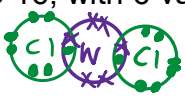
2026 TKGS Chemistry Prelim Paper 1

1	2	3	4	5	6	7	8	9	10
D	**D**	**C**	**C**	**C**	**C**	**D**	**B**	**D**	**A**
11	12	13	14	15	16	17	18	19	20
B	**B**	**B**	**D**	**C**	**B**	**C**	**C**	**A**	**A**
21	22	23	24	25	26	27	28	29	30
D	**D**	**A**	**B**	**D**	**B**	**B**	**A**	**C**	**B**
31	32	33	34	35	36	37	38	39	40
B	**C**	**B**	**C**	**A**	**B**	**D**	**B**	**B**	**C**

Question	Explanation
1 **D**	Both calcium oxide and concentrated sulfuric acid are dehydrating agents. Since the gas to be collected is acidic in nature. It is not suitable to use calcium oxide as the gas will neutralize the calcium oxide. Since the gas is denser than air, it will always sink inside the cylinder.
2 **D**	Calcium nitrate is soluble in water, whereas oil is not soluble in water. Water is added to get calcium nitrate to dissolve in water and this solution will sink below oil. Separating funnel is used to separate the solution and the oil. The calcium nitrate solution can then be heated til saturated to crystallise the calcium nitrate.
3 **C**	In chloroform, the spots in the sample travelled to the same distance as drug **P** and drug **Q.** In propanol, the spots in the sample travelled to the same distance as drug **P** and drug **Q again.** Hence the drugs present in the sample must be drug **P** and **Q.**
4 **C**	The ion has 10 electrons in the shells. Since it has a positive charge, it means that the original atom has lost one electron to form that ion. Hence the original atom has a total of 11 electrons. The number of proton and electron is the same an atom. It has 11 protons and formation of ion does not change the number of protons.
5 **C**	Iodine changes from solid state to gaseous state during sublimation. Iodine exist as a diatomic molecule, I_2
6 **C**	Since **Y** is a monatomic gas, it is a noble gas (Group 18). This would mean that **W** is from Group 16, with 6 valence electrons. Since chlorine has 7 valence electrons,  Hence the formula, **W**C*l*$_2$
7	M_r of NH_3 = 17 M_r of HC*l* = 36.5

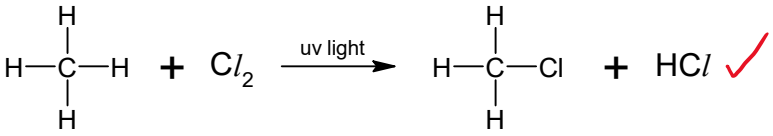
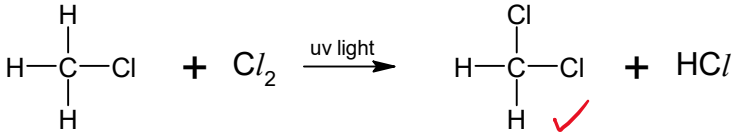
D	The rate of diffusion is slower if the M_r is higher. NH_3 will reach the litmus paper first. Later on, HC*l* reach both litmus papers and turn them from blue to red.
8 **B**	Isotopes have the same number of protons but different number of neutrons. The number of electrons = number of protons.
9 **D**	In graphane, each carbon is bonded to 3 carbon atom and one H atom. There will be no delocalized electrons to act as mobile charge carriers. Hence graphane cannot conduct electricity.
10 **A**	Number of mole of water = mass / Mr $= \frac{10.8}{18}$ $= 0.6$ **X**C*l*$_2$: H_2O 0.1 : 0.6 1 : 6 **X**C*l*$_2$.6H_2O. **n** = 6
11 **B**	$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ If 20 dm^3 of hydrogen used, exact volume for reaction is H_2 : C*l*$_2$ 1 : 1 20 dm^3 : 20 dm^3 30 dm^3 of chlorine is in excess. 20 dm^3 of hydrogen is the limiting reactant. 30 – 20 = 10 dm^3 of chlorine will be left in the final mixture. H_2 : HC*l* 1 : 2 20 dm^3 : 40 dm^3 Final mixture will have 10 cm^3 of chlorine and 40 dm^3 of HC*l*
12 **B**	$2\ Mg + O_2 \rightarrow 2\ MgO$ 5.9 g of MgO is the actual yield.

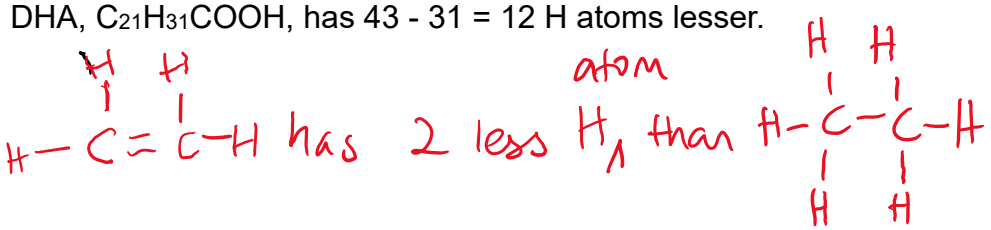
	Number of mole of MgO = 4.8/24 = 0.2 Mg : MgO 2 : 2 0.2 : 0.2 Mass of MgO (theoretical yield) = 0.2 x (24+16) = 8 g % yield = $\frac{5.9}{8}$ x 100 = 73.75 % = 74 %
13 **B**	The following deductions can be made in the reactions 1 **P** is more reactive than **R** **2** **Q** is less reactive than **P** 3 **Q** is more reactive than **R** Hence the decreasing reactivity is **P**, **Q**, **R.** The order down Group 17 is **P**, **Q**, **R.** The trend down Group 17 is colour darkens, melting point increases. In reaction 3, $\mathbf{Q}_2$ oxidised $\mathbf{R}^-$ as the oxidation state of **R** increase from -1 in $\mathbf{R}^-$ to 0 in $\mathbf{R}_2$. $\mathbf{Q}_2$ is an oxidizing agent. Tip: metals can act as reducing agent. Non metals can act as oxidizing agents.
14 **D**	Group 2 comprise of metals. Similar to Group 1, the reactivity increases down Group 2. Strontium is more reactive than Calcium. Strontium should be higher than Calcium in reactivity series. Calcium can react with cold water to form calcium hydroxide (alkali). General equation: very reactive metal + water → metal hydroxide + hydrogen. So strontium can also react with cold water to form strontium hydroxide (alkali)
15 **C**	The metals are on the left side of the Periodic Table while the non metals are on the right. The proton number increases from left to the right of the Periodic Table. Metals on the left form basic oxide. (oxide of **Y**) Metals near dividing line form amphoteric oxide. (oxide of **Z**) Non-metals on the right form acidic oxide. (oxide of **X**)

	Hence the order**: Y, Z, X**.
16 **B**	Caesium is from Group 1 of Periodic Table. It is below Lithium, Sodium and Potassium in that Group. 1. Group 1 metals + water → **metal hydroxide** and hydrogen gas. 2. It reacts with dilute acid to release more heat than potassium. Caesium is more reactive than potassium. Hence the reaction is more vigorous and more exothermic. 3. Density **increases** down Group 1. Caseium has a higher density than sodium. 4. Melting point decrease down Group 1. This is unique to Group 1. Hence statement 2 and 4 are correct.
17 **C**	Characteristics of transition metals: • Very high melting point. • Very high density • Form ions of different oxidation states. Hence they can form more than one chloride. Eg. Iron can form ions of oxidation state +2 and +3. Iron can form chlorides $FeCl_2$ and $FeCl_3$
18 **C**	From the graph, When 0 g of L is added, the pH of solution J is 2. This indicate that the J is a strong acid. Beyond neutralization (pH 7), the pH continue to increase to 13 when the excess L is added. This indicate that L is a strong base that can dissociate to form high concentration of OH^- Aluminium oxide, magnesium oxide and zinc oxide are not soluble in water. Potassium oxide (group 1) oxide is soluble in water to form potassium hydroxide.
19 **A**	Let's see the reaction with state symbols. H_2SO_4 (aq) + $Ba(OH)_2$ (aq) → $BaSO_4$ (s) + H_2O (*l*) Initially, the barium hydroxide solution has a lot of Ba^{2+} and OH^- ions to act as mobile charged carriers. As sulphuric acid is added gradually, Ba^{2+} ions and SO_4^{2-} ions combined to form solid $BaSO_4$ ppt which does not have mobile charge carriers. H^+ and OH^- combined to produce water which are molecules that cannot act as mobile charge carriers. There are lesser mobile Ba^{2+} ions and OH^- ions left in the beaker as the reaction proceeds. Hence electrical conductivity drop.

	At neutralization, only Barium sulfate solid and water are present. Hence electrical conductivity is at the lowest. As excess sulfuric acid gets added, the more and more mobile H^+ and SO_4^{2-} are added to the beaker. Hence electrical conductivity increases.
20 **A**	A aqueous ammonia (weak alkali) and limewater (strong alkali) B acid rain (weak acid) and aqueous sodium chloride (neutral) C dilute hydrochloric acid and dilute sulfuric acid (both are strong acid) D aqueous sodium sulfate and aqueous sodium chloride (both neutral) Aqueous ammonia will turn the butterfly pea flower extract green, while limewater can turn the butterfly pea flower extract yellow.
21 **D**	In the acid test, it is confirmed that the white powder contains carbonate ion as a gas is produced. The remaining solution contains cations from the white powder. Calcium ion will not produce ppt with aqueous ammonia. Copper(II) ion will produce blue ppt with both aqueous ammonia and sodium hydroxide. Both aluminium ion and zinc ion can produce white ppt in aq ammonia and sodium hydroxide. But aluminium oxide (option A) cannot produce a gas with hydrochloric acid.
22 **D**	A: sodium hydroxide and aluminium are used in test for nitrate ions. B: ammonium salt and alkali reacts to produce ammonia gas C: ammonium salt and alkali reacts to produce ammonia gas D: no reaction.
23 **A**	When silver nitrate is added, both chloride ion and carbonate ion can form insoluble silver chloride and insoluble silver carbonate solid ppt. (increasing slope in graph) Then when nitric acid is added, the silver carbonate ppt will dissolve and leaving behind silver chloride ppt. (decreasing slope and then horizontal line in graph)
24 **B**	In **W**, green ppt with aq ammonia test indicates Fe^{2+}. In **W**, yellow ppt with silver nitrate test indicates iodide ion. In **X**, the aq. ammonia test confirmed Zn^{2+}. In **X**, positive test results with sodium hydroxide and aluminium foil indicates nitrate ion present.

25 **D**	One of the products from cracking of long chain alkanes is hydrogen. Increase in pressure increase rate of reaction as both nitrogen and hydrogen reactants are gases. Since reaction is reversible, the final mixture contains unreacted nitrogen, hydrogen and ammonia gases. Ammonia gas has a higher boiling point than nitrogen and hydrogen. Hence temperature is lowered such that only ammonia gas is condensed and then collected.
26 **B**	In Haber process, higher temperature can increase rate of reaction but it decrease the yield of ammonia gas.
27 **B**	Neutralization reactions are not redox reactions. $CuO + H_2SO_4$ is a base and acid reaction.
28 **A**	Acidified potassium manganate(VII) can be used to test for sulfur dioxide gas by showing a colour change from purple to colourless. KMnO4 is an oxidizing agent and since it can react with sulfur dioxide, sulfur dioxide is a reducing agent. Sulfur dioxide reduced purple MnO_4^- to colourless Mn^{2+}
29 **C**	In endothermic reaction, the temperature decreases. When reaction stops, the reaction mixture will warm up to room temperature again.
30 **B**	Copper electrode will act as reactive anode, lose electrons and produce copper(II) ions. $Cu(s) \rightarrow Cu^{2+}(aq) + 2e$ These copper(II) ions will then gets discharged at the cathode. $Cu^{2+}(aq) + 2e \rightarrow Cu(s)$ Hence no net change in concentration of copper(II) ions. Carbon and platinum electrode are inert electrodes.
31 **B**	At the anode, hydroxide ions will be discharged, leaving behind lead(II) ions, nitrate ions and hydrogen ions. At the cathode, hydrogen ions will be discharged, leaving behind potassium ion, iodide ion and hydroxide ion. Lead(II) ions and iodide ions will meet and combine to form yellow lead(II) iodide ppt.

32 **C**	To conduct electroplating, the object to be coated (metal ring) should be placed at the cathode. The plating material (Chromium) should be placed at the anode. Chromium anode will self oxidise to form chromium ions that will then be discharged at the cathode.
33 **B**	Increase in pressure can increase rate of reaction if the reactants are gases. But sulfuric acid is a solution and copper(II) oxide is a solid.
34 **C**	The independent variable (change variable) is oxygen. In experiment 2, there is dissolved oxygen in tap water and air column that contains oxygen gas. In experiment 4, boiled tap water has no oxygen gas. The layer of oil prevents the oxygen in air from entering the boiled tap water.
35 **A**	In substitution reaction,  methane chloromethane  chloromethane dichloromethane No hydrogen gas will be formed.
36 **B**	The trend from the top of the fractionating column to bottom of the column: There are more carbon atoms each molecule The alkane molecule size increases The boiling point of the alkanes increases. The flammability decreases.

37 **D**	If it is a saturated fatty acid (no C=C bond), then using general formula $C_nH_{2n+1}COOH$, the fatty acid formula would be $C_{21}H_{43}COOH$ (with n=21) DHA, $C_{21}H_{31}COOH$, has 43 - 31 = 12 H atoms lesser.  Hence, 12 less H atom means 12/2 = 6 carbon -carbon double bond.
38 **B**	**M** (butene) goes through stage 1 (addition reaction) to form butanol. Butanol goes through stage 2 (oxidation reaction) to form butanoic acid.
39 **B**	The total number of C atoms and H atoms remains the same after cracking. Cracking usually produces smaller alkanes and alkenes. $C_{12}H_{26} \rightarrow 3\ C_2H_4 + C_3H_6 +$ **Q** Alkenes alkane So **Q** is C_3H_8 which is an alkane and alkane does not decolourise bromine.
40 **C**