Question Number	Scheme	Marks
4. (a)	$[\mathrm{P}(S=1)=]\ 0$	B1 (1)
(b)	$[\mathrm{P}(S>2)=]1-\mathrm{P}(S=2)$ or $[\mathrm{P}(S>2)=]\mathrm{P}(S=3)+\mathrm{P}(S=4)+\mathrm{P}(S=5)$ $=1-\left(\frac{2}{5}\times\frac{1}{4}\right)=\frac{9}{10}$ $=\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}\times 2+\frac{3}{5}\times\frac{2}{4}\times\frac{2}{3}\times\frac{1}{2}\times 6+\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}$ $=\frac{1}{5}+\frac{3}{5}+\frac{1}{10}=\frac{9}{10}$	M1 M1 A1 (3)
Alt(b)	$[\mathrm{P}(S>2)=]\mathrm{P}$(at most one blue in first 2) $=\frac{3}{5}\times\frac{2}{4}+2\times\frac{3}{5}\times\frac{2}{4}=\frac{9}{10}$	M1 M1A1 (3)
(c)	$[\mathrm{P}(S=3)=]\left(\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}+\frac{2}{5}\times\frac{3}{4}\times\frac{1}{3}\right)=\frac{1}{5}$	M1 A1 (2)
(d)	$[\mathrm{P}(S=3\mid 2\text{nd is blue})=]\ \frac{\mathrm{P}(S=3\cap 2\text{nd is blue})}{\mathrm{P}(2\text{nd is blue})}=\frac{\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}}{\frac{3}{5}\times\frac{2}{4}+\frac{2}{5}\times\frac{1}{4}}=\frac{\frac{1}{10}}{\frac{2}{5}}=\frac{1}{4}$	M1 A1 (2)
(e)	$[\mathrm{P}(S\ =5)=]4\times\left(\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}\times\frac{2}{2}\times\frac{1}{1}\right)=\frac{2}{5}$	B1 M1 A1 (3)
Alt(e)	$[\mathrm{P}(S=5)=]1-\mathrm{P}(2\leqslant S\leqslant 4)=1-\frac{1}{10}-\frac{1}{5}-\frac{3}{10}=\frac{2}{5}$	B1M1A1

	Notes	Total: 11
(a)	B1 cao	
(b)	M1 for writing or using $1-\mathrm{P}(S=2)$ or $\mathrm{P}(S=3)+\mathrm{P}(S=4)+\mathrm{P}(S=5)$. Condone $1-\mathrm{P}(S\leqslant 2)$	
	M1 for a correct expression for $\mathrm{P}(S=2)$ or $\mathrm{P}(S=3)+\mathrm{P}(S=4)+\mathrm{P}(S=5)$ Ignore labelling. May be implied by $\frac{1}{10}$ or $\frac{9}{10}$ but not if from an incorrect method. May see use of combinations e.g. $\frac{1}{{}^5C_2}$	
	A1 $\frac{9}{10}$ oe	
	Note: $\mathrm{P}(S>2)=\mathrm{P}(S=3)+\mathrm{P}(S=4)+\mathrm{P}(S=5)$ send to review	
Alt(b)	M1 for explaining or indicating that there is at most one blue in the first 2	
	M1 for a correct expression	
	A1 $\frac{9}{10}$ oe	

(c) M1 for both correct products (or 2 × ….) and no others. May see use of combinations e.g. $\frac{2}{{}^5C_2}$. May be implied by $\frac{1}{5}$ oe

Give benefit of the doubt if $\frac{3}{5}\times\frac{2}{4}\times\frac{2}{3}$ oe on its own is seen where the x2 is within the calculation of one product

A1 $\frac{1}{5}$ oe

(d) M1 for a correct ratio of probabilities expression (in symbols or described) or ft their values (num<denom).
Do not withhold this mark if they subsequently proceed to e.g. multiply $\mathrm{P}(S=3)$ and P(2nd is blue) in the numerator (assuming independence)
May see use of combinations e.g. $\frac{1}{{}^4C_1}$. May be implied by $\frac{1}{4}$ oe

A1 $\frac{1}{4}$ oe

(e) B1 for $\times 4$ or the sum of 4 identical products

M1 for any one product correct. May use combinations e.g. $\frac{1}{{}^5C_2}$

A1 $\frac{2}{5}$ oe (note correct answer scores 3/3)

Alt(e)

B1 for writing $1-\left(\mathrm{P}(S=2)+\mathrm{P}(S=3)+\mathrm{P}(S=4)\right)$ oe Condone $1-\mathrm{P}(S\leqslant 4)$

M1 for an attempt at the three terms with at least one product correct

A1 $\frac{2}{5}$ oe (note correct answer scores 3/3)

NOTE:

s	2	3	4	5
$\mathrm{P}(S=s)$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

Note Allow MR using 5 + 2 socks. Deduct up to 2 A1 marks