1)

$P(\text{Cancer}) = 0.008$ $\quad P(\neg\text{Cancer}) = .992$

$P(\oplus \mid \text{Cancer}) = .98$ $\quad P(\ominus \mid \text{Cancer}) = .02$

$P(\oplus \mid \neg\text{Cancer}) = .03$ $\quad P(\ominus \mid \neg\text{Cancer}) = .97$

$P(\oplus \mid \text{Cancer}) \times P(\oplus \mid \text{Cancer}) = .98^2 = 0.9604$

$P(\oplus \mid \neg\text{Cancer}) \times P(\oplus \mid \neg\text{Cancer}) = .03^2 = .0009$

$0.9604 \times .008 + .0009 \times .992 = 0.008576$

↳ $\dfrac{.9604 \times .008}{.008576} = 0.8959$ posterior probability of Cancer

↳ $\dfrac{.0009 \times .992}{.008576} = 0.1041$ posterior probability of no cancer

2) $P(\text{PlayT} = Y) = 0.5 = 1/2$

$P(\text{PlayT} = N) = 0.5 = 1/2$

$P(\text{Outlook} = \text{sun} \mid \text{PlayT} = Y) = 1/3$

$P(\text{Outlook} = \text{sun} \mid \text{PlayT} = N) = 1/2$

$P(\text{Temp}=\text{cool} \mid \text{PlayT}=Y) = 1/6$

$P(\text{Temp}=\text{cool} \mid \text{PlayT}=N) = 1/6$

$P(\text{Hum}=\text{high} \mid \text{PlayT}=Y) = 1/2$

$P(\text{Hum}=\text{high} \mid \text{PlayT}=N) = 1/2$

$P(\text{Wind}=\text{Strong} \mid \text{PlayT}=Y) = 1/6$

$P(\text{Wind}=\text{Strong} \mid \text{PlayT}=N) = 1/3$

$P(\text{Play}=Y \mid \text{Outlook}=\text{sun}, \text{Temp}=\text{cool}, \text{humidity}=\text{high}, \text{wind}=\text{strong}) = 1/3 \times 1/6 \times 1/2 \times 1/6 \times 1/2 = 0.0023$

$P(\text{Play}=N \mid \text{Outlook}=\text{sun}, \text{Temp}=\text{cool}, \text{humidity}=\text{high}, \text{wind}=\text{strong}) = 1/2 \times 1/6 \times 1/2 \times 1/3 \times 1/2 = 0.0139$

$\frac{0.0023}{0.0023 + 0.0139} = 0.1429$ (PlayT = yes | outlook = sun, Temp = cool, humidity = high, wind = strong)

$\frac{0.0139}{0.0023 + 0.0139} = 0.8571$ (PlayT = N | outlook = sun, temp = cool, humidity = high, wind = strong)

We predict the answer is no.

3) $w_{ca} = 0.1$ $w_{cb} = 0.1$ $w_{c0} = 0.1$ $w_{dc} = 0.1$ $w_{d0} = 0.1$ $\eta = 0.3$ $\alpha = 0.9$

a	b	d
1	0	1
0	1	0

$net_c = w_{ca} \cdot a + w_{cb} \cdot b = 0.1 \times 1 + 0.1 \times 0 \times 0.1 = 0.2$

$\frac{1}{1+e^{-0.2}} = 0.54983$

net input d: $0.1 \times 0.54983 + 0.1 = 0.154983$

output: $\frac{1}{1+e^{-.154983}} = 0.53866$

error: $0.53866 \times (1-0.53866)^2 = 0.11464$

$= 0.54983 \times (1-0.5493) \times (.1 \times .11464) = 0.00283$

hidden unit error: $0.2 \times 0.00283 + 0 = 0.00057$

...

Δw_{dc1} $0.2 \times .11464 \times .54983 = 0.01261$

$\Delta w_{d01} = 0.2 \times .11464 = 0.02293$

$0.1 + 0.00057 = 0.10057$ $0.1 + 0.02293 = 0.12293$

$0.1 + 0 = 0.1$

$0.1 + 0.00057 = 0.10057$

$0.1 + 0.01261 = 0.11261$

$o_c = \sigma(w_{c0} + w_{ca} x_a + w_{cb} x_b) = \sigma(0.10057 + 0 + 0.1) = \frac{1}{1+e^{-.20057}}$

$= 0.54998$

$o_d = \frac{1}{1+e^{(.12293 + 0.11261 \times 0.54998)}}$ $= 0.54608 \times (1-0.54608)^2$

$= 0.11252$

$0.54998 \times (1-0.54998) \times (.11261 \times .11252) = 0.003$

$0.2 \times 0.003 + 0.9 \times .00057 = 0.00051$

$0.2 \times .003 + 0 = .0006$

$0.2 \times .003 + 0.9 \times .00057 = 0.00111$

$0.2 \times 0.11252 \times 0.54998 + 0.8 \times 0.01261 = 0.02372$

$0.2 \times .11252 \times 0 + .9 \times .02293 = 0.02067$

$w_{ca} = v_{ca} + \Delta w_{ca} = 0.10057 + 0.00051 = 0.10108$

$w_{cb} = 0.1 + 0.0006 = 0.1006$

$w_{c0} = 0.10057 + 0.00111 = 0.10168$

$w_{dc} = 0.11261 + 0.02372 = 0.13633$

$w_{d0} = 0.12293 + 0.02067 = 0.1436$