Tugasan Copt-1 (Cognitive performances test-1)

Answer all the questions

PART A. OBJECTIVE QUESTIONS

1. Which of the following provides the best evidence that matter consists of tiny particles that move randomly?

    (A) Electrical conductivity of metals
    (B) Air can be compressed easily
    (C) A tiny oil droplet forms a thin layer when it is placed on water
    (D) If a bottle of ammonia is opened, the pungent smell of the gas is quickly detected in the whole laboratory

2. Which of the following subatomic particles are **not** found in a hydrogen atom, H?
    (A) Electron
    (B) Proton
    (C) Neutron
    (D) Nucleus

3. Which of the following has the same number of particles as 1 mole of Oxygen gas?
    [Relative atomic mass: C, 12; O,16; Na,23: K,39]

    (A)   24 dm^3 of Carbon
    (B) 39 g of Potassium
    (C) 0.5 mole of Sodium Carbonate
    (D)   2 x 6.02 X 10^{23} mole of Sodium

4. The number of molecules in one mole of a gas is *x.* What are the number molecules in 8 g of Oxygen gas?
    [Relative atomic mass: O, 16]

    (A) 8*x*
    (B) 0.25*x*
    (C) *x*
    (D) 0.5*x*

5. How many water molecules are contained in 4.5 g of water?
    [Relative atomic mass: H, I; O,16]

    (A) 6 x 10^{23}
    (B) 4 x 10^{23}
    (C) 0.25 x 6 x 10^{23}
    (D) 1.5 x 6 x 10^{23}

6. Which of the following ions are cations?

    I   Sulphate ions
    II Calcium ions
    III Magnesium ions
    IV Phosphate ions

    (A) I and II only
    (B) II and III only
    (C) III and IV only
    (D) I, II and III only

7. Ammonium phosphate is commonly used as a chemical fertiliser. What is the chemical formula of Ammonium Phosphate?

    (A) NH_3PO_4
    (B) $(NH_4)_2PO_4$
    (C) $NH_4(PO_4)_3$
    (D) $(NH_4)_3PO_4$

8. The Figure 1 below shows dry hydrogen gas is passed over a powdered oxide of X.
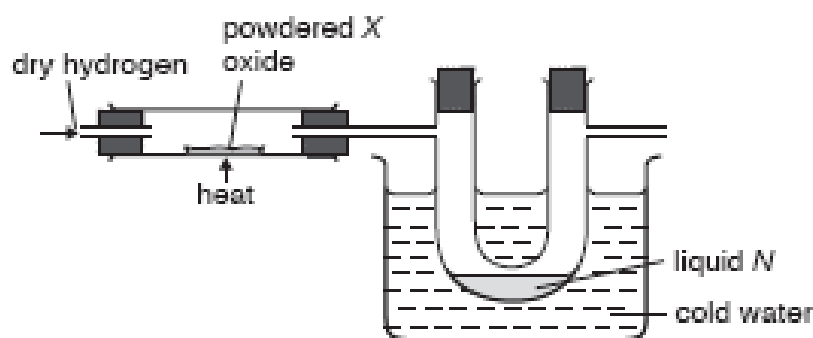

    Figure 1

    A liquid N is collected. The liquid N would

    (A) Neutralise sodium hydroxide
    (B) Turn white anhydrous Copper(II) Sulphate blue
    (C) Has pH value greater than 7
    (D) Be a blue liquid

9. The figure also shows the set-up of the apparatus to determine the empirical formula of an oxide of a metal X. Which could be X?

    (A) Zinc Oxide
    (B) Magnesium Oxide
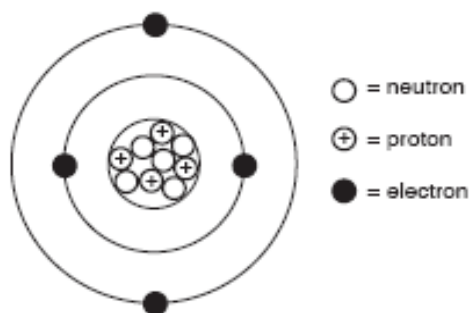   (C) Copper(II) Oxide

(D) Aluminium Oxide

10.

Figure 2

The Figure 2 shows the structure of an atom. Which statement is correct about this atom?
(A) Its nucleon number is 13
(B) Its proton number is 8
(C) It has 4 valence electrons
(D) The electron arrangement of the atom is 2.2

11. Which set of subatomic particles contributes mainly to the mass of an atom
(A) Neutron and electron
(B) Proton and electron
(C) Proton and neutron
(D) Electron only

12. What is the number of protons, neutrons and electrons of a sulphur atom, $_{32}^{16}S$?

	Number of protons	Number of neutrons	Number of electrons
(A)	16	16	16
(B)	16	16	32
(C)	32	16	16
(D)	16	32	16

13. The subatomic particles that are present in an atom are
I   electron
II   neutron
III   proton
IV   photon
(A) I and II only
(B) I and III only
(C) II, III and IV only
(D) I, II and III only

14. What is the mass of one mole of chlorine molecules?
[Relative atomic mass: CI, 35.5]
(A) 35.5 g
(B) 71.0 g
(C) 6 x 10^{23} g

(D) 24 g

15. The molecular mass of a molecule is defined as the
    (A) Total mass of each particle in the molecule
    (B) The number of atoms found in the molecule
    (C) The average mass of each particle in the molecule
    (D) Total number of molecules present in 1g of the substances

16. A compound has a formula $X_3(PO_4)_2$. It has a relative formula mass of 310.
    What is the relative atomic mass of X?
    [Relative atomic mass: O, 16; P;31]
    (A) 40
    (B) 80
    (C) 120
    (D) 159

17. A hydrocarbon compound contains 86% carbon and 14% hydrocarbon by mass.
    What is the empirical formula for this compound?
    [Relative atomic mass: C, 12; H,1]
    (A) CH
    (B) CH_2
    (C) CH_3
    (D) CH_4

18. 3.2 g of a compound of metal P contains 0.96 of element Q. What is the
    empirical formula of the compound of metal P? [Relative atomic mass ; Q ,16;
    P,56]
    A P_2Q_3
    B P_3Q_2
    C PQ_2
    D P_3Q

19. Which one of the following statements is true about the isotopes of elements?
    (A) They have different proton numbers
    (B) They have the same nucleon number
    (C) They have similar chemical properties
    (D) They have the same percentage of abundance in nature

20. Which of the following are isotopes of the same element?

Elements	R	S	T	U	V
Protons	6	7	35	17	35
Nucleon Number	14	14	79	35	81

A. R and S
B. T and U
C. U and V
D. T and V

21. Which of the following shows the incorrect number of particles?

	Substances	Number of particles
(A)	0.5 moles $PbBr_2$	1.8×10^{24} ions
(B)	0.5 moles Br_2	3.0×10^{23} ions
(C)	0.5 moles Ag	3.0×10^{23} ions
(D)	0.5 moles CO_2	1.8×10^{24} ions

22. During the heating of potassium nitrate, the following reaction is obtained:
$$2KNO_3 \quad \rightarrow \quad 2KNO_2 \quad + \quad O_2$$
Calculate the volume of oxygen collected at room conditions when 5.05g KNO_3 is heated strongly
[K=39, N=14, O=16, 1 mole gas at room conditions=24 dm^3]

(A) 2400 cm^3
(B) 2100 cm^3
(C) 1200 cm^3
(D) 600 cm^3

23. The empirical formula shows the
(A) Actual number of atoms
(B) Actual ratio of the elements combined in a compound
(C) Simplest ratio of the elements combined in a compound
(D) How each atom is attached in a molecule of the compound

24. Which of the following compounds has the similar empirical formula as ethene, C_2H_4?
(A) C_6H_{12}
(B) C_6H_6
(C) CH_4
(D) C_5H_{12}

25. The empirical formula of a liquid compound is known as C_2H_4O. What other information is needed to work out its molecular formula?
(A) The percentage composition of the compound
(B) The relative molecular mass of the compound
(C) The volume of the compound
(D) The boiling point of the compound

26. A chemical formula shows
I The number of atoms in it
II The symbols of the elements in it.
III The type of elements in it
IV The mass of each atom
(A) I and II only
(B) II and III only
(C) I, II and III only
(D) I, II, III and IV

27. Ammonium phosphate is commonly used as a chemical fertiliser. What is the chemical formula of ammonia phosphate?
   (A) NH_3PO_4
   (B) $(NH_4)_2PO_4$
   (C) $NH_4(PO_4)_3$
   (D) $(NH_4)_3PO_4$

28. A compound has composition by mass: Na, 36.50%; S, 25.40%; O, 38.10%. Relative molecular mass of this compound is 126. Find the molecular formula of this compound. [R.A.M.: Na=23, S=32, O=16]
   (A) $Na_2S_2O_8$
   (B) $Na_2S_2O_3$
   (C) Na_2SO_3
   (D) Na_2SO_4

29. Table 2 shows the electron configurations of five elements V, W, X, Y and Z.

Elements	Electron configurations
V	2.8
W	2.8.1
X	2.8.2
Y	2.8.4
Z	2.8.7

Table 2

In which of the following pairs will the elements react with each other to form a covalent compound?

A W and Z
B X and Y
C V and W
D Y and Z

30. Table 1 shows the proton number of four elements W, X, Y and Z. Which of the following pairs of ions have the same electron arrangement?

Elements	W	X	Y	Z
Proton number	8	9	11	13

Table

A W^{2-} and X^-
B W^{2+} and X^{2-}
C Y^- and Z^{3-}
D X^+ and Y^{2+}

PART B. STRUCTURE QUESTIONS

1. The figure below shows the structural formula of an organic compound, Z, which contains carbon and hydrogen.
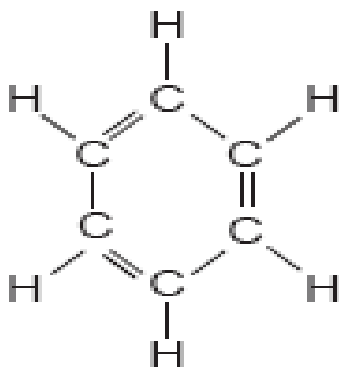
(a) What is the molecular formula of Z?

…………………………………………………………………………….[1mark]

(b) What is the empirical formula of Z?

…………………………………………………………………………….[1mark]

(c) Calculate the relative molecular mass of Z.

………………………………………………………………………….[2 marks]

(d) How many molecules are in 39 g of Z?

………………………………………………………………………... [2 marks]

(e) Calculate the number of carbon atoms in 39 g of Z.

…………………………………………………………………………….[2 marks]
(f) Z burns in excess of oxygen to produce carbon dioxide and water. Write a balanced chemical equation for the combustion of Z.

………………………………………………………………………….[2 marks]

2. (a) A student carried out a series of two experiments with magnesium. In the first experiment, the student heated magnesium with oxygen forming magnesium oxide.

(i) State what the chemist would see in this reaction.

....

....
[1 *mark*]

(ii) Write an equation, including state symbols, for the reaction.

....
[2 *mark*]

(iii)The chemist added water to the magnesium oxide. Some of the Magnesium Oxide reacted forming a solution. Predict a value for the pH of this solution.

....
[1 *mark*]

(iv) Magnesium oxide is a solid with a melting point of 2852 $^\square$C. Explain, in terms of structure and bonding, why its melting point is so high.

....

....

....

....
[2 *mark*]

(b) In a second experiment, the student reacted 1.20 g of magnesium with 2.0 moldm^3 hydrochloric acid. [*Ar* Mg, 24.0; C*l*, 35.5]

$$Mg(s) + 2HCl\ (aq) \rightarrow\ \square\ MgCl_2\ (aq) + H_2(g)$$
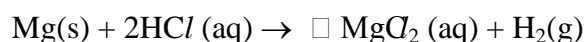
(i) How many moles of Mg were used in the experiment?

[1 *mark*]

(ii) Calculate the minimum volume of 2.00 mol dm^{-3} Hydrochloric Acid needed
   to react completely with this amount of Magnesium.

[2 *mark*]

(iii) Calculate the volume of H_2 gas that would be produced at room
   temperature and pressure (r.t.p.). [1 mole of gas molecules occupies 24.0
    dm^3 at r.t.p.]

[1 *mark*]

(c) The student repeated both experiments with Calcium.

(i) What difference would you expect in reactivity?

   ....
[1 *mark*]

(ii) Explain your answer to (i)

   ....

   ....
[1 *mark*]

3.

substance	Chemical formula	Relative molecular mass
Hydrogen		
Aluminium Hydoxide		
Sodium Oxide		
	$Pb(NO_3)_2$	

Table 1

(a) Fill in the space in Table 1

....
[4 *mark*]

(b)How many molecules are found in
    (i) 4g of Hydrogen

....

....
[2 *mark*]

    (ii) 5.6 dm^3 hydrogen at s.t.p?

....

....
[2 *mark*]

(Relative atomic mass : H, 1; A1, 27; 0, 16; Na, 23; Pb, 207; N,14)
Avogadro number; $6x10^{23}$; 1 mol of gas occupies 22.4 dm^3 at s.t.p.)

(c) Calculate the mass of Aluminium Hydroxide that contains the same number
    of molecules in 4g of Hydrogen.

....

....

....
[3 *mark*]

(d) Write a balanced chemical equation for the solubility of Sodium Oxide in
    water to produce Sodium Hydroxide.

....

....

....
[2 *mark*]

(e) $Pb(NO_3)_2$ compound decomposes when heated as shown in the following equation.

$$2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$$
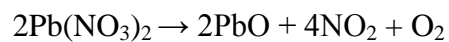
If 6.62 g of the compound is heated. Calculate the
(i) mass of PbO.

....

....

[2 *mark*]

(ii) volume of Oxygen at s.t.p. that is produced (1 mol of gas occupy 22.4dm^3 at s.t.p)

....

....

....

[3 *mark*]

SCORE	
PART A :	........x 2 = ...
PART B :	.........x 1 = ...
TOTAL :	