

## HL Topics 3 and 13 : Periodicity (1)

For each question choose the answer you consider to be the best.

1. Which species has the same arrangement of electrons as a  $\text{Mg}^{2+}$  ion?
  - A. Na atom
  - B.  $\text{F}^+$  ion
  - C. Ne atom
  - D.  $\text{O}^-$  ion
  
2. Which best defines *electronegativity*?
  - A. The energy required for an atom in the gaseous state to gain one electron
  - B. The attraction between the nucleus and the outermost electron of an atom
  - C. The attraction of an atom for a bonded pair of electrons
  - D. The energy required for an atom to form a negative ion with an noble gas electron arrangement
  
3. Which is correct when the ionic or atomic radii are compared?
  - A.  $\text{Ca}^{2+} < \text{Ca}^+$
  - B.  $\text{Cl}^- < \text{Cl}$
  - C.  $\text{Na} < \text{Na}^+$
  - D.  $\text{B} < \text{C}$

4. Which properties increase in value when descending group 1?

- I. First ionization energy
- II. Atomic radius
- III. Reactivity with water

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

5. Which statement about a periodic trend is correct?

- A. Melting points increase from lithium to caesium.
- B. Atomic radii increase from sodium to chlorine.
- C. Electronegativities increase from fluorine to iodine.
- D. First ionization energies increase from carbon to lead.

6. Why do the boiling points of the halogens increase down the group?

- A. The molecules become more polar due to increasing electronegativities.
- B. The strength of the temporary dipoles increases.
- C. The bond enthalpies increase.
- D. The ionization energies increase.



7. Which react with water to form acidic solutions

- I. Sodium oxide,  $\text{Na}_2\text{O}$
- II. Phosphorus pentoxide,  $\text{P}_4\text{O}_{10}$
- III. Sulfur trioxide,  $\text{SO}_3$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

8. Which of the following reacts with water to give a solution with a pH > 7?

- A. Silicon dioxide
- B. Sodium chloride
- C. Sulfur trioxide
- D. Magnesium oxide

9. Which statements are correct about the nature of  $\text{Na}_2\text{O}$ ,  $\text{SiO}_2$  and  $\text{Cl}_2\text{O}$ ?

	$\text{Na}_2\text{O}$	$\text{SiO}_2$	$\text{Cl}_2\text{O}$
A.	Basic	Amphoteric	Acidic
B.	Acidic	Amphoteric	Basic
C.	Basic	Acidic	Acidic
D.	Acidic	Basic	Basic

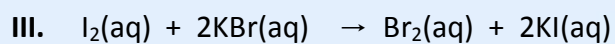
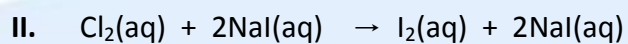
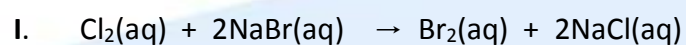
10. Which two elements react the most vigorously with each other?

- A. Potassium and iodine
- B. Potassium and fluorine
- C. Lithium and iodine
- D. Lithium and fluorine

11. Which statement is true about the values for the electronegativity of the two elements?

- A.  $\text{Li} > \text{K}$
- B.  $\text{Li} > \text{B}$
- C.  $\text{Br} > \text{F}$
- D.  $\text{N} > \text{O}$

12. Which reactions are spontaneous under standard conditions?



- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

13. Which is a correct statement about the chlorides of period 3?

- A. All the metal chlorides form neutral solutions in water.
- B. Non-metal chlorides form acidic solutions in water.
- C.  $\text{SiCl}_4$  has a diamond-like giant molecular structure.
- D. Aluminium chloride has a high melting point due to its ionic structure

14. Which statements are correct about the reactions of  $\text{NaCl}$ ,  $\text{MgCl}_2$ , and  $\text{PCl}_5$  with water?

	$\text{NaCl}$	$\text{MgCl}_2$	$\text{PCl}_5$
A.	Forms a basic solution	Forms a neutral solution	Forms an acidic solution
B.	Forms a neutral solution	Forms an acidic solution	Forms an acidic solution
C.	Forms a neutral solution	Forms a basic solution	Forms a basic solution
D.	Forms a neutral solution	Forms a neutral solution	Forms an acidic solution

15. Which of the following form a coloured solution in water?

- I.  $\text{Cu}(\text{NO}_3)_2$
- II.  $\text{Zn}(\text{NO}_3)_2$
- III.  $\text{Ni}(\text{NO}_3)_2$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III



**16.** Which electrons are lost when copper metal forms the  $\text{Cu}^{2+}$  ion?

- A. two s electrons
- B. two d electrons
- C. two p electrons
- D. one s electron and one d electron

**17.** Which are typical properties of transition metal elements?

- I. They form complex ions
  - II. They are good catalysts
  - III. They have variable oxidation states
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

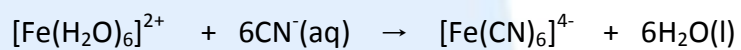
**18.** Which substance is used as a catalyst in the industrial manufacture of ammonia?

- A.  $\text{V}_2\text{O}_5$
- B. Pd
- C. Fe
- D.  $\text{MnO}_2$

19. Which substance is used as a catalyst in catalytic converters in cars?

- A. Pd
- B. MnO<sub>2</sub>
- C. Fe
- D. V<sub>2</sub>O<sub>5</sub>

20. How are cyanide ions behaving in the reaction below?



- A. As an oxidizing agent
- B. As a reducing agent
- C. As a Lewis acid
- D. As a Lewis base