3. (a) Explain the four types of reasoning that can be done using probabilistic inference. [4]

   (b) Suppose a doctor sees a patient with a high temperature. The doctor knows that disease A causes a rash in 80% of cases. The doctor also knows the prior probability of disease A is 1/50,000, and the prior probability of a patient having a high temperature is 1/100. What is the probability that the patient has disease A? [3]

   (c) Suppose that there are two tests, that use independent methods, for determining whether shale gas is present at a site. Test A is 97% effective at identifying shale gas when it is present, but has a 15% false positive rate. Test B is 90% effective at identifying shale gas and has a 5% false positive rate. You have a set of possible sites, each of which has a 1 in 100 chance of having shale gas. Suppose that you only have time to use one of the tests. Which test returning positive is more indicative of the presence of shale gas? Justify your answer mathematically, giving the relevant probabilities. [6]

   (d) Using the Bayesian network given below compute the probability of $NoFuel$ given that $ChargeLight$ and $FuelLight$ are true. You should use inference by enumeration and show your working. [12]