Top of The Bench

Preliminary Round 2020, Years 10/11 Students only.

RSC Birmingham & West Midlands Local Section.

Time 35 Minutes. All answers must be written on the separate Answer sheet.

	Question
1	What are the colours of [i] nickel nitrate, [ii] titanium oxide, [iii] barium sulfate, [iv] methyl orange in alkaline solution, [v] silver iodide, [vi] lead iodide, and [vii] cobalt chloride solution?
2	What are the chemical formulae for substances [i], [ii], [iii] and [v] in Question 1?
3	What are the whole numbers [a,b,c,p,q,r,x,y,z] needed to balance the equations? [i] a S + b O_2 → c SO_3 , [ii] p $KClO_3$ → q KCl + r O_2 , [iii] x $Pb(NO_3)_2$ → y PbO + z NO_2 + O_2
4	Which metals are added to copper to produce the alloys [i] brass and [ii] bronze?
5	Convert [i] $40°C$ to its value on the Kelvin scale, [ii] the boiling point of nitrogen from $77K$ to $°C$
6	Calculate the relative formula mass, Mr, for the following [i] NH_4NO_3 , [ii] V_2O_5 , [iii] NaF , [iv] $S_2O_3^{2-}$, [v] $FeSO_4.7H_2O$. [vi] $CH_3COOC_2H_5$.
7	150 g of toothpaste contains 0.32% by weight of NaF. [i] what is the mass of NaF present, [ii] covert the mass into moles to FIVE decimal places, [iii] convert this mass into milligrams [mg].
8	What is the total number of electrons in [i] a V^{3+} ion, [ii] a S^{2-} ion, [iii] an O_3 molecule?
9	Isotopes are atoms that have the same .....[i].....number but a different .....[ii].....number. What words complete this sentence?
10	Using the words 'increase' or 'decrease' identify the trends in the properties when ascending Group 1, [i] atomic radius, [ii] melting point, [iii] density, [iv] reactivity with water.
11	Name the products when the following are electrolysed using inert electrodes: [i] molten $PbBr_2$, [ii] dilute H_2SO_4 solution, [iii] NaCl solution.
12	Which metal salts, in fireworks, produce the colours [i] crimson, [ii] green, [iii] yellow?
13	Calculate, to ONE decimal place, the % of nitrogen in $(NH_4)_2SO_4$.
14	Transition metals have three special properties. Two are, they have coloured ions and have catalytic properties . What is the third property?
15	A compound, with Mr = 60, has the composition 40.0% C, 6.67% H, and the remaining % is oxygen. Calculate its [i] Empirical formula, and [ii] Molecular formula.
16	The compound in Question 15 is an organic acid, what is its chemical name?
17	Will a chemical reaction happen in the following? Use the words 'yes' or 'no' as the answer. [i] $Cl_2(g)$ + $KI(aq)$, [ii] $Br_2(aq)$ + $KCl(aq)$, [iii] $Ag(s)$ + $Cu(NO_3)_2(aq)$, [iv] $Mg(s)$ + $CuSO_4(aq)$.
18	A bond is formed between two atoms when one electron from each atom forms a shared pair between them. What is the name for this type of bond?
19	Name the two reagents used to test for and identify [i] a sulphate ion, [ii] an ammonium ion, and [iii] a carbonate ion.
20	Using the words 'gain' or 'loss' which word describes the chemical change REDUCTION in terms of [i] oxygen, [ii] hydrogen, [iii] electrons?
21	1 mole of any gas has a volume of 24 dm^3 at room temperature and pressure (rtp). My car produces $110g$ of CO_2 per kilometre. What volume of CO_2 is released on a 50 km journey?
22	[i] state four factors that affect the rate of a reaction, [ii] What is the missing word in the sentence: 'The minimum amount of energy that particles must have to react is called the .... energy'