ChemScapes: an Adaptable Chemistry Escape Room Challenge

Dr Katherine J. Haxton @kjhaxton **Keele University**

Escape rooms are increasing in popularity and the basic premise lends itself well to outreach activities: complete tasks to obtain clues and escape the room. We have adapted the format for use in a laboratory setting, creating a set of challenges that lead to single digit answers that in turn can unlock a combination padlock and obtain the prize. The challenges can be tuned for any age group from early secondary to undergraduate and allow a chance to develop team working skills, deductive reasoning skills, and apply laboratory skills in an engaging and supportive environment. Strategic thinking is encouraged through a token system for seeking help, and perseverance is rewarded. Small tasks developed so far include thin layer chromatography, pH measurements, isomers, and microscale transition metal chemistry, and by using age and stage appropriate language, an inclusive yet challenging activity can be created.

Logistics

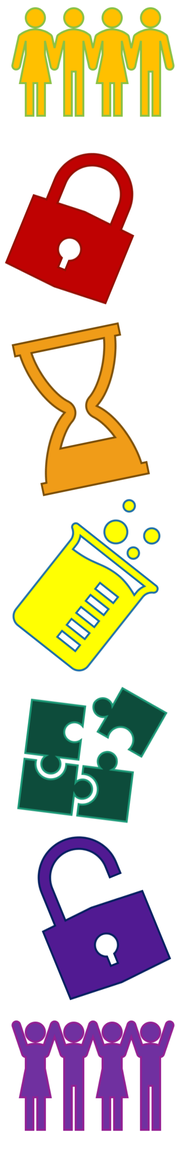
- Teams of 4 – 6 participants, 40 - 50 minutes.
- Intro briefing on team work and being strategic.
- One attempt at the lock, chance to ask science/procedure related questions 'for free'
- 3 tokens per team to exchange for 'big help' (related to verifying answers not underpinning science) or further attempts at lock
- Big clock on screen
- Plenty demonstrators
- Locked lab cupboards with 4-number combination padlock
- Prizes and certificates of achievement/participation
- Instruction booklet that details kit for each challenge
- Riddle to enable numbers to be put in correct order for padlock

Used for

- Salters Festival of Chemistry (Yr 7/8)
- Outreach (year 9/10 – mixed ability)
- Teachers and Technicians

Further reading

Allen, Education in Chemistry 30/11/18 https://eic.rsc.org/ideas/escape-the-classroom/3009832.article
Dietrich, *J. Chem. Educ.* 2018, 95, 6, 996-999
Ng, #RSCposter via twitter.com/jo_usmc/status/970948631128756224
Watermeier & Salzameda *J. Chem. Educ.* 2019, 96, 5, 961-964



Our Challenges

- Curriculum relevant techniques and ideas
- Use revision guides to use age/stage appropriate language and concepts
- Include challenge – next stage up or applying knowledge in new context.

Thin Layer Chromatography (answer between 1 and 4)

- separation science features in KS3, 4 and 5
- compare chromatogram of mixture of inks to individual inks: determine what's missing from the mixture

Isomers (answer between 1 and 9)

- provide worked example and model of chosen hydrocarbon (haloalkanes work well)
- may require definition of isomer and further verbal explanation

Transition Metal Microscale (answer 2 or 3)

- identify oxidation state of unknown iron salt
- give known Fe(II) and Fe(III) compounds, compare colour changes on reaction with different ligands to unknown Fe(x)

pH (answer between 1 and 9)

- accustomed to indicators to show end point in titration
- use pH paper to determine pH at 2nd equivalence point of triprotic acid using acid and alkali solutions of same molarity
- example given in instructions using diprotic acid