a) What is the definition of percentage depth dose, PDD? (3marks)

PDD is the defined as the quotient, expressed as a percentage, of the absorbed dose at any depth d (1 mark) to the absorbed dose at a fixed reference depth d_0 (1mark), along the central axis of the beam (1mark).

b) The percentage depth dose of a photon beam in a water phantom depends on energy, depth, field size and SSD. Explain how they affect the PDD. (4marks)

1) PDD beyond Dmax increases with beam energy because higher-energy beams have greater penetrating power and thus deliver a higher percentage depth dose. (1mark)
2) PDD decreases with depth beyond the Dmax because the photons experience exponential attenuation. (1mark)
3) PDD increases with increasing field size because of the contribution of scattered radiation into the center of the field. (1mark)
4) PDD increases with increased SSD because of the effect of the inverse square law. (1mark)

c) The percent depth dose of 6MV photon beam for a 20 x 20 field size, 10cm depth and 100cm SSD is 71. Find the PDD for the same field size and depth for a 80cm SSD. Round off the answer to one decimal place. (3mark)

$\frac{P(d,r,f_2)}{P(d,r,f_1)} = \left(\frac{f_2+d_m}{f_1+d_m}\right)^2 * \left(\frac{f_1+d}{f_2+d}\right)^2$ (1mark)

$d_m$of 6MV is 1.5cm (1mark)

$P(10,20,80) = \left(\frac{80+1.5}{100+1.5}\right)^2 * \left(\frac{100+10}{80+10}\right)^2 * 71 = 68.4$ (1mark)