Name:..... Index No:.....

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545/1
CHEMISTRY
Paper 1
July/Aug.2022
1 ½ hours

UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Certificate of Education

CHEMISTRY

Paper 1

1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of 50 objective type questions.

Answer ALL questions.

You are required to write the correct answer; A, B, C or D in the box provided on the right hand side of each question.

*Do **not** use pencil.*

For Examiners' Use Only

SECTION A

1. Which one of the following substances does **not** change its mass when heated?
   A. Hydrated sodium carbonate
   B. Anhydrous sosdium carbonate
   C. Calcium carbonate
   D. Copper (II) carbonate

2. The full symbol of an atom of an element **X** is ${}^{16}_{8}X$. The charge on an ion of **X** is;
   A. X^{2+}
   B. X^{2-}
   C. X^{-}
   D. X^{+}

3. Which one of the following salts will **not** form a precipitate with lead (II) ions solution?
   A. Potassium carbonate
   B. Potassium chloride
   C. Potassium nitrate
   D. Potassium sulphate

4. Which one of the following molecular formulae is that of an alkane?
   A. C_3H_8
   B. C_2H_2
   C. C_2H_4
   D. C_3H_6

5. Hydrogen chloride reacts with ammonia according to the following;
   Equation: $NH_3(g) + HCl_{(g)} \longrightarrow NH_4Cl_{(s)}$
   The mass of ammonium chloride formed when excess ammonia is reacted with $0.65dm^3$ of hydrogen chloride at room temperature. (One mole of a gas occupies $24dm^3$ at room temperature. N = 14, H = 1, Cl = 35.5).
   A. $\frac{0.65 \times 24}{53.5}$
   B. $\frac{53.5 \times 0.65}{24}$
   C. $\frac{0.65 \times 24}{50.5}$
   D. $\frac{0.65 \times 50.5}{24}$

6. Which one of the following salts will dissolve in water to form an acidic solution?
   A. $(NH_4)SO_4$
   B. Na_2CO_3
   C. CH_3COONa
   D. K_2CO_3

7. Which one of the following nitrates will decompose when heated to give a metal oxide when strongly heated?
   A. Silver nitrate
   B. Sodium nitrate
   C. Calcium nitrate
   D. Mercury (II) nitrate

8. Which one of the following mixtures can be separated by fractional crystallization?
   A. Iron (III) chloride and lead (II) chloride
   B. Iron and sulphur
   C. Potassium nitrate and sodium nitrate
   D. Sugar and sand

9. A gas was bubbled through water of the P^H 7.0, the pH changed to 10.0. The gas is;
   A. NO_2
   B. NH_3
   C. CO_2
   D. HCl

10. When 3.2g of a solid was heated, 450cm^3 of a gas was produced at s.t.p and a residue of 1.2g was left. The molecular mass of the gas is given by? (1 mole of the gas occupies 22.4 litres at s.t.p)
   A. $\left(\frac{22.4 \times 3.5}{0.45}\right) g$
   B. $\left(\frac{22.4 \times 1.2}{0.45}\right) g$
   C. $\left(\frac{22.4 \times 2.0}{0.45}\right) g$
   D. $\left(\frac{22.4}{0.45 \times 3.2}\right) g$

11. Beginning with the least reactive, the order of reactivity of the following metals with water is;

A. Copper → iron → magnesium → potassium
B. Lead → copper → sodium → magnesium
C. Sodium → magnesium → lead → copper
D. Magnesium → sodium → copper → lead

12. Which one of the following pair of substances consist of weak electrolytes only?

A. Aqueous ammonia and dilute ethanoic acid
B. Sodium hydroxide solution and carbonic acid
C. Potassium hydroxide solution and dilute ethanoic acid
D. Sodium hydroxide solution and dilute sulphuric acid

13. Which one of the following metals can displace iron metal from an aqueous solution of its salt?

A. Copper
B. Silver
C. Lead
D. Magnesium

14. Which one of the following substance is formed at the anode during electrolysis of copper (II) sulphate solution using graphite anode?

A. Copper metal
B. Oxygen gas
C. Hydrogen gas
D. Copper (II) ions

15. The atomic numbers of elements W, X, Y and Z are 17, 19, 20 and 18 respectively. Which one of the following elements shows similar properties as an element with atomic number 12?

A. W
B. X
C. Y
D. Z

16. When $60cm^3$ of air was passed over heated copper $44cm^3$ of gas remained. The percentage of oxygen that reacted with copper is;

A. $\left(\frac{44 \times 100}{104}\right)\%$

B. $\left(\frac{(60 - 44) \times 100}{60}\right)\%$

C. $\left(\frac{(60 - 44) \times 100}{104}\right)$

D. $\left(\frac{44 \times 100}{60}\right)\%$

17. Which one of the following gases is produced when manganese (IV) oxide is heated with concentrated hydrochloric acid?

A. Chlorine

B. Hydrogen chloride

C. Sulphur dioxide

D. Oxygen gas

18. Which one of the following ions react with lead (II) nitrate to form a yellow precipitate?

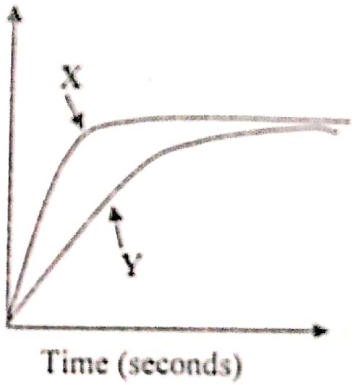
A. Cl^-

B. Br^-

C. I^-

D. SO_4^{2-}

19. Curve **Y** in the graph below shows the variation in the volume of carbon dioxide with time when calcium carbonate is reacted with excess dilute hydrochloric acid at room temperature.



To obtain curve **X**, one would keep all the conditions the same **except;**

A. Reduce the temperature

B. Reduce the concentration of the acid

C. Reduce the particle size of calcium carbonate

D. Increase pressure

20. The atomic number of an element Z is 15. The electronic configuration of the ion of Z is:
A. 2:8:2
B. 2:8
C. 2:8:3
D. 2:8:8

21. Which one of the following substances is used to dry ammonia gas?
A. Anhydrous calcium chloride
B. Concentrated sulphuric acid
C. Calcium oxide
D. Calcium hydroxide

22. The best method that can be used to separate a mixture of methanol and ethanol is;
A. Crystallization
B. Filtration
C. Decantation
D. Fractional distillation

23. Which one of the following pairs of ions consists of ions that react with aqueous ammonia to form precipitates that dissolve in excess ammonia?
A. Zn^{2+} and Cu^{2+}
B. Zn^{2+} and Mg^{2+}
C. Ca^{2+} and Pb^{2+}
D. Fe^{2+} and Fe^{3+}

24. Which one of the following equations represents a reduction reaction?
A. $Cl_{2(g)} + 2e \longrightarrow 2Cl^{-}(g)$
B. $2O^{2-}(g) \longrightarrow O_{2(g)} + 4\bar{e}$
C. $2Br^{-}(aq) - 2e \longrightarrow Br_2(l)$
D. $Fe^{2+} \longrightarrow Fe^{3+} + e$

25. During the manufacture of ammonia by the haber process, nitrogen combines with hydrogen to form ammonia gas according to the following equation;
$N_2 + 3H_2 \rightleftharpoons 2NH_3 \quad \Delta H = -305\ KJmol^{-1}$
Which one of the following conditions would favour maximum yield of ammonia.
A. High temperature and high pressure
B. Low temperature and high pressure
C. High temperature and low pressure
D. Low temperature and low pressure

26. $12.5cm^3$ of dilute hydrochloric acid reacted completely with $25cm^3$ of 0.1M potassium carbonate solution. The concentration of the acid in moles per litre is;

A. 0.4M
B. 0.2M
C. 0.1M
D. 0.8M

27. Which one of the following gases is collected using down ward displacement of air?

A. Hydrogen chloride gas
B. Hydrogen gas
C. Sulphur dioxide
D. Chlorine

28. The substance that undergoes physical change when heated is;

A. Sulphur
B. Iodine
C. Carbon
D. Phosphorous

29. Which one of the following substances is manufactured by electrolysis of sodium chloride?

A. Sodium sulphate
B. Sodium carbonate
C. Sodium nitrate
D. Sodium hydroxide

30. Ethanol burns in oxygen according to the following equation;

$C_2H_5OH_{(l)} + 3O_2(g) \longrightarrow 2CO_2(g) + 3H_2O_{(l)}\ \Delta H = -1370\ KJmol^{-1}$

Calculate the amount of heat evolved when 45g of oxygen is used for complete combustion of ethanol (C = 12, H = 1 , O = 16).

A. 642.2 KJ
B. 1340.2KJ
C. 1284.4KJ
D. 1926.6KJ

31. Which one of the following is the gas that turns moist blue litmus to red and finally bleaches it;

A. Sulphur trioxide
B. Sulphur dioxide
C. Carbon monoxide
D. Nitrogen dioxide

32. The percentage of water of crystallization in hydrated sodium carbonate, $Na_2CO_3.10H_2O$ is $(Na_2CO_3 = 106,\ O = 16, H = 1)$

A. $\left(\frac{286}{106}\ x\ 100\right)\%$

B. $\left(\frac{106}{180}\ x\ 100\right)\%$

C. $\left(\frac{180}{286}\ x\ 100\right)\%$

D. $\left(\frac{180}{106}\ x\ 100\right)\%$

33. Which one of the following equations represents a reaction that takes place at the anode during electrolysis of copper (II) sulphate solution using copper anode?

A. $Cu^{2+}(aq) + 2e \longrightarrow Cu(s)$

B. $4\bar{O}H(aq) \longrightarrow 2H_2O(l) + O_2(g) + 4e$

C. $2H^+(aq) + 2e \longrightarrow H_2(g)$

D. $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e$

34. An oxide of metal, Y contains 13.4% oxygen. The empirical formula of the oxide is (O = 16, Y = 207)

A. YO_2

B. Y_2O

C. Y_2O_3

D. YO

35. The numbers of protons, neutrons and electrons in some particles are shown in the Table below:

Particle	Protons	Neutrons	Electrons
P	11	12	10
Q	12	12	10
R	17	20	17
T	17	18	18

Which one of the following particles represents an anion?

A. T

B. P

C. Q

D. R

36. The concentration of hydrogen ions in a solution made by dissolving 10g of phosphoric acid to make one litre of solution ($H_3PO_4 = 98$).

A. $\frac{10}{98}\ mol\ l^{-1}$

B. $\left(\frac{10\ x\ 3}{98}\right)\ mol\ l^{-1}$

C. $\left(\frac{10}{98\ x\ 3}\right)\ mol\ l^{-1}$

D. $\left(\frac{98}{10\ x\ 3}\right) mol\ l^{-1}$

37. Which one of the following will be the colour of the residue when carbon monoxide is passed over heated lead (II) oxide?

A. Orange when hot and yellow on cooling

B. Yellow when hot and white on cooling

C. Grey solid

D. White solid

38. Copper (II) oxide is reduced by dry ammonia according to copper equation;

$3CuO_{(s)} + 2NH_3(g) \longrightarrow 3Cu_{(s)} + 3H_2O(l) + N_2(g)$

What volume of ammonia is required to reduce 8.0g of copper (II) oxide at room temperature (one mole of a gas at room temperature occupies 24000cm^3, Cu = 64, O = 16).

A. $\left(\frac{8\ x\ 2\ x\ 24000}{80\ x\ 3}\right) cm^3$

B. $\left(\frac{8\ x\ 3\ x\ 24000}{80\ x\ 2}\right) cm^3$

C. $\left(\frac{80\ x\ 3\ x\ 24000}{8\ x\ 2}\right) cm^3$

D. $\left(\frac{80\ x\ 2\ x\ 24000}{8\ x\ 3}\right) cm^3$

39. Which one of the following is an example of a gas which acts as a reducing agent?

A. Oxygen

B. Carbon dioxide

C. Chlorine

D. Hydrogen

40. The metal that can react with water at room temperature is;

A. Calcium

B. Zinc

C. Iron

D. Magnesium

Each of the questions 41 to 45 consists of an assertion (statement) on the left hand side and a reason on the right hand side.

Select:

A. If both the assertion and the reason are true statements and the reason in a correct explanation of the assertion.

B. If both the assertion and the reason are true statements but the reason is not a correct explanation of the assertion.

C. If the assertion is true but the reason is not a correct statement.

D. If the assertion is not correct but the reason is a correct statement.

INSTRUCTIONS TO CANDIDATES

Assertion	*Reason*
A. True	*True (reason is a correct explanation)*
B. True	*True (reason is not a correct explanation)*
C. True	*Incorrect*
D. Incorrect	*Correct*

41.	Lead (II) hydroxide is soluble in excess sodium hydroxide solution.	**BECAUSE**	Lead (II) hydroxide is amphoteric.	
42.	Concentrated sulphurc acid is used to dry ammonia gas.	**BECAUSE**	Concentrated sulphuric acid is hygroscopic.	
43.	Non metals are oxidizing agents.	**BECAUSE**	They gain electrons from metals during reactions.	
44.	Dry oxygen gas is collected using a gas syringe.	**BECAUSE**	It is a neutral gas.	
45.	Ionic compounds conduct electricity in solid state.	**BECAUSE**	Contains cations and anions	

In each of the questions 46 to 50 one or more of the answers given may be correct. Read each question carefully and then indicate the correct answer according to the following:

A. If 1, 2 and 3 only are correct

B. If 1 and 3 only are correct

C. If 2 and 4 only are correct

D. If 4 only is correct

46. Which one of the following nitrate(s) will decompose on heating to form denitrogen oxide (N_2O)?

1. Potassium nitrate
2. Magnesium nitrate
3. Sodium nitrate
4. Ammonium nitrate

47. Which one of the following cations forms a precipitate soluble in excess ammonia solution?

1. Zn^{2+}
2. Mg^{2+}
3. Cu^{2+}
4. Pb^{2+}

48. Which pair(s) of the mixtures below can be separated by filtration?

1. Sodium chloride and potassium nitrate
2. Copper (II) chloride and copper (II) carbonate
3. Ammonium chloride and zinc chloride
4. Lead (II) nitrate and lead (II) carbonate.

49. Oxidation is a reaction in which.

1. Hydrogen is removed from a substance
2. Oxygen is added to a substance
3. Electron is lost from a substance
4. Oxygen is removed from a substance

50. The electronic structure of elements P, Q, R and S are as shown in Table below:

Element	Electronic configuration
P	2:8:2
Q	2:8:7
R	2:8:6
S	2:8:1

Which one of the following pairs of elements will combine to form covalent compound(s)?

1. P and Q
2. P and R
3. R and S
4. Q and R

END