ORDRE DES INGÉNIEURS DU QUÉBEC

MAY 2015 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

14-BA-B3 - BUILDING AIR QUALITY

1: (2 points) How can Legionella Bacteria be contracted and what are the related health problems?

2: (3 points) CASE STUDY:
Air samples were obtained from a school office in which the employees were complaining of allergy symptoms. The consultant took an outdoor sample and 2 indoor samples. The results are:

Air sample 1 – Indoor reference sample of non-complaint area: Classroom
Mould concentration = 1 679 CFU/m^3

1. Cladosporium spp. (92%)
2. Penicillium spp. (4%)
3. Epicoccum spp. (4%)

Air Sample 2 – Complaint Area: Office
Mould concentration = > 30 923 CFU/m^3

1. Penicillium spp. (60%)
2. Aspergillus versicolor (22%)
3. Cladosporium spp. (18%)

Air Sample 3 – Outside reference sample
Mould concentration = > 1 850 CFU/m^3

1. Cladosporium spp. (77%)
2. Epicoccum spp. (15%)
3. Alternaria spp. (8%)

Based on the results available to you, do you think there is a fungal problem in the school office? Why or why not?

3: (3 points) The problem lies in a six stories high building located on Sherbrook Street. Most of the ground floor is commercial, including a dry-cleaner and a restaurant. Three months ago a tenant who operates a chemical laboratory on the 6th floor occupies the upper floors and installed a large fume hood. Recently, there have been complaints about toilet odours on the ground floor and chemical odours on the top floor. The property manager refuses to believe there is a problem because the toilet exhausts on all floors were tested a year ago. What is the likely cause of these problems, and how would you go about testing to prove it?

4: (6 points) During walk-through investigation in a partitioned office, the concentration of contaminants XTR6 was measured in three workstations, as well as in supply and return air. The measured concentrations in PPM are:

No of Sample	**1**	**2**
Workstation 1	0.236	0.235
Workstation 2	0.328	0.285
Workstation 3	0.234	0.234
Supply Air	0.171	0.171
Return Air	0.287	0.291

From which workstation contaminant is removed more efficiently? Why?

5: (6 points) To study the pattern of airflow in a problem building, the investigator use methane (CH_4) as a tracer gas. Methane was injected at a constant flow rate for a period of 3 hours when it reached a steady state concentration of 800 ppm. Assuming that the volume and air change rate of the building are 210 m^3 and 0.6 hr^{-1}, calculate the injection flow rates of the tracer gas (cm^3/min). Density of Methane is 0.71 kg/m^3. State your assumption(s).