Started on	Sunday, 17 September 2023, 6:01 PM
State	Finished
Completed on	Sunday, 17 September 2023, 7:32 PM
Time taken	1 hour 30 mins
Grade	**28.50** out of 35.00 (**81**%)

Question 1

Correct

Mark 5.00 out of 5.00

During a water quality survey conducted in a village, the samples collected from a pond and borewell were found to be polluted. Further, the experts conducted risk assessment studies and the hazard indices from drinking the pond water and borewell water were estimated to be 1.76 and 1.23, respectively. The observation table is provided below. Estimate the missing values.

Pollutant	Reference Dose (RfD) (mg/kg/day)	Average daily dose corresponding to the exposure duration (mg/kg/day)	
		Pond water sample	Borewell water sample
P1	0.15	0.035	0.047
P2	0.28	0.089	?
P3	?	0.152	0.075
P4	0.05	0.023	0.014

a) What is the hazard quotient for pollutant P4 from drinking pond water (rounded off to 2 decimal places)?

0.46 ✓

One possible correct answer is: 0.46

(1 mark)

b) What is the reference dose for pollutant P3 (rounded off to 3 decimal places) in mg/kg/day?

0.203 ✓

One possible correct answer is: 0.203

(2 marks)

c) What is the average daily dose of pollutant P2 from drinking borewell water corresponding to the exposure duration (rounded off to 3 decimal places) in mg/kg/day?

0.075 ✗

One possible correct answer is: 0.238

(2 marks)

Your answer is correct.

Comment:

Question 2

Incorrect

Mark 0.00 out of 1.00

The total alkalinity and total hardness of a water sample having a pH of 7.0 are 150 and 280 mg/L as $CaCO_3$ respectively. Select the correct statement(s) for this water sample based on the available data. There is no partial marking.

Select one or more:

- ☐ **Carbonate hardness is 130 mg/L as $CaCO_3$**
- ☐ **Calcium hardness is 150 mg/L as $CaCO_3$**
- ☑ **Calcium hardness is 130 mg/L as $CaCO_3$** ✗
- ☑ **Carbonate hardness is 150 mg/L as $CaCO_3$** ✓

Your answer is incorrect.

The correct answer is: **Carbonate hardness is 150 mg/L as $CaCO_3$**

Question 3

Partially correct

Mark 0.50 out of 1.00

The sub-isokinetic sampling can be categorized by following characteristics.

Select one or more:

- [ ] a. Over estimation of mass concentration
- [ ] b. Velocity in the stack is greater than the velocity in the particle sampling probe.
- [ ] c. Velocity in the particle sampling probe is equal to the velocity in the stack.
- [x] d. Velocity in the stack is less than the velocity in the particle sampling probe ✗
- [x] e. Underestimation of particle mass concertation. ✓

Your answer is partially correct.

You have correctly selected one option.
The correct answers are: Underestimation of particle mass concertation., Velocity in the stack is greater than the velocity in the particle sampling probe.

Question 4

Incorrect

Mark 0.00 out of 2.00

The test results of IIT tap water analysis are presented below. Answer the following questions based on the available data.

Dissolved ions	***Concentration in mg/L as $CaCO_3$***
Ammonium	**5.7**
Bicarbonate	**40**
Calcium	**465**
Carbonate	**0**
Chloride	**268**
Fluoride	**1.2**
Iodide	**0.3**
Lithium	**1.7**
Magnesium	**270**
Nitrate	**37**
Phosphate	**48**
Sodium	**285**
Sulfate	**155**

Total hardness in the water sample in mg/L as $CaCO_3$ =

1198 ✗

One possible correct answer is: 735

(1 mark)

Carbonate hardness in the water sample in mg/L as $CaCO_3$=

0 ✗

One possible correct answer is: 40

(1 mark)

Your answer is incorrect.

Question 5

Correct

Mark 2.00 out of 2.00

(a) Using following reaction (equation 1 and 2) estimate the production of ammonium sulphate (in ppm) in the atmosphere. The SO_2 concentration in flue gas emission from a thermal power plant was measured as 120 ppm. The NH_3 emissions from nearby crop field using fertilizer was measured as 40 ppm if there is no other emission source exists in the area.

20 ✓

One possible correct answer is: 20

[Marks 1]

(b) How much ammonium sulphate (in ppm) will be produced if 75% SO_2 is removed from the atmosphere.

20 ✗

One possible correct answer is: 30

[Marks 1]

$$SO_2+2OH \rightarrow H_2SO_4 ...(1)$$

$$2NH_3+H_2SO_4 \rightarrow (NH_4)_2SO_4 ...(2)$$

Roundoff answer to 3 decimal places.

Your answer is correct.

Comment:
Regraded

Question 6

Correct

Mark 2.00 out of 2.00

Choose the incorrect statements.

Select one or more:

- [ ] a. MACT and RACT are implemented at emission source under clean air act 1970.
- [x] b. In patient with hemolytic anemia the ability of blood to transport the oxygen to tissue level reduces because of exposure to CO. ✓
- [x] c. During winter the mixing of alcohol with gasoline was implemented under Clean air act 1970 for the cities with ozone problem. ✓
- [x] d. Long term exposure with low concentration is termed as acute health effect. ✓
- [x] e. Bioaccumulation of Hg is greater than Hg2+ ✓
- [ ] f. NOx and VOCs are responsible for ozone formation.
- [ ] g. Use of oxyfuel is one of the mitigation policies used to reduce CO emissions.

Your answer is correct.

The correct answers are: During winter the mixing of alcohol with gasoline was implemented under Clean air act 1970 for the cities with ozone problem., Long term exposure with low concentration is termed as acute health effect., In patient with hemolytic anemia the ability of blood to transport the oxygen to tissue level reduces because of exposure to CO., Bioaccumulation of Hg is greater than Hg2+

Question 7

Correct

Mark 5.00 out of 5.00

A student collected wastewater sample from Jwalamukhi STP and tried to determine the biochemical oxygen demand. He prepared the incubation bottles by adding 2 mL of wastewater sample and 298 mL of dilution water. He incubated the samples for 5 days at 20 °C. On the day of sample collection, the DO in the bottle was 8.64 mg/L and after the incubation, DO in the bottle was reduced to 5.08 mg/L. The rate constant at 20 °C was determined to be 0.23 per day. Answer the following questions.

a) What is the 5-day BOD (at 20 °C) of the water sample (rounded off to 2 decimals) in mg/L?

530.44 ✓

One possible correct answer is: 530.44

(1.5 marks)

b) Calculate the rate (in day^{-1}) at which the BOD will be exerted if the samples were incubated at 31.9 °C. (rounded off to 2 decimals)

0.40 ✓

One possible correct answer is: 0.4

(1.5 marks)

c) What is the ultimate BOD of water sample (rounded off to 2 decimals) in mg/L? Assume there is only carbonaceous demand.

776.22 ✓

One possible correct answer is: 776.63

(2 marks)

Your answer is correct.

Question 8

Correct

Mark 1.00 out of 1.00

The air pollution disaster in London in 1952 was consequence of

Select one:

- a. Emission of CO2
- b. Formation of ozone
- c. Formation of smog ✓
- d. Emission of CO

Your answer is correct.

The correct answer is: Formation of smog

Question 9

Correct

Mark 2.00 out of 2.00

A PhD student has been working on different methods to oxidize glycine ($CH_2(NH_2)COOH$). The following reactions were noted down after the studies.

Estimate the theoretical oxygen demand (in mg/L, rounded off to 2 decimals) of distilled water containing 527 mg/L of glycine.

[Atomic weight in g: C=12, H=1, N=14, O=16, Cl=35.5]

$$2CH_2(NH_2)COOH + 4HOCl \rightarrow 4CO_2 + N_2 + 4HCl + 5H_2$$

$$2CH_2(NH_2)COOH + 7O_2 \rightarrow 4CO_2 + 2HNO_3 + 4H_2O$$

Answer: 786.99 ✓

The correct answer is: 786.81

Question 10

Correct

Mark 1.00 out of 1.00

Select the parameter(s) that do(es) NOT come under acceptability factors. There is no partial marking.

Select one or more:

- [x] Pathogens ✓
- [ ] Odor
- [x] Alkalinity ✓
- [ ] Color

Your answer is correct.

The correct answers are: Alkalinity, Pathogens

Question 11

Partially correct

Mark 2.50 out of 5.00

The emissions of $PM_{2.5}$ and co-pollutant gases were measured inside a brick kiln stack using VS3. The particles collected on filter substrate after dilution. Following parameters were recorded in Table 2. Determine the emission factors (in g/kg) of $PM_{2.5}$ and NOx. The NO to NO_2 ratio was 2:1.

Emission factor (in g/kg) of $PM_{2.5}$

32.6 ✓

One possible correct answer is: 32.6

Emission factor (in g/kg) of NOx

1457.0 ✗

One possible correct answer is: 80.9

Roundoff answer to one decimal place. **[Marks 5]**

Table 2. Parameters/Variable recorded from experiment.

Parameters	**Values**
Stack height (m)	150
Stack Dimeter (m)	2.2
Average velocity of flue gas inside the stack (m/s)	6
Mass of PM2.5 collected on filter (µg)	180
Average NOx concentration (ppm)	100
Sampling flow rate (LPM)	2.5
Sampling time (min)	60
Source flow rate (LPM)	0.85
Zero air flow rate (LPM)	45
Amount of coal burned (kg)	160

Your answer is partially correct.

You have correctly answered 1 part(s) of this question.

Question 12

Correct

Mark 5.00 out of 5.00

The mass size distribution measurement of undiluted particulate matter was conducted at the tailpipe of a Honda city car. The experiment was conducted for 90 mins. The mass of particles collected on filter papers and the volume flow rate of the instrument were recorded in a Table 1.

(a) Estimate the cumulative mass (in mg) of particles inhaled during 3 hr exposure to the emissions from same Honda city car. The inhalation rate of an adult can be assumed as 0.7 $m^3 h^{-1}$.

61.515 ✓

One possible correct answer is: 61.515

[Marks 2]

(b) What would be the cumulative mass (in mg) of particles trapped in

Tracheo-bronchial region. Assume there is no deposition of particles in between the given size bins.

12.536 ✓

One possible correct answer is: 12.536

[Marks 1.5]

Pulmonary region. Assume there is no deposition of particles in between the given size bins.

6.491 ✓

One possible correct answer is: 6.491

[Marks 1.5]

Roundoff answer to 3 decimal place.

Table 1 Particle sampling and deposition information

Aerodynamic diameter (nm)	Particles collected on filter (mg)	Sample volume flow rate (LPM)	Particle deposition fraction	
			TB	Pulmonary
1	7.5	11	0.25	0.03
10	2.5	11	0.65	0.17
100	7	11	0.25	0.25
1000	6	11	0.04	0.09
10000	6	11	0.07	0.02

Your answer is correct.

Question 13

Correct

Mark 1.00 out of 1.00

First clean air act was framed by

Select one:

- a. Europe
- b. UK ✓
- c. USA
- d. Vietnam

Your answer is correct.

The correct answer is: UK

Question 14

Partially correct

Mark 1.50 out of 2.00

Match the following. Select the most appropriate answer.

Fixed solids	Inorganic solids ✓
Dissolved solids	Passed through the filter paper ✓
Suspended solids	Retained on filter paper ✓
Volatile solids	Evaporated in oven ✗

Your answer is partially correct.

You have correctly selected 3.

The correct answer is: Fixed solids → Inorganic solids, Dissolved solids → Passed through the filter paper, Suspended solids → Retained on filter paper, Volatile solids → Organic solids