

MONDAY, 19th JUNE - Afternoon, 2.30 - 5

Not more than six questions may be attempted

Gram-molecular volume = 22.4 litres.

Atomic weights: H = 1, C = 12, O = 16,
Na = 23, S = 32, Ca = 40.

1. Describe the principal properties of (i) electrons, (ii) protons, (iii) neutrons. Show, by means of diagrams, the atomic structure of (a) hydrogen, (b) deuterium, (c) fluorine, (d) neon.

Explain why neon is inert and why fluorine is very reactive. (66 marks)

2. Describe, with the aid of a diagram, how you would prepare and collect reasonably pure chlorine. Give an account of the properties of chlorine. State the conditions under which chlorine reacts with (i) hydrogen, (ii) an aqueous solution of potassium iodide, (iii) ammonia. Use equations to illustrate the reactions. (66 marks)

OR

2. Give an account of the preparation of bromine and describe its principal properties. Describe, with the aid of a diagram, how you measure the vapour density of bromine. (66 marks)

3. Give an account of the kinetic theory of gases and the assumptions on which it is based. What do you understand by osmotic pressure? Calculate the osmotic pressure of a solution which contains 3.6 gm. of glucose ($C_6H_{12}O_6$) per litre at 25°C. How is osmotic pressure affected by temperature? (66 marks)

4. Outline three different methods by which hydrogen may be prepared and give an account of the properties of hydrogen.

Describe and discuss the structure of the hydrogen molecule. (66 marks)

5. What do you understand by a normal solution of (i) sodium hydroxide, (ii) sulphuric acid? 24 c.c. of 0.125 N sodium hydroxide were required to neutralise 20 c.c. of a given sulphuric acid solution. Find the concentration of the sulphuric acid solution (i) in terms of normality, (ii) in grams of sulphuric acid per litre. Describe how the above titration would be carried out and refer to the indicator you would use. (66 marks)

6. An organic acid has the following gravimetric composition: carbon 40%, hydrogen 6.6%, oxygen 53.3%. Its calcium salt contains 25.3% calcium. Write the name and structural formula for the acid and outline its principal properties. (66 marks)

OR

6. State what you understand by (i) atomic weight, (ii) equivalent weight, (iii) molecular weight.

Describe briefly any method for measuring the equivalent weight of a metal. Name the metal. The equivalent weight of a given metal is 32.69. If the specific heat of the metal is 0.0928, calculate its atomic weight. (The product of the atomic weight and the specific heat is approximately 6.3.) (66 marks)

7. The following elements occur in this order in the electrochemical series: sodium, magnesium, iron, hydrogen, copper. Discuss each of the following:

- Metals displace less electropositive metals from solutions of their salts;
- Hydrogen is displaced from water by the more electropositive metals;
- The most electropositive elements are the strongest reducing agents;
- The least electropositive metals are found free in nature.

8. Write the structural formula for (i) ethyl alcohol, (ii) acetaldehyde, and describe the principal properties of each of these compounds. Describe how you would prepare and collect acetaldehyde. (67 marks)

9. In the case of each of any three of the following gases outline, with the aid of labelled diagrams, how you would prepare and collect the gas: (i) carbon dioxide, (ii) nitric oxide, (iii) sulphur dioxide, (iv) ammonia. Describe one characteristic chemical test for each of the gases you have selected. (67 marks)

10. Describe fully what you understand by (i) an electrovalent bond, (ii) a covalent bond, and give an example in each case.

What do you understand by electronegativity? Describe any use which may be made of electronegativities. (The electronegativities of a number of elements are given in the following table; you may wish to refer to some of them in your answer.)

H								He
2.1								-
Li	Be	B	C	N	O	F	Ne	
1.0	1.5	2.0	2.5	3.0	3.5	4.0	-	
Na	Mg	Al	Si	P	S	Cl	Ar	
0.9	1.2	1.5	1.8	2.1	2.5	3.0	-	