

Use a # 2 pencil to fill in the information portion of your NCS answer sheet including the appropriate circles (bubbles). Write "**No Star Form**" - above your name in the margin of your NCS answer sheet. Read all questions and answers *carefully* before choosing the **single BEST response** for each question. Feel free to ask the instructor for clarification. Don't be shy.

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In December 2003, The Food and Drug Administration (FDA) alerted the public to safety concerns about dietary supplements containing *Ephedra*, and notified manufacturers/marketers of those products that sales would be prohibited in the near future.

*Ephedra* spp. are erect branching shrubs found in desert or arid regions throughout the world. The medical use of *Ephedra* spp. (Ma Huang) dates from 2800 B.C. in China, where it was used to treat colds, asthma, hay fever, hypotension (low blood pressure), and other common maladies. Western medicine's interest in *Ephedra* began in the 1920's when the active ingredient ephedrine was isolated and studied to determine its pharmacologic effects. Since then, the chemical has been synthesized and marketed as pseudoephedrine, a common cold and allergy medication.

Ephedrine increases blood pressure, heart rate, and cardiac output. It also relaxes muscles in the airways of lungs. At the cellular level, it increases permeability of the inner mitochondrial membrane to  $H^+$  (makes it leaky to protons), resulting in decreased metabolic efficiency, higher metabolic rate and greater heat production (thermogenesis).

Dietary supplements containing ephedrine have been marketed primarily as weight loss aids; its main mechanism is to increase metabolic rate and burn stored fat. The recent FDA announcement was based upon broad analysis of the efficacy of the drug for weight loss compared to the risks associated with increased stress on the cardiovascular system. While there are data to support the hypothesis that ephedrine can contribute to short-term weight loss, there are also data to suggest that adverse outcomes such as heart attack and stroke are a real risk. Other common but minor negative side effects include anxiety, sleeplessness and irritability. Manufacturers of Ephedra supplements often include other mild stimulants such as caffeine to increase the fat burning effect.

In one experiment, eight healthy women received a single oral dose of a thermogenic dietary supplement containing 20 mg ephedrine and 200 mg caffeine after an overnight fast. Another eight healthy women received a placebo after an overnight fast. Heart rate and blood pressure were measured in both groups before the dose and every 15 minutes for 14 hours. Average blood pressure was higher for the women taking the supplement and reached a peak 90 minutes after ingestion. Average heart rate was higher for the women taking the supplement and reached a maximum increase of 15 beats per minute after about 6 hours.

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A biologist was presented with the following puzzle: There is an animal that is neither a mammal nor a bird that has a fairly constant, and high, internal body temperature. In this species, year-round body temperature ranges from about 86 - 88°F in its natural environment.

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Other than clouds of mosquitoes that plague the caribou herds during the brief Arctic summer, there aren't many insects that make their homes in the far North. One notable exception is the Arctic Bumblebee, a key pollinator of tundra plants that regularly occurs far above the Arctic Circle. To help

keep warm on chilly spring days, Arctic Bumblebees have a thicker coat of "hairs" than their temperate and tropical cousins.

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Counter current heat exchange systems are used to conserve heat in seal flippers, beaver tails, and whale flukes (tails), which are all flat and have little fur covering them.

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The following two solutions, which were made with water, are separated by a selectively permeable membrane.

<i>Total volume = 100ml</i>	<i>Total volume = 100ml</i>
<i>1% Sodium</i>	<i>5% Sodium</i>
<i>1% Chloride</i>	<i>5% Chloride</i>
<i>5% Magnesium</i>	<i>5% Magnesium</i>
<i>20% Potassium</i>	<i>10% Potassium</i>
<i>Temperature = 25°C</i>	<i>Temperature = 20°C</i>