

25-03-2020

My dear students

Safety Greetings from Home! First time in the human history, the entire world is struggling against the virulent pandemic Coronavirus COVID-19 (almost all continents) and more than half of the population of the world is under lockdown. We are witnessing the unbounded global spread of the disease, moving very fast in all directions. Unfortunately, each of us is affected, either overtly or covertly and in fact the whole humanity is in trouble. That's our common sorrow, common pain and common fight.

Before, we discuss about assignments during this lockdown, let me brief you about the disease. Coronavirus is the family of viruses that causes outbreak of severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS), two illnesses (**SARS-CoV-1 and SARS-CoV-2**), which causes SARS that emerged within the last two decades. SARS-CoV-1, like its successor now circulating across globe, infected around 8000 in 2002 and in 2003 and was eradicated by case isolation measures and fortunately no such case has been detected since 2004. SARS-CoV-1 is human coronavirus mostly related to SARS-CoV-2, the two viruses behaved similarly, but surprisingly science yet fails to explain why SARS-CoV-2 (**COVID-19**) has become a much larger outbreak. Needful to mention, that SARS-CoV-2 first emerged in China last December and has spread like a wildfire around the globe.

Students, you can contribute a lot by reading literature about new materials/devices and how they can be used to contain covid-19. Many people across the globe are working on Pandemic. You will be given chance to debate with doctors and of course, there are many good materials which can stop the spread of coronavirus. I am giving you a list of assignments, of which you can choose the assignment of your own choice/interest and submit once you are back. Meanwhile, I am trying to make lectures, which shall be available on my web page.

Remember, new challenges bring new technologies and new answers. Please, stay aware of the latest information on the COVID-19, don't neglect basic protective measures, be safe and stay at home!

With very best regards
Shah M A

Assignment during Covid-19 lockdown for M.Sc II Semester 2020

Note:

- (a) You can choose assignment of your own choice and interest.
- (b) You can write additional details, if you wish to make it informative.
- (c) Make also a PPT of your topics and defend once you are back to class.
- (d) Submit a hard copy of the topic with a set of questions, to be discussed.
- (e) Spend your time for useful things, useful for humanity and come up with answers.

Roll No Assignment

1. List and write details of materials used to fight infectious and inflammatory diseases.
2. Materials for fabrication of devices used for diagnostic purposes.
3. Energy band in semiconductors- Both direct and indirect semiconductors, variation of energy bands with composition. How it is beneficial?
4. Charge Carriers in semiconductors-Extrinsic and Intrinsic, Electrons and Holes in Quantum Wells & Dots. Can you improve it?
5. Carrier concentration-The Fermi Level-Electron and Hole Concentration. Does it depend on temperature?
6. Drift carriers in electric and magnetic fields-Conductivity and Mobility, Effect of temperature and doping on mobility. How doing helps?
7. High Field effects, The Hall effect- Do we need to improve the set-up? Have we been able to carry experiment in our lab?
8. Excess carriers in semiconductors, Photo-luminescence- Electro-luminescence, Photoconductivity devices. Please mention their use.
9. Diffusion of carriers, Diffusion and drift in fields, The continuity equation- How can diffusion helps technology?
10. Fabrication of junctions-pn Junction. What materials are used for making the bipolar junction. Where it is used.
11. Chemical Vapour Deposition- CVD, Photolithography, Ion Implantations. Few set-ups are in our Central facilities. Please come up with some suggestions.
12. Equilibrium conditions, Equilibrium Fermi Level, Forward and reverse Based junction, Carrier injection. Are they used in amplications/rectifications?
13. Capacitance of pn-Junction, The Varactor Diode. How it is being used. There are many devices where this type of diode is being used, name?
14. Metal Semiconductor junctions, Schottky junctions, Rectifying contacts. Write details?
15. Field Effect Transistor, The Junction FET. How it is improved with nanomaterials.
16. The Metal Semiconductor FET, The MOS Field Effect Transistor. Can we list the uses and improve with new materials.
17. Bipolar Junction Transistors, BJT Fabrication- Operation, Hetrojunction Bipolar transistors. Write transistors of all kinds, their applications?
18. Photodiodes, Solar Cells, Photo detectors
19. Light Emitting Diodes, Light Emitting Materials- Why these materials are important?
20. Fiber optic communications- Can tgis communication be improved?
21. Semiconductor Lasers-Materials, pn -Junction Lasers and their applications?
22. Dielectric Properties for future transistor generation and list materials?
23. Write detailed applications of all superconductors. List all?
24. What are devices, how physics principles are involved. How they could be improved?
25. The electronic Properties of Graphene-Low dimensional semiconductors

-Shah M A