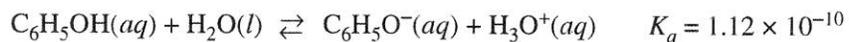


**2016 AP<sup>®</sup> CHEMISTRY FREE-RESPONSE QUESTIONS**



4. Phenol is a weak acid that partially dissociates in water according to the equation above.
- (a) What is the pH of a 0.75 M  $\text{C}_6\text{H}_5\text{OH}(aq)$  solution?
- (b) For a certain reaction involving  $\text{C}_6\text{H}_5\text{OH}(aq)$  to proceed at a significant rate, the phenol must be primarily in its deprotonated form,  $\text{C}_6\text{H}_5\text{O}^-(aq)$ . In order to ensure that the  $\text{C}_6\text{H}_5\text{OH}(aq)$  is deprotonated, the reaction must be conducted in a buffered solution. On the number scale below, circle each pH for which more than 50 percent of the phenol molecules are in the deprotonated form ( $\text{C}_6\text{H}_5\text{O}^-(aq)$ ). Justify your answer.

1      2      3      4      5      6      7      8      9      10      11      12      13      14