from each. See graph below.
4. (4) \( \Phi = f(L, k) + \lambda (T_c - \omega L - r k) \)

\( \Phi = f(L, k) + \lambda (T_c - \omega L - r k) \)

\( \frac{\partial \Phi}{\partial L} = M_p L - \omega \lambda = 0 \)

\( \frac{\partial \Phi}{\partial k} = M_p k - r \lambda = 0 \)

\( \frac{\partial \Phi}{\partial \lambda} = T_c - \omega L - r k = 0 \)

Solve for \( \lambda \) in (ii) \( \lambda = \frac{M_p}{\omega} \)

Sub into (ii) \( M_p k - r \frac{M_p}{\omega} = 0 \)

Rearrange \( \frac{\omega}{r} = \frac{M_p}{M_p k} \)

Slope of isocost \( \text{slope of isocost} \)

\( \Phi = 20L + 5k + \lambda (-3k^{2/3} L^{1/3} + 120) \)

\( \frac{\partial \Phi}{\partial L} = 20 - \lambda \frac{2k^{1/3}L^{2/3}}{k^{1/3}} = 0 \)

\( \frac{\partial \Phi}{\partial k} = 5 - \lambda \frac{2L^{1/3}k^{2/3}}{k^{2/3}} = 0 \)

\( \frac{\partial \Phi}{\partial \lambda} = 1200 - 3k^{2/3}L^{1/3} = 0 \)

From (i) \( \lambda = 20 \frac{L^{2/3}}{k^{1/3}} \)

Sub into (ii) \( 5 - 2 \cdot 20 \frac{L^{2/3}}{k^{1/3}} \cdot \frac{L^{1/3}}{k^{1/3}} = 0 \rightarrow 5k = 40L \)

\( k = 8L \)

Sub into (ii) \( 1200 - 3 \cdot (8L)^{2/3} L^{1/3} = 0 \)

\( 1200 = 3 \cdot 4L \)

\( 1200 = 12L \)

\( L = 100 \)

\( K = 800 \)
6. (3) See graph.

Graphically - finding iso cost that is closest to origin that includes the isoquant at 1200

7. (4) Marginal revenue – change in total revenue given a change in quantity.
Marginal cost – change in total cost given a change in quantity.

\[ MR = \frac{dT R}{dQ} \quad \text{derivative of total revenue with respect to Q} \]

\[ MC = \frac{dT C}{dQ} \quad \text{derivative of total cost with respect to Q} \]

A perfectly competitive firm has a horizontal firm specific demand because of the price taking nature of the perfectly competitive market (large number of firms/consumers and a homogeneous product). Thus, price remains constant for any quantity that a firm sells. The change in total revenue given a change in quantity is the market price.