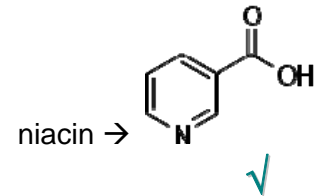




1 I am a PROCESS, MOLECULE, LOCATION



Level



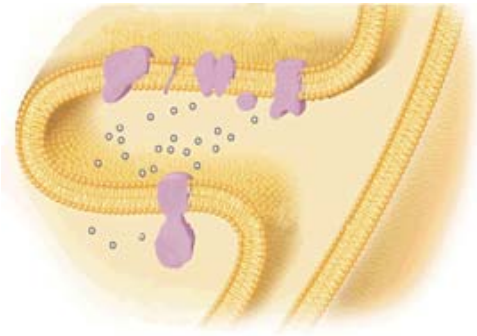
Clue



| | |
|----|---------------------------------------------------------------------------------|
| 10 | Niacin is my biochemical precursor. |
| 9 | Hydride ion (H^-) additional gives me a net neutrality. |
| 8 | My nucleotide component structure is purine-based. |
| 7 | My reputation as a superb electron donate is universal among eukaryotes. |
| 6 | My redox pair has a very high (negative) potential. |
| 5 | My ability to donate electrons is highest. |
| 4 | I can be regenerated by fermentation for cellular respiration to continue. |
| 3 | The citric acid (Krebs) cycle is my primary electron source during respiration. |
| 2 | Although weak by myself, I can be converted to a carrier of energy. |
| 1 | Both electrons & protons can be added to me. |

I am _____

Instructions: Fill in the name of the process, molecule or location in the blank space at the bottom. Place a checkmark (✓) at the level in which you were first decided upon what became your final correct answer; record the level number next to the ✓ ; await further instructions. 😊



(1) Rotenone binds to the first electron carrier of the electron transport chain. This blocks the transfer of electrons from NADH to the electron transport chain (ETC) in cellular respiration. In a cell that has been poisoned with rotenone, which one or more of the following would you observe?--

- a) Decrease of ATP production from the ATP synthase activity.
- b) Lack of a proton (H^+) gradient across the inner mitochondrial membrane
- c) Accumulation of NADH with a shortage of NAD^+
- d) both (a) & (b)
- e) All of the above would be observed.

◆ ◆ ◆
(2) The Krebs cycle functions *only* when oxygen (O_2) is present in the cell. Why is this so?

- a) ATP and NADH cannot be made without oxygen.
- b) Oxygen present at the end of chemiosmosis enables NADH to be regenerated to NAD^+ .
- c) Carbon dioxide (CO_2) in the Krebs Cycle is formed directly from oxygen (O_2) in the matrix.
- d) The presence of oxygen will speed up any chemical reaction exposed to it.
- e) It is impossible for oxygen (O_2) to diffuse into the mitochondrial matrix.



◆ ◆ ◆
(3) Murder mysteries sometimes involving a poisoning: Use of cyanide, which inhibits a key enzyme in the electron transport chain, is a frequently used method. After cyanide poisoning, you would hypothesize that the victim would have...

- a) an excess of CO_2 .
- b) an excess of NAD^+ .
- c) a shortage of NADH.
- d) a shortage of oxygen (O_2).
- e) a shortage of ATP.

2 I am a **PROCESS, MOLECULE, LOCATION**

Level

Clue



| | |
|----|---------------------------------------------------------------|
| 10 | I am found in plasma membrane of virtually all animal cells. |
| 9 | I am an active (transport) antiporter |
| 8 | I can be inhibited by the toxin ouabain. |
| 7 | I am situated as a transmembrane enzyme |
| 6 | I operate continuously. |
| 5 | I am usually transiently phosphorylated. |
| 4 | Cellular respiratory failure will compromise activity. |
| 3 | My activity forms both electrical and concentration gradients |
| 2 | I require ATP as fuel. |
| 1 | I restore rest potential (voltage) along axonal membranes. |

I am _____

Instructions: Fill in the name of the process, molecule or location in the blank space at the bottom. Place a checkmark (✓) at the level in which you were first decided upon what became your final correct answer; record the level number next to the ✓; await further instructions. 😊

The following table describes data a physiologist collected for several different nerves, some of which she suspected did not function properly.

| | Na ⁺ channel | Na ⁺ /K ⁺ pump |
|---------|-------------------------|--------------------------------------|
| Nerve 1 | Constantly open | Operating |
| Nerve 2 | Constantly closed | Operating |
| Nerve 3 | Able to open and close | Operating |
| Nerve 4 | Able to open and close | Not Operating |

(1) Which of the nerves could reach resting potential?

- a) Nerve 1 only
- b) Nerve 2 only
- c) Nerve 3 only
- d) Nerves 2 and 3 only
- e) Nerves 2,3, and 4



(2) Following an action potential, if ATP is no longer available in the axon of a nerve, you would predict that...

- a) subsequent action potentials would occur more frequently.
- b) the sodium ion (Na⁺) channel would not close.
- c) the axon would not return to resting potential.
- d) a sodium ion (Na⁺) gradient would rapidly reform.
- e) the Na⁺/ K⁺ ATPase pump would increase the rate of Na⁺ pumping.



Ethanol is one of the most abused drugs in the U.S. today. In addition to disrupted muscular coordination, human behavior patterns are often altered after excessive ethanol intake. Ethanol begins to exert its adverse effects when it keeps open the potassium ion (K⁺) channels (gates) within the axon's membrane. This prevents those gates from closing on time during action potential propagation.

(3) Which one or more of the following correctly predicts ethanol's effects upon the neurons of an intoxicated person?

- a. Fewer neurotransmitter molecules are released by pre-synaptic cells.
- b. Fewer action potentials are propagated down the axon membrane.
- c. The Na⁺/K⁺ pump within the axon membrane is no longer operating.
- d. all of the above
- e. both a and b

3 This is a PROCESS, MOLECULE, LOCATION

| <i>Level</i> ↓ | <i>Clue</i> ↓ | √ |
|-------------------|--------------------------------------------------------------------------------------|---|
| 10 | $dN/dt = r N$ & $N = N_0 e^{rt}$ | |
| 9 | $(b + i) > (d + e)$ | |
| 8 | $\Delta G > 0$ | |
| 7 | $G > 0$ | |
| 6 | This is not sustainable indefinitely within nature . | |
| 5 | This never increases linearly. | |
| 4 | This will be initially demonstrated by a few <i>E. coli</i> in Nutrient Broth flask. | |
| 3 | K is not reached in this model. | |
| 2 | $r N = G$ | |
| 1 | J - curve | |

This is _____

Variables:

b = birth rate

d = death rate

i = immigration rate

e = emigration rate

r = growth rate

G = growth increment

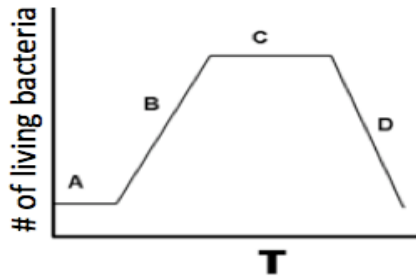
K = carrying capacity

N_0 = starting population size

N = population size after time interval (t)

e = 2.71828 (natural log base)

Instructions: Fill in the name of the process, molecule or location in the blank space at the bottom. Place a checkmark (√) at the level in which you were first decided upon what became your final correct answer; record the level number next to the √ ; await further instructions. 😊



(1) This growth curve records the bacteria population extended throughout an incubation period of 12 hours at 37°C [T = time]. You could therefore conclude that within phase D...

- a) $b = d$
- b) $d > b$
- c) $r > 0$
- d) $G = 0$
- e) $K = N$

(2) If 100 *Vibrio cholera* bacteria (the clinical cause of cholera epidemics) were inoculated into a one liter flask of nutrient media, and you plot the growth of their population as exponential for the next 5 days, you would correctly conclude that during that 5 day period...

- a) the bacteria's available nutrients and oxygen were in excess supply.
- b) the measured growth rate (r) was constant on each day.
- c) the measured growth increment (G) was constant on each day.
- d) Both (a) & (b) are correct.
- e) (a), (b) & (c) are all correct.

[3] If the world population reaches its carrying capacity (K) later in the 21st century, what characteristic would most clearly demonstrate this?

- a) Each family in the world will average 2 children born.
- b) The birth rate would equal the rate of famine-caused deaths.
- c) One person will die of disease for each one born.
- d) The human death rate will equal the birth rate.
- e) Human life expectancy will dramatically decline.

