Key Concepts

Aggregate Supply

The aggregate production function shows that the quantity of real GDP \((Y)\) supplied depends on the quantity of labor \((L)\), the quantity of capital \((K)\), and the state of technology.

- When the wage rate makes the quantity of labor supplied equal the quantity of labor demanded, there is full employment. At full employment, the unemployment rate is the natural rate of unemployment, and the amount of GDP produced is potential GDP.

Aggregate supply is the relationship between the quantity of real GDP supplied and the price level. Aggregate supply depends on the time frame.

The macroeconomic long run is the period of time necessary for all changes to have occurred so that real GDP equals potential GDP.

- The long-run aggregate supply curve, \(LAS\), is the relationship between the price level and real GDP when real GDP equals potential GDP. The \(LAS\) curve is vertical, as illustrated in Figure 6.1.
- Along the \(LAS\) curve, both the prices of goods and services and the prices of productive resources change.

In contrast, the macroeconomic short run is the period of time during which real GDP is above or below potential GDP.

- The short-run aggregate supply curve, \(SAS\), is the relationship between the price level and the quantity of real GDP supplied in the short run when the money wage rate and other resource prices are constant. The \(SAS\) curve slopes upward, as illustrated in Figure 6.1.
- Along the \(SAS\) curve, only the price level changes; the money wage rate and other resource prices are constant.
- The \(SAS\) curve shifts leftward when the money wage rate (or other costs) rise.

When the \(LAS\) curve shifts, so does the \(SAS\) curve. Three factors shift the \(LAS\) curve:
- Changes in the full-employment quantity of labor.

This is Chapter 21 in Economics.
♦ Changes in the quantity of capital, including human capital.
♦ Advances in technology.
The short-run aggregate supply decreases when the cost of resources rises.
♦ A rise in the money wage rate shifts the SAS curve leftward, but does not shift the LAS curve.

### Aggregate Demand

The quantity of real GDP demanded equals the sum of consumption expenditure \((C)\), investment \((I)\), government purchases \((G)\), and exports \((X)\) minus imports \((M)\).

**Aggregate demand** shows the relationship between the quantity of real GDP demanded and the price level. As illustrated in Figure 6.2 the aggregate demand curve, \(AD\), slopes downward. It does so for two reasons:

- Wealth effect — A higher price level decreases the amount of *real* wealth (that is, the purchasing power of wealth), which decreases the quantity of real GDP demanded.
- Substitution effects — An increase in the price level raises the interest rate, which reduces the quantity of real GDP demanded. In addition, an increase in the U.S. price level raises the price of U.S. goods relative to foreign goods.

When aggregate demand increases, the \(AD\) curve shifts rightward. Three key factors shift the \(AD\) curve:

- Expectations — higher expected future incomes, higher expected inflation, or higher expected profits increase current aggregate demand.
- Fiscal policy and monetary policy — **Fiscal policy** is government attempts to influence economic activity by changing taxes or government spending. An increase in government spending increases aggregate demand. Reduced taxes and increased transfer payments raise **disposable income** (aggregate income minus taxes plus transfer payments) and thereby increase consumption expenditures and hence aggregate demand. **Monetary policy** is changes the quantity of money and interest rates. Increasing the quantity of money or lowering interest rates increases aggregate demand.
- International factors — a decline in the foreign exchange rate or an increase in foreign incomes increase net exports and hence aggregate demand.

### Macroeconomic Equilibrium

**Short-run macroeconomic equilibrium** occurs when the quantity of GDP demanded equals the quantity supplied, which is where the \(AD\) and SAS curves intersect. In Figure 6.3 the equilibrium real GDP is $10 trillion and the price level is 110. The price level adjusts to achieve equilibrium. Short-run equilibrium does not necessarily take place at full employment.

**Long-run macroeconomic equilibrium** occurs when real GDP equals potential GDP so that the economy is on the \(LAS\) curve.
Economic growth takes place when potential GDP increases. Inflation occurs when aggregate demand increases more than long-run aggregate supply. Business cycles result when aggregate demand and short-run aggregate supply do not grow at the same rate.

- Figure 6.3 shows a below full-employment equilibrium because potential GDP exceeds real GDP. The recessionary gap is the amount by which potential GDP exceeds real GDP ($1 trillion in the figure).
- An above full-employment equilibrium occurs when real GDP exceeds potential GDP. The inflationary gap is the difference between real GDP and potential GDP.

The AD/AS framework illustrates how the economy responds to an increase in aggregate demand:

- In the short run, the AD curve shifts rightward and the equilibrium moves along the initial SAS curve. Real GDP increases and the price level rises.
- The money wage rate rises to reflect the higher prices, and the SAS curve shifts leftward, decreasing real GDP and further raising the price level.
- In the long run, the SAS curve shifts leftward enough so that real GDP returns to potential GDP. Further adjustments cease. Real GDP is at potential GDP, and the price level is permanently higher than before the increase in aggregate demand.

The AD/AS model also explains how the economy responds to a decrease in aggregate demand:

- The SAS curve shifts leftward, real GDP decreases and the price level rises. A period of time with combined recession and inflation is known as stagflation.

### U.S. Economic Growth, Inflation, and Cycles

GDP and the price level have changed dramatically over time in the U.S. economy. Both real GDP and the price level have grown over time.

- Growth in GDP results from growth in potential GDP, owing to increases in the labor force, capital stock, and advances in technology.
- Persistent inflation occurs when aggregate demand grows faster than long-run aggregate supply.
- Growth in real GDP is not steady but goes in cycles because aggregate demand and short-run aggregate supply do not increase at the same rate.

### Helpful Hints

1. **Short-Run and Long-Run Aggregate Supply:** The distinction between suppliers’ short-run and long-run behavior is crucial. The short run and long run are not defined as particular, fixed lengths of time but in terms of whether resource prices change. In the short run, the prices of productive resources do not change in response to change in prices; in the long run, resource prices do change.

Consider what happens when the price level rises. In the short run, resource prices do not change. Firms find that the prices of their outputs rise while the costs of their inputs do not change. Firms react by hiring more resources and supplying more real GDP, so the short-run aggregate supply curve slopes upward: As the price level rises, the quantity of real GDP supplied increases.

In the long run, resource prices adjust by the same amount as the price level, which means that firms find their costs have risen by the same percentage as their revenue. These two effects offset each other, so firms do not change their supply as the price level rises. Hence the long-run aggregate supply curve is vertical.

2. **Shifts and Movements Along the AD and AS Curves:** Be sure to distinguish between a shift of a curve and a movement along a curve. This distinction is crucial in understanding the factors that influence AD and AS, and you can be sure that your instructor will test you on it! The slope of the AD curve reflects the impact of a change in the price level on aggregate demand. A change in the price level produces a movement along the AD curve. A change in any of the factors affecting the AD curve other than the price level is reflected by a shift of the entire AD curve.

Similarly, a change in the price level produces a movement along the SAS curve or the LAS curve, but does not shift these curves. Instead, these curves shift when any relevant factor other than the price level changes.

These rules are similar to those you learned about the supply and demand curves for specific products. For those curves, changes in the price of the product created movements along the curves and changes in other relevant factors shifted the curves.
Questions

True/False and Explain

Aggregate Supply
1. At full employment, there is no unemployment.
2. Along the LAS curve, a rise in the price level and all resource prices increase the aggregate quantity of goods and services supplied.
3. Along the SAS curve, a rise in the price level increases the aggregate quantity of goods and services supplied.
4. Both the long-run and short-run aggregate supply curves shift rightward when the quantity of capital increases.
5. Any factor that shifts the short-run aggregate supply curve also shifts the long-run aggregate supply curve.

Aggregate Demand
6. Aggregate demand equals consumption expenditure plus investment plus government purchases plus exports minus imports.
7. According to the wealth effect, the lower the quantity of real wealth, the larger will be the quantity of real GDP demanded.
8. The term “monetary policy” refers to the government’s spending more money to purchase more goods and services.

Macroeconomic Equilibrium
9. Long-run macroeconomic equilibrium occurs when real GDP equals potential GDP.
10. In the short run, an increase in expected future profits raises the price level and increases real GDP.
11. If the economy is in equilibrium at below full employment, there is a recessionary gap.
12. A rise in the money wage rate increases short-run aggregate supply, that is, shifts the short-run aggregate supply curve rightward.
13. If aggregate demand increases so the economy is producing more output than potential real GDP, then, with the passage of time, the money wage rate will rise in response to the higher price level.

U.S. Economic Growth, Inflation, and Cycles
14. If the aggregate demand curve shifts rightward by more than the short-run aggregate supply curve shifts rightward, the price level rises.
15. If the aggregate demand curve and the short-run aggregate supply curve both shift rightward at the same time, real GDP increases.
16. The main forces generating persistent growth in real GDP are those that cause increases in long-run aggregate supply.
17. The AD/AS model shows that growth in potential GDP causes inflation.

Multiple Choice

Aggregate Supply
1. Long-run aggregate supply is the level of real GDP at which
   a. aggregate demand always equals short-run aggregate supply.
   b. full employment occurs.
   c. more than full employment occurs.
   d. prices are sure to rise
2. Along which curve do money wages and the price level change in the same proportion?
   a. Both the SAS and the LAS curves.
   b. Only the SAS curve.
   c. Only the LAS curve.
   d. None of the above because there is no curve along which both money wages and the price level change in the same proportion.
3. Long-run aggregate supply will increase for all the following reasons EXCEPT
   a. reduced money wages.
   b. increased human capital.
   c. introduction of new technology.
   d. increased capital.
4. A technological improvement shifts
   a. both the SAS and LAS curves rightward.
   b. both the SAS and LAS curves leftward.
   c. the SAS curve rightward, but it leaves the LAS unchanged.
   d. the LAS curve rightward, but it leaves the SAS curve unchanged.
5. An increase in the money wage rate shifts
   a. both the SAS and LAS curves rightward.
   b. both the SAS and LAS curves leftward.
   c. the SAS curve leftward, but leaves the LAS curve unchanged.
   d. the LAS curve rightward, but leaves the SAS curve unchanged.

**Aggregate Demand**

6. The aggregate demand curve (AD) illustrates that, as the price level falls,
   a. the quantity of real GDP demanded increases.
   b. the quantity of real GDP demanded decreases.
   c. the AD curve shifts rightward.
   d. the AD curve shifts leftward.

7. As the price level rises, the quantity of real wealth  
   and the aggregate quantity demanded .
   a. increases; increases
   b. increases; decreases
   c. decreases; increases
   d. decreases; decreases

8. Which of the following is classified as monetary policy?
   a. The government changing the amount of its purchases.
   b. The government changing its level of taxation.
   c. The government changing interest rates.
   d. The government financing a change in money wages.

9. Which of the following will shift the aggregate demand curve rightward?
   a. An increase in expected inflation.
   b. An increase in taxes.
   c. A fall in the price level.
   d. A rise in the price level.

**Macroeconomic Equilibrium**

10. Short-run macroeconomic equilibrium occurs at the level of GDP where the
    a. economy is at full employment.
    b. AD curve intersects the SAS curve.
    c. SAS curve intersects the LAS curve.
    d. AD curve intersects the LAS curve.

Use Table 6.1 for the next four questions.

<table>
<thead>
<tr>
<th>Price level</th>
<th>Aggregate demand (billions of 1996 dollars)</th>
<th>Short-run aggregate supply (billions of 1996 dollars)</th>
<th>Long-run aggregate supply (billions of 1996 dollars)</th>
</tr>
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</tr>
<tr>
<td>130</td>
<td>500</td>
<td>900</td>
<td>600</td>
</tr>
</tbody>
</table>

11. In the short-run macroeconomic equilibrium, the price level is  
    and the level of real GDP is  billion.
    a. 100; $600
    b. 110; $700
    c. 120; $600
    d. 130; $600

12. In the short run, the economy is in a(n)
    a. full-employment equilibrium and resource prices will not change.
    b. above full-employment equilibrium and resource prices will rise.
    c. above full-employment equilibrium and resource prices will fall.
    d. below full-employment equilibrium and resource prices will fall.

13. In the short-run equilibrium, there is
    a. an inflationary gap of $100 billion.
    b. an inflationary gap of $50 billion.
    c. a recessionary gap of $50 billion.
    d. a recessionary gap of $100 billion.

14. Assuming no changes in aggregate demand or long-run aggregate supply, in the long-run macroeconomic equilibrium, the price level is  
    and the level of real GDP is  billion.
    a. 100; $600
    b. 110; $700
    c. 120; $600
    d. 130; $600
15. If real GDP is greater than potential real GDP, then the economy is
   a. not in macroeconomic equilibrium.
   b. in a full-employment equilibrium.
   c. in an above full-employment equilibrium.
   d. in a below full-employment equilibrium.

16. A below full-employment equilibrium can be the result of the
   a. \( AD \) curve shifting rightward.
   b. \( SAS \) curve shifting rightward.
   c. \( LAS \) curve shifting leftward.
   d. \( AD \) curve shifting leftward.

Use Figure 6.4 for the next four questions.

**FIGURE 6.4**

**Multiple Choice Questions 17, 18, 19, 20**

17. Which of the following factors might have shifted the aggregate demand curve rightward?
   a. Reduced taxes
   b. Less investment
   c. A decrease in government purchases
   d. Higher money wages

18. After the aggregate demand curve has shifted permanently to \( AD_1 \), the new short-run macroeconomic equilibrium is at point
   a. point \( a \).
   b. point \( b \).
   c. point \( c \).
   d. No point identified with a letter in the figure.

19. When the economy in Figure 6.4 is moving to its long-run equilibrium, which curve shifts?
   a. The \( LAS \) curve shifts rightward.
   b. The \( LAS \) curve shifts leftward.
   c. The \( SAS \) curve shifts rightward.
   d. The \( SAS \) curve shifts leftward.

20. After the aggregate demand curve has shifted permanently to \( AD_1 \), the new long-run macroeconomic equilibrium will be at
   a. point \( a \).
   b. point \( b \).
   c. point \( c \).
   d. No point identified with a letter in the figure.

21. The price level rises and real GDP falls. Which of the following is a possible explanation?
   a. Higher profits are expected in the future.
   b. The price of raw materials increased.
   c. The stock of capital increased.
   d. The quantity of money increased.

**U.S. Economic Growth, Inflation, and Cycles**

22. The fact that the short-run aggregate supply and aggregate demand curves do not shift at a fixed, steady pace explains
   a. persistent inflation.
   b. business cycles.
   c. trend growth in real GDP.
   d. large government budget deficits.

23. Persistent inflation is caused by
   a. persistent rightward shifts in the \( AD \) curve.
   b. persistent rightward shifts in the \( SAS \) curve.
   c. the tendency for long-run aggregate supply to increase faster than aggregate demand.
   d. persistent leftward shifts in the \( SAS \) and \( AD \) curves.

24. Which of the following statements about economic growth in the United States is most accurate?
   a. Inflation was high in the 1960s, low in the 1970s, and moderate in the 1980s and 1990s.
   b. Economic growth was rapid in the 1960s, slow in the 1970s, and rose in the 1980s and 1990s.
   c. Economic growth and inflation were both high in the 1970s, but lower in the 1980s and 1990s.
   d. Economic growth and inflation were both low in the 1970s, but higher in the 1980s and 1990s.
Short Answer Problems

1. Why is the LAS curve vertical?
2. Why does the SAS curve have a positive slope?
3. The international substitution effect implies that an increase in the price level will lead to a decrease in the aggregate quantity of goods and services demanded. Explain why.

4. In Figure 6.5 illustrate an economy in long-run equilibrium, producing at the full-employment level of production. Indicate the equilibrium price level and level of real GDP. Also indicate the potential level of real GDP.

5. In Figure 6.6 illustrate an economy in short-run equilibrium producing at a below full-employment level of production. Indicate the equilibrium price level and level of real GDP and show the amount of the recessionary gap.

6. In Figure 6.7 illustrate an economy in short-run equilibrium producing at an above full-employment level of production. Indicate the equilibrium price level and level of real GDP and show the amount of the inflationary gap.
CHAPTER 6 (21)

Problem 7

**FIGURE 6.8**

Problem 7

<table>
<thead>
<tr>
<th>Price level (GDP deflator, 1996 = 100)</th>
<th>Real GDP (billions of 1996 dollars)</th>
<th>0</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<th>12</th>
<th>13</th>
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</tr>
</tbody>
</table>

**TABLE 6.2**

Short Answer Problem 7

<table>
<thead>
<tr>
<th>Price level (billions of 1996 dollars)</th>
<th>Short-run aggregate supply (billions of 1996 dollars)</th>
<th>Long-run aggregate supply (billions of 1996 dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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<td>12</td>
</tr>
<tr>
<td>140</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>

7. Table 6.2 shows the initial aggregate demand, short-run, and long-run aggregate supply schedules for the nation of Macro.

a. Draw the *AD*, *SAS*, and *LAS* curves for Macro in Figure 6.8. Label the equilibrium point *a*. What is the equilibrium level of real GDP and price level?

b. Suppose that government purchases increase so that aggregate demand increases by $2 billion at every price level. In Figure 6.8 draw the new aggregate demand curve. Label the new short-run equilibrium point *b*. What is the equilibrium level of real GDP and price level in the short run?

c. Why is point *b* not a long-run equilibrium? In your answer, mention the level of potential real GDP, and describe whether point *b* represents an above full-employment, a full-employment, or a below full-employment equilibrium. If either an inflationary or recessionary gap exists, calculate what it equals.

d. As time passes, what happens to move the economy back to its long-run equilibrium? Illustrate this process in Figure 6.8 by drawing any other curves you need. Label the long-run equilibrium point *c*. What is the equilibrium level of GDP and price level in the long run?

8. Suppose that the *AD* curve shifts rightward. In the long run, how does this shift affect the *SAS* curve? Why does the *SAS* change only in the long run?

**FIGURE 6.9**

Short Answer Problem 9

9. Suppose that new, productivity enhancing technologies are discovered. In Figure 6.9 show how these technological advances affect the equilibrium level of real GDP and the price level.

10. Why are increases in the quantity of money the factor that created the persistent inflation that the United States has experienced for the last several decades?

**You’re the Teacher**

1. “I’ve really tried, but I just don’t see why a change in the price level doesn’t shift the short-run aggregate supply curve. After all, it seems like when the price level falls, firms should decrease the amount they produce and that this should shift the *SAS*...
curve. Plus, I’m a little shaky on how to use the AD/AS model. I sure hope the AD/AS model isn’t too important so that I don’t get hurt badly by not knowing this.” In truth, your friend may be mortally wounded by not understanding the difference between a shift of a curve and a movement along a curve. Use an example in which the AD curve shifts leftward to help explain to your friend how to use the AD/AS model for the short run and also why a drop in the price level does not shift the SAS curve.

2. After you have helped overcome the previous problems, your friend offers an observation: “I think I’m catching on to this stuff now. And the diagram you just drew was really helpful. But, is that diagram the end of the story? Or does something else happen as more time passes?” Basically, your friend is asking you to complete the explanation you started by showing what happens in the long run. Doing so would help reinforce your friend’s grasp of the AD/AS model. So, using another diagram of the AD/AS model. So, using another diagram, show what happens in the long run after an initial decrease in aggregate demand has occurred.
Answers

True/False Answers

Aggregate Supply
1. F Even at full employment, there is some unemployment, which is called the natural rate of unemployment.
2. F The LAS curve is vertical at the level of potential GDP. This fact indicates that the amount of potential GDP does not change when the price level and all resource prices rise.
3. T The SAS curve slopes upward, which means that an increase in the price level increases the quantity of real GDP supplied.
4. T An increase in the capital stock increases the nation’s potential real GDP, thereby shifting both the LAS and SAS curves rightward.
5. F A change in money wages shifts the SAS curve, but does not shift the LAS curve. The LAS curve shifts only when potential GDP changes.

Aggregate Demand
6. T Any factor that changes consumption expenditure, investment, government purchases, exports, or imports will have an effect on aggregate demand.
7. F The lower the quantity of real wealth, the smaller is the quantity of real GDP demanded, which is a reason for the negative slope of the aggregate demand curve.
8. F Monetary policy refers to changes in the quantity of money or interest rates.

Macroeconomic Equilibrium
9. T At the long-run macroeconomic equilibrium, the economy is on its long-run aggregate supply curve.
10. T The increase in expected future profits shifts the AD curve rightward, thereby raising the price level and increasing real GDP.
11. T The recessionary gap is the amount by which actual GDP falls short of potential GDP.
12. F An increase in money wages causes short-run aggregate supply to decrease (not increase), which means the short-run aggregate supply curve shifts leftward (not rightward).

13. T If the economy is producing more than potential GDP, the amount of employment exceeds full employment. The tight labor market then puts upward pressure on money wages and money wages rise.

U.S. Economic Growth, Inflation, and Cycles
14. T As long as the shift of the AD curve exceeds that of the SAS curve, the price level rises. But if the shift of the SAS curve exceeds that of the AD curve, the price level falls.
15. T Both shifts increase real GDP.
16. T As the nation’s potential real GDP grows, the long-run aggregate supply curve shifts rightward.
17. F If the AD curve does not shift rightward, growth in potential real GDP, which shifts the LAS curve rightward, lowers the price level.

Multiple Choice Answers

Aggregate Supply
1. b Long-run aggregate supply is at potential GDP, which occurs when the economy is at full employment.
2. c Moving along the LAS curve, both money wages and the price level change in the same proportion. (Moving along the SAS curve, only the price level changes.)
3. a Along the LAS curve, both the price level and money wage rate change, so a change in the money wage rate does not shift the LAS curve.
4. a Any factor that shifts the LAS curve, such as technological advances, also shifts the SAS curve.
5. c The change in money wages shifts the SAS curve but not the LAS curve.

Aggregate Demand
6. a As the price level falls, a movement occurs along a stationary AD curve to a larger quantity of real GDP demanded.
7. d Real wealth equals the amount of wealth divided by the price level, so an increase in the price level decreases real wealth. In turn, this reduction decreases the quantity of real GDP demanded.
8. c Monetary policy includes changes in the quantity of money and interest rates.
9. a An increase in expected inflation causes people to increase their demand now in order to beat
the higher prices expected in the future. Note that answers (c) and (d) are wrong because changes in the price level do not shift the aggregate demand curve but instead cause movements along it.

**Macroeconomic Equilibrium**

10. **b** The intersection of the $AD$ and $SAS$ curves always determines the equilibrium level of real GDP and price level. (In the long run, where the $AD$ and $SAS$ curves cross, the both also cross the $LAS$ curve.)

11. **b** The equilibrium price level is 110 because that is the price level at which the quantity of real GDP demanded equals the (short-run) quantity supplied, $700 billion.

12. **b** Potential GDP is only $600 billion, so, with actual GDP greater than potential GDP, the economy is at an above full-employment equilibrium.

13. **a** The inflationary gap equals the difference between actual GDP ($700 billion) and potential real GDP ($600 billion).

14. **c** In long-run equilibrium, the price level is such that the aggregate quantity demanded equals potential real GDP. (In the long run, the $SAS$ curve shifts so that it goes through the point where the $AD$ and $LAS$ curves cross.)

15. **c** Whenever real GDP exceeds potential GDP, the economy is in an above full-employment equilibrium.

16. **d** A leftward shift of the $AD$ curve decreases real GDP and causes a below full-employment equilibrium.

17. **a** Lower taxes increase consumption expenditure, thereby shifting the aggregate demand curve rightward.

18. **b** The short-run equilibrium is where the $SAS$ curve intersects the $AD$ curve.

19. **d** At point $b$, real GDP exceeds potential GDP, so point $b$ is an above full-employment equilibrium. Hence money wages rise and the $SAS$ curve shifts leftward, moving the economy to its (new) long-run equilibrium.

20. **c** The long-run equilibrium occurs where the $LAS$ curve crosses the $AD$ curve. In the long run, the $SAS$ curve will have shifted so that it, too, goes through point $c$.

21. **b** A leftward shift in the $SAS$ curve causes the price level to rise and real GDP to decrease. One reason the $SAS$ curve may shift leftward is an increase in the price of raw materials (such as oil).

**U.S. Economic Growth, Inflation, and Cycles**

22. **b** If the short-run aggregate supply and aggregate demand curves shifted rightward steadily, economic growth would be steady.

23. **a** As the $AD$ curve shifts rightward, the price level rises, so persistent rightward shifts of the $AD$ curve cause persistent increases in the price level; that is, cause inflation.

24. **b** The fluctuations in economic growth reflect the uneven growth in long-run aggregate supply.

**Answers to Short Answer Problems**

1. Long-run aggregate supply is the level of real GDP supplied at full employment. Because this level of real GDP, potential GDP, is independent of the price level, the long-run aggregate supply curve is vertical. Potential real GDP is attained when prices of resources, such as the money wage rate, have had enough time to adjust so as to restore full employment in all resource markets.

2. The short-run aggregate supply curve has a positive slope because it holds prices of productive resources constant. Thus when the price level rises, firms see the prices of their output (revenues) rising, but the prices of their inputs (costs) remain unchanged. Each firm is then induced to increase output because by so doing it can increase its profits. Hence, as firms increase their output, aggregate output (real GDP) increases.

3. International substitution means substituting domestically produced goods for foreign-produced ones or vice versa. If the price of domestic goods rises and foreign prices remain constant, domestic goods become relatively more expensive, and households buy fewer domestic and more foreign goods. This substitution decreases the demand for real (domestic) GDP. Thus a rise in the price level (the prices of domestic goods) leads to a decrease in the aggregate quantity of (domestic) goods and services demanded via the international price effect. Conversely, a fall in the price level leads to an increase in the aggregate quantity of domestic goods and services demanded.
4. Figure 6.10 shows the economy in a long-run, full employment equilibrium. The equilibrium price level is \( P \), and the equilibrium level of real GDP is \( \text{GDP}_{\text{pot}} \). Potential real GDP also equals \( \text{GDP}_{\text{pot}} \).

5. Figure 6.11 shows the economy when it is in a below full-employment equilibrium. The price level is \( P \), and the level of real GDP is GDP. The recessionary gap is the difference between potential real GDP, \( \text{GDP}_{\text{pot}} \), and the actual GDP, so it equals the length of the arrow in Figure 6.11.

6. Figure 6.12 shows the economy in a short-run, above full-employment equilibrium. The equilibrium price level is \( P \), and the level of real GDP is GDP. The inflationary gap is the difference between actual GDP and potential real GDP, \( \text{GDP}'_{\text{pot}} \). The inflationary gap equals the length of the double-headed arrow in the figure.

7. a. Figure 6.13 shows the initial aggregate demand curve \( (AD_0) \), the initial short-run aggregate supply curve \( (SAS_0) \), and the long-run aggregate supply curve \( (LAS) \). Point \( a \) is the equilib-
rium point, where the aggregate demand curve crosses the short-run aggregate supply curve. This point also is a long-run equilibrium because it is on the LAS curve. The price level is 110 because this price level sets the aggregate quantity demanded equal to the aggregate quantity supplied. The level of real GDP is $10 billion.

b. As illustrated in Figure 6.13, the increase in government purchases shifts the aggregate demand curve from $AD_0$ to $AD_1$. The new, short-run equilibrium point is labeled $b$. The price level rises to 120 and the level of real GDP increases to $11$ billion.

c. Point $b$ cannot be the long-run equilibrium because the economy is producing more than the potential level of real GDP. The long-run AS curve shows the potential level of real GDP to be $10$ billion. Hence the situation illustrated by point $b$ in Figure 6.13 is an above full-employment equilibrium. The inflationary gap in Figure 6.13 equals $1$ billion, the difference between real GDP and potential real GDP.

8. A rightward shift of the $AD$ curve raises the price level. In the short run, the money wage rate does not change, but in the long run the money wage rate will rise to reflect the higher price level. Hence, in the long run, the increase in money wages shifts the SAS curve leftward. The curve does not shift in the short run because money wages do not respond immediately to higher prices. Initially, prices rise but money wages are constant. But then, over time, workers demand higher money wage rates to make up for the fact that they must pay higher prices for the goods and services they purchase. Thus in the long run, money wages rise along with prices.

d. As the answer in part (c) just described, the short-run equilibrium at point $b$ is an above full-employment equilibrium. Unemployment is below its natural rate. As a result of the tight conditions in the labor market (and other resource markets), money wages (and other resource prices) rise. As money wages rise, the short-run aggregate supply curve shifts leftward. Figure 6.14 illustrates this process, whereby the short-run aggregate supply curve has shifted from $SAS_0$ to $SAS_1$. When the short-run aggregate supply curve is $SAS_1$, the economy has reached its new long-run equilibrium at point $c$. At point $c$, the price level is 130 and the level of real GDP has returned to potential real GDP, $10$ billion.

9. As Figure 6.15 shows, technological advances shift both the LAS and SAS curves rightward. However, the $AD$ curve does not shift. As a result, the equilibrium price level falls from $P_0$ to $P_1$, and the level of real GDP increases, from $GDP_0$ to $GDP_1$.

10. The price level can rise as the result of either an increase in aggregate demand or a decrease in aggregate supply. However, the steady and persistent in-
Increases in the price level have been caused by aggregate demand increasing faster than aggregate supply. (In terms of the AD/AS diagram, the LAS curve generally shifts rightward and thus, for prices to rise, the AD must be moving rightward even faster.) The most important reason for this behavior of aggregate demand is persistent increases in the quantity of money. Hence the persistent inflation in the United States during the past several decades is the result of persistent increases in the quantity of money.

**You’re the Teacher**

1. “Look, using the AD/AS model has to be important because a whole chapter’s devoted to it and, when I flipped through the next chapters in the book, I saw lots of AD/AS figures. So, you’ve got to get this straight, or I won’t be seeing you in class after a while.

   “Here’s the deal: A change in the price level does not shift the AD or the AS curves. Instead, the price level changes in response to a shift of the AD or AS curve.

   “Let me give you an example to hammer this point home. I need to draw a figure — let’s call it Figure 6.16. Now in Figure 6.16, the initial equilibrium is at point a because that’s where the initial aggregate demand curve, \( AD_0 \), and short-run aggregate supply curve, \( SAS_0 \), cross.

   “Let’s figure out what happens in our model when firms lose confidence in future profits. The drop in expected future profit from new investment leads to a decrease in aggregate demand, which means that the aggregate demand curve shifts leftward from \( AD_0 \) to \( AD_1 \).

   “You can best understand what happens next by imagining that the curve \( AD_0 \) can be peeled off the page so that it no longer exists. I mean, this is reasonable because, after all, the factors that created it no longer exist! Now before any adjustments take place, this leaves us with the curves \( SAS_0 \) and \( AD_1 \), and with the price level of 100. At this price level, there is a surplus of goods and services: \( SAS_0 \) shows that the quantity of real GDP supplied is equal to $10 trillion, but the \( AD_1 \) curve shows that the quantity of real GDP demanded is only $8 trillion. Firms find their inventories piling up. In this case, they cut prices to try to sell the output, and the price level falls. Once the price level reaches 95, there is no longer a surplus of output and firms stop cutting their prices. This, then, is the new equilibrium, with a price level of 95 and a real GDP of $9 trillion.

   “The key here is that the price level falls because the \( AD \) curve shifted. The fall in the price level did not shift the \( AD \) curve. In addition, the fall in the price level does not shift the \( SAS \) curve. If you want, you can think that we have moved along the \( SAS_0 \) curve from point a to point b (that is, from the old equilibrium point to the new equilibrium point), but the key thing is that the \( SAS \) curve has not shifted! After all, \( SAS_0 \) tells us that when the price level is 100, then $10 trillion of goods and services are supplied and when the price level is 95, then $9 trillion of goods and services are supplied. The slope of the \( SAS \) curve — and not a shift of the \( SAS \) curve — shows us that, when the price level falls, so, too, does the quantity of goods and services supplied.”

2. “I’m really glad that you’re starting to catch on because I like having a friend in class. Now that you understand what happens at the start, it won’t be hard to see the rest of the story.

   “You’re right that what we called point b in Figure 6.16 can’t be the end of the story. So far the only thing that has happened is that the price level has fallen and we’ve moved along \( SAS_0 \) to a lower level of real GDP. From the firms’ standpoint, the prices of the things they sell have fallen, but their costs haven’t changed. As a result, their profits are being...
squeezed. This is why they cut production. But, as they were cutting back on output, they were firing and laying off workers. Point $b$ is a below full-employment equilibrium, with more unemployment than the natural rate. So workers start to accept lower wages and, in general, the prices of resources start to fall.

"Whenever we get to a below full-employment equilibrium, these sorts of adjustments occur. And as the prices of resources such as the money wage rate fall, firms find their profits starting to bounce back. As a result, they are willing to increase their supply of goods and services even if the price level doesn’t change. For instance, even if the price level stays at 95, because their costs are falling, firms are willing to produce more than $9 trillion of goods and services. To reflect this change, the $SAS$ curve shifts rightward. As long as the money wage rate continues to fall, the $SAS$ curve continues to shift rightward.

"Suppose that eventually the $SAS$ curve has shifted from $SAS_0$ to $SAS_1$ in Figure 6.17. In this case, just like in Figure 6.16, where we pretended to erase the $AD_0$ curve once it was no longer relevant, in Figure 6.17 we can now pretend to erase the $SAS_0$ curve because the fall in money wages makes $SAS_1$ the relevant curve. So Figure 6.17 shows us that the new equilibrium will occur at point $c$, where $SAS_1$ crosses $AD_1$. The price level is 90 and real GDP is $10 trillion."

"The new level of real GDP is on the $LAS$ curve; that is, the new equilibrium level of GDP is equal to potential real GDP. This situation is a full-employment equilibrium so unemployment is back at its natural rate, eliminating downward pressure on money wages. So money wages stop falling, which means that the $SAS$ curve stops shifting rightward. As a result, point $c$ is the new long-run equilibrium point. Compared to the initial point $a$, at point $c$, once all the adjustments are completed, we see that the price level is lower (90 versus 100), but that real GDP is the same (both are $10 trillion)."
Chapter Quiz

1. Which curve is vertical?
   a. The $AD$ curve.
   b. The $SAS$ curve.
   c. The $LAS$ curve.
   d. None of the above.

2. The short-run aggregate supply curve shifts rightward when
   a. the price level rises.
   b. the price level falls.
   c. the money wage rate rises.
   d. the level of potential GDP increases.

3. A change in the money wage rate
   a. shifts the $AD$ curve.
   b. shifts the $SAS$ curve.
   c. shifts the $LAS$ curve.
   d. causes a movement along the $SAS$ curve.

4. Short-run equilibrium is always at the point where
   the
   a. $AD$ curve crosses the $LAS$ curve.
   b. $LAS$ curve crosses the $SAS$ curve.
   c. $AD$ curve crosses the $SAS$ curve.
   d. None of the above because the short-run equilibrium point is always moving.

5. Aggregate demand increases when
   a. investment spending increases.
   b. government spending increases.
   c. net exports increase.
   d. All of the above increase aggregate demand.

6. The amount of capital increases. Hence the price level ____ and real GDP ____.
   a. rises; increases
   b. rises; decreases
   c. falls; increases
   d. falls; decreases

7. An inflationary gap occurs when
   a. GDP is below full-employment GDP.
   b. GDP equals full-employment GDP.
   c. GDP is above full-employment GDP.
   d. The $AD$ curve shifts leftward.

8. Which of the following is NOT a reason why the aggregate demand curve slopes downward?
   a. Wealth effect.
   b. Intertemporal substitution effect.
   c. International substitution effect.
   d. Real wage effect.

9. In the short run, a temporary increase in oil prices causes the price level to ____ and level of real GDP to ____.
   a. rise; increase
   b. rise; decrease
   c. fall; increase
   d. fall; decrease

10. Which of the following does NOT shift the aggregate demand curve?
    a. A decrease in the quantity of money.
    b. An increase in consumption expenditure.
    c. An increase in taxes.
    d. A rise in the price level.

The answers for this Chapter Quiz are on page 309