Q1 Priors:

$P(\text{Action}) = \frac{4}{8} = \frac{1}{2}$ $\quad |V| = 12$

$P(\text{Drama}) = \frac{4}{8} = \frac{1}{2}$

Conditional P:

D1: $P(\text{murder}|\text{Action}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$ $\quad P(\text{Murder}|\text{Drama}) = \frac{2+0.2}{16+12\cdot 0.2} = \frac{11}{92}$

$P(\text{betrayal}|\text{Action}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$ $\quad P(\text{betrayal}|\text{Drama}) = \frac{2+0.2}{16+12\cdot 0.2} = \frac{11}{92}$

$P(\text{enemy}|\text{Action}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$ $\quad P(\text{enemy}|\text{Drama}) = \frac{2+0.2}{16+12\cdot 0.2} = \frac{11}{92}$

$P(\text{conspiracy}|\text{Action}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$ $\quad P(\text{conspiracy}|\text{Drama}) = \frac{3+0.2}{16+12\cdot 0.2} = \frac{4}{23}$

$P(\text{Action}|D_1) = \frac{1}{2}\cdot\left(\frac{3}{46}\right)^4 = 0.000009$

$P(\text{Drama}|D_1) = \frac{1}{2}\cdot\left(\frac{11}{92}\right)^3\cdot\frac{4}{23} = 0.000149$

D_2: $P(\text{cars}|\text{Action}) = \frac{3+0.2}{16+12\cdot 0.2} = \frac{4}{23}$ $\quad P(\text{cars}|\text{Drama}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$

$P(\text{treasure}|\text{Action}) = \frac{3+0.2}{16+12\cdot 0.2} = \frac{4}{23}$ $\quad P(\text{treasure}|\text{Drama}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$

$P(\text{robbery}|\text{Action}) = \frac{2+0.2}{16+12\cdot 0.2} = \frac{11}{92}$ $\quad P(\text{robbery}|\text{Drama}) = \frac{1+0.2}{16+12\cdot 0.2} = \frac{3}{46}$

$P(\text{crash}|\text{Action}) = \frac{2+0.2}{16+12\cdot 0.2} = \frac{11}{92}$ $\quad P(\text{crash}|\text{Drama}) = \frac{0+0.2}{16+12\cdot 0.2} = \frac{1}{92}$

$P(\text{Action}|D_2) = \frac{1}{2}\cdot\left(\frac{4}{23}\right)^2\cdot\left(\frac{11}{92}\right)^2 = 0.000216$

$P(\text{Drama}|D_2) = \frac{1}{2}\left(\frac{3}{46}\right)^3\cdot\frac{1}{92} = 0.000002$

D_1 mostly likely belongs Drama, D_2 mostly likely belongs to Action.