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#	Ans	Workings/Remarks
1	D	Condenser allows unreacted M and N that have boiled off to convert back into liquid state. The condenser is positioned vertically so that liquid M and N could flow back into the boiling flask and continue reacting with each other.
2	A	Barium sulphate is insoluble.
3	A	Alkaline gases turn red litmus paper blue. Ammonia reacts with water in damp litmus paper to form ammonium hydroxide, which is alkaline. Chlorine turns blue litmus to red then bleach.
4	C	Cation to anion ratio in ionic crystal lattice must show stoichiometry of the compound.
5	C	Giant covalent compound is insoluble in water.
6	D	Electronic configuration of O: 2.6 → 2.8 by providing 2 electrons to be stable Electronic configuration of F: 2.7 → 2.8 by providing 1 electron to be stable Electronic configuration of C: 2.4 → 2.8 by providing 4 electrons to be stable
7	B	P-Q: Change in temperature, average kinetic energy of molecules increases. Q-R: No change in temperature, change in state occurs. Melting takes place at 0°C. R-S: Rise in temperature of water at liquid state. T-U: Boiling, change in state, occurs at a fixed temperature 100°C.
8	A	Only option A consists of one insoluble (calcium carbonate) and one soluble (sodium chloride) salt.
9	D	Sublimation is the change from solid to gaseous state. Mercury is a liquid at room temperature.
10	B	M_r of nitrogen and carbon monoxide is the same. Rate of diffusion is the same.
11	A	% change in vol. = $\dfrac{\text{final no. of mole of gas – initial no. of mol of gas}}{\text{initial no. of mol of gas}} \times 100\%$ A: 3/6 x 100 % = 50% B: 5/7 x 100 % = 71.4% C: 2/3 x 100 % = 66.7% D: 3/3 x 100 % = 100% *note: ALL gases have same molar volume (vol. of one mole).
12	A	$2HCl + Na_2CO_3 \rightarrow CO_2 + 2NaCl + H_2O$ No. of mol of Na_2CO_3 = 25 / 1000 × 0.2 = 0.005 No. of mol of HCl = 0.005 x 2 = 0.01 Volume of HCl = 0.01 / 0.1 × 1000 = 100 cm^3
13	A	Mass of O in X = 8 - 5.6 = 2.4g No. of moles of O = 2.4 / 16 No. of moles of X = (2.4 / 16) × (2 / 3)

14	A	For the same time taken, no. of electrons flowing in both the cells is the same.
		Since Q and S have different increase in mass, no. of electrons required to discharge each cation in both cells would be different. This implies oxidation state of cation in both cells is different and therefore different element and atomic mass.
15	C	I: melting is endothermic.
		II: boiling id endothermic
		III: combustion is exothermic
		IV: condensation is exothermic
16	C	Largest initial concentration gives fastest initial rate of reaction.
		A: $40/36.5 = 1.10$ mol/dm^3
		B: $20/36.5 = 0.548$ mol/dm^3
		C: $10/36.5 \times 10 = 2.74$ mol/dm^3
		D: $4/36.5 \times 20 = 2.19$ mol/dm^3
17	D	At time 0, pH of solution should be more than 7 due to presence of NaOH
		After neutralization (pH 7), pH of solution should be less than 7 due to presence of excess HCl
18	D	Carbon dioxide is acidic.
19	A	Test for Al^{3+} ion with NaOH: Aluminium hydroxide (white ppt) is soluble in excess of NaOH.
20	B	Lead (II) carbonate reacts with sulphuric acid to form lead (II) sulphate, which forms an insoluble layer over lead(II) carbonate, preventing further reaction with acid.
21	A	$H_3PO_4 + 3NaOH \rightarrow Na_3PO_4 + 3H_2O$
		Since concentration of both reactants is the same, volume of acid to volume of base ratio should be 1:3
22	B	A: oxidation state of Mg: 0 in Mg to +2 in $MgCl_2$ [O]
		oxidation state of H: +1 in HCl to 0 in H_2 [R]
		B: no change in oxidation state
		C: oxidation state of Cu: 0 in Cu to +2 in $Cu(NO_3)_2$ [O]
		oxidation state of N: +5 in HNO_3 to +4 in NO_2 [R]
		D: oxidation state of Cu: 0 in Cu to +2 in $CuSO_4$ [O]
		Oxidation state of S: +6 in H_2SO_4 to +4 in SO_2 [R]
23	D	Organic acids are weak acids.
		One mole of sulphuric acid gives two moles of H^+ ions whereas one mole of hydrochloric acid gives one mole of H^+ ion.
24	C	A: metals form basic oxides; non-metals form acidic oxides
		B: group number predicts no. of electrons involved in bonding, thus formula of compound.
25	D	$CuSO_4 + Na_2CO_3 \rightarrow Na_2SO_4 + CuCO_3$
		No. of moles of $CuSO_4 = 4 / 1000 \times 1.0 = 0.004$
		No. of moles of $Na_2CO_3 = 8 / 1000 \times 1.0 = 0.008$
		Compounds remained behind after reaction: colourless Na_2CO_3 (aq) (excess reactant), colourless Na_2SO_4 (aq), green $CuCO_3$ (s).

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26	A	Melting point increases down the elements of Group VII.
		Therefore, Y is below X in the group.
		This implies Y has more protons and less reactive than X.
		Group VII elements form diatomic molecules.
27	C	
28	B	A: calcium hydroxide reacts with sulphuric acid to form salt and water only.
		C: all carbonates are insoluble in water except sodium, potassium and ammonium carbonates.
		D: zinc oxide reacts with sulphuric acid to form salt and water only.
29	B	Copper is less reactive than iron. Therefore, iron displaces copper ions from its solution, resulting in copper deposit.
		$Fe (s) + Cu^{2+} (aq) \rightarrow Fe^{2+} (aq) + Cu (s)$
30	D	A: Copper does not react with acid because it is less reactive than hydrogen.
		B: Lead (II) sulphate is insoluble.
		C: Some are colourless e.g. $Pb(NO)_3$
31	C	*Note: This is different form question that is asking for % of nitrogen by mass in the compound, in which mass of nitrogen is compared against M_r of compound.
		Thus, the compound which contains the most number of nitrogen atoms in the molecular formula should be the correct answer.
32	B	
33	B	Combustion of fuels in cars and power stations produces carbon dioxide.
		Plants need to take in carbon dioxide for photosynthesis. Carbon in glucose comes from carbon in CO_2.
		$6CO_2 + 12H_2O \xrightarrow{\text{sunlight}} C_6H_{12}O_6 + 6O_2 + 6H_2O$
34	B	Syllabus states that paraffin (kerosene) is used as a fuel for heating and cooking and for aircraft engines.
35	D	A: R, S and T contain 4 carbons.
		B: Alkyl group (CH_3) attached to last carbon atom in linear chain is not considered as branched chain.
		C: S is but-2-ene.
36	B	General formula of alkane is C_nH_{2n+2}
37	D	Combustion hydrocarbon in excess oxygen gives carbon dioxide and water only. Therefore, X is CO_2.
		Alkenes decolourise bromine spontaneously because of C=C bond. Therefore, Y is ethane.
38	A	Nylon is polyamide, which must contain amide linkage.
		Terylene is polyester, which must contain ester linkage.
39	B	Esterification involves removal of one mole of H_2O. (-OH from acid and –H from alcohol)
40	B	$Mg + 2CH_3COOH \rightarrow (CH_3COO)_2Mg + H_2$