國立聯合大學 101 學年度碩士班考試招生

環境與安全衛生工程學 系(所) 入學考試試題

科 目：工業安全衛生 第 1 頁共 2 頁

一、選擇題：(請將答案作答於答案紙上，並清楚標明題號，每題各5分)

1. The LOQ from a laboratory for respirable dust is 100 micrograms. The occupational exposure limit is 3 mg/m^3. Calculate the required air volume to be sampled if an industrial hygienist wants to be able to report quantities as low as 10% of the exposure limit.
   A. 33 liters
   B. 100 liters
   C. 333 liters
   D. 3000 liters

2. The sound of a train whistle is measured to 65 dBA at a distance of 100 feet. What is the estimated sound level for the train engineer that is 10 feet from the whistle? Assume there are no obstructions between the train engineer and the whistle.
   A. 65 dBA
   B. 67 dBA
   C. 75 dBA
   D. 85 dBA

3. Which pollution control technology (of those listed below) is most effective in removing arsenic from a waste water discharge?
   A. Aeration
   B. Hydrogen peroxide
   C. Ion exchange
   D. Ultraviolet irradiation

4. Air is moving at 1000 fpm in an 8" duct. The air moves through a transition to a 6" duct. What is the velocity pressure of the air in the 6" duct?
   A. 0.020" H_2O
   B. 0.197" H_2O
   C. 0.444" H_2O
   D. 1.778" H_2O

5. Santa Claus is an elderly worker and manager living at the North Pole. Mr. Claus spends most of the year managing a toy manufacturing and distribution center. On December 24 of each year, he turns his focus to becoming an overnight delivery service. He utilizes flying reindeer and an open sleigh to deliver items to children all over the planet in a single night. The standard protocol is for Mr. Claus to land on the roof a residence and slide down through the chimney to deliver his packages to girls and boys. Mr. Claus recently hired an industrial hygienist to provide a risk assessment related to the delivery system. The IH has many concerns with ergonomics, fall protection and thermal stress. The IH is also concerned about airborne exposures to the lungs of his client. What air sampling would the IH want to use to sample the breathing zone of Mr. Claus on December 24?
   A. Charcoal tube with a sampling pump analyzed for total VOC.
   B. Tenax tube with a sampling pump analyzed for phosphorous vapor.
   C. Passive sampling badge for ozone.
   D. PVC filter with a sampling pump analyzed for total dust.

6. Which of the following is not commonly used to prevent the spread of TB?
   A. Assessment and isolation of suspect TB patients
   B. Negative pressure isolation rooms
   C. Positive pressure isolation rooms
   D. N-95 respirators

7. A cooling water pump on a reactor with an exothermic reaction has failed 6 times in the past 3 years. What is the probability that this pump would fail twice in the next 6 months?
   A. 18.39%
   B. 8.36%
   C. 12.93%
   D. 32.72%

8. In indoor warehousing operations, the preferred type of powered truck is:
   A. liquefied petroleum gas trucks
   B. electric trucks
   C. diesel trucks
   D. gasoline trucks

二、問答與計算：(每題各 10 分)

1. 某體重70 kg之勞工，其工作內容為從事甲苯分裝作業。假設其8小時日時量平均暴露濃度為3 ppm，已知甲苯之參考劑量為0.2 mg/kg/day，成人呼吸量為20 m^3/day，甲苯之吸收率為50%，試推估該勞工之非致癌性風險為何？
2. 某作業場所每小時使用甲苯500克，假設甲苯爆炸下限值為1.2%，試問欲將作業場所之甲苯濃度控制在爆炸下限值的50%時，其每小時必要換氣量應為多少立方公尺？今若考量甲苯在該作業場所混合不均勻，欲取安全係數K＝3，試問必要換氣量每小時應為多少立方公尺？已知甲苯莫耳分子量為92克。
3. 在自由音場中，若某勞工暴露於穩定性噪音環境為5小時，以噪音計測定，每2分鐘讀取一次並記錄10分鐘，結果資料為87、86、85、87、88 dB，試求該場所噪音之時量平均音壓級為何？又當日該名勞工另於距離音功率為0.04 W之另一穩定性點音源4.5米處工作3小時，試計算該勞工當日之噪音暴露劑量及8小時TWA，並請加以評估該名勞工噪音暴露是否合法？
4. 請製表分別列出α、β、γ與中子等輻射線：(1)與物質作用的形式；(2)遮蔽材料選擇之原則。
5. 在控制器的設計中，何謂「控制－反應比」(control-response, C/R比)？最佳C/R比應注意那些因素？
6. 化學反應器中，流向冷卻盤管的水之流量由下圖中所示之系統所控制。流量透過差壓裝置(differential pressure device)量測而獲致，控制器決定適當的控制措施，控制閥控制冷卻水流量，其失效率(failure rate, faults/year)分別是1.41、0.29、0.6，請問在一年的運轉期間，此一系統的可靠度(reliability)、失效機率(或不可靠度；failure probability)、系統整體失效率(overall failure rate, faults/year)以及平均失效時間(MTBF)是多少？