Lending a hand with sanitiser

Education in Chemistry
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Reading comprehension questions and basic mathematical skills applied to chemical formulations

1. Read through the article and find the sentence that contains each of the following phrases.

   Discuss with a partner what they each mean.

   Can you think of another example of a sentence in which you might use the phrase?

   'the materials of choice'

   'demand …… outstrip supply'

   'rendered inert'

   'spearhead a programme'

   'given the green light'

   'talents could be put to other uses'

   'think on their feet'

2. The hand sanitiser described in the article is an example of a **formulation**.

   A **formulation** is a mixture with a precise formula that has been designed as a useful product.

   a. Define a mixture.

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   _____

   WHO recommends two different formulations for hand sanitiser.

   The difference between the formulations is the type of alcohol in the mixture.

   Formulation 1 uses ethanol as the alcohol.

   Formulation 2 uses isopropanol as the alcohol.

   b. Using the description given by Tim Gallagher of how he and his team made up their sanitiser, list the substances besides alcohol contained in the formulation for hand sanitiser.

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   _____

c. The alcohols used in the two different formulations are subject to different regulations.

Draw lines to match up the alcohol to its regulations and the government body responsible for enforcing these regulations.

Finally, identify the alcohol used by the different teams discussed in the article.

Alcohol	Regulations	Government body	Used by
ethanol	Hand sanitisers containing this alcohol are classed as biocides.	HMRC Her Majesty's Revenue and Customs	Craft-gin company 'Psychopomp'
isopropanol	A controlled substance because of its use in the drinks industry. Tax and duty must be paid on its sale and the availability of the high purity alcohol is limited.	HSE UK Health and Safety Executive	Tim Gallagher and his team

3. The formulations recommended by WHO contain **75% alcohol**.

a. Calculate the volume of isopropanol needed by Tim Gallagher's team to make 10 L of the WHO formulation.

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b. To be effective against Sars-Cov-2 a hand gel needs to contain at least 60% alcohol.

i. Calculate the volume of isopropanol needed to make up 10 L of hand sanitiser containing 60% alcohol.

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ii. If 2 L of isopropanol costs £76.10, calculate how much would be saved when making 10 L of hand sanitiser if the alcohol percentage was reduced from 75% to 60%.

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Challenge: Commercially available isopropanol isn't pure. It is described as having 99.8% purity.

This means that 100 cm^3 of the liquid contains 99.8 cm^3 of pure isopropanol.

Calculate the volume to the nearest cm^3 of 99.8% pure isopropanol needed to make up 10 L of the WHO formulation to ensure that it contains 75% alcohol. (1 L = 1000 cm^3)