

BITS, PILANI, DUBAI CAMPUS
First SEMESTER 2012-2013
Environmental Pollution Control (CHE C411/ ET C362)
Comprehensive Examination (Closed Book)

DURATION: 3 hours

DATE: 6-01-2013
MAXIMUM MARKS: 40

Note: Attempt ALL questions. Attempt Part A and Part B in separate answer sheets.

Part A

This part consists of 10 questions and carries 20 marks.

1. What do you understand by natural and anthropogenic sources of environmental pollution? Give two examples of each with respect to air pollution. [2]
2. With temperature – altitude profile and plume diagram compare and contrast fumigation and lofting types of plume behavior. [2]
3. Draw a labeled schematic diagram of a sampling train in case of stack sampling. [2]
4. What is photochemical smog? What are the factors that contribute to it? [2]
5. Mention the factors on which the efficiency of spray towers depends. [2]
6. Briefly explain the adverse effects of air pollution on vegetation. [2]
7. Mention one main adverse health effect of each of the following air pollutants: Cd, Hg, CO, Asbestos, Ni, Pb, SO₂, and Be. [2]
8. Discuss following 2 process modifications in the method of air supply to the aeration tank of the activated sludge process: a) tapered aeration, and b) step aeration. [2]
9. How the following water quality parameters are measured: [2]
 - (i) dissolved oxygen
 - (ii) COD
10. What is biochemical oxygen demand? Mention the different processes which may interfere with BOD determination. [2]

Part B

This part consists of 4 questions and carries 20 marks.

1. Briefly explain the process of electrocoagulation with reactions involved and diagram. Differentiate between series and parallel arrangements of mono-polar electrodes. [4]
2. Calculate the minimum size of the particle that will be removed with 100% efficiency from a settling chamber under the following conditions. Verify whether laminar flow assumption is valid or not. [5]

Water: volumetric flow rate = $1.4 \text{ m}^3/\text{s}$,

Particle: density = 1750 kg/m^3

Chamber: length = 9.5 m , height = 0.9 m , width = 1.4 m

Assume laminar flow. Given: $g = 9.8 \text{ m/s}^2$,

Water viscosity = 0.0012 kg/m-s , water density = $990 \text{ m}^3/\text{s}$

3. The BOD results given below are observed on a sample of waste water:

t, days	0	1	2	3	4	6	8	10
BOD, mg/L	0	5.1	10.3	14.8	20.6	26.8	40.1	52.3

Calculate the reaction-rate constant k_1 and ultimate BOD, L_u . Use the Thomas method and linear regression. [6]

4. (i) A motor cyclist is warming up his racing cycle at a racetrack approximately 200 m from a sound level meter. The meter reading is 56 dB . What meter reading would you expect if 15 of the motorcyclist's friends join him with motorcycles having exactly the same sound emission characteristics? [3]
- (ii) A sound level of 95 dB is measured for 5 minutes followed by a 60 dB for a period of 60 minutes. Calculate the equivalent sound level for the whole duration of 65 minutes. [2]

*** END OF PART B ***

BITS, PILANI, DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
Second SEMESTER 2011-2012
Environmental Pollution Control (CHE C411/ET C362)
Test – 2 (Open Book)

DATE: 27 Nov 2012

DURATION: 50 MINUTES

MAXIMUM MARKS: 20

Note: Attempt ALL questions. Do not alter any data. Show all calculation steps.

1. A grit particle of diameter 0.35 mm and 2300 kg/m³ density is to be captured in a horizontal grit chamber of 14 m length and 1.4 m width. The wastewater approach velocity carrying the grit particle is 0.22 m/s and the flow rate is 0.154 m³/s. Determine whether the particle will be settled in the grit chamber or not. Calculate the Reynolds number to justify the use of appropriate equations. Given: density of wastewater = 1000 kg/m³, and its viscosity = 0.0012 kg/m-s. [5]

2. The BOD results given below are observed on a sample of waste water:

t, days	0	1	2	4	6	8
BOD, mg/L	0	6.5	11	18	22	25

Calculate the reaction-rate constant k_1' and ultimate BOD, L_u . Use the Thomas method and linear regression. [7]

3. What proportion of total BOD of a wastewater would be utilized in five days with k_1' values of 0.1 and 0.2? [2]

4. A completely mixed activated sludge process is to be designed to treat 1200 m³/d of industrial waste containing 550 mg/l of BOD₅. Environmental norms require that the effluent be treated to a level of 40 mg/l. The aeration tank is 3 m wide and 3 m deep. The concentration of MLVSS is 7000 mg/l. other data are: $Y = 0.6$, $k = 5/\text{day}$, $K_d = 0.04/\text{day}$, $K_s = 110 \text{ mg/L}$. Calculate: [6]

- Mean cell residence time,
- Hydraulic retention time,
- Length of aeration tank,
- F/M ratio.

*** END OF PAPER ***

BITS, PILANI, DUBAI CAMPUS
First SEMESTER 2012 – 2013
Environmental Pollution Control (CHE C411/ ET C362)
Test – 1 (Closed Book)

DATE: 09-10-2012

DURATION: 50 MINUTES

MAXIMUM MARKS: 20

Note: Attempt ALL questions. Do not alter any data. Report units in your answers.

1. A high volume sampler operated at $1.6 \text{ m}^3/\text{min}$. The sampling period was 24 h. the filter weighed 3.16 g at the start of the run and 3.58 g at the end of the sampling period. What is the concentration of the suspended particulate in microgram per cubic meter? [2]
2. The average car emits about 4 g of nitric oxide (NO) per km. the average car in UAE travels about 24000 km/year. Estimate the number of tons of NO emitted by each automobile per year. If the number of automobiles in UAE is about 4.2 million, calculate total NO emission from automotive transportation in tons/ year. [2]
3. Air containing 6% methane (by volume) is burned in a flare. Determine the flue gas composition. [3]
4. A multi-tray settling chamber having 10 trays handles $12 \text{ m}^3/\text{s}$ of air at 35°C . The trays are spaced 0.30 m apart and the chamber is 2 m wide and 5 m long. Given: air viscosity at $35^\circ\text{C} = 1.6 \times 10^{-5} \text{ kg/m-s}$, air density = 1.2 kg/m^3 . [Total Marks = 5]
 - a) Determine the minimum particle size of density 2400 kg/m^3 that can be collected with 100% efficiency, assuming laminar flow condition within the chamber. [2]
 - b) What will be the efficiency of the settling chamber if 40 micron particles are to be removed? [1]
 - c) Verify if in the above calculation, the laminar flow assumption is justified or not. [2]
5. Mention any 4 important properties that a solvent should have for good absorption. [2]
6. Mention any two differences between physical adsorption and chemical adsorption. [2]
7. What are advantages of catalytic oxidation over other combustion methods? [2]
8. Mention the factors on which the efficiency of spray towers depends. [2]

BITS, PILANI, DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
First SEMESTER 2012-2013
Environmental Pollution Control (CHE C411/ ET C362)
Quiz - II

DATE: 11-12-2012

DURATION: 20 MINUTES

MAXIMUM MARKS: 10

Note: Attempt ALL questions. This quiz consists of 20 questions. All questions carry equal marks.

Student's Name:

I.D.

-
1. Garbage is classified as a) putrescible waste, b) non-putrescible waste.
 2. Urban solid waste consists of
 - a) Domestic and commercial waste
 - b) Commercial and industrial waste
 - c) Domestic and agricultural waste
 - d) Agricultural and commercial waste
 3. Which of the following is NOT a solid waste disposal method
 - a) sanitary landfill
 - b) incineration
 - c) composting
 - d) filtration
 4. Landfill operation is essentially a method of waste treatment
 - a) biological
 - b) chemical
 - c) geological
 - d) atmospheric
 5. Solid waste has about heating value of coal
 - a) 3 times
 - b) 1/3rd
 - c) 10 times
 - d) 1/10th
 6. Composting is an aerobic/ anaerobic method of decomposing solid waste.
 7. The composting process
 - a) Is started by psychrophilic bacteria and later taken over by thermophilic bacteria
 - b) Is started by thermophilic bacteria and later taken over by mesophilic bacteria
 - c) Is started by mesophilic bacteria and later taken over by psychrophilic bacteria
 - d) Is started by mesophilic bacteria and later taken over by thermophilic bacteria
 8. The layers of vegetable waste and night soil are alternated in the composting method called
 - a) Indore process
 - b) Bangalore process
 - c) Ecuador on-farm composting
 - d) Berkeley composting

BITS, PILANI, DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI
First SEMESTER 2011-2012
Environmental Pollution Control (CHE C411/ ET C362)
Quiz - I

DATE: 25-09-2012

DURATION: 20 MINUTES

MAXIMUM MARKS: 10

Note: Attempt ALL questions. This quiz consists of 20 questions. All questions carry equal marks.

Student's Name:

I.D.

-
1. Dust as a particulate pollutant is defined as having particle size
 - a) less than 0.01 micron
 - b) greater than 1 micron
 - c) from 0.1 to 1 micron
 - d) from 0.01 to 0.1 micron
 2. Which gas is reddish brown in color, has a strong odor, is a major pollutant, and is a component of photochemical smog?
 - a) Ozone
 - b) SO₂
 - c) NO₂
 - d) CO₂
 3. Biosphere extends to about km from the bottom of the ocean to the highest point in the atmosphere
 - a) 1 km
 - b) 2 km
 - c) 20 km
 - d) 200 km
 4. Decomposers are organisms like
 - a) Hawks and vultures
 - b) Bacteria and fungi
 - c) Human beings and other mammals
 - d) Insects and birds
 5. Precipitation and advection are processes which are parts of:
 - a) carbon cycle
 - b) hydrologic cycle
 - c) nitrogen cycle
 - d) phosphorus cycle
 6. Which of the following is the biggest reservoir for carbon on earth?
 - a) atmosphere
 - b) soil
 - c) ocean
 - d) living beings
 7. Which of the following functional groups reduce CO₂ in the atmosphere?
 - a) Producers
 - b) Consumers
 - c) Decomposers

17. With the increase in the viscosity of the fluid, the terminal settling velocity of the particle settling in it will **increase/ decrease**.
18. Which of the following is Not a sampling method for particulates?
 - a) Absorption in liquids
 - b) adsorption on solids
 - c) Impingement
 - d) Freeze-out sampling
19. Smoke is classified as ***gaseous/ particulate*** air pollutant.
20. Isokinetic sampling is needed for ***gaseous/ particulate*** pollutants.

*** END OF PAPER ***