59. The method of claim **54**, wherein the capture region comprises an extraction chamber formed in a microfluidic chip, and wherein the capture material comprises an array of microstructures extending into the extraction chamber, each of the microstructures having an aspect ratio (height to width) of at least 2:1.

60. The method of claim **54**, wherein the captured nucleic acid is eluted from the capture region by forcing elution fluid to flow through the capture region, and wherein the volume of sample placed in the lysing chamber is greater than the volume of elution fluid forced to flow through the capture region, whereby the nucleic acid extracted from the sample is concentrated in the smaller volume of elution fluid.

61. The method of claim **54**, wherein the ratio of the volume of fluid forced to flow through the capture region in step (d) to the volume capacity of the capture region is at least 2:1.

62. The method of claim **54**, wherein the step of lysing the cells, spores, or microorganisms with the at least one chemical comprises drying the sample on the paper or membrane material by heating or desiccation.

63. The method of claim **62**, wherein the cartridge further includes a desiccant adjacent the lysing chamber, and wherein the sample is dried on the paper or membrane material by heating the sample and absorbing moisture with the desiccant.

64. The method of claim **54**, wherein the nucleic acid is released from the paper or membrane material into the fluid in the lysing chamber by heating the paper or membrane material.

65. The method of claim **54**, wherein step (d) is preceded by the additional steps of binding the nucleic acid released from the cells, spores, or microorganisms to the paper or membrane material, washing the lysing chamber with wash fluid, and forcing the wash fluid to flow out of the lysing chamber and into the at least one waste chamber while the nucleic acid remains bound to the paper or membrane material.

66. The method of claim **54**, wherein step (d) is preceded by the additional step of binding contaminants or inhibitors in the sample to the paper or membrane material, and wherein the contaminants or inhibitors remain bound to the paper or membrane material while the nucleic acid is removed from the lysing chamber.

67. The method of claim **54**, wherein the chemical comprises at least one lysing agent selected from the group consisting of enzymes, detergents, and chaotropes.

68. The method of claim **54**, wherein the chemical comprises a chaotropic salt.

69. The method of claim **54**, wherein the paper or membrane material comprises cellulose, nitrocellulose, polycarbonate, or nylon.

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