

## HL Topics 3 and 13 : Periodicity (2)

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

1. An element is in period 3 and group 5 of the periodic table. How many electrons are present in the highest occupied energy level of this element?
  - A. 3
  - B. 5
  - C. 13
  - D. 15
  
2. Which best describes the trends of electronegativity values within the periodic table?
  - A. The values increase across a period (from left to right) and decrease down a group.
  - B. The values increase across a period (from left to right) and increase down a group.
  - C. The values decrease across a period (from left to right) and decrease down a group.
  - D. The values decrease across a period (from left to right) and increase down a group.
  
3. Which is the correct trend for the elements moving from left to right across Period 3?
  - A. The oxides become less acidic
  - B. The bonding of the chlorides changes from ionic to covalent
  - C. The atomic radii increase
  - D. The melting points of the elements increases

4. The first ionization energies for three consecutive elements in the periodic table are 1251, 1521 and 419 kJ mol<sup>-1</sup> respectively. Which elements have these values?

- A. carbon, nitrogen, oxygen
- B. neon, sodium, magnesium
- C. sodium, magnesium, aluminium
- D. chlorine, argon, potassium

5. Which factors lead to an element having a high first ionization energy?

- I. Completely filled outer energy level
  - II. Small atomic radius
  - III. High number of completely filled inner energy levels
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III



6. Which equation represents the first ionization energy of carbon?

- A.  $C(s) \rightarrow C^+(g) + e^-$
- B.  $C(g) + e^- \rightarrow C^-(g)$
- C.  $C(s) + e^- \rightarrow C^-(g)$
- D.  $C(g) \rightarrow C^+(g) + e^-$

7. Which is a correct statement about the halogens or their ions?

- A. Halide ions are all oxidising agents with the fluoride ion being the strongest
- B. Bromine can oxidise iodide ions.
- C. Iodine can oxidise chloride ions.
- D. Fluorine is a stronger reducing agent than iodine.

8. Which are the correct products when chlorine gas reacts with water?

- A.  $H_2$  and  $Cl_2O$
- B.  $H_2$ ,  $O_2$  and  $HClO$
- C.  $H_2$ ,  $Cl_2$  and  $HClO$
- D.  $HClO + H^+ + Cl^-$



**9.** Which is a correct statement about the nature of the chlorides of period 3?

- A. They change from basic to acidic from left to right across the period.
- B. They change from acidic to basic from left to right across the period.
- C. They change from neutral to acidic from left to right across the period.
- D. They change from neutral to basic from left to right across the period.

**10.** Which reaction produces a coloured substance.

- A. The addition of sodium metal to water.
- B. The addition of sulfur dioxide gas to water.
- C. Burning sodium metal in chlorine gas.
- D. The addition of chlorine gas to a solution of potassium iodide.

**11.** Which is a correct statement about all the elements in the same period?

- A. They all contain the same number of electrons in their outer energy level
- B. Their boiling points increase (going from left to right).
- C. They have the same number of occupied energy levels.
- D. Their atomic radii decrease (going from left to right).



**12.** Which support the statement that aluminium oxide is amphoteric.

- I.  $\text{Al}_2\text{O}_3$  can react with strong acids and bases.
- II.  $\text{Al}_2\text{O}_3$  dissolves in water to give a neutral solution.
- III.  $\text{Al}_2\text{O}_3$  can react to form a salt with sodium hydroxide and with hydrochloric acid.

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

**13.** Which element is a transition metal?

- A. lead, Pb
- B. gallium, Ga
- C. strontium, Sr
- D. iron, Fe

**14.** What must all ligands contain?

- A. An unpaired electron
- B. A negative charge
- C. A non-bonding pair of electrons
- D. Two or more atoms or ions



15. Which species can act as ligands?

- I.  $\text{NH}_3$
- II.  $\text{Cl}^-$
- III.  $\text{SiCl}_4$

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

16. The compounds  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}$  and  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2$  are isomers. What is the oxidation state of chromium in these two compounds?

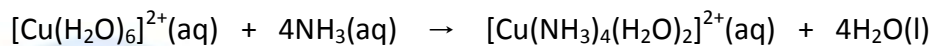
	$[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}$	$[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2$
A.	+ 3	+3
B.	+2	+1
C.	+4	+5
D.	+6	+6

17. Which is used as a catalyst during the manufacture of sulfuric acid?

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



18. In the following reaction :



Which are correct statements?

- I. The  $\text{Cu}^{2+}$  ion is acting as a Lewis base
- II.  $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$  has an octahedral shape
- III. The oxidation state of copper remains unchanged

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

19. In which complex ion does the metal have an oxidation state of +2?

- A.  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- B.  $[\text{Ag}(\text{NH}_3)_2]^+$
- C.  $[\text{CuCl}_4]^{2-}$
- D.  $[\text{Fe}(\text{CN})_6]^{3-}$

20. Which species will **not** be coloured?

- A.  $\text{Cu}_2\text{SO}_4$
- B.  $\text{Mn}_2\text{O}_3$
- C.  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
- D.  $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$

