Question Number	Scheme	Marks
1.	H_0 : There is no association between treatment and presence of fungus H_1 : There is association between treatment and presence of fungus	B1
	<table><tr><td>Expected</td><td>No treatment</td><td>Sulphur</td><td>Copper sulphate</td></tr><tr><td>No Fungus</td><td>$\frac{123\times30}{150}$ [=24.6]</td><td>$\frac{123\times63}{150}$ [=51.66]</td><td>$\frac{123\times57}{150}$ [=46.74]</td></tr><tr><td>Fungus</td><td>$\frac{27\times30}{150}$ [=5.4]</td><td>$\frac{27\times63}{150}$ [=11.34]</td><td>$\frac{27\times57}{150}$ [=10.26]</td></tr></table>	M1
	<table><tr><td>Observed</td><td>Expected</td><td>$\frac{(O-E)^2}{E}$</td><td>$\frac{O^2}{E}$</td></tr><tr><td>20</td><td>24.6</td><td>0.86016…</td><td>16.2601...</td></tr><tr><td>55</td><td>51.66</td><td>0.21594…</td><td>58.5559…</td></tr><tr><td>48</td><td>46.74</td><td>0.03396…</td><td>49.2939…</td></tr><tr><td>10</td><td>5.4</td><td>3.91851…</td><td>18.5185…</td></tr><tr><td>8</td><td>11.34</td><td>0.98373…</td><td>5.6437…</td></tr><tr><td>9</td><td>10.26</td><td>0.15473…</td><td>7.8947…</td></tr><tr><td colspan="2">Totals:</td><td>6.167…</td><td>156.167…</td></tr></table>	dM1
	$X^2 = \sum\frac{(O-E)^2}{E}$ or $\sum\frac{O^2}{E}-150$	dM1
	= awrt 6.17	A1
	$\nu = (3-1)(2-1) = 2$	B1
	$\chi^2_2(0.05) = 5.991$	B1ft
	[Reject H_0/significant/in the CR] There is sufficient evidence to suggest there is an association between <u>treatment</u> and presence of <u>fungus</u>.	A1ft
		[8]
	Notes	
	1st B1 both hypotheses correct with treatment (oe) and fungus (oe) (treatment and fungus need to only appear in either H_0 or H_1). May be written in terms of independence. 1st M1 attempt at $\frac{\text{row total}\times\text{column total}}{\text{total}}$ (can be implied by at least one correct E_i to 1dp) 2nd M1 (dep on 1st M1) at least 2 correct terms for $\frac{(O-E)^2}{E}$ or $\frac{O^2}{E}$ or correct expressions with their E_i (allow 2sf accuracy) (May be implied by awrt 6.17 or awrt 156.17) 3rd M1 (dep on 2nd M1) for using $\sum\frac{(O-E)^2}{E}$ or $\sum\frac{O^2}{E}-150$ (May be implied by awrt 6.17) 1st A1 awrt 6.17 2nd B1 DoF/$\nu = 2$ (May be implied by 5.991) 3rd B1ft 5.991 (or better) allow ft from their stated degrees of freedom) 2nd A1ft (dep on 3rd M1 and 3rd B1) for a correct ft contextualised conclusion. Must include "treatment" and "fungus". Ignore any non-contextual statements. If hypotheses are the wrong way round then A0.	