1. Define:
- glycolysis
- ATP
- NAD⁺ / NADH
- FAD⁺ / FADH₂
- glyceraldehyde-3-phosphate
- pyruvate
- lactic acid fermentation
- alcoholic fermentation
- “arrow in” and “arrow out”
- heterotroph
- Krebs Cycle
- Oxidation of Pyruvate
- Electron Transport & Chemiosmosis
- aerobic respiration
- anaerobic respiration

2. What is the Cellular Respiration chemical equation?

3. Understand the connection between Cellular Respiration and Photosynthesis.

4. Know and understand the following concepts about:
   - **Glycolysis**:
     - Location (be specific)
     - Purpose
     - What kinds of critters perform this process?
     - Net ATP & NADH production
     - End products & what happens to these end products?
     - Aerobic process or Anaerobic process?
   
   - **Fermentation**:
     - Location (be specific)
     - Purpose
     - What kinds of critters perform this process?
     - End products & what happens to these end products?
     - Uses for end products.
     - Differences between each type of fermentation.
     - How are fermentation and glycolysis connected?
     - When will the cell perform fermentation?
     - Aerobic process or Anaerobic process?

   - **Oxidation of Pyruvate**:
     - Location (be specific)
     - Purpose
     - What kinds of critters perform this process?
     - Net ATP & NADH production
     - Purpose of coenzyme A
     - What happens to Coenzyme A once it has completed its purpose?
     - Aerobic process or Anaerobic process?
     - End products & what happens to these end products?

   - **Krebs Cycle**:
     - Location (be specific)
     - Purpose
     - What kinds of critters perform this process?
     - Net ATP & NADH & FADH₂ production
     - Aerobic process or Anaerobic process?
     - End products & what happens to these end products?

   - **Electron Transport Chain & Chemiosmosis**:
     - Location (be specific)
     - Purpose of Electron Transport.
     - Purpose of Chemiosmosis.
     - What kinds of critters perform this process?
     - # ATP produced from each NADH/FADH₂
     - Donor/acceptor molecules (names & function)
     - What is produced from the acceptor molecule?
     - Net ATP produced from 1 molecule of glucose
     - Aerobic process or Anaerobic process?

**POSSIBLE ESSAY QUESTIONS:**
- In anaerobic respiration, how are fermentation and glycolysis connected?
- Explain the connection between photosynthesis and cellular respiration.
- Autotrophs use energy directly from the sun during photosynthesis to produce energy storing compounds. Do plants also perform cellular respiration? WHY or WHY NOT?
BIOLOGY: STUDY GUIDE
CA5: Cellular Chemistry (Cellular Respiration)

This study guide addresses the following learning targets that will be tested on Common Assessment #5.

- **LEARNING TARGET #1**: DEFINE & UNDERSTAND the following vocabulary:
  - cellular respiration
  - aerobic respiration
  - Glyceraldehyde 3-phosphate
  - anaerobic respiration
  - monomer
  - NAD⁺ and NADH
  - polymer
  - FAD⁺ and FADH₂

- **LEARNING TARGET #2**: Understand the differences between aerobic and anaerobic respiration.

- **LEARNING TARGET #3**: EXPLAIN the processes involved in anaerobic respiration: glycolysis and fermentation (purpose, location, what is produced).

- **LEARNING TARGET #4**: EXPLAIN the processes involved in aerobic respiration: glycolysis, oxidation of pyruvate, Krebs Cycle, Electron Transport (purpose, location, what is produced).

- **LEARNING TARGET #5**: COMPARE and CONTRAST cellular respiration and photosynthesis.

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**NOTE**: These are sample questions only & should be used to help master concepts.

**ANAEROBIC RESPIRATION (Glycolysis & Fermentation):**

1. Glycolysis is a process that occurs in what kind of “critters?” (be specific)
2. _______________________________ is the name of the monomer produced during glycolysis when the chemical bond is broken between carbon #3 & #4 (not pyruvate).
3. Glycolysis occurs in the __cytoplasm / mitochondrion__ of the cell.
4. The purpose of Glycolysis is to break apart one molecule of ____________ to produce ____ ATP and ____ NADH.
5. ____________ is the “sponge” that picks up the acidic ____________.
6. After one cycle of Glycolysis, all the NAD⁺ has become ____________.
7. How does fermentation take care of the problem mentioned in question #6?

8. When there is no oxygen or not enough oxygen to perform aerobic respiration, the cell will perform ____________ to survive.
9. lactic acid / alcoholic fermentation is important for making and baking bread
10. lactic acid / alcoholic fermentation is responsible for making muscles sore
11. glycolysis / fermentation produces a net gain of 2ATP, 2NADH & 2 pyruvate
12. glycolysis / cellular respiration almost the opposite process of photosynthesis
13. glycolysis / fermentation regenerates NAD⁺ in aerobic respirators when not enough oxygen is present
14. Photosynthesis is the __STORAGE / RELEASE__ of energy in molecules of ____________, whereas, cellular respiration breaks down molecules of ____________ to __STORE / RELEASE__ energy in the form of ________.
AEROBIC RESPIRATION (oxidation of pyruvate, Krebs cycle, ETC/Chemiosmosis)

15. What kinds of “critters” are able to conduct aerobic respiration? (be specific)

16. Oxidation of Pyruvate takes place in the ____________________________________________________________.

17. What is produced during the oxidation of pyruvate?

18. How does the oxidized form of pyruvate (acetyl) gain entry to the matrix of the mitochondrion?

19. What happens to coenzyme A after it drops off acetyl?

20. The Krebs Cycle take place in the ________________________________

21. The purpose of the Krebs Cycle is to produce __________________, __________________, ____________________.

22. What is the purpose of FAD$^+$ in the Krebs Cycle?

23. Where is the electron transport chain located in cellular respiration?

24. What is the purpose of the electron transport chain in cellular respiration?

25. What is the purpose of Chemiosmosis in cellular respiration?

26. During cellular respiration, __________ & __________ are the “donor molecules” in the ETC.

27. During cellular respiration, __________ is the final acceptor in the ETC that produces ___________.

28. What happens to NAD$^+$ and FAD$^+$ after being produced in the Electron Transport Chain?

29. _______ ATP are produced from one molecule of glucose.

DIRECTIONS: For questions #30-35, identify the phrase(s) as a description of either: cellular respiration, glycolysis, alcoholic fermentation, or lactic acid fermentation.

30. important for making and baking bread ___________________________________________________________

31. builds up in muscles after a few seconds of intense activity ___________________________________________

32. requires glucose and oxygen ___________________________________________________________________

33. produces a net gain of 2 ATP & 2NADH molecules and 2 pyruvate ___________________________________

34. almost the opposite process of photosynthesis ___________________________________________________

35. regenerates NAD$^+$ in aerobic respirators when not enough oxygen is present _________________________.
