545/1

S4 CHEMISTRY

Exam 10 marking guide

PAPER 1

DURATION: 1 hour 30 minutes

Instructions:
This paper consists of 50 objective type of questions
Attempt all questions

You are required to write the correct answer A, B, C D in the boxes on the right hand side of the paper.

1. What change in structure occurs when Fe^{2+} is converted to Fe^{3+}
   A: the atomic number of iron increases by 1
   B: the extra neutron enters the nucleus
   C: the Fe^{2+} ion loses an electron
   D: the Fe^{2+} ion gains an electron

2. Metal L will displace metal K from an aqueous solution of the nitrate of K, but does not react with the nitrate of M. N is displaced from solutions of its compounds by each of the metals K, L and M. The correct order in the displacement series is
   A: K L M N **B:** M L K N C: N M L K D: L K M N

3. When potassium manganate (VII) is heated, it is necessary to take the delivery tube out of the water to avoid a 'suck back' The suck back is caused by
   A: the gas given off dissolving in water
   B: the gas in the tube cools and contracts
   C: the gas given off drives the air out of the tube creating a vacuum
   D: the gas given off is insoluble in air and relights a glowing splint.

4. Which of the following reactions represents the reduction of sulphuric acid
   A: $H_2SO_4(aq) + Zn(s) \longrightarrow ZnSO_4(aq) + H_2(g)$
   B: $H_2SO_4(aq) + ZnSO_3(s) \longrightarrow ZnSO_4(aq) + SO_2(g) + H_2O(l)$

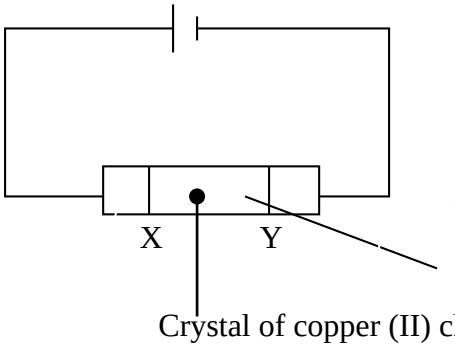
C: $2H_2SO_4(aq) + Zn(s) \longrightarrow ZnSO_4(s)(aq) + SO_2(g) + 2H_2O(l)$
D: $H_2SO_4(aq) + ZnSO_4.5H_2O(aq) \longrightarrow ZnSO_4(s) + 5H_2O(l) + H_2SO_4(aq)$

5. Which of the following reagents will readily bring bout the change
$Fe^{2+}(aq) \longrightarrow Fe^{3+}(aq) + e$
A: Sodium hydroxide **B:** hydrogen peroxide
C: hydrogen D: hydrogen sulphide
hydrogen peroxide is an oxidizing agent

6. The bhange for the reaction
$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l) \quad \triangle H = -57.5\ Kjmol^{-1}$

Which of the following equations represents a heat change of t`u same magnitude?
A: $2H_2(g) + O_2(g) \longrightarrow 2H_2O(l)$
B: $CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + H_2O(l) + 2CO_2(g)$
C: $KOH(aq) + HNO_3(aq) \longrightarrow KNO_3(aq) + H_2O(l)$
D: $NH_3(aq)\ ) HCl(aq) \longrightarrow NH_4Cl(aq)$
Both are neutralization reaction involving reaction of 1mole of $H^+(aq)$ and 1mole of $OH^-(aq)$ to produce 1mole of water

7. The diagram below shows the apparatus set up of investigating the effect of an electric current on an electrolyte



Which of the following will be observed in the reactions X and Y

	X	Y
A:	Blue	yellow
B:	yellow	blue
C:	yellow	colorless
D:	blue	colorless

The yellow chromate ions migrate to the anode while the blue copper ions migrate to the cathode

8. A Current of 5 amperes was passed through a voltammeter containing iron (III) chloride solution for 10 minutes. The weight of iron in gram deposited is

A: $\frac{5 \times 10 \times 60 \times 56}{96{,}500 \times 3}$ B: $\frac{5 \times 10 \times 96{,}500 \times 3}{965{,}00}$

B: $\frac{5 \times 10 \times 965{,}200 \times 3}{56}$ D: $\frac{5 \times 10 \times 56}{965{,}000 \times 3}$

Q = It = (5 x 10 x 60)C
3 x 96500C liberate 56g of iron
(5 x 10 x 60)C liberate $\frac{(5 \text{ x } 10 \text{ x } 60)x\ 56}{3\ x\ 96500}$ g of iron

9. 2g of butanol ($C_4H_{10}O$) when burned caused the temperature of 250g of water to raise by 30°C (given the following: the amount of heat required to rise 1 g of water through 1°C is 4.2J, C = 12, H = 1, O = 16).
Calculate the molar heat of combustion of butanol in kilo joules.

A: $\frac{250 \text{ x } 4.2 \text{ x } 30 \text{ x } 74}{1000 \text{ x } 2}$ B: $\frac{250 \text{ x } 4.2 \text{ x } 30 \text{ x } 74 \text{ x } 2}{1000}$

C: $\frac{250 \text{ x } 4.2 \text{ x } 74 \text{ x } 2}{1000 \text{ x } 30}$ D: $\frac{250 \text{ x } 4.2 \text{ x } 30 \text{ x } 2}{74 \text{ x } 1000}$

Formula mass of $C_4H_{10}O$ = 12 x 4 + 1 x 10 + 16x 1= 74
heat liberated= mcθ = (250 x 4.2 x 30)
2g of $C_4H_{10}O$ liberate (250 x 4.2 x 30)J
74f of $C_4H_{10}O$ liberate = $\frac{(250 \text{ x } 4.2 \text{ x } 30)x\ 74}{2\ x\ 1000}\ kJ$

10. The volume of oxygen measured at s.t.p can be produced from 34 gram of hydrogen peroxide?
$2H_2O_2(aq) \longrightarrow 2H_2O(g) + O_2$

A: 11.2dm^3 B: 16dm^3 C: 22.4dm^3 D: 32dm^3
Formula mass of H_2O_2 = 1 x 2 + 16 x 2 = 34g
2 x 34 g of H_2O_2 produce 22.4dm^3 of oxygen
34g of H_2O_2 produce $\frac{22.4\ x\ 34}{2\ x\ 34}$ = 11.2dm^3 of oxygen

11. A hydrocarbon contains 82.8%(by mass carbon. Its molecular mass is 58. Its formula is (C = 12, È= 1)
A: C_2H_5 B: C_4H_8 C: C_4H_{12} **D:** C_4H_{10}

Element	C	H
Percentage	82.8	100 – 82.8 =17.2
Atomic mass	12	1
Moles	6.9	17.2
Mole ratio	1	2.5
Empirical formula	C_2H_5	

$(C_2H_5)n$ = 59
n(2 x 12 + 1 x 5) = 58; n = 2
Molecular formula = C_4H_{10}

12. Which method would you use to extract sodium from its ore?
A: Reduction using hydrogen gas
B: reduction using carbon monoxide
C: reduction using a metal higher up in the electrochemical series like potassium
D: Electrolysis of the salt of sodium.

13. Nylon and cotton are used in making cloth. Which of these polymers would you use as dress in Uganda?
    A: nylon because it is durable and therefore cheap
    B: Nylon because it is crease free
    C: Cotton because it has a high degree of absorption
    D: cotton so as to promote the growth of it in the country

14. The elements P,Q,R and S have the following electronic configuration
    P 2.4 Q 2.8.2 R 2.8 S 2.8.7
    The pair of elements that will not form a covalent bond is
    A: P and R B: P and S C: R and S **D:** Q and S
    Metal and nonmetal form ionic bond
15. Which one of the following processes increase the concentration of oxygen in the atmosphere?
    A: Rusting B: combustion
    C: Respiration **D:** photosynthesis

16. The formula of the ion formed when excess sodium hydroxide solution is added to aqueous zinc chloride is
    A: $[Zn(OH)_4]^{2-}$ B: $[Zn(OH)_4]^{-}$
    C: $[Zn(OH)_4]^{4-}$ D: $[Zn(OH)_4]^{2+}$

17. $25cm^3$ of 0.2M acid was neutralized by $10cm^3$ of 1.5M sodium hydroxide. The basicity ;of the acid is
    A: 1 B: 2 **C:** 3 D: 4
    Moles of the acid = $\frac{25\ x\ 0.2}{1000}$ moles
    moles of sodium hydroxide =$\frac{10\ x\ 1.5}{1000}$ moles
    mole ratio = $\frac{moles\ of\ sodium\ hyroxide}{mole\ of\ the\ acid} = \frac{10\ x\ 1.5}{1000} \div \frac{25\ x\ 0.2}{1000} = 3$

18. Which hydrocarbon has the highest carbon content? (C = 12 H = 1)
    A: C_2H_2 B: C_3H_6 C: C_3H_8 D: C_4H_{10}
    Formula mass of C_2H_2 = 12 x 2 + 1 x 2 = 26
    Percentage of carbon = $\frac{24}{26}\ x100 = 92.3\%$
    Formula mass of C_3H_6 = 12 x 3 + 1 x 6 = 42
    Percentage of carbon = $\frac{36}{42}\ x100 = 85.7\%$
    Formula mass of C_3H_8 = 12 x 3 + 1 x 8 = 44
    Percentage of carbon = $\frac{36}{44}\ x100 = 82\%$
    Formula mass of C_4H_{10} = 12 x 4 + 1 x 10 = 58
    Percentage of carbon = $\frac{48}{58}\ x100 = 82.7\%$

19. Concentrated sulphuric acid reacts with ethanol to form ethene. What kind of reaction is this?
A: substitution B: decarboxylation
C: addition **D:** dehydration

20. 11.6g of an oxide of iron was strongly heated with hydrogen to form 8.4g of metallic ion. The simplest formula of the oxide is [Fe = 56 O = 16]
A: FeO B: Fe_2O_3 **C:** Fe_3O_4 D: Fe_3O_2

Element	Fe	O
Mass	8.4	11.6 – 8.4= 3.2
Atomic mass	56	16
moles	0.15	0.2
Empirical formula	Fe_3O_4	

21. The main composition of air is
A: O_2 and H_2 B: N_2 and CO_2 **C:** N_2 and O_2 D: N_2 and H_2

22. Which of the following substances will react to form hydrogen?
A: sulphuric acid and copper
B: fuming sulphuric acid and zinc
C: dilute sulphuric acid and zinc carbonate
D: dilute sulphuric acid and zinc

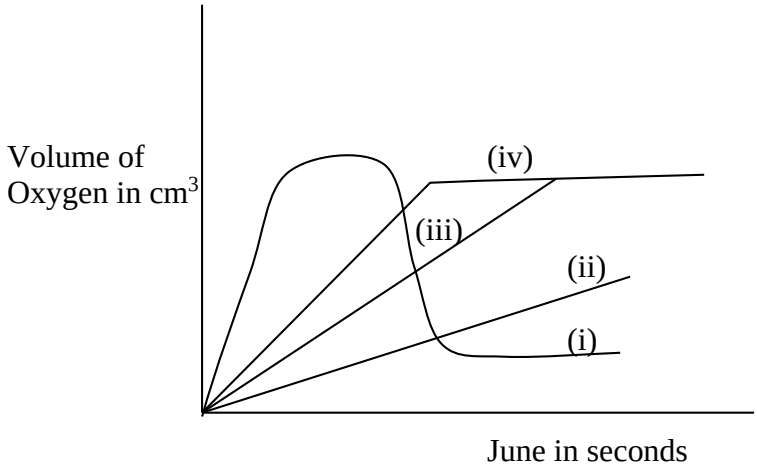
23. Anhydrous iron (II) chloride is prepared in the laboratory by
A: heating iron with chlorine gas
B: dissolving iron in dilute hydrochloric acid
C: heating iron with hydrogen chloride gas
D: dissolving iron (II) oxide in dilute hydrochloric acid

24. The molarity of 20g of sodium hydroxide in $500cm^3$ solution is

A: $\frac{20 \times 500}{40 \times 1000}$ B: $\frac{40 \times 1000}{20 \times 500}$ **C:** $\frac{20 \times 1000}{40 \times 500}$ D: $\frac{40 \times 500}{20 \times 100}$

Formula mass of NaOH = 23 + 16 +1 = 40
mass of NaOH in $1000cm^3 = \frac{20\,x\,1000}{500}$
Molarity pf NaOH = $\frac{20\,x\,1000}{500\,x\,40}$

25. Which one of the graphs below best represents the effect of a catalyst on the decomposition of hydrogen peroxide



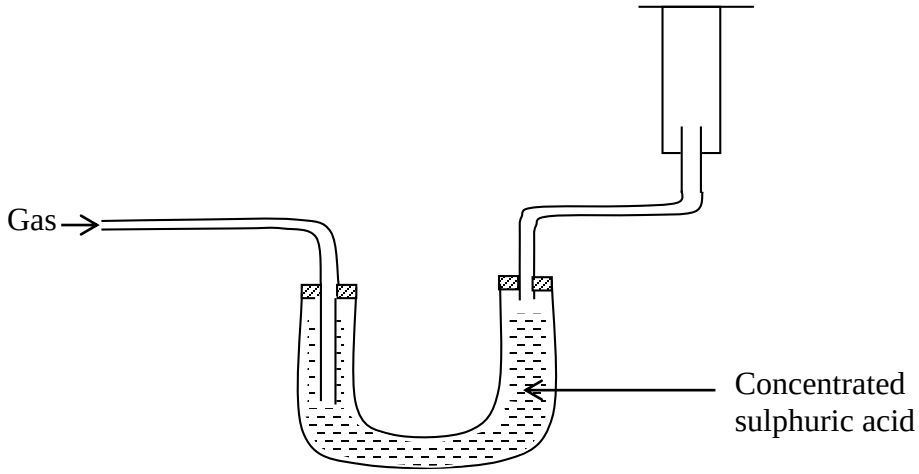
A: (i) B: (ii) C: (iii) D: (iv)

A catalyst increases the rate of reaction

26. Which of the following make water hard?

A: HSO_4^- B: HCO_3^- C: SO_4^{2-} **D:** Ca^{2+}

27. The diagram is used to collect a gas in the laboratory. Which of the following gases is collected by the method?



A hydrogen B: ammonia C: oxygen D: carbon monoxide

28. Solid W decomposes to give oxygen on heating. It reacts with concentrated hydrochloric acid on heating to form a greenish yellow gas which bleaches wet litmus paper. The solid W is

A: potassium manganate (VII) B: lead (IV oxide
C: Lead (II) oxide D: Manganese (IV) oxide

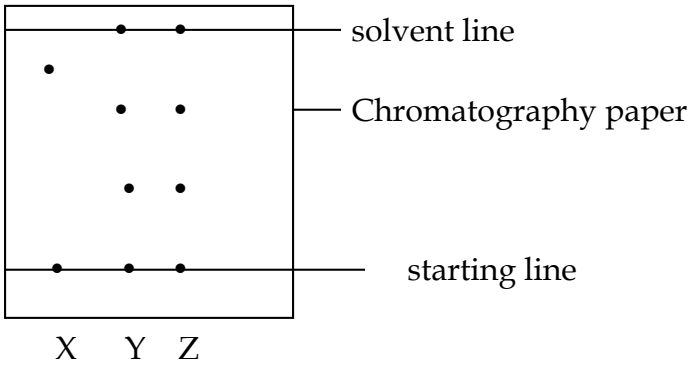
29. Which of the following substances are formed when ammonia is oxidized by air?
A: nitrogen and hydrogen **B:** nitrogen and water
C: nitrogen monoxide + water D: nitrogen dioxide and water

30. When carbon dioxide is bubble in a solution of sodium hydroxide for a long time a white precipitate is observed. This is best explained as
A: sodium hydrogen carbonate which soluble is formed first and then sodium carbonate which is insoluble formed next.
B: sodium hydrogen carbonate which is insoluble is formed
C: Sodium carbonate which is soluble is formed first and then sodium hydrogen carbonate which is insoluble formed next.
D: Sodium carbonate which is insoluble is formed.

31. Metals are good conductors of heat because
A: they are shiny B: they are dilute
C: they have mobile electrons D: they have high melting points

32. Which of the following is an example of a simple molecular structure?
A: Cu **B:** I_2 C: NaCl D: SiO_2

33. The results of the chromatograph of the dyes used in making three sweets X, Y, Z is shown in the figure below.



The number of dyes used in making the sweets is
A: 3 B: 4 C: 5 D: 7

34. Which of the following is a synthetic polymer?
A: wood B: cotton C: silk **D:** Rayon

35. A mixture of sodium chloride and sodium chlorate can be separated by
A: fractional distillation B: sublimation
C: fractional crystallization D: filtration

In each of the questions 36 to 45 one or more of the answers given may be correct. Read each question carefully and then indicate your answer according to the following:
A: if 1,2,3 only are correct
B: If 1,3 only are correct
C: if 2, 4 only are correct
D: if 4 only are correct.

Instructions summarized			
A	B	C	D
1,2,3 only correct	1,3 only correct	2,4 only correct	4 only correct

36. When lead (II) nitrate was added to a solution X a white precipitate was formed. The precipitate dissolved on heating. X contained
    1. carbonate
    2. sulphate
    3. suphide
    4. chloride

B

37. Which of the following is true about steel?
    1. it is a compound of iron, carbon and chromium
    2. it is a mixture of iron, carbon and aluminium
    3. it rusts easily
    4. it does not rust easily

D

38. Which of the following substances would undergo permanent changes when strongly heated?
    1. iodine
    2. sugar
    3. potassium carbonate
    4. potassium chlorate

C

39. Permanent hardness is removed by addition of
    1. Sodium aluminium silicate
    2. calcium hydroxide (slaked line)
    3. washing soda
    4. ammonia solution

A

40. Red hot iron reacts with steam to form
    1. Iron (III) hydroxide
    2. hydrogen
    3. iron (III) oxide
    4. tri iron tetraoxide

C

41. When an electric current is passed through two voltameters in series 0.05 moles of element X are deposited on the first cathode and 0.10 moles of element Y are deposited on the second cathode during the same time.
From this information
    1. the ions of X and Y are positively charged
    2. the ion of element X carries a charge of two units
    3. the charge on the ion of element X is twice the charge on the ion of elements Y
    4. the charge on the ion of element X is half the charge on the ion of element Y

B

42. Gax X turns litmus paper blue and is heavier than air. The following can be deduced about gas X.
    1. it can be dried using calcium oxide
    2. it can be dried using concentrated sulphuric acid
    3. it is collected by downward delivery
    4. it is collected by upward delivery.

B

43. Powdered copper (II) oxide can be distinguished from powdered charcoal by
    1. mixing the powder with lead and heating
    2. heating the powder in oxygen and testing with lime water
    3. passing hydrogen over the heated powder
    4. heating the powder strongly and then missing with water when cool and filtering the mixture.

B

44. The following reaction takes place in the contact process
$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\triangle H = -ve$
They yield of sulphur trioxide is increased by
    1. increasing the pressure
    2. the presence of a catalyst vanadium (V) oxide
    3. using high temperature
    4. using excess oxygen

C

45. Which of the following nitrates when heated form an oxide?
    1. zinc nitrate
    2. silver nitrate
    3. calcium nitrate
    4. potassium nitrate

A

Each of the following questions 46 to 50 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 is a correct explanation of the assertion.
B: if both 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 true statement.

Instructions summarized	
Assertion	Reason
A: true	True (reason is a correct explanation
B: true	True (reason is not a correct explanation
C: True	Incorrect
D: Incorrect	True

46	Nitric acid can be prepared in the laboratory by reacting concentrated sulphuric acid with a nitrate.	because	Nitric acid is less volatile than sulphuric acid	C
47	In the Daniell cell the zinc plate undergoes reduction	because	Zinc is higher in the electrochemical series than copper.	D
48	The reactivity of group VII elements in the periodic table decreases down the group	because	The atoms of group (VII) elements lack only electron for an octet configuration to be attained	B
49	A mixture of potassium chlorate and potassium chlorides is separated by fractional crystallization	because	Potassium chlorate and potassium chloride have different solubilities in water.	A
50	An oil will decolorize bromine water	because	Oil is a liquid	B

End