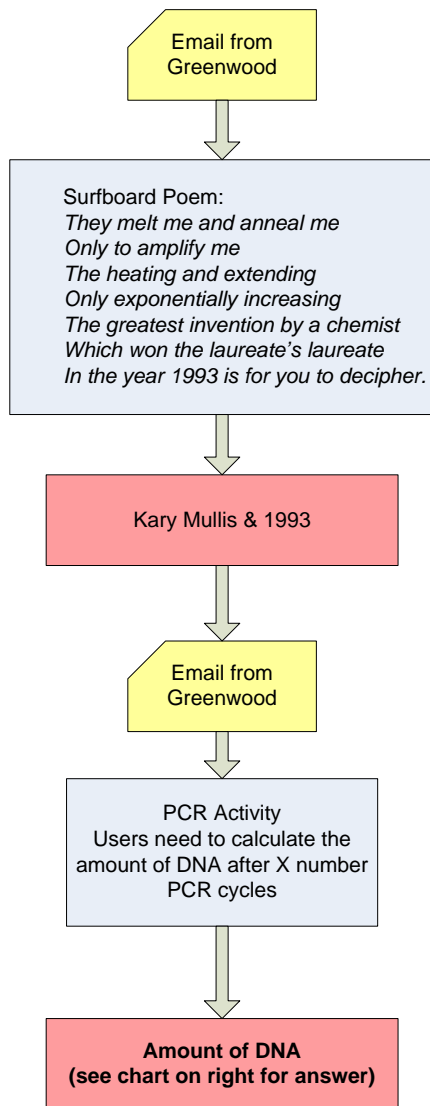


# HISTORY OF BIOLOGY

## Teacher's Walkthrough

### MISSION 12: SURFING SCIENCE

#### A) WORKFLOW



Cycles	Amt of DNA
1	1
2	2
3	4
4	8
5	32
6	64
7	128
8	256
9	512
10	1,024
11	2,048
12	4,096
13	8,192
14	16,384
15	32,768
16	65,536
17	131,072
18	262,144
19	524,288
20	1,048,576
21	2,097,152
22	4,194,304
23	8,388,608
24	16,777,216
25	33,554,432
26	67,108,864
27	134,217,728
28	268,435,456
29	536,870,912
30	1,073,741,824

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## Teacher's Walkthrough

### B) EMAILS, CLUES, OBJECTS

	Contents	Explanation
EMAIL	<p><b>M12: INTRO EMAIL</b>  <b>From:</b> Dr. Jordan Greenwood  <b>Subject:</b> Surfing</p> <p>Dear user,</p> <p>The bacterium that you identified, <i>Thermus aquaticus</i>, was originally found in the hot springs of Yellow Stone National Park. Dr. Shyre attended a conference there and he brought back a surf board that he keeps in the corner of his office.</p> <p>Maybe there's a clue to be found on it!</p> <p>Greenwood</p>	
OBJECT	<p>Surfboard – clicking on it reveals the poem on the other side</p> <p><i>They melt me and anneal me</i>  <i>Only to amplify me</i>  <i>The heating and extending</i>  <i>Only exponentially increasing</i>  <i>The greatest invention by a chemist</i>  <i>Which won the laureate's laureate</i>  <i>In the year 1993 is for you to decipher.</i></p>	<p>Searching for chemist, nobel prize, 1993 leads user to Kary Mullis</p> <p>Note : that his discovery was in 1983 but received the Nobel Prize in 1993.</p>
EMAIL	<p><b>M12: PCR EMAIL</b>  <b>From:</b> Dr. Jordan Greenwood  <b>Subject:</b> PCR</p> <p>Dear user,</p> <p>Oh yes, Kary Mullis is a brilliant man! He is credited with the discovery of PCR, the polymerase chain reaction. Now I understand why Shyre led us to <i>Thermus aquaticus</i> - it is the source of the enzyme Taq polymerase used in PCR. Kary Mullis was one of the first to use Taq in his PCR amplification reactions.</p> <p>PCR was a groundbreaking technique that changed how scientists were able to do experiments. Before PCR, scientists often could not extract enough DNA from samples to perform the experiments they needed to do. With PCR, they could amplify specific regions of DNA and create millions of copies in just a few hours! After every cycle of PCR, the amount of DNA doubles. For example, if you start with a single copy of DNA, after the first cycle of PCR, you</p>	

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	<p>have 2 copies. After a 2nd cycle of PCR, you now have 4 copies of DNA. After the 3rd cycle of PCR, you have 8 copies of DNA...and so on...</p> <p>I was just about to post Shyre’s quiz for the week, but now I realize it was probably meant just for you. This must be the clue: ‘How much DNA is produced after  v dna_cycles v , cycles of PCR?’ Greenwood</p>																																																															
CLUE	<p>How much DNA is produced after X # of cycles of PCR?</p> <p>User needs to determine/research the formula for exponential increase:</p> <table><tr><th>Cycles</th><th>Amt of DNA</th></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>2</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>8</td></tr><tr><td>5</td><td>32</td></tr><tr><td>6</td><td>64</td></tr><tr><td>7</td><td>128</td></tr><tr><td>8</td><td>256</td></tr><tr><td>9</td><td>512</td></tr><tr><td>10</td><td>1,024</td></tr><tr><td>11</td><td>2,048</td></tr><tr><td>12</td><td>4,096</td></tr><tr><td>13</td><td>8,192</td></tr><tr><td>14</td><td>16,384</td></tr><tr><td>15</td><td>32,768</td></tr><tr><td>16</td><td>65,536</td></tr><tr><td>17</td><td>131,072</td></tr><tr><td>18</td><td>262,144</td></tr><tr><td>19</td><td>524,288</td></tr><tr><td>20</td><td>1,048,576</td></tr><tr><td>21</td><td>2,097,152</td></tr><tr><td>22</td><td>4,194,304</td></tr><tr><td>23</td><td>8,388,608</td></tr><tr><td>24</td><td>16,777,216</td></tr><tr><td>25</td><td>33,554,432</td></tr><tr><td>26</td><td>67,108,864</td></tr><tr><td>27</td><td>134,217,728</td></tr><tr><td>28</td><td>268,435,456</td></tr><tr><td>29</td><td>536,870,912</td></tr><tr><td>30</td><td>1,073,741,824</td></tr></table>	Cycles	Amt of DNA	1	1	2	2	3	4	4	8	5	32	6	64	7	128	8	256	9	512	10	1,024	11	2,048	12	4,096	13	8,192	14	16,384	15	32,768	16	65,536	17	131,072	18	262,144	19	524,288	20	1,048,576	21	2,097,152	22	4,194,304	23	8,388,608	24	16,777,216	25	33,554,432	26	67,108,864	27	134,217,728	28	268,435,456	29	536,870,912	30	1,073,741,824	Number of cycles is randomly generated
Cycles	Amt of DNA																																																															
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EMAIL	<p><b>M12: VICTORY EMAIL</b></p> <p><b>From:</b> Dr. Jordan Greenwood</p> <p><b>Subject:</b> Awesome work</p> <p>Dear user,</p>																																																															

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	<p>Congratulations on solving Shyre's quiz. PCR is an indispensable tool for today's molecular biologists. It is the basis for many experiments from DNA sequencing, gene analysis, disease diagnosis and DNA barcoding.</p> <p>Greenwood</p>	
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