# Lending a hand with sanitiser – answers

***Education in Chemistry***September 2020
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Reading comprehension questions and basic mathematical skills applied to chemical formulations.

1. Line 6

 *While soap and water are the materials of choice for hand washing, an alcohol-based hand sanitiser is a great alternative when bathroom facilities aren’t available.*

 Line 8

 *And when everyone wants a bottle for their handbag or coat pocket, demand is bound to outstrip supply.*

 Line 11

 *Once the RNA is exposed, it’s quickly broken down and the virus is rendered inert.*

 Line 22

 *One such organisation was Bristol University’s School of chemistry, where one professor, Tim Gallagher, turned his attention away from synthetic organic chemistry to spearhead a programme of hand sanitiser manufacture.*

 Line 36

 *IPA, on the other hand, is not used for drinks (in fact, it’s toxic), but hand sanitisers made using this recipe are classed officially as biocides and as such need to be given the green light by another organization – the UK Health and Safety Executive (HSE).*

 Line 71

 *Bristol-based Psychopomp usually specialises in limited-edition gin, but they soon saw that their talents could be put to other uses when news of the coronavirus broke.*

 Line 96

 *Now that gap is closing, they can think about going back to their day jobs, but with more sectors of the economy opening up after lockdown (and the threat from other diseases such as influenza being an ever-present danger) the ability of small groups of people to adapt and think on their feet in this way is – quite literally – a life saver.*

2. a. A mixture consists of two or more elements or compounds not chemically combined together.

 b. Other ingredients include:

* hydrogen peroxide
* glycerol
* water

c.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Alcohol** |  | **Regulations** |  | **Government body** |  | **Used by** |
| ethanol |  | Hand sanitisers containing this alcohol are classed as biocides. |  | HMRCHer 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. |  | HSEUK Health and safety executive |  | Tim Gallagher and his team |

3. a. $\frac{75}{100}$ × 10 L = 7.5 L

 b. i. $\frac{60}{100}$ × 10 L = 6 L

 ii. Volume of isopropanol saved = 7.5 L – 6 L = 1.5 L

 Cost = $\frac{£76.10}{2 L}$ × 1.5 L = £57.08

**Challenge**

To make up 10 L of hand sanitiser containing 75% isopropanol, 7.5 L of isopropanol is required.

7.5 L of commercially available isopropanol contains only 99.8% isopropanol.

The volume of impure isopropanol needed to contain 7.5 L is therefore:

$\frac{7.5 L}{99.8}$ × 100 = 7.515 L or 7515 cm3.