CLAIMS

1. An apparatus, comprising:

   - a housing defining a channel configured to receive a sample container, the housing defining a detection volume configured to place the channel in communication with a detector, the housing including a first seal surface and a second seal surface, a first portion of the sample container and the first seal surface configured to isolate the detection volume from a volume outside of the housing when a second portion of the sample container is disposed within the detection volume; and
   - a shutter having a portion movably disposed within the housing between a first shutter position and a second shutter position, the shutter defining a port configured to receive at least one of a light source or a light guide, a seal surface of the shutter and the second seal surface configured to isolate the detection volume from the channel of the housing when shutter is in the first shutter position, the port in communication with the detection volume when the shutter is in the first shutter position, the channel of the housing being in communication with the detection volume when the shutter is in the second shutter position, the port being isolated from the detection volume when the shutter is in the second shutter position.

2. The apparatus of claim 1, wherein the first seal surface includes a gasket.

3. The apparatus of any one of claims 1 and 2, wherein the shutter is in the first shutter position when the second end portion of the sample container within the channel is outside of the detection volume, and the shutter is in the second shutter position when the second end portion of the sample container is within the detection volume.

4. The apparatus of any one of claims 1 to 3, wherein the shutter includes an actuation surface configured to engage the second portion of the sample container to move the shutter from the first shutter position to the second shutter position.

5. The apparatus of any one of claims 1 to 4, wherein the shutter includes a ramp configured to engage the second portion of the sample container when the second portion of the sample container moves within the channel towards detection volume to move the shutter towards the second shutter position.

6. The apparatus of any one of claims 1 to 5, wherein the shutter is configured to translate within the housing in a direction offset from a longitudinal axis of the channel.

7. The apparatus of any one of claims 1 to 6, further comprising: a biasing member configured to urge shutter towards the first shutter position.

8. The apparatus of any one of claims 1 to 7, wherein the shutter defines a mounting portion configured to be coupled to a biasing member.

9. The apparatus of any one of claims 1 to 8, wherein the shutter defines a biasing channel configured to receive a biasing member, the biasing member configured to urge shutter

towards the first shutter position in a direction offset from a longitudinal axis of the channel.

10. The apparatus of any one of claims 1 to 9, wherein the detection volume is configured to place the channel in communication with the detector via a detection window, the port in communication with the detection window when the shutter is in the first shutter position.

11. The apparatus of claim 10, wherein the detection window is aligned with a longitudinal axis of the channel.

12. The apparatus of any one of claims 1 to 11, wherein the shutter defines a passageway configured to receive at least the second portion of the sample container, the channel of the housing being aligned with the passageway to place the second portion of the container in communication with the detection volume when the shutter is in the second shutter position.

13. An apparatus, comprising:

    - a housing defining a channel configured to receive a sample container, the housing defining a detection volume configured to place the channel in communication with a detector, the housing including a seal surface; and
    - a shutter having a portion movably disposed within the housing between a first shutter position and a second shutter position, the shutter defining a port configured to receive at least one of a light source or a light guide, the port in communication with the detection volume when the shutter is in the first shutter position, the port being isolated from the detection volume when the shutter is in the second shutter position, the shutter including a seal surface and an actuation portion, the actuation portion configured to engage a distal end portion of the sample container to translate the shutter in a direction offset from a longitudinal axis of the channel from the first shutter position to the second shutter position when the distal end portion of the container is moved towards the detection volume, the seal surface of the shutter and the seal surface of the housing configured to isolate the detection volume from the channel of the housing when shutter is in the first shutter position, the seal surface of the shutter configured to maintain sliding contact with the seal surface of the housing when the shutter is moved from the first shutter position to the second shutter position, the channel of the housing being in communication with the detection volume when the shutter is in the second shutter position.

14. The apparatus of claim 13, wherein: the seal surface of the housing is a distal seal surface, the housing defining a proximal seal surface; and a proximal end portion of the sample container and the proximal seal surface configured to isolate the detection volume from a volume outside of the housing when the distal end portion of the sample container is disposed within the detection volume.

15. The apparatus of any one of claims 13 to 14, further comprising: a biasing member configured to urge shutter towards the first shutter position.

16. The apparatus of any one of claims 13 to 15, wherein the shutter defines a passageway configured to receive at least the distal end portion of the sample container, the channel of the housing being aligned with the passageway to place the distal end portion of the container in communication with the detection volume when the shutter is in the second shutter position.

17. The apparatus of any one of claims 13 to 16, wherein the detection volume is configured to place the channel in communication with the detector via a detection window, the detection window being aligned with the longitudinal axis of the channel.

18. An apparatus, comprising:

    - a housing defining a channel configured to receive a sample container, the housing including a detection window configured to place a distal end portion of the sample container in communication with a detector, the housing including a seal surface; and

    - a shutter defining a passageway configured to receive the distal end portion of the sample container therein, the shutter movably disposed within the housing between a first shutter position and a second shutter position, the shutter defining a port configured to receive at least one of a light source or a light guide, the port in communication with the detection window when the shutter is in the first shutter position, the port being isolated from the detection window when the shutter is in the second shutter position, a seal surface of the shutter and the seal surface of the housing configured to isolate the detection window from the channel of the housing and the passageway of the shutter when shutter is in the first shutter position, the channel of the housing being aligned with the passageway of the shutter such that the distal end portion of the sample container can be received within the passageway of the shutter to place the distal end portion of the sample container in communication with the detection window when the shutter is in the second shutter position.

19. The apparatus of claim 18, wherein: the seal surface of the housing is a distal seal surface, the housing defining a proximal seal surface; and a proximal end portion of the sample container and the proximal seal surface configured to isolate the detection window from a volume outside of the housing when the distal end portion of the sample container is disposed in communication with the detection window.

20. The apparatus of any one of claims 18 to 19, wherein the shutter includes an actuation surface configured to engage the distal end portion of the sample container to move the shutter from the first shutter position to the second shutter position when the distal end portion of the container is moved towards the detection window.

21. The apparatus of any one of claims 18 to 20, wherein the shutter is configured to translate within the housing in a direction offset from a longitudinal axis of the channel.

22. The apparatus of any one of claims 18 to 21, wherein the detection window is aligned with a longitudinal axis of the channel.

~~23. A method, comprising:~~

- coupling a housing of a reagent module to a reaction chamber to form a container assembly defining a fluid-tight seal, the reaction chamber containing a sample, the reagent module including a bottom surface;

- loading the container assembly into an instrument; and

actuating the instrument to:

- apply a force on the container assembly to

(1) move an end portion of the reaction chamber into a detection volume of the instrument, and

(2) place the bottom surface into contact with a gasket of the instrument to form a light-tight seal with a housing of the instrument;

- cause a detector of the instrument to receive, when the end portion of the reaction chamber is in the detection volume, an optical signal associated with a magnitude of light emission in the detection volume; and

- manipulate, during the receiving of the signal, an actuator of the reagent module to convey a reagent into the reaction chamber.

24. The method of claim 23, wherein the instrument is configured to maintain the force to maintain contact between the bottom surface and the gasket.

25. The method of any one of claims 23 to 24, wherein:

- the force is a downwards force applied by a manipulator assembly; and

- the manipulating the actuator of the reagent module by the instrument includes moving, by the manipulator assembly, the actuator from a first position to a second position.

26. The method of any one of claims 23 to 25, wherein when the end portion of the reaction chamber is moved into the detection volume a shutter of the instrument is moved from a first shutter position to a second shutter position, the detection volume being optically isolated from a channel of the housing by the shutter when the shutter is in the first shutter position.

27. The method of any one of claims 23 to 26, wherein the reagent includes at least one of a eukaryotic or a bacterial luciferase substrate.

28. The method of any one of claims 23 to 27, wherein the reagent includes tridecanal, the light emission being associated with a flash luminescence reaction.

29. The method of any one of claims 23 to 28, wherein the actuator is a second actuator, the reagent is a second reagent, the second reagent including tridecanal, the reagent module containing a first reagent including at least one of an antibiotic or a transduction particle engineered to include a nucleic acid molecule formulated to cause a target cell within the sample to produce a plurality of reporter molecules, wherein the actuating the instrument further causes the instrument to manipulate, before the receiving of the signal, a first actuator of the reagent module to convey the first reagent into the reaction chamber.

30. The method of any one of claims 23 to 28, wherein the reagent module includes a non-replicative, bacteriophage-based transduction particle formulated to cause a target cell within the sample to produce a reporter molecule, wherein the actuating the instrument further causes the instrument to manipulate, before the receiving of the signal, a first actuator of the reagent module to convey the transduction particle into the reaction chamber.

31. The method of any one of claims 23 to 30, wherein the reagent module includes a delivery member that defines a delivery path having a centerline that points towards a side wall of the reaction chamber such that when the reagent is conveyed into the reaction chamber, the reagent is propelled along the side wall and into the reaction chamber.

32. The method of any one of claims 23 to 31, wherein:

- the reagent module includes a reagent container containing the reagent,
- the manipulating the reagent module includes puncturing the reagent container to communicate the reagent into the reaction chamber.

33. The method of any one of claims 23 to 32, wherein the light emission is luminescence conveyed from the reaction chamber through a flat base of the reaction chamber.

34. The method of any one of claims 23 to 33, wherein the sample includes at least one of an antibiotic or a transduction particle engineered to include a nucleic acid molecule formulated to cause a target cell within the sample to produce a plurality of reporter molecules.

35. The method of any one of claims 23 to 34, further comprising removing from the instrument, after the signal is received, the reaction chamber coupled to the reagent module.

36. The method of any one of claims 23 to 35, wherein the instrument includes a manipulator assembly configured to produce the force to move the end portion of the reaction chamber and to manipulate an actuator of the reagent module.

37. The method of any one of claims 23 to 36, wherein:

- the reagent module includes a non-replicative, bacteriophage-based transduction particle formulated to cause a target cell within the sample to produce a reporter molecule associated with a luminescence reaction;
- the actuating the instrument further causes the instrument to manipulate, before the receiving of the signal, a first actuator of the reagent module to convey the transduction particle into the reaction chamber; and
- the reagent includes tridecanal formulated to catalyze the luminescence reaction.

38. The method of any one of claims 23 to 36, wherein:

- the reagent module includes a non-replicative, bacteriophage-based transduction particle formulated to cause a target cell within the sample to produce a reporter molecule associated with a luminescence reaction; and
- the actuating the instrument further causes the instrument to:

- manipulate, before the receiving of the signal, a first actuator of the reagent module to convey the transduction particle into the reaction chamber; and
- heat, after the transduction particle within the reaction chamber, the end portion of the reaction chamber.