Quality Assurance Mark Scheme

Q1.

Question	Answer	Additional guidance	Mark
(a)	B3 The chart should have • a line showing the target weight at 510 g • Lines showing warning limits at 550 g and 470 g • Lines showing action limits at 570 g and 450 g • The sample means (495 g and 558 g) are plotted B2 • 495 g is inside the warning limits no action is required • 558 g is between the warning limits and action limits another sample should be taken	B5 for a complete explanation including the key values explaining how the quality control chart is drawn and used (Award B1 for each correct bullet point to a maximum of B3 for the first four bullet points)	(5)
(b) (i)	B1 approximately equal to		(1)
(b) (ii)	B1 greater than		(1)

Q2.

Question	Answer	Additional guidance	Mark
(a)	B1 e.g. Half of the chocolate bars would be unsellable (below 60 g in weight)	B1 for any suitable reason	(1)
(b)	B1 mean of population should be approximately equal to mean of sample / 62 g B1 standard deviation of population will be greater than standard deviation of sample means / 0.4 g	B1 for a correct deduction about the mean B1 for a correct deduction about the standard deviation	(2)
(c)	M1 warning lines are $\bar{x} \pm 2$ s.d. action lines are $\bar{x} \pm 3$ s.d. A1 61.2 and 62.8 and 60.8 and 63.2 A1 warning lines and action lines drawn on graph B1 sample 7 is outside warning lines B1 so another sample 8 should have been taken immediately B1 sample 8 is also outside action limits so the machine should be stopped and reset	M1 for attempting to find warning lines or action lines A1 for correctly calculating the warning lines A1 for correctly drawing warning and action lines B1 for identifying sample 7 outside warning line B1 for stating the appropriate action to take after sample 7 B1 for stating the appropriate action to take after sample 8	(6)

Q3.

Question number	Answer	Additional guidance	Mark
(a)	B1 lower warning line added at 4.0 and labelled. B1 both action lines correct and labelled (Upper line at 4.25, lower line at 3.95)	B1 for knowing warning lines should be symmetrical. B1 for knowing that action lines should be 3 × s.d. from the mean. Both lines correct with correct labels.	(2)
(b)	B1ft Another sample should be taken immediately B1 If further sample is also beyond warning line then production should be stopped. (If within warning lines then production can continue.)	B1ft for attempting correct practical decision based on position of their value relative to warning/action lines. B1 (cao) for complete description of actions needed including criteria for stopping after a second sample.	(2)
(c)	B1 David is incorrect because sample means will be more closely grouped than individual values OR standard deviation will be >0.05	B1 for demonstrating understanding that sample means will have a closer grouping.	(1)

Q4.

	5ST1H_01 Scheme	Marks
(a)	Horizontal lines at 108 and 110, labelled **warning** and **action** respectively	B2 (2)
(b)	5	B1 (1)
(c)(i)		
(ii)	point plotted (6, 97.8)	B1
(d)	Production line must be stopped	B1 (2)
	If a sample (mean) is **between** warning **and** action limits a further sample is taken. If further sample is also outside warning limits then stop the process OR If further sample is within warning limits take no action	B1 B1 dB1 (3) **[8]**
	Notes	
(a)	B2 lines and labels (B1 1 line + correct label or both lines and no/incorrect labels)	
(c)(i)	Point plotted between (6, 97.2) and (6, 98)	
(c)(ii)	B1 allow reset/adjusted	
(d)	1st B1 for sample between warning and action limits 2nd B1 for a further sample is taken 3rd B1 dependent on at least one B1 being earned previously for a correct decision of what action to take following the outcome of the further sample	

Q5.

Question	Scheme	Marks
(a)	Another sample should be taken (immediately)	B1 (1)
(b)(i)	5.2	B1
(ii)	Point plotted at (7, 5.2)	B1ft
(iii)	The machine should be shut down/reset.	B1ft (3)
		[4]

	Notes
(ii)	Allow ½ square tolerance Follow through their answer to (b)(i) but must be plotted above the 7
(iii)	Must have an answer to part (b)(i) or (b)(ii) Must ft their answer to (b)(ii). If no answer to (b)(ii), must ft their (b)(i) If their answer to (b)(ii) lies between 4 and 5 allow 'take another sample' or 'shut down/reset the machine' If their answer to (b)(ii) < 4, then e.g. 'no further action is required'/'allow machine to continue'

Q6.

Question number	Answer	Additional guidance	Mark
(a)	M1 $200 + 3 \times 2.5$ A1 207.5	M1 for use of $\mu \pm 3\sigma$ A1 for 207.5	(2)
(b)	B1 e.g. the process would be stopped / reset more frequently	B1 for a correct interpretation of effect of changing upper action limit	(1)
(c)	B2 for indicating that the machine should be **reset** (oe) as the range is outside the upper action limit although the mean is outside the upper warning limit (but not action limit) (B1 for indicating that the machine should be reset as the range is outside the upper action limit (no consideration of mean) / for indicating that as mean outside the upper warning limit another sample should be taken (no consideration of range))	B2 for a single correct decision (reset/stop the machine) with full reasoning (B1 for a decision with incomplete reasoning or for two different but correct separate decisions reached for the mean and the range)	(2)

Q7.

Question number	Answer	Additional guidance	Mark
(a)	B1 recognising that the standard deviation is 2 M1 One warning line or action line A1ft both warning lines correct $\pm 2\ \sigma$ A1ft both action lines correct $\pm 3\ \sigma$ A1 correct scale	Allow ft on their identified standard deviation	(5)
(b)	B1 not appropriate since the machine should be stopped/reset the first time the action limit is exceeded	B1 for not appropriate and correct supporting reason Condone for 'first time' reference to immediately / straight away	(1)
(c)	B1 Means will be the same/similar B1 Standard deviation of individual values will be greater dB1 So conclusion not supported	B1 for assessment of means B1 for assessment of standard deviations dB1 for conclusion (dep on 2nd B1)	(3)