1. How many copper atoms are in a copper block with a mass of 3.10 g, given that copper has a molar mass of 63.55 g/mol?

    a) 2.94×10^{22} Cu atoms

    b) 5.88×10^{22} Cu atoms

    c) 9.81×10^{22} Cu atoms

    d) 2.11×10^{23} Cu atoms

2. An electron configuration for an atom shows the specific orbitals (s, p etc.) that electrons occupy for that atom. What is the electron configuration for Silicon, which has 14 electrons?

    a) $1s^2 2sp^8 3s^2 3p^2$

    b) $2s^1 2s^2 6p^2 2s^3 2p^3$

    c) $1s^2 2s^2 2p^6 3s^2 3p^2$

    d) None of the above

3. What is the equilibrium expression, K_c, for the reaction: $2S_{(s)} + 3O_{2(g)} \rightleftharpoons 2SO_{3(g)}$?

    a) $[SO_3]^2/[O_2]^3$

    b) $[SO_3]^2/[S]^2[O_2]^3$

    c) $2[SO_3]/3[O_2]$

    d) $2[SO_3]/(2[S]+3[O_2])$

Questions 7-14 have been adopted by the International Baccalaureate® (IB) Data Banks.

4. Why does the atomic radius of an atom decrease across a row in the periodic table?

   a) The electrons repel each other.

   b) The nucleus decreases in size.

   c) The electronegativity increases.

   d) All of the above.

5. What is the molarity of Na^+ ions in a solution made by dissolving 4.20 g of $NaHCO_3$ (M = 84.0) and 12.6 g of Na_2CO_3 (M = 126) in water and diluting to 1.00 L?

   a) 0.250 M

   b) 0.150 M

   c) 0.100 M

   d) 0.050 M

6. In which reaction at equilibrium will the amount of reactants present increase with an increase in the container volume?

   a) $N_{2(g)} + 3\ H_{2(g)} \rightleftarrows 2NH_{3(g)}$

   b) $CO_{(g)} + NO_{2(g)} \rightleftarrows CO_{2(g)} + NO_{(g)}$

   c) $H_{2(g)} + F_{2(g)} \rightleftarrows 2\ HF_{(g)}$

   d) $C_{(s)} + CO_{2(g)} \rightleftarrows 2CO_{(g)}$

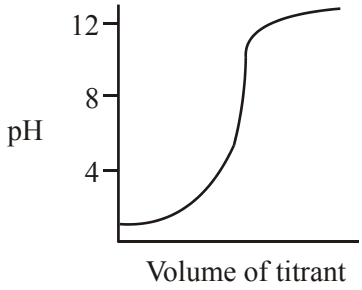
7. What occurs during the operation of a voltaic cell based on the following reaction?

$$Ni(s) + Pb^{2+}(aq) \rightarrow Ni^{2+}(aq) + Pb(s)$$

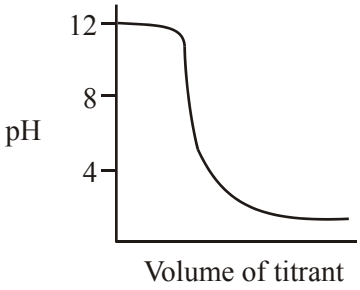
	External circuit	Ion movement in solution
a)	electrons move from Ni to Pb	$Pb^{2+}(aq)$ move away from Pb(s)
b)	electrons move from Ni to Pb	$Pb^{2+}(aq)$ move toward Pb(s)
c)	electrons move from Pb to Ni	$Ni^{2+}(aq)$ move away from Ni(s)
d)	electrons move from Pb to Ni	$Ni^{2+}(aq)$ move toward Ni(s)

8. Which curve is produced by the titration of a 0.1 mol dm^{-3} weak base with 0.1 mol dm^{-3} strong acid?

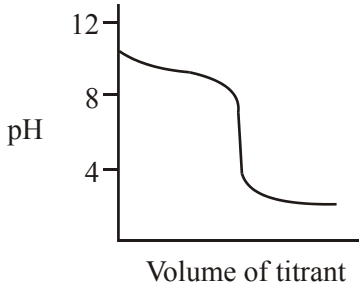
A.



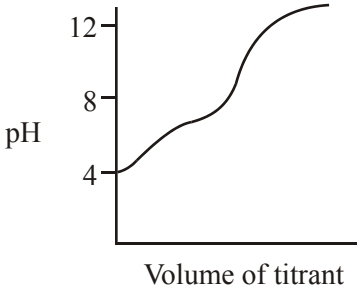
B.



C.



D.



9. What will happen if $CO_2(g)$ is allowed to escape from the following reaction mixture at equilibrium?

$$CO_2(g) + H_2O(l) \rightleftharpoons H^+(aq) + HCO_3^-(aq)$$

a) The pH will decrease.

b) The pH will increase.

c) The pH will remain constant.

d) The pH will become zero.

10. Which molecule is polar?

a) CO_2

b) PF_3

c) CH_4

d) BF_3

11. How many lone pairs and bonding pairs of electrons surround xenon in the XeF_4 molecule?

	Lone pairs	Bonding pairs
a)	4	8
b)	0	8
c)	0	4
d)	2	4

12. The reaction between NO_2 and F_2 gives the following rate data at a certain temperature. What is the order of reaction with respect to NO_2 and F_2?

$[NO_2]$/mol dm^{-3}	$[F_2]$/mol dm^{-3}	Rate /mol dm^{-3} min^{-1}
0.15	0.20	0.1
0.30	0.20	0.40
0.15	0.40	0.20

What is the overall order of reaction?

a) 3

b) 2

c) 1

d) 0

13. What is the effect of increasing temperature on the rate constant, k?
    a) The rate constant does not change.
    b) The rate constant decreases linearly.
    c) The rate constant increases exponentially.
    d) The rate constant increases proportionally with temperature.

14. 1.0mol of N_2 (g), 1.0mol of H_2 (g) and 1.0mol of NH_3 (g) are placed in a 1.0dm^3 sealed flask and left to reach equilibrium. At equilibrium the concentration of N_2 (g) is 0.8mol dm^{-3}.

$$N_2(g) + 3H_2(g) \rightleftarrows 2NH_3(g)$$

What are the equilibrium concentration of H_2 (g) and NH_3 (g) in mol dm^{-3} ?

	[H_2 (g)] / mol dm^{-3}	**[NH_3 (g)] / mol dm^{-3}**
a)	0.2	1.2
b)	0.4	1.4
c)	0.4	0.4
d)	0.8	1.2

Basic Principles of Chemistry
Sample Questions

1. A
2. C
3. A
4. C
5. A
6. A
7. B
8. C
9. B
10. B
11. D
12. A
13. C
14. B