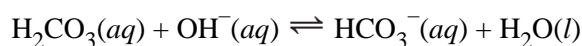


11. Which of the following mixtures would form a buffer solution?
- (A) 100.0 mL of  $0.1 \text{ mol L}^{-1} \text{NH}_4\text{Cl}$  mixed with 100.0 mL of  $0.1 \text{ mol L}^{-1} \text{NH}_4\text{OH}$
- (B) 200 mL of  $0.1 \text{ mol L}^{-1} \text{NaOH}$  mixed with 100 mL of  $0.1 \text{ mol L}^{-1} \text{NaCl}$
- (C) 100 ml of  $0.1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4$  mixed with 200 mL of  $0.1 \text{ mol L}^{-1} \text{NaOH}$
- (D) 50.0 mL of  $0.1 \text{ mol L}^{-1} \text{HCl}$  mixed with 50.0 mL of  $0.1 \text{ mol L}^{-1} \text{NaOH}$
12. A solution is prepared by mixing 100.0 mL of  $0.100 \text{ mol L}^{-1}$  of  $\text{NaNO}_3$  with 100.0 mL of  $0.100 \text{ mol L}^{-1} \text{HCl}$  and then adding sufficient water to give a final volume of 500.0 mL. What is the pH of the solution?
- (A) 1.00
- (B) 1.12
- (C) 1.40
- (D) 1.70

13. In the following reaction a proton is transferred:



The proton transfer is from

- (A)  $\text{H}_2\text{CO}_3(\text{aq})$  to  $\text{H}_2\text{CO}_3^-(\text{aq})$ .
- (B)  $\text{OH}^-(\text{aq})$  to  $\text{H}_2\text{O}(\text{l})$ .
- (C)  $\text{H}_2\text{CO}_3(\text{aq})$  to  $\text{H}_2\text{O}(\text{l})$ .
- (D)  $\text{H}_2\text{CO}_3(\text{aq})$  to  $\text{OH}^-(\text{aq})$ .
14. The following excerpt is taken from the Sydney Morning Herald describing the work of Sam Fonti in his preparation of fireworks for Sydney's 2010 New Year's Eve celebrations.

*It may look like trial and error, but it is really rocket science. Mr Fonti is trying to devise a new firework colour – aquamarine, a “clean, shiny, natural blue” – to join the lime, magenta and peach he has previously perfected.*

John Huxley, 28 December 2009

Which of the following chemicals is most likely to be used by Mr Fonti to produce a natural blue-coloured firework?

- (A) lead (II) oxide
- (B) barium oxide
- (C) copper (II) oxide
- (D) calcium oxide
15. In 1918 Fritz Haber was awarded a Nobel Prize in Chemistry. Which of the following best describes why this prize was awarded?
- (A) He designed an industrial plant to synthesise ammonia.
- (B) He manufactured synthetic fertilisers to feed growing world populations.
- (C) He developed reaction conditions to economically produce ammonia.
- (D) He was the first chemist to synthesise ammonia from its elements.