

THE OPEN UNIVERSITY OF SRI LANKA  
CENTRE FOR ENVIRONMENTAL STUDIES AND  
SUSTAINABLE DEVELOPMENT



M.Sc. IN ENVIRONMENTAL SCIENCES- LEVEL 10 – 2018/19

PHPA309– Cleaner Production

NO BOOK TEST - 02

DATE: 04<sup>th</sup> August 2019

DURATION: ONE HOUR  
TIME: 1.00 pm – 2.00 pm

REGISTRATION NO: .....

This question paper consists of nine (09) pages with twenty (20) Multiple Choice Questions (Part A) and four (04) Short Answer Questions (Part B).

**IMPORTANT INSTRUCTIONS TO CANDIDATES**

- Write your Registration Number in the space provided.
- Answer **ALL** questions.
- **Multiple Choice Questions (Part A):** Indicate answers in the answer sheet provided by placing a cross (X) in the relevant cage.
- **Short Answer Questions (Part B):** Write answers within the space provided.
- Do not remove any page/part of this question paper from the examination hall.



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ANSWER SHEET FOR PART A

Q. No.	(a)	(b)	(c)	(d)
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**Part A – Multiple Choice Questions**

*(40 marks)*

Choose the most suitable answer and indicate with an 'X' in the answer sheet provided.

- 1) According to Cleaner Production(CP) methodology, Brain storming is a tool mainly used for
  - a) Improvement of product Quality
  - b) Generation of ideas from employees
  - c) Training employees for improved Skills
  - d) Assess the most suited technology for production
  
- 2) After a CP assessment the CP techniques are used to minimize waste. They include
  - a) Material substitution, Housekeeping, Reuse
  - b) Recycle and improved process control
  - c) All of the above
  - d) None of the above
  
- 3) Ishikawa diagram (fish bone diagram) is used in CP to
  - a) Identify major and minor causes for a problem
  - b) Quantify the waste generated in a plant
  - c) Generate ideas for improvement of a process
  - d) Assess the suitability of technology as a green technology
  
- 4) One of the following is not a step in the 6 step CP methodology
  - a) Getting started
  - b) Generation and evaluation of CP options
  - c) Monitoring and review
  - d) Sustaining CP



- 5) In Cleaner Production methodology, material balance is used to
- Quantify material losses in the plant
  - To check the final output from a process
  - To quantify the work in progress within a plant
  - To quantify the total output as a percentage of input
- 6) Life cycle assessment of a product includes following phases
- Inventory analysis, costing of materials in product, impact analysis
  - Inventory analysis, improvement assessment, profitability potential
  - Goal and scope identification, material balance, impact analysis
  - Goal and scope identification, inventory Analysis, impact assessment
- 7) Eco Design or design for sustainability is defined as
- Incorporating environmental considerations at the design stage
  - Incorporating environmental disposal technique at design stage
  - Changing the raw material used for making of the product
  - Changing the technology used for making of the product
- 8) A large metal treatment industry has steam generation of 8 t/h through a boiler running on 90% load continuously. This fulfils the requirement, while the number of tanks to be heated at a time varies. The industry has now gone for new, latest energy efficient boiler as they need to install more tanks for increase in production. Which Cleaner Production option they implemented.
- Good housekeeping.
  - New technology
  - Reuse
  - All three of them
- 9) Acetone, which is used as a cleaning agent, was up to now disposed of in a separate waste incineration plant, after use. Used Acetone is now used as thinning agent for glues as a substitute for fresh acetone in the labelling department. At the same time purchasing quantities of Acetone are reduced Residue from production processes which should be treated and disposed, Which Cleaner Production option they implemented.
- Good housekeeping.
  - New technology
  - Reuse
  - All three of them



- 10) Phase 5 and 6 of standard Cleaner Production methodology are
- Feasibility analysis and sustaining CP
  - Implementation and sustaining CP
  - Feasibility analysis and implementation
  - None of the above
- 11) The total cost of waste for one full year is referred to as
- Cleaner Production Output
  - Recovered Revenue
  - Annual Profit Loss
  - Cleaner Production Potential
- 12) Followings are examples for the Good house Keeping methods except,
- Tighten valves and faucets
  - Replace faulty faucets and valves
  - Use materials with longer lifetime
  - Store chemicals in appropriate places
- 13) In a manufacturing process the input material weight is M kgs. There are two auxiliary inputs with weights of  $m_1, m_2$  kgs each. The output weight is P kgs and the waste streams were measured to be  $w_1, w_2, w_3$  and  $w_4$  kgs in weight. The material balance equation for the process is
- $M+P=m_1+m_2+w_1+w_2+w_3+w_4$
  - $M+w_1+w_2+w_3+w_4=P+m_1+m_2$
  - $M=P+m_1+m_2+w_1+w_2+w_3+w_4$
  - $M+m_1+m_2=P+w_1+w_2+w_3+w_4$
- 14) According to CP methodology there are 8 CP techniques for waste minimizing. Which of the following is not a CP technique
- Good housekeeping
  - Input material change
  - Awareness and training
  - Technology change
- 15) A company producing roasted coffee packets processes 800 kgs of coffee seeds daily and they produce 50 gram and 100 gram coffee powder packets. The roasting loss is 22% of the total weight. The daily production is 6400 nos of 50 gram coffee packets and 2400 nos of 100



gram coffee packets. They found the actual weight of each coffee packet is 5 grams more. The spill of coffee is 20 kgs. The total waste of coffee including the roasting loss to the company is

- a) 196 kgs
- b) 64 kgs
- c) 220 kgs
- d) 240 kgs

16) A typical barrier to the introduction of cleaner production in a plant is:

- a) Resistance among the management and the workers on changing their attitudes and everyday habits
- b) Lack of cleaner production options
- c) Lack of -Technology
- d) The size of the plant

17) The steps for introducing cleaner production in an enterprise include all of ,following except

- a) Involvement of employees
- b) Seeking government subsidies
- c) Monitoring and evaluations
- d) Making a material balance

18) The Product changes are performed by the manufacturer of a product with the intent of reducing waste resulting from a product's use. Product changes include except;

- a) Product substitution
- b) Raw material changes
- c) Product conservation
- d) Changes in product composition

19) What is the product oriented environmental management system which related to Life Cycle Analysis?

- a) ISO 14001
- b) ISO 14010
- c) ISO 14031
- d) ISO 14040

20) The tasks under getting started stage in Cleaner Production includes

- a) Selecting a team, listing process steps and identifying audit focus
- b) Selecting a team, listing process steps, drawing a process flow diagram
- c) Selecting a team, drawing a process flow diagram and material balance
- d) Listing the process steps, identifying audit focus and material balance.



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**Part B –Short Answer Questions**

*(60 marks)*

Write answers in the space provided.

ABC is a coffee manufacturing company which buys D-Stone coffee seeds from the market and process it in their factory. The D-Stone coffee seeds are purchased, sorted and store in bags.

The coffee seeds are then roasted in an electrical roasting machine

The roasted coffee is then packed in 25kg batches and left for cooling for a day.

The roasted coffee is then powdered in an electrically operated grinding machines

The coffee powder is manually transported in poly bags to the packing department in next building and packing manually.

1.) Identify inputs and outputs in this process

Inputs	Outputs



2.) Draw a process flow diagram





3.) What are the main waste cause categories in this process

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4.) Give some recommendation for following CP techniques using the above case study

- a. Good housekeeping in company
- b. Input material change
- c. Design and layout of the equipment/process

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