STATEMENT OF PURPOSE

My name is Srijon Sen, a resident of India, have pursued my Bachelors in Chemistry Hons from Rahara Ramakrishna Mission V.C. College, Rahara. I changed over my stream to 'Chemical and Molecular Biology' in my Masters at IIT Kharagpur and am working in a Structural Biology Lab for my Masters' Thesis work. I have secured a cumulative GPA of 8.58 on 10-point grading scale (till 3rd Semester) and I am looking to take up research as a Ph.D. student thereafter.

While screening through the different journals, many researches have been done on different 2D materials for printing of biosensors for POC applications. Studies have been done by Cheng *et al.* where he fabricated a simple abrasive paper stencil printing process, an MXene-based piezo-resistive, to monitor body activities and medical states by placing on joints or muscles. Zhang *et al*. prepared an ultrasensitive non-enzymatic glucose biosensor by a facile screen-printing method and have also reported 3D ice-printing of an antifouling microcapsule array using aqueous solutions as ink. Ting Leng *et al*. screen-printed NFC tag antenna with graphene conductive ink and inkjet-printed the photosensor with WS_2 ink as photoactive component. Mandon *et al.*, directly incorporated biosensing molecules into the 3D printable ink which can lead to the development of POCT devices that have sensing elements directly embedded within the 3D printed material. Guo et al., developed a highly sensitive, flexible, and degradable pressure sensor for the first time to predict the health status of patients by mapping the skin (i.e., electronic skin). Wang et al., fabricated a stretchable temperature sensor consisting of a cellular graphene/ polydimethylsiloxane composite through a direct 3D ink-writing technique.

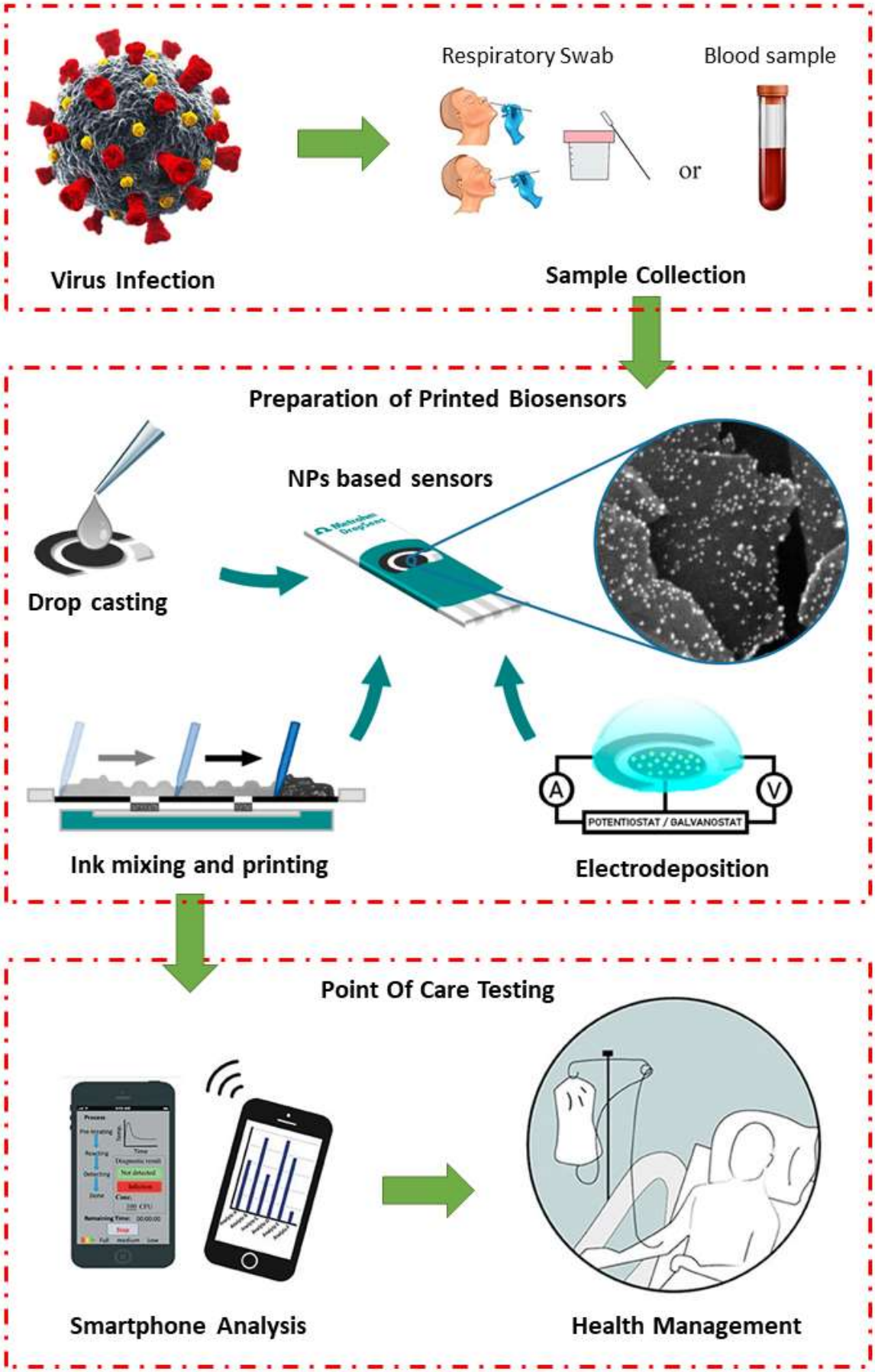
Although several biosensors based POCT have been developed for the detection of various analysts, there are challenges which needs to be looked after before it can be produced in wide scales. These drawbacks include: **(i) inadequate detection sensitivity to distinguish biomarkers at the different stages of the diseases in various samples with a cost-effective manner to take adequate clinical management and improve patient treatment, (ii) high selectivity and multiplexed capacity.** Henceforth, one should plan to overcome such limitations in the development of biomarker-detecting POC biosensors. More deeper studies need to be done to reduce batch-to-batch variations, fabricate multiplexed sensing platform

and finally utilizing novel nanomaterials and substrates to develop highly sensitive and biocompatible devices for monitoring patient health at anywhere and anytime. Some scientists have suggested that printed metal, conducting polymers, and optics with electrochemical and optical properties similar to current molding methods, will become more prominent in the upcoming decade.

Some questions which need to be addressed for advancement in terms of materials, printing techniques, and integration methods, include:

1. Which innovative methods can help increase the capacity and flexibility of printed biosensors?
2. How will emerging methods in material engineering enable more robust printing to improve printed biosensors?
3. What printed transducers should be further included in printed biosensors?
4. How can the toxicity and biocompatibility of the printed material in sensors be improved for *in vivo* applications?

A schematic diagram as to how we can proceed with the research plan is given below:


Respiratory Swab
Blood sample
or
Virus Infection
Sample Collection
Preparation of Printed Biosensors
NPs based sensors
Drop casting
Ink mixing and printing
A
V
POTENTIOSTAT / GALVANOSTAT
Electrodeposition
Point Of Care Testing
Smartphone Analysis
Health Management