

- a quantity of adenosine monophosphate (AMP).
- wherein said AdK and PPK enzymes work synergistically to regenerate cellular ATP energy from PPi and AMP.

3. A cell-free protein expression system as described in claim 2 wherein said thermostable Gst Adk enzyme comprises SEQ ID NO. 8.

4. A cell-free protein expression system as described in claim 2 further comprising a quantity of Sorbitol-dehydrogenase (SDH).

5. A cell-free protein expression system as described in claim 2 further comprising a quantity of tRNAs isolated from same type of microorganism used to generate said cell extract.

6. A cell-free protein expression system as described in claim 2 wherein said at least one nucleic acid synthesis template comprises a linear DNA template.

7. A cell-free protein expression system comprising:

- a cell-free expression bioreactor having:
 - a reaction mixture containing a cell extract having all cell-free reaction components necessary for *in vitro* macromolecule synthesis;
 - at least one nucleic acid synthesis template;
 - a cellular adenosine triphosphate (ATP) energy regeneration system comprising:
 - a quantity of purified Adenosyl Kinase (AdK) enzyme; and
 - a quantity of purified Polyphosphate Kinase (PPK) enzyme;
 - a quantity of inorganic polyphosphate (PPi); and
 - a quantity of adenosine monophosphate (AMP).
 - wherein said AdK and PPK enzymes work synergistically to regenerate cellular ATP energy from PPi and AMP.

8. A cell-free protein expression system as described in claim 7 wherein said cell extract comprises a thermophilic bacterial cell extract and/or a thermostable bacterial cell extract.

9. A cell-free protein expression system as described in claim 7 further comprising a quantity of thermostable RNA polymerase (RNAP).

10. A cell-free protein expression system as described in claim 7 wherein said nucleic acid synthesis template comprises a linear DNA template.

11. A bacterial cell-free protein expression system comprising:

- a cell-free expression bioreactor having:
 - a reaction mixture containing a cell extract derived from a bacterial culture having all cell-free reaction components necessary for *in vitro* macromolecule synthesis;
 - at least one nucleic acid synthesis template;
 - a cellular adenosine triphosphate (ATP) energy regeneration system comprising:
 - a quantity of Adenosyl Kinase (AdK) enzyme; and
 - a quantity of Polyphosphate Kinase (PPK) enzyme;
 - a quantity of inorganic polyphosphate (PPi); and
 - a quantity of adenosine monophosphate (AMP).
 - wherein said AdK and PPK work synergistically to regenerate cellular ATP energy from PPi and AMP.

12. An *in vitro* cell-free protein expression system comprising:

- a cell-free expression bioreactor having:
 - a reaction mixture containing a cell extract derived from a culture having all cell-free reaction components necessary for *in vitro* macromolecule synthesis;
 - at least one nucleic acid synthesis template;
 - a cellular adenosine triphosphate (ATP) energy regeneration system comprising:
 - a quantity of purified Adenosyl Kinase (AdK) enzyme; and
 - a quantity of purified Polyphosphate Kinase (PPK) enzyme;
 - a quantity of inorganic polyphosphate (PPi); and
 - a quantity of adenosine monophosphate (AMP).
 - wherein said AdK and PPK work synergistically to regenerate cellular ATP energy from PPi and AMP.

13. An energy supplemented cell-free protein expression system comprising: