Unit 6 · Periodic Table

WORKSHEET

Full marks 45

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 45

1 Key words [4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

atomic mass	**atomic numbers**	**d subshell**	**electron affinity**	**electronegativity**
Hund's rule	**inner transition elements**	**ionization potential**	**Pauli's exclusion principle**	**periods**

The modern periodic law says that the properties of the elements are periodic functions of their _____. The horizontal rows of the table are called _____. The minimum energy needed to remove the most loosely held electron from an isolated gaseous atom is its _____. The energy released when an isolated gaseous atom gains an electron is its _____. The tendency of an atom in a molecule to attract a shared pair of electrons is its _____. Electrons go into the orbitals of a subshell singly before they pair up: this is _____. The elements of groups 3 to 12 fill a _____, and the lanthanides and actinides are called the _____.

2 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Which rule says that electrons enter the orbitals of a subshell singly before they pair up? [1]

a. Aufbau principle
b. Pauli's exclusion principle
c. Hund's rule
d. the octet rule

ii. The electronic configuration of chromium (Z = 24) is: [1]

a. [Ar] $4s^2\ 3d^4$
b. [Ar] $4s^1\ 3d^5$
c. [Ar] $4s^2\ 4p^4$
d. [Ar] $3d^6$

iii. Why does argon (atomic mass 39.95) come before potassium (atomic mass 39.10) in the modern periodic table? [1]

a. argon was discovered first
b. argon is a gas and potassium a solid
c. argon has 18 protons and potassium 19
d. argon has fewer neutrons than potassium

iv. An element has the outer configuration $3d^5\ 4s^2$ ([Ar] $4s^2\ 3d^5$). It belongs to: [1]

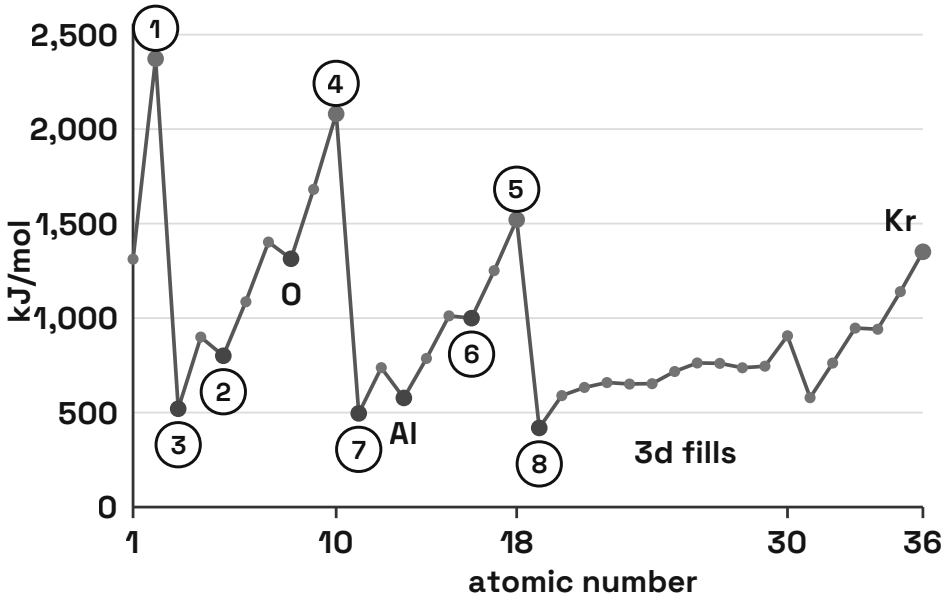
a. the s block, group 2
b. the p block, group 17
c. the d block, group 7
d. the f block

v. What happens when chlorine water is added to potassium iodide solution? [1]

a. nothing: iodine is more reactive than chlorine
b. the solution turns brown as iodine is set free
c. chlorine gas bubbles out
d. a white precipitate of potassium chloride forms

3 Label the graph [4]

The graph shows the first ionization potential of the elements 1 to 36. Write the symbol of the element in place of 1 to 8. Each carries 0.5 mark.



1. _____ **2.** _____

3. _____ **4.** _____

5. _____ **6.** _____

7. _____ **8.** _____

4 Very short answers [4]

Write very short answers to the following questions.

a. State the modern periodic law. [1]

_____

_____

b. Write the short electronic configuration of Fe^{3+} (iron, Z = 26). [1]

_____

_____

c. Why is white phosphorus stored under water? [1]

_____

_____

d. Which is larger, Na or Na^{+}? [1]

_____

_____

5 Short answers [8]

Write short answers to the following questions.

a. The ionization potential of magnesium is higher than that of aluminium, although aluminium is to its right in period 3. Give a reason. [2]

b. Chlorine has a higher electron affinity than fluorine. Give a reason. [2]

c. The compounds of zinc are white, while those of copper are usually colored. Give a reason. [2]

d. Write any two differences between electron affinity and electronegativity. [2]

6 Long answers [8]

Write long answers to the following questions.

a. Explain why the periods of the periodic table contain 2, 8, 8, 18 and 18 elements. [4]

b. How does the reactivity of the halogens change down group 17? Describe one experiment that shows it, with equations. **[4]**

7 Numerical problems **[9]**

Solve the following problems. Show your working.

a. The successive ionization potentials of an element Y, in kJ/mol, are 578, 1,817, 2,745 and 11,577. (i) How many valence electrons does Y have? (ii) To which group does it belong? (iii) Write the formula of its oxide. **[3]**

Answer:

b. Calculate the energy released when 3.55 g of chlorine atoms, in the gas state, each gain an electron. The electron affinity of chlorine is 349 kJ/mol. (Cl = 35.5) **[2]**

Answer:

c. How many unpaired electrons are there in (i) phosphorus (15), (ii) iron (26), (iii) Fe^{3+} and (iv) chromium (24)? Which of them would be attracted most strongly by a magnet? **[4]**

Answer:

Science Playground, Katunje, Bhaktapur
https://science-playground.com/learn/grade-10-optional-science/periodic-table

8 Think [3]

Yangchen says, “Fluorine has 9 protons and lithium only 3, so fluorine’s atom must be bigger, because it has more of everything.” Explain her mistake, using the numbers.

9 Activity: Atoms to scale (not marked)

On chart paper, draw each atom as a circle, using 1 cm for 50 pm. Take the radius from the unit’s tables. Before you draw, guess which will be biggest and which smallest.

Atom	Radius (pm)	Radius of the circle (cm)	Shells	Pull felt
Li				
F				
Na				
Cl				
K				