KENYA NATIONAL EXAMINATION COUNCIL
REVISION MOCK EXAMS 2016
TOP NATIONAL SCHOOLS

ALLIANCE BOYS HIGH SCHOOL
CHEMISTRY
PAPER 1
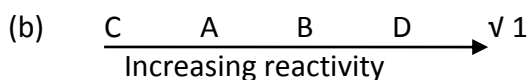*MARKING SCHEME*

1.   It is highly flammable / it burns or explode in air.
2.   Correct charge√   correct electronic structure √

   Correct charge √

        Correct electronic structure √

3.   (a) This is the energy required to remove the 1st outermost electron from an atom in gaseous state to form an ion √ 1
        (b)   C   A   B   D   √ 1
                _____→
                Increasing reactivity
            Higher ionization energy implies high nuclear charge which hinders removal of electron.

4.   (a) Pt or copper
        (b) No formed is oxidized by O_2 to NO_2 which is brown
        (c) The reaction is exothermic

5. $Ca(HCO_3)_{2\ (aq)}$ ⟶ $CaCO_{3(s)}$ + $CO_{2(g)}$ + $H_2O_{(l)}$
        $Mg(HCO_3)_{2(aq)}$ $\underrightarrow{MgCO_{3(s)}}$ + $CO_{2(g)}$ + $H_2O_{(l)}$
        When water containing these salts are boiled, they decompose into carbonate, carbon (IV) oxide and water. These carbonates precipitate out and form scales.

6.   (i) N_2O, ozone – methane
            water vapour
        (ii)   Spraying of CO_2 into the sky using jets so that cloud may form and rain may fall.

7.   (a)   When a stress is subjected to a system at equilibrium, the system re-adjust itself in a manner that   absorbs / reduce the stress
        (b)   Addition of Sodium hydroxide lowers the concentration of H^+ ions. Therefore the system shift to the right to produce H^+ ions. The white BiOCl is formed.

8.   (a) physical   (b) Physical   (c) Chemical

9.   (a) When gases react together, the volumes of the gases which react and those of the products; if gases, bear a simple whole number ratio to one another, all volumes being measured at the same temperature and pressure.
        (b) $CH_{4(g)}$ + $H_2O_{(g)}$ ⟶ $CO_{(g)}$ + $3H_{2(g)}$
           1vol.   1vol.   1vol.   3vol
        1cm^3 of H_2O react to produce 1cm^3 $CO_{(g)}$ and 3cm^3 $H_{2(g)}$
        100cm^3 of steam react to produce 100cm^3 $CO_{(g)}$ and 300cm^3 $H_{2(g)}$
        Total volume of the gases formed = 100 + 300 = 400cm^3

10.
                    H   Cl
                    |
                    |
                    |
        H – C – H + 2 Cl – Cl   H – C – Cl + 2H-Cl
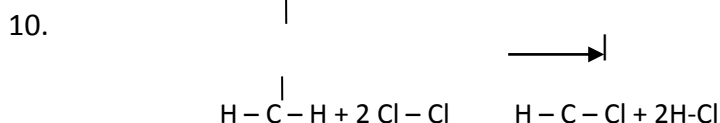
        Heat absorbed for bond breaking = 4(C-H) + 2(Cl – Cl)
                        = 4 x 414 + 2 x 244 = 1656 + 488 = 2144KJ
                    H = +2144KJ
        Heat evolved for bond formation = 2(C-H) + 2(C- Cl) + 2(H – Cl)

$$= 2(-414) + 2(-326) + 2\ 9\text{-}431)$$
$$= (-828) + (-652) + (-862)$$
$$H = -2342$$
$$\Delta H = 2144 - 2342 = -198KJ$$

11. $2[2H^+_{(aq)} + 2e^- \rightarrow H_{2(g)}]$ - cathode
$4OH^-_{(aq)} \rightarrow 4e^- \rightarrow H_2O_{(l)} + O_{2(g)}$ – Anode
For 4 electrons to be lost at anode, 2 moles of hydrogen gas is formed.

12. (a) **N** – Sodium ethanoate (CH_3COONa) $\quad\quad$ **P** – Methane (CH_4)
(b) Substitution

13. (a) Time taken for a given mass of a radioactive isotope to reduce to half.
(b) No. of $t\frac{1}{2} = {}^{100}/_{25} = 4$
$$^5/_m = (\tfrac{1}{2})^4$$
$$^5/_m = {}^1/_{16}$$
$$m = 5 \times 16 = 80g$$

14. (a) Solid **P** – Sodium Peroxide, reject formula
(b) Slightly soluble in water
(c) To ensure that the air that occupied the apparatus initially is expelled.

15. (i) **A** – soapy detergent $\quad\quad$ **B** – soapless detergent
(ii) $\quad$ - Non-biodegradable
$\quad\quad$ - Nuisance as form formed on water bodies is not present.

16. (i) $V_{(s)} // S^{2+}_{(aq)} + 2e^- \rightarrow V_{(s)} // E^\theta = -1.20V$ $\quad$ |_____|
(ii) $E_{cell} = E_{right} - E_{left}$ $\quad\quad\quad$ -1.20V $\quad\quad\quad$ +1.0V
$\quad\quad = 1.07\ 9\text{-}(-1.20) = 2.27V$

17. (i)
$$-\overset{|}{\underset{|}{C}} - C \overset{|}{-} C \overset{|}{-} C - \overset{O}{\overset{||}{C}} - OH \quad \text{Pentanoic acid} \quad \text{(ii) carboxylic acid}$$

Or $-C - C - C - O - C - C$ ethylpropanoate - ester

18. $2KOH_{(aq)} + H_2SO_{4(aq)} \rightarrow K_2SO_{4(aq)} + 2H_2O_{(l)}$
$\quad$ 36cm^3 $\quad\quad$ 0.5M 25cm^3
Moles of $H_2SO_4 = \dfrac{0.5 \times 25}{1000} = 0.0125$moles
Moles of KOH = 2 x 0.0125 = 0.025
Molarity of KOH = $\dfrac{0.025 \times 1000}{36} = 0.6944$
$\quad\quad\quad \approx 0.7$
Concentration in g/dm^3 = 38.9g

19. (a) Test tube 1 – there is effervescence / bubbles/dissolved.
$\quad\quad$ Test tube 2 – No effervescence / no reaction/ dissolved
(b) Ethanoic acid ionizes in water to release H^+ ions which react with CO_3^{2-} to form CO_2

20. (i) MgO has giant ionic structure with ionic bonds.
$\quad$ P_4O_{10} has molecular structure with weak intermolecular forces
(ii) Aluminium oxide

21. (a) Drying agent H_2SO_4 in a wash bottle// anhydrous $CaCl_2$ in U-tube

Collection by downward delivery.

      (b) $NaCl_{(s)} + H_2SO_{4(l)} \rightarrow NaHSO_{4(s)} + HCl_{(g)}$
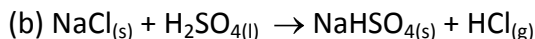
          Balanced √1mk   with state symbols

          No state symbols award ½mk

22.   - Mix /react/ add $200cm^3$ of 2M HNO_3 with $200cm^3$ of 2M NaOH to obtain $NaNO_3$ solution.
      - Heat the mixture until crystals of $NaNO_3$ start to form
      - Cool to obtain more crystals of $NaNO_3$ and dry between filter papers.

23.   Magnesium is above iron in the activity series. It supplies electrons to the iron bar hence prevent it from rusting.

24.   (a) Sulphur (IV) oxide / $SO_{2(g)}$

      (b) $Na_2SO_{3(s)} + 2HCl_{(aq)}$ $2NaCl_{(aq)} + SO_{2(g)} + H_2O_{(l)}$

      (c) It bleaches the litmus paper/ it decolourises

        SO_2 in water form H_2SO_3 which ionizes to give SO_3^{2-} ions.

            $H_2SO_{3(aq)} \rightleftharpoons 2H^+_{(aq)} + SO_3^{2-}_{(aq)}$

            SO_3^{2-} pick [O]from litmus paper to form $SO_4^{2-}_{(aq)}$

25.   (a) Molar enthalpy of displacement of an element is the energy change when one mole of its aqueous   ions is displaced from the solution by another element.

      (b) $\Delta T = 33 - 18.5 = 14.5$

          Mass of solution = (25 x 1=25g) √ ½mk

          $\Delta H = 25 \times 4.2 \times 14.5 = 1522.5J$

          No. of moles of copper ion displaced = $\underline{25 \times 0.5}$

                                1000   = 0.0125moles

      Molar enthalpy of displacement = $\underline{-1522.5}$

                              0.0125

                        = -121800J/mol

               Or -121.8KJmol^{-1}

26. SO_3^{2-} and CO_3^{2-}

      Reject SO_4^{2-} it does not react with dil. HCl acid

27.   (i) $PbS_{(s)} + O_{2(g)} \rightarrow PbO_{(s)} + SO_{2(g)}$

      (ii) Carbon (II) Oxide

      (iii) – Used in making pipe or roofing materials

   -   Used in accumulation or for covering electric cables.

   -   It protects workers handling radioactive material as it absorbs harmful radiations

   -   In making alloys e.g. solder (Pb and Sn) type metal (Pb, Sb, Sn)

28.   A – hottest

29.   Mass of M that crystallize = 55 – 25 = 30g