

M501: MEASUREMENT OF HAZARDOUS SUBSTANCES INCLUDING RISK ASSESSMENT

ANSWERS TO OVERNIGHT REVISION QUESTIONS – DAY 3

1.

Contaminant	Filter	Sampling Head	Flow Rate
Total Inhalable Dust	Glassfibre or PVC	IOM or equivalent	2.0 L/min
Respirable Dust	PVC	Cyclone	1.7 – 2.5 L/min depending on cyclone
Quartz Dust	PVC	Cyclone	1.7 – 2.5 L/min depending on cyclone
Rosin Based Solder Flue Fume	MCE	Swinnex	1 – 2 L/min
Asbestos Fibres	MCE	Open faced filter with conductive cowl	1 – 4 L/min (8 – 16 L/min in UK)
Welding Fumes	PVC	IOM or equivalent	2.0 L/min

2. A steady flow rate is required if the cyclone is to selectively size the sampled aerosol into the correct fraction (50% cut at 4 μm).
3. Maintenance, battery charge (memory effects), calibration of internal flowmeters.
4. See section 8.3.1 of the Student Manual.
5. A primary standard is one which is directly traceable to a national standard. A secondary standard is one which has to be calibrated at regular intervals against a primary standard.
6. If a result of 5 mg/m^3 was thought to be obtained at a flowrate of 2.0 L/min but in fact the true flowrate is 1.8 L/min, then the true concentration can be found by simple proportion

$$\text{ie } \frac{2.0}{1.8} \times 5$$

$$= 5.6 \text{ mg/m}^3$$

It is important to understand that as the volume is determined by the flowrate a lower flowrate (ie 1.8 L/min) would mean a lower volume and hence a higher concentration (as the mass on the filter hasn't changed).

Notwithstanding this calculation the sample should have been voided as pre and post calibration vary by >5%.

7. Exposure over 8 hours (TWA) =

$$\frac{0.1 \times 1 + 0.2 \times 2 + 0.15 \times 3 + 0 \times 2}{8}$$

$$= 0.12 \text{ mg/m}^3$$

8. Until recently, most devices were based on laser scattering. The response from such instruments depends on the size, shape and reflectivity of the airborne particles rather than their mass.

Some instruments over-respond in locations where high moisture is present (sprays) making their application limited. New technology (eg TEOM) may overcome these issues.

9. Dust lamp.
10. To overcome any static electricity effects.
11. Refer to practical session.
12. Refer to health effects of zinc, following which sampling using an IOM head and a PVC filter would be appropriate. It may be appropriate to analyse for iron as high exposures can occur from the parent metal in steel and also the welding rod. It may also be appropriate to analyse for contaminants present in the welding rod flux.

13. Chemical composition of the material (toxic effect) and particle size (where it deposits in the body).
14. Because membrane filters are constructed such that the airways follow a torturous pathway and thus aerosols of $<1\text{ }\mu\text{m}$ can be collected without significant errors.
15. Because the level of contaminant exposure outside the shield is usually significantly higher than inside and it is the worker's true exposure that we wish to measure.