**What Controls Flowering**

1 **The timing of flowering and seed production is precisely tuned to a plant's physiology and the rigors of its environment**. In temperate climate plants lost flower early enough so that their seeds can mature before the deadly winds of autumn. Depending on how quickly the seed and food develop flowering may occur in spring as it does in oaks; in summer as in lettuces; or even in autumn as in asters.

2 **What environmental cues do plants use to determine the seasons?** Most cues such as temperature or water availability are quite variable: autumn can be warm; a late snow could fall in spring; also summer might be unusually cool and wet. So the only reliable cue is day length: longer days always mean that spring and summer are coming; shorter days foretell the onset of autumn and winter.

3 **With respect to flowering, botanists classify plants as day neutral, long day or short day.** A day neutral plant flowers as soon as it has sufficiently grown and developed regardless of the length of day. The neutral plants include tomatoes, corn, snapdragons and roses. Although the naming is traditional, long day and short day plants are better described as short night and long night plants because their flowering actually depends on the duration of continuous darkness rather than on day length. Short night plants (which include lettuces, spinach, iris, clover and petunias) flower when the length of darkness is shorter than a species' specific critical period. Long night plants (including asters, potatoes, soy beans, goldenrod and cockleburs) flower when the length of uninterrupted darkness is longer than the species' specific critical period. Thus spinach is classified as a short night plant because it flowers only if the night is shorter than eleven hours (its critical period), and the cocklebur is a long night plant because it flowers only if an uninterrupted darkness lasts more than 8.5 hours. Both of these plants will flower with ten-hour nights.

4 **Plant scientists can induce flowering in the cocklebur by exposing leaves to long nights** (longer than its 8.5 hour critical period) in a special chamber, while the rest of the plant continues to experience short nights. Clearly, a signal that induces flowering transmitted from the leave to the flowering bud. Plant physiologists have been attempting for decades to isolate these elusive signaling molecule often called florigen (literally, flowering maker). Some researchers believe they are close to demonstrating a flower's stimulating substance for specific type of plant. Using genetic manipulation, it is likely, however, that interactions among multiple and yet unidentified plant hormones stimulate or inhibit flowering, and that these chemicals may differ among plant species. Researchers have had more success in determining how plants measure the length of uninterrupted darkness, which is a crucial stimulus for producing whatever substance control flowering.

5 **To measure continuous darkness, a plant needs two things: some sort of metabolic clock to measure time (the duration of darkness) and a light detecting system to set the clock.** Virtually all organisms have an internal biological clock that measures the time even without environmental cues. In most organisms including plants, the biological clock is poorly understood, but we know that the environmental cues, particularly light, can reset the clock. How do plants detect light? The light detecting system of plants is a pigment in leaves called **phytochrome** (literally, plant color).

6 **Plants seem to use the phytochrome system in combination with their internal biological clocks to detect the duration of continuous darkness.** Cockleburs, for example, flower under the schedule of sixteen hours of darkness and eight hours of light. However, interrupting the middle of the dark period with just a minute or two of lights prevents flowering. Thus their flowering is controlled by the length of continuous darkness. It is evident that even brief exposure to sunlight or white light will reset their biological clocks. The color of the light used for the light exposure is also important. A nighttime flash of pure red light inhibits flowering, while flash of light at the far-red end of the spectrum has no effect on flowering, as if no light were detected.

**Paragraph 1**

The timing of flowering and seed production is precisely tuned to 被调整到 a plant's physiology 构成 and the **rigors** of its environment. In temperate 温和的 climate plants lost flower early enough so that their seeds can mature before the deadly 致命的 winds of autumn. Depending on 根据 how quickly the seed and food develop, flowering may occur in spring as it does in oaks; in summer as in lettuces; or even in autumn as in asters. 根据种子和食物生长的速度，开花可能在春天的橡树上，夏天的莴苣上，甚至在秋天的紫菀属上出现

1. The word "rigors" in the passage is closest in meaning to

1. characteristics
2. advantages
3. stability
4. difficulties

2. The word "precisely" in the passage is closest in meaning to

1. severely
2. quickly
3. exactly
4. efficiently

3. Paragraph 1 suggests which of the following are the seeds of asters in temperate climate?

1. They mature a short time after the plant blooms.
2. They begin to develop in autumn and mature in winter.
3. They were more plentiful than those of oaks or lettuces.
4. They are not designed to survive temperate climate.

**Paragraph 2**

What environmental cues do plants use to determine the seasons? Most cues such as temperature or water availability are quite variable: autumn can be warm; a late snow could fall in spring; also summer might be unusually cool and wet. So the only reliable cue is day length: longer days always mean that spring and summer are coming; shorter days foretell the onset of autumn and winter.

**Paragraph 3**

With respect to/ concerning/ with regard to flowering botanists classify plants as day neutral, long day or short day. A day neutral plant flowers as soon as it has sufficiently grown and developed regardless of the length of day. 一个日照中性的植物会在它完全生长和成熟之后开花而不受日照长度控制 The neutral plants include tomatoes, corn, snapdragons and roses. Although the naming is traditional, long day and short day plants are better described as short night and long night plants because their flowering actually depends on the duration of continuous darkness rather than on day length. 尽管这个命名方式很传统，但是长日照和短日照植物更应该被成为短夜间和长夜间植物因为他们的开花实际上是由连续不被打断的黑暗所控制的而不是日照时间 Short night plants (which include lettuces, spinach, iris, clover and petunias) flower when the length of darkness is shorter than a species' specific critical period. Long night plants (including asters, potatoes, soy beans, goldenrod and cockleburs) flower when the length of uninterrupted 不被打扰的 darkness is longer than the species' specific critical period. Thus spinach is classified as a short night plant because it flowers only if the night is shorter than eleven hours (its critical period), and the cocklebur is a long night plant because it flowers only if an uninterrupted darkness lasts more than 8.5 hours. Both of these plants will flower with ten-hour nights.

4. The author mentions "tomatoes, corn, snapdragons and roses" in order to

1. Name some of the most well-developed and commonly grown domestic plants
2. Provide examples of plants whose flowering is not determined by length of day
3. Demonstrate that the neutral plants are more common than long-day or short-day plants
4. Support the claim that some plants flower at night as well as during the day

5. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

Although the naming is traditional, long day and short day plants are better described as short night and long night plants because their flowering actually depends on the duration of continuous darkness rather than on day length.

1. Traditionally, long day and short day plants are better known as short night and long night plants because they actually flower during periods of continuous darkness.
2. The naming of long day and short day plants is traditional and depends on whether they flower during long days or long nights.
3. Whether plant is better described in terms of day length or night depends on whether it flowers during the day or during continuous darkness.
4. Despite their traditional names, the flowering of what are called long day and short day plants actually depends on the length of continuous darkness rather than on day length.

6. According to paragraph 3, why is spinach considered a short night plant?

1. It will not flower if it experiences too many hours of uninterrupted darkness.
2. It flowers after certain number of short nights.
3. It flowers as soon as the nights become shorter than the days.
4. It flowers for only a short period of time usually at night.

Paragraph 4

Plant scientists can induce加快 flowering in the cocklebur by exposing leaves to将枝叶暴露于 long nights (longer than its 8.5 hour critical period) in a special chamber室, **while** the rest of the plant continues to experience short nights. Clearly, a signal 【that induces flowering】 transmitted转化 from the leave to the flowering bud. Plant physiologists生理学家 have been attempting尝试 for decades to isolate将…分离出来 these elusive难以捉摸的 signaling molecule often called florigen弗罗里根 (literally, flowering maker). Some researchers believe they are close to demonstrating展示 a flower's stimulating substance刺激物质 for specific type of plant. Using genetic manipulation基因操纵, it is likely**, however,** that interactions among multiple and yet unidentified仍然没被定义的 plant hormones stimulate刺激 or inhibit抑制 flowering, **and** that these chemicals may differ among plant species. 利用基因操纵，科学家发现这些种类繁多而且没有被定一个植物荷尔蒙之间的互动刺激或者抑制了植物的开花，并且这些化学物质因花的种类而异 Researchers have had more success in determining how plants measure the length of uninterrupted darkness, which is a crucial stimulus for producing whatever substance control flowering.

7. The word "induce" in the passage is closest in meaning to

1. bring about
2. prevent
3. settle down
4. control

8. According to paragraph 4, what had experiments with cockleburs revealed about the flowering process?

1. Flowering is triggered not by multiple chemicals but by a single hormone in the bud.
2. The entire plant must experience the crucial period of darkness in order to flower.
3. The signal to begin flowering can originate in the leaves.
4. Flowering is not always related to length of darkness.

9. According to paragraph 4, which of the following is true of the signal for the cocklebur to flower?

1. Only certain leaves produced signal.
2. The signal must arise from the flower bud.
3. The signaling molecule has not been chemically identified.
4. The length of uninterrupted darkness cockleburs need in order to signal varies a lot.

10. The word "inhibit" in the passage is closest in meaning to

A. speed up

B. restrain

C. contribute to

D. prolong

**Paragraph 5**

To measure continuous darkness, a plant needs two things: some sort of metabolic clock生物钟 to measure time (the duration of darkness) and a light detecting检测 system to set the clock设定钟. Virtually基本上 all organisms have an internal biological clock that measures the time even without environmental cues. In most organisms including plants, the biological clock is poorly understood, but we know that the environmental cues, particularly light, can reset the clock重置时钟. How do plants detect light? The light detecting system of plants is a pigment色素 in leaves called phytochrome (光敏色素literally, plant color phyto- 植物).

**11.According to paragraph 5, what is the function of plants' phytochrome?**

1. measuring time durations in the absence of environmental cues
2.  helping reset the plant's biological clock through light detection
3. stimulating the growth for plants' leaves
4. determining the color of the plants' leaves

**Paragraph 6**

Plants seem to use the phytochrome system in combination with与…结合 their internal biological clocks to detect the duration of continuous darkness. Cockleburs**, for example,** flower under the schedule of sixteen hours of darkness and eight hours of light. However, interrupting the middle of the dark period with just a minute or two of lights prevents flowering. Thus their flowering is controlled by the length of continuous darkness连续的黑夜. It is evident that这是真的 even brief exposure to sunlight短暂的暴露于日光 or white light will reset重置 their biological clocks. The color of the light used for the light exposure is also important. A nighttime flash of pure red light inhibits flowering, **while** flash of light at the far-red end of the spectrum has no effect on flowering, as if no light were detected. 一个夜间的纯红光闪烁就可以打断开花，但红外线对开花就没有影响，就像没有光被检测到了一样

12. According to paragraph 6, which of the following types of light will not reset a cocklebur's biological clock?

1. White light
2. sunlight
3. pure red light
4. far-red light

**Paragraph 6**

Plants seem to use the phytochrome system in combination with their internal biological clocks to detect the duration of continuous darkness. Cockleburs, for example, flower under the schedule of sixteen hours of darkness and eight hours of light. However, interrupting the middle of the dark period with just a minute or two of lights prevents flowering. ■ Thus their flowering is controlled by the length of continuous darkness. ■ It is evident that even brief exposure to sunlight or white light will reset their biological clocks. ■ The color of the light used for the light exposure is also important. A nighttime flash of pure red light inhibits flowering, while flash of light at the far-red end of the spectrum has no effect on flowering, as if no light were detected.■

13.Look at the four squares [■ ] that indicate where the following sentence can be added to the passage.

**But not all types of light will have this effect.**

Where would the sentence best fit?

14.Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some answer choices do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

**Attempts have been made to explain what controls the flowering.**

●

●

●

Answer Choices

1.Day neutral plants flower as soon as they have sufficiently developed but the flowering of short night and long night plants is dependent on the duration of continuous darkness.

2.Scientists do not yet know what chemical or combination of chemicals is responsible for the signal to flower, but they do know that the signal travels from leaf to bud.

3.Plants measure darkness through an internal biological clock which is reset when the plant's phytochrome detects certain types of light.

4.Short night plants flower if any part of the plant is exposed to continuous darkness, but long night plants will not flower if even one leaf experiences a flash of light.

5.Day neutral plants use the phytochrome system to detect environmental conditions other than light, which may affect the viability of their flowers and seeds.

6 Once a flower has started to bloom, the color and duration of light it is exposed to is important, because some kind of light will prevent flowering while others will have no effect.