

# **M501: MEASUREMENT OF HAZARDOUS SUBSTANCES INCLUDING RISK ASSESSMENT**

## **ANSWERS TO OVERNIGHT REVISION QUESTIONS – DAY 4**

1. Whole of air or grab sampling – constant concentrations or for identification of peaks or identification of unknowns.
2. Midget impingers, gas wash bottles and fritted glass bubblers can suffer from the following limitations:
  - Collection efficiencies – bubble size, number of bubbles, volume of liquid, reaction rate and flow rate
  - Need to keep upright
  - Awkward to use for personal sampling
3. Adsorption is the technique where by the gas or vapour is collected by passing it over and retained on the solid surface of the solid sorbent media.
4.
  - Activated charcoal – organic vapours
  - Silica gel – polar substances
  - Porous polymers – pesticides
  - Florisil – PCBs
  - Polyurethane foam – pesticides and PNAs
  - Thermal desorption tubes
5. Breakthrough occurs when the sorbent tube has become saturated and material passed through the collection bed without being retained. This is said to occur (NIOSH) when the concentration in the back-up section excess 20% of the concentration in the front section.
6. Factors affecting breakthrough include:
  - Sampling rates too high
  - Concentrations too high
  - Incorrect sorbent
  - Sample volatility – sample migration

7. 20 – 200 mL/minute
8. See section 9.5 of the Student Manual.
9. Fick's Law.
10. Advantages – Devices are lightweight and easy to use and do not require use of a pump, batteries or air flow calibration.

Limitations and Disadvantages – Cannot be used for everything (gravimetric, low vapour pressure organics and reactive compounds), sampling rate supplied by manufacturer, some have a back-up section, issues with low or excessive wind speeds.

11. Some of the advantages of direct reading instruments include:
  - Where immediate data is needed
  - Personal exposure monitoring
  - Help develop comprehensive evaluation programmes
  - Evaluate effectiveness of controls
  - Emergency response
  - Confined space
  - For difficult to sample chemicals
  - Multi sensors/multi alarms
  - Stationary installations for both a record of exposure levels and when connected to an alarm to indicate hazardous levels
  - Fit testing
  - Video monitoring etc.
12. Disadvantages and limitations of direct reading instruments include:
  - Often costly to purchase
  - Need for frequent and regular calibration
  - Lack of specificity
  - Effect of interferences
  - Cross sensitivity

- Need for intrinsically safe instruments
  - Battery life
  - Sensors (finite life, poisoning, lack of range)
13. Indicator tubes, infrared analysers, flame ionisation detectors, photoionisation detectors.
14. Liquid impinger, diffusion badge, treated filters and paper tape monitor.
15. Some of the advantages of direct reading colorimetric tubes include:
- Relatively inexpensive and cheap to use
  - Wide range of gases and vapours
  - Immediate results
  - No expensive laboratory costs
  - Can be used for spot checks

The limitations include:

- Interferences from other contaminants
- Need to select correct tube and correct range of tube
- Cross sensitivities can be an issue
- Correct storage requirements (some tubes require special storage procedures)
- Limited shelf life of tubes