GLYCOLYSIS – Answer Sheet

Each step of the glycolytic pathway requires the use of a specific __________ ENZYME __________. This process occurs in the __________ CYTOPLASM __________ of the cell and does not require __________ OXYGEN __________. Thus, it is part of __________ ANAEROBIC ____________ respiration.

1. The first step of glycolysis is “energy-requiring”. This energy is made available when an __________ ATP __________ molecule donates a __________ PHOSPHATE __________ group to glucose in a __________ PHOSPHORYLATION __________ reaction. The major products of this reaction are __________ GLUCOSE-6-PHOSPHATE (G6P) __________ and __________ ADP __________.

2. The __________ G6P __________ is converted to __________ FRUCTOSE-6-PHOSPHATE (F6P) __________.

3. A second __________ ATP __________ is used to transfer a __________ PHOSPHATE __________ group to the sugar. Now, the molecule __________ FRUCTOSE 1,6-BISPHOSPHATE (F1,6-BP) __________ has been formed.

4,5. The backbone splits apart to form two 3-carbon molecules of __________ GLYCERALDEHYDE-3-PHOSPHATE (G3P) __________. One comes a temporary DHAP molecule.

6. Each molecule of __________ NAD __________ (called an electron or energy carrier) reacts with a molecule of __________ G3P __________. In this reaction, 2 __________ ELECTRONS __________ and a __________ PROTON __________ are gained by NAD⁺ converting it to NADH (thus 2 NADH are formed). Since NAD⁺ gained electrons (and hydrogen), it has been __________ REDUCED __________. Since G3P lost electrons (and hydrogen), it has been __________ OXIDIZED __________. As well, each G3P gains an inorganic __________ PHOSPHATE __________ (Pᵢ) group which was floating around in the cytoplasm.

This produces two molecules of __________ 1,3-BISPHOSPHOGLYCERATE (BPG) __________.

7. Each molecule of BPG donates a phosphate group to an __________ ADP __________ molecule producing two molecules of __________ ATP __________. Such a transfer from a glycolysis intermediate to ADP is called “SUBSTRATE LEVEL PHOSPHORYLATION” (enzymatically driven ATP production). This step of glycolysis is “energy-releasing” since ATP was made. This leaves two molecules of __________ 3-PHOSPHOGLYCERATE (3PG) __________.

8. Each 3PG is converted into __________ 2-PHOSPHOGLYCERATE (2PG) __________.

9. Each 2-PGA releases a water molecule leaving two molecules of __________ PHOSPHOENOLPYRUVATE __________ or __________ PEP __________.

10. Each PEP performs “substrate-level phosphorylation” by donating a __________ PHOSPHATE __________ group to an __________ ADP __________ producing two more __________ ATP __________. This leaves two 3-carbon molecules of __________ PYRUVATE __________.

Net Products of Glycolysis:

_________2__ ATP  __________2__ NADH  __________2__ pyruvate