

**Macroeconomics, 8e, Global Edition (Blanchard)**  
**Chapter 12: Technological Progress and Growth**

**12.1 Technological Progress and the Rate of Growth**

1) In the following production function,  $Y = f(K, NA)$ , a 20% increase in A will cause which of the following variables to increase by 20%?

- A) labor
- B) effective labor
- C) output
- D) output per worker
- E) none of these

2) In the following production function,  $Y = f(K, NA)$ , suppose A increases by 20%. This 20% increase in A implies that

- A) the same output can be produced with 20% less labor.
- B) the effective quantity of labor has increased by 20%.
- C) output will increase by less than 20%.
- D) all of these

3) In the production function  $Y = f(K, NA)$ , for a given state of technology, constant returns to scale implies that output (Y) will increase by 7% when

- A) K or NA increase by 7%.
- B) K and N increase by 7%.
- C) N or A increase by 7%.
- D) N and A increase by 7%.
- E) all of these

4) Which of the following will cause an increase in output per *effective* worker?

- A) an increase in population growth
- B) an increase in the rate of depreciation
- C) a reduction in the saving rate
- D) an increase in the rate of technological progress
- E) an increase in the saving rate

Use the following information to answer the question(s) below:

- (1) the rate of depreciation is 10% per year,
- (2) the population growth rate is 2% per year, and
- (3) the growth rate of technology is 3% per year.

5) Refer to the information above. Which of the following equals the annual growth rate of "effective labor" in the steady state in this economy?

- A) 2%
- B) 3%
- C) 5%
- D) 10%
- E) 15%

6) Refer to the information above. Which of the following represents the level of investment needed to maintain a constant capital stock (K) in this economy?

- A) .02K
- B) .03K
- C) .05K
- D) .10K
- E) .15K

7) Refer to the information above. Which of the following represents the level of investment needed to maintain constant capital per effective worker ( $K/NA$ ) in this economy?

- A) .02K
- B) .03K
- C) .05K
- D) .10K
- E) .15K

8) Refer to the information above. Which of the following represents the steady-state growth rate of output in this economy?

- A) 2%
- B) 3%
- C) 5%
- D) 10%
- E) 15%

9) Refer to the information above. Which of the following represents the steady-state growth rate of output per worker in this economy?

- A) 2%
- B) 3%
- C) 5%
- D) 10%
- E) 15%

10) Which of the following will cause an increase in the steady-state growth rate of capital?

- A) an increase in the saving rate
- B) an increase in the population growth rate
- C) a temporary increase in technological progress
- D) all of these
- E) none of these

11) Which of the following will cause a reduction in the steady-state growth rate of output per worker?

- A) a reduction in the saving rate
- B) an increase in the population growth rate
- C) an increase in the rate of depreciation
- D) an increase in the saving rate
- E) none of these

12) Which of the following is always true after an economy reaches a balanced growth equilibrium?

- A) the growth rate of output equals the rate of depreciation
- B) population growth is zero
- C) the growth rate of capital is equal to the growth rate of the effective work force
- D) the growth rate of capital is equal to the savings rate
- E) none of these

13) Suppose there is an increase in the saving rate. This increase in the saving rate will cause an increase in which of the following once the economy reaches its new steady state equilibrium?

- A) growth rate of output
- B) growth rate of capital
- C) growth rate of capital per worker
- D) all of these
- E) none of these

14) Suppose output per worker in a country has grown at the same rate as technology over for many years. This country's growth would be described as

- A) "appropriable" growth.
- B) "balanced" growth.
- C) "effective" growth.
- D) "diffuse" growth.
- E) none of these

15) Which of the following represents a dimension of technological progress?

- A) larger quantities of output for given quantities of capital and labor
- B) better products
- C) a larger variety of products
- D) new products
- E) all of these

16) Assume that an economy experiences both positive population growth and technological progress. In this economy, which of the following is constant when balanced growth is achieved?

- A)  $K$
- B)  $NA$
- C)  $K/N$
- D)  $Y/NA$
- E) none of these

17) Assume that an economy experiences both positive population growth and technological progress. In this economy, which of the following is constant when balanced growth is achieved?

- A) I
- B) S
- C) Y/N
- D) all of these
- E) none of these

18) Which of the following is *not* constant when balanced growth is obtained?

- A) Y/NA
- B) NA
- C) K/NA
- D) all of these
- E) none of these

19) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that the capital stock is

- A) constant.
- B) growing at a rate of  $g_A$ .
- C) growing at a rate of  $g_N$ .
- D) growing at a rate of  $g_A + g_N$ .
- E) none of these

20) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that output (Y) is

- A) constant.
- B) growing at a rate of  $g_A + g_N$ .
- C) growing at a rate of  $g_N$ .
- D) growing at a rate of  $g_A$ .
- E) growing at a rate of  $g_A - g_N$ .

21) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that the capital per effective worker ratio ( $K/NA$ ) is

- A) growing at a rate of  $\delta + g_A + g_N$ .
- B) growing at a rate of  $g_A + g_N$ .
- C) growing at a rate of  $g_N$ .
- D) growing at a rate of  $g_A$ .
- E) none of these

22) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that the output per effective worker ratio ( $Y/NA$ ) is

- A) growing at a rate of 0.
- B) growing at a rate of  $g_A + g_N$ .
- C) growing at a rate of  $g_N$ .
- D) growing at a rate of  $g_A$ .
- E) none of these

23) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that the output per worker ratio ( $K/N$ ) is

- A) constant.
- B) growing at a rate of  $g_A - g_N$ .
- C) growing at a rate of  $g_N$ .
- D) growing at a rate of  $g_A$ .
- E) growing at a rate of  $\delta + g_A + g_N$ .

24) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that the capital per worker ratio ( $K/N$ ) is

- A) constant.
- B) growing at a rate of  $g_A - g_N$ .
- C) growing at a rate of  $g_N$ .
- D) growing at a rate of  $g_A$ .
- E) growing at the same rate as  $Y/N$ .

25) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that

A)  $S/NA = (\delta + g_A + g_N)K/NA$ .

B)  $S/NA = (g_A + g_N)K/NA$ .

C)  $I/NA = (\delta)K/NA$ .

D)  $I = \delta K$ .

E) none of these

26) Assume that an economy experiences both positive population growth and technological progress. Once the economy has achieved balanced growth, we know that growth rate of  $K/NA$  is

A)  $g_A g_N$ .

B)  $g_A + g_N$ .

C) 0.

D)  $g_A$ .

E) none of these

27) Let  $\alpha$  represent labor's share of total output. The Solow residual is represented by

A)  $g_y - [\alpha g_N + (1 - \alpha)g_K]$ .

B)  $g_y$ .

C)  $g_K$ .

D)  $\alpha g_N$ .

E)  $1/(1 - \alpha)$ .

28) Let  $\alpha$  represent labor's share of total output. The Solow residual is, therefore, represented by

A)  $\alpha g_y$ .

B)  $\alpha g_A$ .

C)  $\alpha g_K$ .

D)  $\alpha g_N$ .

E)  $1/\alpha$ .

Use the information provided below to answer the following question(s).

$$\delta = .11$$

$$g_A = .03$$

$$g_N = .02$$

29) Refer to the information above. Given this information, we know that effective labor ( $N_A$ ) grows at which rate?

- A) 0
- B) 1%
- C) 4%
- D) 5%
- E) 15%

30) Refer to the information above. Which of the following represents the amount of investment per effective worker needed to maintain a constant level of capital per effective worker ( $K/N_A$ )?

- A)  $.02(K/N_A)$
- B)  $.03(K/N_A)$
- C)  $.05(K/N_A)$
- D)  $.13(K/N_A)$
- E)  $.16(K/N_A)$

31) Refer to the information above. Given this information, the steady state rate of growth of  $Y/N_A$  is

- A) 0.
- B) 2%.
- C) 3%.
- D) 5%.
- E) 16%.

32) Refer to the information above. Given this information, the steady state rate of growth of output per worker is

- A) 0.
- B) 2%.
- C) 3%.
- D) 5%.
- E) 16%.



33) Refer to the information above. Given this information, the steady state rate of growth of output is

- A) 0.
- B) 2%.
- C) 3%.
- D) 5%.
- E) 16%.

34) Assume that an economy experiences both positive population growth and technological progress. A reduction in the saving rate will cause

- A) no change in  $K/NA$ .
- B) a permanent reduction in the rate of growth of output per worker.
- C) a permanent reduction in the rate of growth of output.
- D) no change in  $Y/NA$ .
- E) none of these

35) Which of the following will cause an increase in the steady-state growth rate of output per worker?

- A) an increase in the saving rate
- B) a reduction in the population growth rate
- C) a reduction in the rate of depreciation
- D) a reduction in the saving rate
- E) none of these

36) Suppose there is a reduction in the saving rate. This decrease in the saving rate will cause a reduction in which of the following once the economy reaches its new steady state equilibrium?

- A) growth rate of output
- B) growth rate of capital
- C) growth rate of capital per worker
- D) all of these
- E) none of these