

ENTRY NO: ~~2~~ 3

( USE BLUE OR BLACK pen)

1. To calculate the crystallite size from a X-ray diffraction pattern using the Scherer equation you will use the (a) Intensity (b) Area under the peak (c) Full width at Half maximum (1)
2. In the ideal perovskite structure ,  $ABO_3$ , what is the the B – O distance if the lattice parameter is 4 Å (1)
3. If you somehow dissolve Nacre (biomaterial making shell of many sea organisms like molluscs) in water, which cation will be found in the maximum concentration ? (1)
4. In the smart glass used in electrochromic windows in the Dreamliner, if we replace  $WO_3$  with  $La_2O_3$ , the color change will not take place when a current is passed. Why ? Explain (2)
5. Among the superconductors ,  $YBa_2Cu_3O_7$  is very well- known .
  - (a) Write down the stoichiometric equation and the methodology (solid state method) to synthesize  $YBa_2Cu_3O_7$  (3)
  - (b) Write down the stoichiometric equation to synthesize  $PrBa_2Cu_3O_7$  (1)  
(  $Pr_6O_{11}$  is to be taken as starting material for Pr)
  - (c) How the procedure be modified to get the oxygen –deficient compound  $YBa_2Cu_3O_6$  (1)
6. AT and EQ when added to ZX dissolved in water to give a solid AEX(step 1) which decomposes to give  $AEO_n$  when heated in air(step 2). What is the method of this synthesis called? Give the most plausible alternate scenario after step 1. What would be the possible products after step 1 and step 2 in that case ? (2, 3)
7. Microwave method is the fastest way to make materials. Give two drawbacks of this method. (2)
8. Give an example of an ion-exchange reaction (1)
9. (a) Draw and label the components of a Li rechargeable battery . (2)  
(b) Give the reactions doing charging and discharging