

Brett Robbins Academic Consulting

Chemistry 20 Practice Test

Unit C: Matter as Solutions, Acids and Bases

25 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

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Question 1

A solution is prepared by dissolving 0.40 mol of solute in enough water to make 2.0 L of solution.

The concentration of the solution is

- A) 0.20 mol/L
- B) 0.80 mol/L
- C) 2.0 mol/L
- D) 5.0 mol/L

Question 2

Which statement about an aqueous solution is correct?

- A) Water is always the solute in an aqueous solution
- B) An aqueous solution must contain an ionic solute
- C) Water is the solvent in an aqueous solution
- D) An aqueous solution is always a strong electrolyte

Question 3

Which of the following substances, when dissolved in water, produces a solution that conducts electricity well?

- A) $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq})$ (glucose)
- B) $\text{NaCl}(\text{aq})$
- C) $\text{C}_2\text{H}_5\text{OH}(\text{aq})$ (ethanol)
- D) $\text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{aq})$ (sucrose)

Question 4

A solution with a pH of 2 is compared to a solution with a pH of 4.

The hydronium ion concentration of the pH 2 solution is greater by a factor of

- A) 2
- B) 10
- C) 20
- D) 100

Question 5

Which observation is a property of an acidic solution?

- A) It turns blue litmus red
- B) It turns red litmus blue
- C) It feels slippery to the touch
- D) It has a pH greater than 7

Question 6

A 100 mL sample of 2.0 mol/L hydrochloric acid is diluted with water to a final volume of 500 mL.

The concentration of the diluted acid is

- A) 0.10 mol/L
- B) 1.0 mol/L
- C) 0.40 mol/L
- D) 10 mol/L

Question 7

The amount of solute in 3.0 L of a 0.25 mol/L solution is

- A) 0.083 mol
- B) 0.75 mol
- C) 8.3 mol
- D) 12 mol

Question 8

A 25.0 mL sample of 6.0 mol/L HCl(aq) is diluted to a final volume of 250.0 mL.

The concentration of the diluted solution, to the nearest hundredth, is ____ mol/L.

Question 9

A solution that contains undissolved solute, and in which the rate of dissolving equals the rate of crystallizing, is

- A) unsaturated
- B) dilute
- C) concentrated
- D) saturated

Question 10

As the temperature of water increases, the solubility of oxygen gas in the water

- A) decreases
- B) increases
- C) does not change
- D) doubles

Question 11

Which chemical equation represents a neutralization reaction?

- A) $\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$
- B) $\text{HNO}_3\text{(aq)} + \text{KOH(aq)} \rightarrow \text{KNO}_3\text{(aq)} + \text{H}_2\text{O(l)}$
- C) $\text{CaCO}_3\text{(s)} \rightarrow \text{CaO(s)} + \text{CO}_2\text{(g)}$
- D) $2\text{H}_2\text{O}_2\text{(aq)} \rightarrow 2\text{H}_2\text{O(l)} + \text{O}_2\text{(g)}$

Question 12

A student must prepare 500.0 mL of 0.250 mol/L NaOH(aq) from solid sodium hydroxide, molar mass 40.00 g/n

The mass of NaOH(s) required, to the nearest hundredth of a gram, is ____ g.

Question 13

The equivalence point of an acid – base titration is reached when

- A) the indicator first begins to change colour
- B) equal volumes of acid and base have been mixed
- C) the amount of acid added is chemically equivalent to the amount of base originally present
- D) the pH of the mixture is exactly 7

Question 14

A 25.0 mL sample of NaOH(aq) is completely neutralized by 20.0 mL of 0.200 mol/L HCl(aq).

The concentration of the NaOH(aq), to the nearest thousandth, is ____ mol/L.

Question 15

A solution has a hydronium ion concentration of 1.0×10^{-9} mol/L.

The solution is

- A) acidic, with a pH of 9
- B) basic, with a pH of 5
- C) neutral, with a pH of 7
- D) basic, with a pH of 9

Question 16

A student dissolves 5.85 g of NaCl(s), molar mass 58.44 g/mol, in enough water to make 500 mL of solution.

The concentration of the solution, to the nearest hundredth, is ____ mol/L.

Question 17

Which procedure correctly describes how to prepare a standard solution from a solid solute?

- A) Weigh the solute, dissolve it in a small volume of distilled water in a beaker, transfer the solution and all rins to a volumetric flask, and fill to the calibration mark with distilled water.
- B) Fill a volumetric flask to the calibration mark with distilled water, then add the weighed solute and stir until dissolved.
- C) Weigh the solute directly into a volumetric flask, add distilled water to the calibration mark, and shake until dissolved.
- D) Dissolve the solute in exactly the final volume of water, measured with a graduated cylinder.

Question 18

A 50.0 mL sample of a 3.0 mol/L solution is diluted with water to produce a 0.50 mol/L solution.

The volume of water, in millilitres, that must be added is ____

Question 19

Hydrochloric acid and ethanoic acid solutions are both 0.10 mol/L.

The HCl(aq) conducts electricity much better than the ethanoic acid mainly because

- A) ethanoic acid does not dissolve in water
- B) HCl ionizes completely, producing a higher concentration of ions
- C) ethanoic acid has a larger molar mass than HCl
- D) HCl contains more hydrogen atoms per molecule than ethanoic acid

Question 20

The amount of NaOH(aq), in moles, required to completely neutralize 250.0 mL of 0.40 mol/L HNO₃(aq), to the

Question 21

A flask contains NaOH(aq) and a few drops of phenolphthalein, so the solution is pink.

HCl(aq) is added from a burette. At the endpoint, the colour change is

- | | |
|-----------------------|-----------------------|
| A) blue to yellow | B) colourless to pink |
| C) pink to colourless | D) yellow to blue |

Question 22

A 250.0 mL sample of 0.100 mol/L solution is to be prepared by diluting a 1.50 mol/L stock solution.

The volume of stock solution required, to the nearest tenth of a millilitre, is ____ mL.

Question 23

Which of the following solutions is the most concentrated?

- A) 0.10 mol of solute in 500 mL
- B) 0.30 mol of solute in 2.0 L
- C) 0.050 mol of solute in 100 mL
- D) 0.90 mol of solute in 1.5 L

Question 24

According to the modified Arrhenius theory, an acid is a substance that

- A) reacts with water to produce $H_3O^+(aq)$ ions
- B) reacts with water to produce $OH^-(aq)$ ions
- C) neutralizes hydronium ions in solution
- D) always contains hydroxide ions in its formula

Question 25

In a titration, 25.0 mL of 0.10 mol/L HCl(aq) is required to completely neutralize 20.0 mL of NaOH(aq).

The concentration of the NaOH(aq) is

- A) 0.080 mol/L
- B) 0.125 mol/L
- C) 0.20 mol/L
- D) 0.25 mol/L

Answer Key

- | | | |
|---------|-----------|----------|
| 1. A | 10. A | 19. B |
| 2. C | 11. B | 20. 0.10 |
| 3. B | 12. 5.00 | 21. C |
| 4. D | 13. C | 22. 16.7 |
| 5. A | 14. 0.160 | 23. D |
| 6. C | 15. D | 24. A |
| 7. B | 16. 0.20 | 25. B |
| 8. 0.60 | 17. A | |
| 9. D | 18. 250 | |

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