California Chemistry Diagnostic Test Sample Questions

Competency areas: Compounds and elements; states of matter; reactions of matter; structure of matter; periodic properties; solutions; qualitative kinetics and thermodynamics; lab skills, mathematical skills. A Periodic Table is provided with the exam.

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1. The correct formula for aluminum nitrate is

   (a) Al_3N_2 (b) $Al_3(NO_3)$ (c) $Al(NO_2)_3$ (d) $Al(NO_3)_3$

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2. A substance releases heat when it changes from

   (a) liquid to solid
   (b) solid to gas
   (c) liquid to gas
   (d) solid to liquid

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3. Given the balanced equation:

   $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

   How many grams of H_2O are formed if 9.00 mol $H_{2(g)}$ reacts completely with an excess of $O_{2(g)}$? The molar mass of H_2O is 18.0g/mol.

   (a) 18.0g (b) 36.0g (c) 81.0g (d) 162g

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4. Which element has exactly five electrons in the highest principal energy level (the outer shell)?

   (a) Se (b) Ba (c) P (d) Ge

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5. Which element is a metal?

(a) Se (atomic number = 34)

(b) Co (atomic number = 27)

(c) C (atomic number = 6)

(d) Br (atomic number = 35)

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6. What volume of 1.5M NaOH is needed to provide 0.75 mol of NaOH?

(a) 500L (b) 5.0 L (c) 500 mL (d) 0.75 L

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7. For a chemical reaction it is usually found that the reaction rate is faster at higher temperature. The rate increases because

(a) the concentrations of reactants increase

(b) more reactants collide with energy equal to or greater than the activation energy

(c) the concentrations of products increase

(d) the volume expands and there is more room for new compounds (products) to form

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8. Which answer is closest to the true value of the expression:

$(9.1 \times 10^{4})(1.1 \times 10^{-5})(\log 10^{-13})(1000)$

(a) 1.3 (b) 13000 (c) -13000 (d) 1.3×10^{-11}

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9. Which substance does not obey the Lewis octet rule?

(a) N_2 (b) NO (c) CF_4 (d) Ar

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10. For the reaction at equilibrium:

$2\ NO_{(g)} + O_{2(g)} \leftrightarrows 2\ NO_{2(g)}$

which change will <u>increase</u> the amount of $NO_{2(g)}$?

(a) remove NO gas

(b) add NO gas

(c) add a catalyst

(d) remove O_2 gas

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11. For the reaction

$$2C_6H_{6(g)} + 15O_{2(g)} \leftrightarrows 12CO_{2(g)} + 6H_2O_{(g)}$$

the expression for the equilibrium constant, K, is

(a) $\frac{[CO_2]\,[H_2O]}{[C_6H_6]\,[O_2]}$

(b) $\frac{[CO_2]^{12}[H_2O]^{6}}{[C_6H_6]^{2}[O_2]^{15}}$

(c) $\frac{[C_6H_6]\,[O_2]}{[CO_2]\,[H_2O]}$

(d) $\frac{[12CO_2]\,[6H_2O]}{[2C_6H_6]\,[15O_2]}$

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answers: 1d; 2a; 3d; 4c; 5b; 6c; 7b; 8c; 9b; 10b; 11b