Unit 16 · Fundamentals of Applied Chemistry

WORKSHEET

Full marks 35

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 35

1 Key words [4]

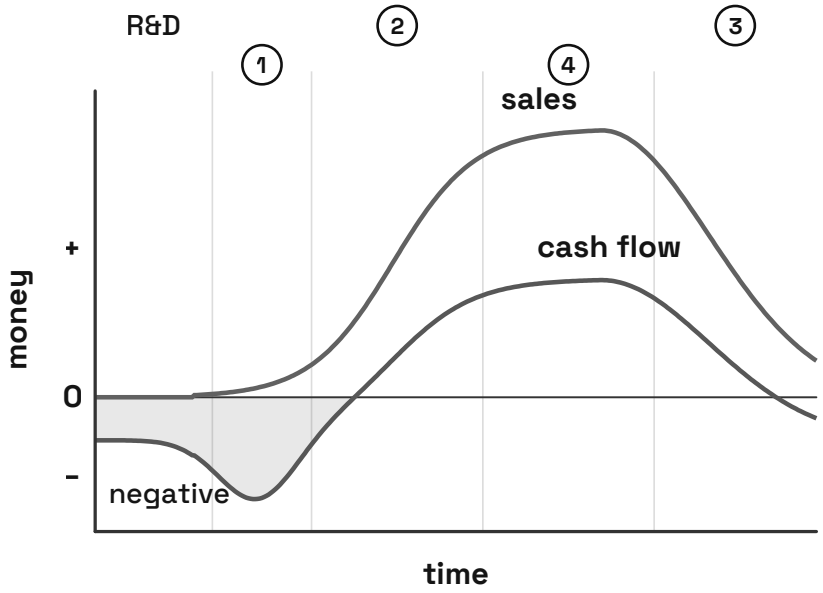
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

applied chemistry	**batch processing**	**capital-intensive**	**commodity chemicals**	**concept**
continuous processing	**labor-intensive**	**pilot plant**	**productivity**	**prototype**

Using the principles of chemistry to solve real-world problems and make products is _____. Chemicals made in huge amounts and sold to other industries, such as sulphuric acid and caustic soda, are _____. The first working version of a new product is its _____, and a small version of a chemical factory, built to test a recipe at a larger scale, is a _____. Output per unit of input is called _____. A plant with few workers and many machines is _____. Making a product in separate lots, one after another, is _____; making it without stopping, with materials always flowing in and out, is _____.

2 Label the diagram [2]

The graph shows how sales and cash flow change over a product's life. Write the stage that belongs in place of 1 to 4. Each carries 0.5 mark.



1. _____ 2. _____

3. _____ 4. _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Which of these is tertiary production? [1]

a. quarrying limestone
b. making cement in a kiln
c. a dealer carrying and selling cement
d. growing rice

ii. A chlor-alkali plant electrolyzes brine to make: [1]

a. sodium carbonate and carbon dioxide
b. chlorine, sodium hydroxide and hydrogen
c. hydrochloric acid and oxygen
d. sodium metal and chlorine

iii. Which of these is a fixed factor of production for a cement plant? [1]

a. the limestone it quarries
b. the coal it burns
c. the kiln
d. the electricity it uses

iv. Which of these is most likely to be made by batch processing? [1]

a. sulphuric acid
b. cement clinker
c. a cough syrup
d. petrol in a refinery

v. Which greenhouse gas does a cement plant give out from the limestone itself, as well as from its fuel? [1]

a. carbon dioxide
b. methane
c. nitrous oxide
d. sulphur dioxide

4 Short answers [9]

Write short answers to the following questions.

a. How does applied chemistry differ from pure chemistry? Give an example. [2]

b. Why does a company screen its ideas before it develops a product? [2]

c. Write two safety measures in a chemical plant, and say why regular inspection matters even in an automated plant. [2]

d. Name three ways in which a chemical industry harms the environment, and write one way to prevent each. **[3]**

5 Long answer **[4]**

Write a long answer to the following question.

What does designing a chemical plant mean, and who does it? Explain any three things the design must cover.

6 Numerical problems **[8]**

Solve the following problems. Show your working. Take N = 14, H = 1, C = 12, O = 16. Cash conversion cycle = days the stock is held + days to collect payment − days to pay suppliers.

a. A soap factory makes 4,800 bars a day with 40 workers. After a new mixing machine is installed, it makes 6,300 bars a day with 42 workers. i. Find the labor productivity before and after, and the percentage rise. ii. The factory holds its stock for 35 days, its customers pay in 20 days, and its suppliers allow 30 days. Find its cash conversion cycle, and the new cycle if it cuts its stock to 20 days. **[4]**

Answer:

b. A fertilizer plant is designed to make 600 tonnes of urea a day by $2\,NH_3 + CO_2 \rightarrow (NH_2)_2CO + H_2O$. Ignoring losses, find i. the mass of ammonia and ii. the mass of carbon dioxide it must take in each day, and iii. the mass of hydrogen needed to make that ammonia by $N_2 + 3\,H_2 \rightarrow 2\,NH_3$. **[4]**

Answer: _____

7 Think **[3]**

A paint company sells all its paint at a profit, yet one month it cannot pay its workers' wages. Explain how this can happen, and suggest two ways it could avoid it.

8 Activity: Industries at home (not marked)

Pick four things made in a factory from your home or a shop nearby (for example a bag of cement, a bottle of syrup, a bar of soap, a packet of noodles). Read the label, or ask, to find out where each was made.

Product	Where it was made	Main raw materials	Batch or continuous?

Which of your products could Nepal make from its own raw materials?