

Indian Institute of Technology
Centre for Biomedical Engineering
BIOMATERIALS (BM820)
(Major Test 2016) 10.06.2016

Time: 2hr

Marks 50

- Q1) Answer **any three** of the following:
- Give preparation and properties of silicon rubber and its advantage over natural rubber. How will you synthesize room curable (RTV) and heat curable silicon rubber (HTV). Give two biomedical application in each case.
 - What are the draw backs of plaster of paris as a support for fractured bones? How will you prepare and use of a polymeric material as a replacement of plaster of paris? Also mention its advantages over plaster of paris.
 - Give preparation of acrylic cement, its limitation, improvement and biomedical applications.
 - How will you synthesize polymeric micro and nano particles? Give two important biomedical applications in each case. (15)
- Q2) Recommend ideal material for the following biomedical applications:
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| (a) Polymer for encapsulation for pacemaker | (b) Hip joint |
| (c) Support plate for multifracted bone | (d) Lens for spectacles |
| (e) Post sterilizable medical packaging | (f) Intraocular lenses |
| (g) Protection mask for radiation therapy | (h) Disposable syringes |
| (i) Suture for internal injury | (k) Calipers for polio effected children |
- (5)
- Q3) Write short note on **any two** of the following:
- Polymeric hydrogels: preparation and biomedical applications
 - Chemical attachment of drugs/enzymes (**any three**) onto polymers at room temperature.
 - Write chemical structure of polyglycolic acid, polylactic acid, Polyethylene terephthalate, Polyhydroxybutyrate and polycaprolactone. Suggest one application in each case. (10)
- Q4) Give preparation, properties and biomedical applications of polyvinyl chloride (PVC). Why PVC is rigid and brittle at room temp. Mention in brief about various plasticizers used to make PVC flexible. What are the drawbacks of flexible PVC as a biomaterial and how can you improve them by chemical and physical methods? (7)
- Q5) Separate biodegradable, biostable and biosoluble polymers from the list given below: Polymethyl methacrylate, Polymethacrylic acid, Silicon rubber, PolyN-vinyl-2-pyrrolidone, Polytetrafluoroethylene, Polyglycolic acid, Collagen, Chitin, Polyethylene terephthalate, Polycarbonate, (5)
- Q6) (a) Synthesize an acrylic copolymer with a Tg of 60°C using any two acrylic monomers (Tg of PMMA = 105°, n-BMA = 18 °C, n-BA = -54 °C)
- (b) ¹HNMR spectrum of PLA-b-PEG block copolymer showed ester proton of PLA (-CH-COO) peak at 5.1 ppm with a peak intensity of 2 whereas ether proton (-OCH₂) of PEG appeared at 3.8 ppm with a peak intensity of 4. Calculate the copolymer composition.
- (c) Draw a GPC chromatogram of a polymer mixture with Molecular weight of 20,000 and 80,000. (4+2+2)=8