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You may use the Periodic Table of Elements and the following information wherever appropriate.
1 atm = 760 mm Hg = 101,300 Pa
1 L = 1 dm^3 = 1000 cm^3 = 1000 mL

SECTION A: MULTIPLE CHOICE [25 marks]
Each question is followed by five suggested answers, A to E.
For each question, select the best answer and shade the letter corresponding to this answer on the answer sheet provided.

1. Which statement about the element, potassium, is true?

A Its chemical symbol is P.
B It forms covalent compounds.
C Its electronic configuration is 2,8,8,1.
D Its atomic number is 39.
E It belongs to group 5 of the Periodic Table.

2. Which statement about a pure compound is **false**?

A It has a fixed set of physical properties.
B It has a fixed set of chemical properties.
C Its component elements are chemically combined.
D It has a fixed composition by mass.
E It can be easily separated into its components by physical means.

3. Aqueous solutions

A are always colorless.
B are always colored.
C always contain water.
D are heterogeneous mixtures.
E are always saturated.

4. Three solid samples, X, Y and Z all melted at 112^0C. A mixture of Y and Z melted between 100^0C and 105^0C. A mixture of X and Z melted at 112^0C. It can be concluded that

A X,Y and Z are samples of the same substance.
B X and Z are samples of the same substance.
C X and Y are samples of the same substance.
D Y and Z are samples of the same substance.
E X,Y and Z are samples of three different substances.

5. The atomic number of an element is

A the number of protons in each atom of the element.
B the number of neutrons in each atom of the element.
C the number of valence electrons in each atom of the element.
D the number of nucleons in each atom of the element.
E the number of electrons which each atom of the element must lose, gain or share in order to attain a noble gas configuration.

6. An atom becomes a cation by

A losing electrons.
B gaining electrons.
C losing protons
D gaining protons.
E losing neutrons.

7. Isotopes of an element have the same

A atomic mass.
B nucleon number.
C mass number.
D neutron number.
E atomic number.

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8. What type of bonding occurs between calcium and oxygen to form calcium oxide?

A Metallic
B Non-metallic
C Ionic
D Covalent
E Weak

9. Which gas is dark brown?

A Oxygen
B Hydrogen
C Nitrogen
D Nitrogen dioxide
E Carbon dioxide.

10. Which gas relights a glowing splint?

A Oxygen
B Hydrogen
C Nitrogen
D Nitrogen dioxide
E Carbon dioxide

11. Which gas turns limewater milky?

A Oxygen
B Hydrogen
C Nitrogen
D Nitrogen dioxide
E Carbon dioxide

12. The correct name for the compound Fe_2O_3 is

A iron oxide
B di-iron trioxide
C iron(11) oxide
D iron(111) oxide
E iron oxygen

13. How does a mixture of iron and sulphur differ from a compound of iron and sulphur?

A In the mixture, iron and sulphur are in physical contact whereas in the compound they are chemically combined.
B In the mixture, iron and sulphur can be present in any proportion by mass whereas in the compound they are present in a fixed proportion by mass.
C Iron and sulphur retain their individual properties, whereas the compound has different properties from iron and sulphur.
D All of the above are correct.
E None of the above is correct.

14. Nitrogen has two naturally occurring isotopes with mass numbers 14 and 15. The relative atomic mass of nitrogen must therefore be

A 14
B 15
C between 14 and 15.
D less than 14
E higher than 15.

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15. Which statement is **not** true?

A All matter is composed of atoms.
B All atoms of an element are exactly alike.
C Atoms combine in whole numbers to form molecules.
D Atoms are neither created nor destroyed in the course of a chemical reaction.
E Atoms of one element cannot be changed into atoms of another element during a chemical change.

16. The formula of the compound ammonia is NH_3. What term or phrase **cannot** be used to describe ammonia?

A A binary compound.
B A tetra-atomic compound.
C A covalent compound
D A molecular compound
E A trivalent compound

17. A student prepared three samples of copper(11)oxide in three different ways. After analysis, it was found that each sample contained the elements, copper and oxygen, in the same relative amounts. This provides evidence for

A The law of conservation of mass.
B The law of definite proportions.
C Boyle's law.
D Charles' Law.
E The law of multiple proportions.

18. The conditions of standard temperature and pressure as applied to gases are

A 1 atm and 0 K
B 1 atm and 273^0C
C 760 mmHg and 273 K
D 760 mmHg and 273^0C
E 760 mmHg and 0 K

19. Sulphuric acid is described as a **strong** acid because

A sulphuric acid reacts readily with bases.
B sulphuric acid dissociates completely when dissolved in water.
C sulphuric acid turns blue litmus paper red.
D sulphuric acid always exists in high concentrations.
E sulphuric acid is dibasic.

20. The formula S_8 represents
A a solution
B a compound
C a mixture
D an element
E a metal

Question 21 to 25 concern the terms

A diffusion
B distillation
C sublimation
D neutralization
E solution

Select, from A to E, the term which best fits each description.

21. The reaction of an acid with a base to form a salt.
22. The movement of particles from an area of higher concentration to an area of lower concentration.
23. A technique used to separate liquids with different boiling points.
24. A change of state from solid to gas.
25. A homogeneous mixture.

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SECTION B: Answer **ALL** questions **in the spaces provided on the question paper**.

1. Atoms are made up of protons, electrons and neutrons.

a) The number of which particles of an atom identifies the element?.....

b) Which particles of an atom contribute the least to its mass? .....

c) Which particles of an atom take part in chemical changes? .....

d) Which particles of an atom have no charge? ..... [4]

2. Draw a fully labeled diagram to represent the particle $^{33}S^{2-}$. Your diagram should show all sub-atomic particles present, as well as the electronic configuration [3]

3. Each molecule of the compound, butane, has 4 carbon atoms and 10 hydrogen atoms.

a) What is a molecule? [1]

b) Write the molecular formula of butane.[1]

c) Find the RMM of butane.[1]

d) Give the empirical formula of butane[1]

e) Is butane an ionic or covalent compound? **Give a reason for your answer**.[1]

f) Would you expect butane to be soluble in water? **Give a reason for your answer**.[1]

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4. Complete the table.[6]

Name of compound	Formula of compound
Copper (11) hydroxide	
Nitric acid	
Aluminium oxide	
	PCl_3
	$Mg(NO_3)_2$
	Na_2CO_3

5. Classify each reaction as a combination(synthesis), neutralization, partner exchange, or decomposition reaction.[4]

Reaction	Type of reaction
$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$	
$CuCl_2(aq) + 2\ NaOH(aq) \rightarrow Cu(OH)_2(s) + 2\ NaCl(aq)$	
$HCl(aq) + KOH(aq) \rightarrow KCl(aq) + H_2O(l)$	
$2\ Mg(s) + O_2(g) \rightarrow 2\ MgO(s)$	

5. a) State Boyle's Law.[1]

b) State Charles'Law[1]

c) A sample of neon gas, at a pressure of 1.2 atm occupied a volume of 250 cm^3 at 27^0C. What volume would the gas occupy at 1.0 atm and 127^0C?[4]

END OF EXAMINATION