

Additional Science A (Twenty First Century)

General Certificate of Secondary Education **J631**

Mark Schemes for the Units

June 2007

J631/MS/R/07

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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GCSE Additional Science A Twenty First Century (J631)

MARK SCHEMES FOR THE UNITS

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**Mark Scheme A215/01
June 2007**

PLEASE ENSURE YOU FAMILIARISE YOURSELF WITH THE MARK SCHEME BEFORE MARKING YOUR PRACTICE SCRIPTS.

YOU WILL HAVE TO MARK TEN PRACTICE AND TEN STANDARDISATION SCRIPTS BEFORE YOU CAN BE APPROVED TO MARK.

1. Mark strictly to the mark scheme. If in doubt consult your Team Leader by telephone or the messaging system within Scoris, or by email.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. There is a NR (No Response) option. The keyboard short-cut is #.
Award 0 marks - for an attempt that earns no credit (including copying out the question or some crossed out working)

Award NR (No Response) - if there is nothing written at all in the answer space
OR - if there is any comment which does not in any way relate to the question being asked (e.g. 'can't do', 'don't know')
OR - if there is any sort of mark which isn't an attempt at the question (e.g. a dash, a question mark)
4. The **comments box** will be used by your team leader to explain the marking of the practice scripts. Please refer to these comments when checking your practice scripts.
Please do not use the comments box for any other reason
Any questions or comments you have for your team leader should be communicated by phone, Scoris messaging system or e-mail.
5. Abbreviations, annotations and conventions used in the detailed Mark Scheme
/ = alternative and acceptable answers for the same marking point
point = point must be present to gain the mark
(description) = description which need not be present to gain the mark
e.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy'
work done = 0 marks: work done lifting = 1 mark change in potential energy = 0 marks gravitational potential energy = 1 mark
6. If a candidate alters his/her response, examiners should accept the alteration. If the alteration is impossible to interpret, raise an exception as 'answer outside guidance'
7. If a tick (or other indication) is crossed out and there is no replacement, mark the crossed-out tick as in point 3 above.
8. If the candidate responds to a question in a way which is different from the instructions, such as underlining rather than ringing a word in a list, then the mark should be awarded if the candidate has unambiguously selected the correct response.

9. Ignore any misspelling in a written response providing that the candidate's meaning is clear and unambiguous.

10. Marking method for tick boxes:

If there is a set of boxes, some of which should be ticked and others left empty, then you need to judge the entire set of boxes.

If a question requires candidates to identify a city in England,
Then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out). For a two-mark question, the rationale would be

All boxes are indicated scores 0 marks.

All boxes blank is NR.

All four boxes correct scores 2 marks.

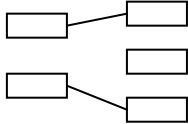
Three boxes correct scores 1 mark.

Two boxes correct scores 1 mark.

e.g.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

If in doubt consult your Team Leader

Question			Expected Answers	Rationale	Marks
1	a	i	Lithium: harmful; Chlorine: toxic ;		2
		ii			2
	b		lithium + chlorine → lithium chloride <u>OR</u> chlorine + lithium → lithium chloride	Ignore use of capital letters. Spellings must be correct for endings. Ignore symbols if words also present. If symbols only, the equation must be correct. $2\text{Li} + \text{Cl}_2 \rightarrow 2\text{LiCl}$	1
Total					5
2	a		yellow / green / yellow-green; liquid; I ₂ [NOT 'I'];	all 3 correct = 2 1 or 2 correct = 1 I ₂ must use a capital I	2
	b		non-metals; less; negative;	all 3 correct = 2 1 or 2 correct = 1	2
	c		two crosses in inner ring and 7 in outer ring	ignore spacing of x and s	1
Total					5

Question		Expected Answers		Rationale	Marks
3	a		green blue;		1
	b	i	hydrogen		1
		ii	lithium hydroxide	If name and formula given then mark the name only. If formula only given then it must be correct (LiOH) Special case: 'lithium hydroxide + hydrogen' Ignore the 'hydrogen' as it is also a product of the reaction, but if any other substance is given in addition to lithium hydroxide then no mark.	1
	c		K Na rubidium;	all must be correct The 'N' in Na must be conventional upper case The 'a' in Na must be clearly lower case. Do not penalise inappropriate letter size NOT NA, NOT na, allow Na Accept unambiguous spelling of Rubidium	1
				Total	4
4	a	i	17 [metres per second]		1
		ii	4.5 [seconds]		1
	b		force work		1 1
	c		arrow B		1
				Total	5

Question		Expected Answers		Rationale	Marks
5	a		A D C		1
	b		A E	any order 'Accident & Emergency'	1 1
	c		speed = $\frac{600}{30} = 20$ m/s		1
	d		<p>it reduces the force on her when she lands;</p> <div style="display: inline-block; vertical-align: middle; border: 1px solid black; padding: 2px;"> <input type="checkbox"/> </div> <p>this increases the time taken of the impact with the ground</p> <div style="display: inline-block; vertical-align: middle; border: 1px solid black; padding: 2px;"> <input checked="" type="checkbox"/> </div>	both ticked for (1) mark	1
Total					5
6	a		downwards upwards weight	If first answer is upwards and second answer is downwards allow for 1 mark	1 1 1
	b		A		1
Total					4

Question			Expected Answers	Rationale	Marks
7	a	i	A;		1
		ii	C;		1
	b		brain; skin;		1 1
	c	i	increases; increases; stays the same;	all 3 correct = 2 1 or 2 correct = 1	2
	d		column 1 column 2 column 3 column 4 column 5 1 2 3 4 5 	correct link between columns 2&3 and no other links between these two columns = 1 correct link between columns 3&4 and no other links between these two columns = 1 ignore last column	2
Total					8
8	a		= sugar = water = urea	three correct = 2 one or two correct = 1 "So What U!"	2
	b		bladder;		1
Total					3

Question		Expected Answers			Rationale	Marks
9	a			B greater than A		1
	b			<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-right: 5px; text-align: center;">✓</div> <div>lly permeable</div> </div>		1
	c			<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">more sugar</div> <div style="border: 1px solid black; width: 30px; height: 30px; text-align: center;">✓</div> </div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-top: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-top: 5px;"></div> <div style="border: 1px solid black; width: 30px; height: 30px; margin-top: 5px;"></div>		1
Total						3

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Three boxes correct scores 1 mark.

Two boxes correct scores 1 mark.

e.g.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

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Question			Expected Answers	Rationale	Marks
1	a		B		1
	b		C		1
	c		A		1
Total					3
2	a		green and blue;		1
	b	i	hydrogen		1
		ii	lithium hydroxide	If name and formula given then mark the name only. If formula only given then it must be correct (LiOH) Special case: 'lithium hydroxide + hydrogen' Ignore the 'hydrogen' as it is also a product of the reaction, but if any other substance is given in addition to lithium hydroxide then no mark.	1
	c	i	K Na rubidium;	all must be correct The 'N' in Na must be conventional upper case The 'a' in Na must be clearly lower case. Do not penalise inappropriate letter size NOT NA, NOT na, allow Na Accept unambiguous spelling of Rubidium	1
		ii	Rubidium/Rb Potassium/K Sodium/Na	must be in correct order Allow ecf for incorrect symbols from ci if in correct order	1
Total					5
3	a		lithium chloride; Not lithium chlorine; 2Li and 2LiCl (need both);	Ignore minor spelling errors eg.lithium chloride	2
	b	i	Cl ⁻	minus sign to right of Cl accept Cl ¹⁻ or Cl ⁻¹	1
		ii	it gains one electron ; it gains a full outer shell;	1 st and 4 th box only	2
	c		Do a flame test;	1 st box	1
Total					6

Question			Expected Answers	Rationale	Marks	
4	a		downwards upwards weight	If first answer is upwards and second answer is downwards allow for 1 mark	1	
					1	
	b		A		1	
Total					4	
5	a	i	the energy lost by the car is transferred by heating; work is done by the car brakes to slow the car down	1 st box cross 2 nd box tick 3 rd box tick 4 th box cross	All 4 correct = 2 2 or 3 correct = 1	2
		ii	3.75			1
		iii	13 600			1
	b		B The kinetic energy of the car decreases as it does work against gravity.		1	
Total					5	
6	a	i	A = 2 marks; B = 1 mark; C or D = 0		2	
		ii	1920 J	3 rd answer	1	
	b		240 000	Allow 240 k (because this means 240 kJ)	1	
	c		Cheryl		1	
Total					5	

Question		Expected Answers	Rationale	Marks	
7	a	<input checked="" type="radio"/> Sugar <input type="radio"/> water <input checked="" type="radio"/> urea	three correct = 2 one or two correct = 1 (So What U!)	2	
	b	bladder;		1	
	c	i		1 mark for each side	2
		ii	pituitary gland;	1	
Total				6	
8	a	amylase was working at 20 and 40 °C; the active site of amylase changes shape at 60 °C	Only 3 rd and 4 th boxes ticked	2	
	b	60 ;		1	
Total				3	
9		hypothalamus; increases; vasodilate; increases;	four correct = 3 three correct = 2 two correct = 1 one or none correct = 0	3	
Total				3	
10	a	B greater than A		1	
	b	Add more sugar	1 st box ticked	1	
Total				2	

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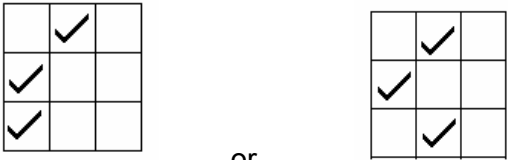

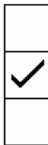
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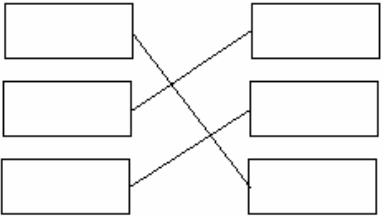
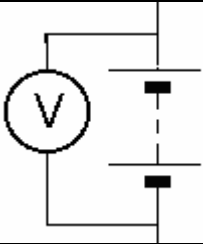

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

11. If in doubt consult your Team Leader.

Question		Expected Answers	Rationale	Marks	
1	a	mitosis		1	
	b	(D) → B → C → A	B anywhere before C (1 mark) C anywhere before A (1 mark) Before Cars Arrived	2	
	c	DNA; bases; nucleus; cytoplasm;	Four correct scores 3 marks. Three correct scores 2 marks. Two correct scores 1 mark. One or none correct scores 0 marks.	3	
Total				6	
2	a		First row: one tick in second column scores 1 mark. Second row: one tick in first column scores 1 mark. Third row: EITHER one tick in first column scores 1 mark. OR one tick in second column scores 1 mark. in any row, more than one tick scores 0 marks for that row.	3	
	b		Need three empty boxes (possibly with crossed out ticks) and a tick in the second box to gain this mark. Accept any clear mark in the box, or other response to indicate choice.	1	
	c	i	16 (cell stage);	1	
	c	ii		Need two empty boxes (possibly with crossed out ticks) and a tick in the second box to gain this mark. Accept any clear mark in the box, or other response to indicate choice.	1
Total				6	

Question		Expected Answers	Rationale	Marks										
3	a	<div style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div>	<p>Need two empty boxes (possibly with crossed out ticks) and a tick in the SECOND box to gain this mark.</p> <p>Accept any clear mark in the box, or other response to indicate choice.</p>	1										
	b	zygote: identical; inactive;	Three correct scores 2 marks Two correct scores 1 mark One or none correct scores 0 marks	2										
Total				3										
4	a	<div style="text-align: center;"> N_2 or $N2$ </div>	<p>Must be a capital N followed by a subscript 2 to earn the mark. Subscript 2 must be at least half the height of N. N^2 scores 0 marks. Ignore anything in the 'other gases' box.</p>	1										
	b	<div style="text-align: center;"> <table border="1" style="border-collapse: collapse;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px; text-align: center;">✓</td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px; text-align: center;">✓</td></tr> </table> </div>		✓	✓		✓			✓		✓	<p>Ignore any row with two ticks. All five rows correct scores 2 marks. Any four or three correct rows scores 1 mark. Less than three correct rows scores 0 marks.</p> <p>Accept any clear mark in the box, or other response to indicate choice.</p>	2
	✓													
✓														
✓														
	✓													
	✓													
	c	<div style="text-align: center;"> A </div>	<p>If necessary, look at the diagram for the response.</p>	1										
Total				4										

Question		Expected Answers	Rationale	Marks
5	a		<p>Look at the links as they leave the left-hand boxes. All four links correct scores 2 marks. Three or two links correct scores 1 mark. One link correct scores 0 marks.</p> <p>Two links from any box on the left scores 0 marks for those links.</p>	2
	b		<p>All five rows correct scores 2 marks. Any four or three rows correct scores 1 mark. Less than three rows correct scores 0 marks.</p> <p>Accept any clear mark in the box, or other response to indicate choice.</p>	2
Total				4
6	a		<p>Need two empty boxes (possibly with crossed out ticks) and a tick in the first box to gain this mark.</p> <p>Accept any clear mark in the box to indicate choice.</p>	1
	b	oxygen oxygen oxidised	all three correct scores 2 marks. any two correct scores 1 mark. only one correct scores 0 marks.	2
	c	i	350 °C	1
		ii	malleability/very malleable/malleable	1
Total				5

Question		Expected Answers	Rationale	Marks
7	a		<p>Look at the links as they leave the left-hand boxes. All three links correct scores 2 marks. One or two links correct scores 1 mark.</p> <p>Two links from any box on the left scores 0 marks for those links.</p>	2
	b	230 V		1
	c	i	kilowatt-hours	1
		ii	energy transfer	1
Total				5
8	a	negative; repel; electrons;	<p>Three correct scores 3 marks. Two correct scores 2 marks. One correct scores 1 mark.</p>	3
	b	B		1
	c	Kevin		1
Total				5
9	a		<p>Look for a circle with a V inside it. Opposite ends of the circle to be connected by continuous lines (not necessarily straight) to either end of the battery, as shown. Can be drawn to the right of the battery.</p> <p>Voltmeter connected across more than just the battery scores 0 marks.</p>	1
	b		<p>All four rows correct scores 2 marks. Any three rows correct scores 1 mark. Less than three rows correct scores 0 marks.</p> <p>Accept any clear mark in the box, or other response to indicate choice.</p>	2
	c	$\frac{9}{0.12} = 75 \Omega$	Accept any clear indication of response.	1
Total				4

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Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out). For a two-mark question, the rationale would be

All boxes indicated scores 0 marks.

All boxes blank is NR.

All four boxes correct scores 2 marks.

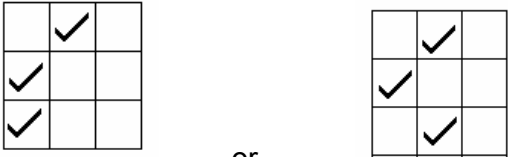
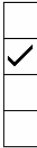
Three boxes correct scores 1 mark.

Two boxes correct scores 1 mark.

e.g.

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

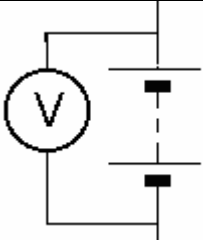
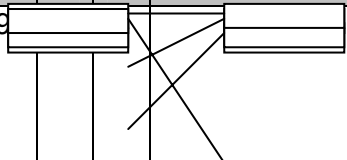
11. If in doubt consult your Team Leader.

Question		Expected Answers	Rationale	Marks
1	a		<p>First row: one tick in second column scores 1 mark. Second row: one tick in first column scores 1 mark. Third row: EITHER one tick in first column scores 1 mark. OR one tick in second column scores 1 mark. in any row, more than one tick scores 0 marks for that row.</p>	1 1 1
	b		<p>Need three empty boxes (possibly with crossed out ticks) and a tick in the second box to gain this mark.</p> <p>Accept any clear mark in the box, or other response to indicate choice.</p>	1
	c	reactivated; replace;	both correct = 1 mark	1
Total				5
2	a	B;	more than one response = 0 marks	1
	b	i A;	more than one response = 0 marks	1
		ii D;	more than one response = 0 marks	1
	c	auxin moves across the stem to the shady side;	more than one response = 0 marks	1
Total				4
3	a	nucleus; cytoplasm; DNA; three;	all 4 correct = 2 marks 2 or 3 correct = 1 mark 1 or none correct = 0 marks	2
	b	i C; D; A;	C before D (1 mark); D before A (1 mark);	2
		ii C;	more than one response = 0 marks	1
Total				5

Question			Expected Answers	Rationale	Marks										
4	a		N ₂ or N ₂	Must be a capital N followed by a subscript 2 to earn the mark. Subscript 2 must be at least half the height of N. N ² scores 0 marks. Ignore anything in the 'other gases' box.	1										
	b		<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td></td><td>✓</td></tr> <tr><td>✓</td><td></td></tr> <tr><td>✓</td><td></td></tr> <tr><td></td><td>✓</td></tr> <tr><td></td><td>✓</td></tr> </table>		✓	✓		✓			✓		✓	Ignore any row with two ticks. All five rows correct scores 2 marks. Any four or three correct rows scores 1 mark. Less than three correct rows scores 0 marks. Accept any clear mark in the box, or other response to indicate choice.	2
	✓														
✓															
✓															
	✓														
	✓														
	c		A	If necessary, look at the diagram for the response.	1										
Total					4										
5	a	i	liquid <u>and</u> gas	both correct answers = 1 mark l = liquid and g = gas	1										
		ii	(Aq) <u>and</u> (s)	both correct answers = 1 mark sodium chloride dissolved in water = Aq, accept aq/AQ and solid sodium chloride = s, accept S	1										
	b		the water contains free moving ions	more than one response = 0 marks	1										
	c		K ⁺ MgCl ₂ SO ₄ ²⁻	no alternative answers accepted	1 1 1										
Total					6										

Question		Expected Answers	Rationale	Marks
6	a	C	more than one response = 0 marks	1
	b	$3e^-$	accept $3e = 2$ marks $e/e^- = 1$ mark	2
	c	\checkmark $-$ \checkmark $-$	both ticks correct = 1 mark more than 2 ticks = 0 marks need two empty boxes (possibly with crossed out ticks) for the SECOND and FOURTH rows plus a tick in the FIRST and THIRD boxes to gain this mark. Accept any clear mark in the box to indicate choice.	1
Total				4
7	a		3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 marks more than one response in a box = incorrect	2

	b	D	more than one response = 0 marks	1
	c	24 V	the mark should be awarded if the candidate has unambiguously selected the correct response	1
	d	0 V	the mark should be awarded if the candidate has unambiguously selected the correct response	1
			Total	5

Question		Expected Answers	Rationale	Marks					
8	a		<p>Look for a circle with a V inside it. Opposite ends of the circle to be connected by continuous lines (not necessarily straight) to either end of the battery, as shown. Can be drawn to the right of the battery.</p> <p>Voltmeter connected across more than just the battery scores 0 marks.</p>	1					
	b	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 20px; height: 20px;">✓</td></tr> <tr><td style="width: 20px; height: 20px;"> </td></tr> <tr><td style="width: 20px; height: 20px;"> </td></tr> <tr><td style="width: 20px; height: 20px;"> </td></tr> <tr><td style="width: 20px; height: 20px;">✓</td></tr> </table>	✓				✓	<p>All four rows correct scores 2 marks. Any three rows correct scores 1 mark. Less than three rows correct scores 0 marks.</p> <p>Accept any clear mark in the box, or other response to indicate choice.</p>	2
✓									
✓									
	c	$\frac{9}{0.12} = 75\Omega$	Accept any clear indication of response.	1					
Total				4					
9			<p>look at the links as they leave the left-hand boxes.</p> <p>all 4 links correct = 2 marks. 2 or 3 links correct = 1 mark 1 or 0 links correct = 0 marks</p> <p>2 links leaving a left hand box and leading to 2 or more right hand boxes = 0 mark for this part of the response</p>	2					
	b	(C) A D E B	A before D (1 mark); D before E (1 mark); E before B (1 mark)	3					
Total				5					

**General Certificate of Secondary Education
Twenty First Century Science (Specification Code J631)
June 2007 Assessment Series**

Unit Threshold Marks

		<i>Unit</i>	Maximum Mark	a*	a	b	c	d	e	f	g	u
A215/01	Raw		42	n/a	n/a	n/a	28	24	20	17	14	0
	UMS		34	n/a	n/a	n/a	30	25	20	15	10	0
A215/02	Raw		42	35	30	25	20	15	12	n/a	n/a	n/a
	UMS		50	45	40	35	30	25	23	n/a	n/a	n/a
A216/01	Raw		42	n/a	n/a	n/a	24	20	16	13	10	0
	UMS		34	n/a	n/a	n/a	30	25	20	15	10	0
A216/02	Raw		42	29	24	19	15	11	9	n/a	n/a	n/a
	UMS		50	45	40	35	30	25	23	n/a	n/a	n/a

For a description of how UMS marks are calculated see;
http://www.ocr.org.uk/exam_system/understand_ums.html

Statistics are correct at the time of publication

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