

PACHAGES S4- CHEMISTRY-1

CHEMISTRY HOLIDAY PACKAGES

1. Bromine (atomic number=35) consists of two isotopes, ^{79}Br (relative abundance 50.5%) and ^{81}Br (relative abundance 49.5%).

a). What is meant by the term ISOTOPES and why do isotopes of bromine show similar chemical properties?

b). Calculate the relative average mass (RAM) of bromine, correct to two figures.

c). Calculate the number of neutrons in the least abundant isotopes of bromine.

d). Determine the height of peaks for the mass spectrum of bromine.

2. The table below shows the first ionization energies and the melting points of the elements of the period 3 of the periodic table of elements.

Elements	Na	Mg	Al	Si	P	S	Cl	Ar
Atomic number	11	12	13	14	15	16	17	18
First ionization energies(J/mol)	495	740	580	790	1060	1000	1255	-
Melting point in $^{\circ}\text{C}$	98	650	660	1410	44	119	-101	-189.2

a). Explain what is meant by the term **“first ionization energy”**.

b).From table, explain the general trend in the first ionization energy.

c). Why the first ionization energy of sulphur is lower than that of phosphorus.

d). Explain in terms of bonding, why the melting point of magnesium is higher than that of sodium.

3. Consider the compound A of the formula:



a). Many function groups are represented in A. Name two as examples.

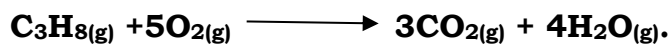
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b). What is the observation if A react with

i). Brady's reagent (2, 4-dinitrophenylhydrazine)

ii). Fehling reagent.

4. a). Calculate the enthalpy of the following reaction:



C-C: 346 KJmol⁻¹ C-H: 413 KJmol⁻¹

O=O: 498 KJmol⁻¹ C=O: 803 KJmol⁻¹ O-H: 464 KJmol⁻¹

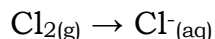
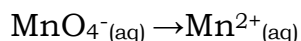
b). At 25°C, the reaction of hydrogen and oxygen is



R = 8.31 J/mol K.

5. a). Will chlorine oxidize manganese (II) ions to permanganate (VII) ions?

Explain and balance in acidic medium



6. The production of ammonia in the Haber process involves the reaction:



c). How does an increase in pressure affect the yield of ammonia? Explain your answer.

d). what are the conditions of temperature and pressure to be used so one can get highest yield?

e). Give one large scale use of ammonia.

7. 1.40g of a sample of an iron wire (M_wFe: 56g/mol) was dissolved in dilute sulphuric acid (M_w: 98g/mol) and the solution made to 250cm³ with water.

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If the titration of 25cm³ of this solution required 25.37cm³ of a solution containing 2.33g of potassium permanganate per litre,

- a). Explain why sulphuric acid is used instead of other mineral acid
- b). Explain the double role of sulphuric acid in the above procedure of analysis.
- c). Potassium permanganate (Mw: 158g/mol) is a powerful oxidizing agent. Explain the advantage of potassium permanganate in the titration.

8. For each of the following pairs of compounds, identify the chemical test which can be used to distinguish between them. State clearly the expected observations and write relevant equations for the reaction involved.

- a). Na₂SO₄ and Na₂SO₃
- b). Zn (NO₃)₂ and Pb(NO₃)₂
- c). NH₄⁺ and NO₃⁻

8. (a) Write an equation for the reaction between water and the hydride of:

- i. Sodium
- ii. Sulphur

(b) Write an equation for the reaction between sodium hydroxide solution and:

- i. Aluminium oxide
- ii. Sulphur dioxide

9. A compound Q contains 62.1% carbon, 10.3% hydrogen and the rest being oxygen. The vapour density of Q is 2.59x10⁻³ g/cm³ at s.t.p.

- a. Determine the
 - i. Empirical formula of Q
 - ii. Molecular formula of Q
- b. Write the structural formulae of all isomers of Q

10. The ionic radii and enthalpies of hydration of Na⁺, Mg²⁺ and Al³⁺ are given in the table below:

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Ion	Na ⁺	Mg ²⁺	Al ³⁺
Ionic radii /nm	0.095	0.065	0.050
ΔH hydration/kj /mol	-390	-1891	-4613

a) Briefly explain the variation in trends of:

- Ionic radii of ions
- Enthalpy of hydration

b) Calculate the charge/radius ratio for:

- Na⁺
- Mg²⁺
- Al³⁺

c) Which of the ion has?

- The least polarizing power
- The greatest polarizing power

d) Give the reasons for your answers in (c)(i)

Thanks

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