

# General Certificate of Education

## Use of Maths *UOM4/1*

# Mark Scheme

## *2005 examination – June series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

**Use of Mathematics**

**Advanced Subsidiary Level – Applying Mathematics Paper 1 (UOM 4/1)**

**Answers and marking Scheme – June 2005**

**Question 1**

(a)	$C = 1000e^{-0.3466 \times 8} = 62.5$	M1, A1	or finding half of 125 (ie amount after 4 half-lives)
(b)	$800 = 1000 e^{0.3466xt}$ $0.8 = e^{-0.3466t}$ $\ln 0.8 = (-) 0.3466t$ $t = \frac{\ln 0.8}{-0.3466} = 0.644 \text{ hrs (or 38.6 mins)}$	M1  M1  A1	Allow SC2 for answer in range  0.62 – 0.65 taken from graph
	<b>TOTAL</b>	<b>5</b>	

**Question 2**

	Two of age, sex, size (height and weight), metabolism	B1 + B1	or other sensible eg if eaten recently
	<b>TOTAL</b>	<b>2</b>	

**Question 3**

	$500 = 1000e^{-2k}$ or $1000e^{-kt}$ $\frac{1}{2} = e^{-2k}$ $e^{2k} = 2$ $2k = \ln 2$ or $kt = \ln 2$ $k = \frac{1}{2} \ln 2 = 0.3466$	M1   M1  A1	<b>Alternative:</b> $\ln \frac{1}{2} = -2k$ $-\ln 2 = -2k$ M1 $k = \frac{1}{2} \ln 2$ A1
	<b>TOTAL</b>	<b>3</b>	

**Question 4**

	Four hours is equivalent to two half lives so the amount of drug decreases by a factor of  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ , ie 0.25	B1  B1	SC1 0.25 is based upon half life  OR SC1 0.25 is the fraction left in body after 4 hours  No marks for 4 (hours) is related to $\frac{1}{4}$
	<b>TOTAL</b>	<b>2</b>	

**Question 5**

	$C_{n+1} = 0.25C_n + 1000$ $C_1 = 0.25 \times 1000 + 1000 = 1250$ $C_2 = 0.25 \times 1250 + 1000 = 1312.5$ $C_3 = 0.25 \times 1312.5 + 1000 = 1328.125 = 1328$	M1 A1 A1	SC2 for list of final values 1000, 1250, 1312.5, 1328
	<b>TOTAL</b>	<b>3</b>	

**Question 6**

(a)	$C_{n+1} = 0.5^{T/2} C_n + 250T$ $T = 8$ $C_{n+1} = 0.5^{8/2} C_n + 250 \times 8$ $\therefore C_{n+1} = \frac{C_n}{16} + 2000$	M1 A1	
(b)	$C_1 = 0.0625 \times 1000 + 2000 = 2062.5$  $C_2 = 2062.5 \times 0.0625 + 2000 = 2129$	M1 A1	(substitution in their recurrence relation)  With working only or 2128.9...
	<b>TOTAL</b>	<b>4</b>	

**Question 7**

	A relatively large value of $T$ (eg $T > 16$ ) Substituted into $C_{n+1} = 0.5^{T/2} C_n + 250T$ using $0.5^{T/2} C_n \rightarrow 0$ and $250T$ tends to a relatively large dose	E1  E1 E1	SC2 $T = 8$ , clear correct argument based on $T = 8$ or 16
	<b>TOTAL</b>	<b>3</b>	

**Question 8**

	Initial dose lower Half life longer	B1 B1	allow B1 stating both initial dose (800mg) and half life (4 hours) without comparison
	<b>TOTAL</b>	<b>2</b>	
	<b>TOTAL FOR PAPER</b>	<b>24</b>	

Accuracy marks 1(b), 3, 5, 6      [ 3 correct 3 marks  
2 correct 2 marks  
1 correct 1 mark ]