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PROCESS COSTING

(*INCLUDING* JOINT PRODUCTS AND BY-PRODUCTS)

"Process costing is used to ascertain the cost of each stage of manufacture where material is passed through various operations to obtain a final product to result, with by-products in many cases at different stages"

—Lunt and Ripley

MEANING OF PROCESS COSTING

Process costing is a method of costing applied to industries where the material has to pass through two or more processes for being converted into a finished product. Each process is treated as a cost centre. The cost of each process is accumulated and per unit cost is determined. For this purpose the following formula is applied :

$$\text{Cost per unit of each process} = \frac{\text{Cost of Output in the process}}{\text{Normal number of units in the process}}$$

In this method, the output of the first process works as the raw material of the second process and the output of the second process works as the raw material of third process and so on. In this manner, the raw material passes through various processes till it reaches the last process from where the entire process is completed and the product is made ready for sale.

This method is used in the manufacture of chemical products, soap, vegetable oil, paints, varnishes, etc., where the production is continuous and the product has to pass from one process to the other until completion.

CHARACTERISTICS OF PROCESS COSTING

The characteristics of Process Costing are as follows :

1. The production is continuous and the end product is the result of a sequence of processes. Each plant is *divided into separate process centres* and each process-centre processes a single product.
2. The *product is homogeneous,* and the units produced are identical and standardised. The units of any one process are indistinguishable from each other, although the units of one process may differ from the units of the other process. The units of 'A' process may differ from those of 'B' process, but the units of 'A' process will be similar to each other.
3. The sequence of operations for *processing* the product is *specific* and predetermined.
4. The *finished product of one process works as raw material for the next* or the succeeding process until completion.
5. To complete the production work, the *sequence of process is clearly defined* and activities of the process are also clearly identified.
6. Production is done on *large scale.*

7. The cost per unit of production is the average cost which is determined by dividing the total cost of production by total units of production.
8. In each process, there is a *certain quantity of loss* which cannot be eliminated. This loss is called as normal loss. This loss is due to the nature of raw material, for *e.g.*, loss in weight, vaporisation, chemical reaction, etc. This loss is borne by good units.
9. It is also possible to obtain *joint product or by-product* from the use of raw material or production technology.
10. Chances of *abnormal loss or abnormal gain may* also be there which are dealt separately in process costing.
11. *Inter-process profit are* also kept in consideration when output is transferred to next process at market price.
12. The *concept of equivalent production* is also recognised in process accounts, *i.e.*, those units which are at the stage of work-in-progress are made equivalent to completed units.

Industries where Applied or Uses of Process Costing

This costing method is applied to the following industries :

A. *Manufacturing Industries.* Iron and steel, cement, paper, rubber, ceramics, automobile plants, ice, paints industries, etc.

B. *Chemical Industries*. Chemicals, perfumery, soap, oil, medicines, etc.

C. *Mining*. Mineral oil, coal, sulphur, gold, iron, zinc, gas, etc.

D. *Public Utility Works*. Electricity generation and distribution, water supply, gas supply, etc.

DISTINCTION BETWEEN JOB COSTING AND PROCESS COSTING

Job costing includes batch and contract costing. The distinction between job and process costings is as under :

	Job Costing	*Process Costing*
1.	Unit is one and specific and work is done by specific order.	Production is divided into several units and the units are uniform. Production is continuous.
2.	One job is not related to or dependent on each other.	The succeeding process is dependent on the preceding one.
3.	The costs are collected against job order number separately.	The unit cost is computed by dividing total cost by total output, and it is an average cost.
4.	The cost of job can be ascertained only on the completion of the job.	The process cost is ascertained at the end of cost period, for each process separately.
5.	The cost of a job is not transferred to the other.	The cost of a process is transferred to the next process.
6.	There may or may not be work-in-progress.	Due to continued production work-in-progress is a regular feature.
7.	Cost control is difficult.	Cost control is easy due to uniform production.

GENERAL PRINCIPLES OF PROCESS COSTING

The general principles are as follows :

1. Materials, wages and overheads are collected according to processes or operations in a period.

2. The record of each process is so maintained that the output, waste and scrap of each may be correctly ascertained.

3. The total cost of each process is divided by the units manufactured in that process, and thus the cost of each unit of that process is computed.

4. The work-in-process at the end is calculated in terms of equivalent units for costing.

PROBLEMS OF PROCESS COSTING

The main object of process costing is to determine the per unit cost of production each process individually and collectively. In order to have information of it, consideration has to be paid on wastage of material, joint and by-product and profit in each process.

(1) *Wastage of Material.* Where a material passes through various processes, then there is some amount of wastage due to chemical reaction, vaporisation, wear and tear, etc. This wastages of normal or abnormal nature have their impact on cost of the product. The solution to it can be found by process costing.

(2) *By-Products and Joint Products.* There are certain types of product, the production of which leads to attainment of some secondary products or products of same level automatically which are termed as joint product or by-product. The expenses incurred jointly on joint products have to be distributed on each joint product. This leads to ascertainment of cost of individual product through process account.

(3) *Margin of Profit.* Whether there is a profit or loss on product manufactured, can be obtained only after the product passes through all the processes and can be made comparable by the market price. But more important than it is to determine whether the processes are profitable or not. The output of one process may be transferred to next process at market value or by adding a certain percentage of profit to cost. The effect of this policy results in inclusion of profit in value of closing stock of the respective process. Thus, except the first process, the closing stock of all the remaining products have an element of profit included in the value of stock. This profit is imaginary but not real, because the goods are actually not sold. Hence, what is the amount of profit included in the closing stock and what is the actual cost, becomes a matter of study in process costing.

PREPARATION OF PROCESS COST ACCOUNTS

Items of Debit Side of Process Account

For each process a separate account is opened. All the expenses are debited to the process. Generally, the following items are debited to process accounts :

Materials. The basic material related to production is shown in the first process. This material is shown at its cost. In process accounts, the quantity as well as the value both are shown. In the same way some material may be used in other process. Hence, whatever material is used in concerned process, it should be debited to the respective process.

Labour. In each process, work is performed by separate workers. The wages paid to these workers should be debited to the process to which the workers are functioning upon. It may be possible that a worker or few workers may be working on more than one process. In this case, the wages paid to the worker or workers will have to be distributed to the processes on the basis of the time spent by the worker/workers on each process. In this process, process card prepared on the basis of job card are very helpful.

Direct Expenses. All those expenses which are exclusively incurred for a respective process are debited to the process account as direct expenses.

Indirect Expenses. All those expenses which are jointly concerned with various processes are called indirect expenses. These expenses are distributed to individual process on some suitable basis.

Abnormal Gain. If in any process, the actual production is more than the normal production, then the excessive production over normal production is termed as abnormal gain. The cost and

...ity of abnormal gain is debited to the concerned process account where it has occurred. (A ...ail discussion is done ahead.)

Opening Balance. If there is any opening stock of any process in the current year, its ...ity and value both are debited to the concerned process.

...ns of Credit Side of Process Account

Following items are shown in the credit side of the process accounts :

Process Loss. In order to make a finished product, the raw material has to pass through ...ous processes. It is possible that in process during production some material may be lost or ...sed due to inherent nature of the process. To say, that the output received is less than the ...s introduced in the beginning. This is also unavoidable however, efforts can be made to ...ce it. This loss can be of two types : (i) Normal loss, (ii) Abnormal loss.

Detailed description of these losses has been given ahead. However, both these losses are ...wn in the credit side of process accounts.

By-Product. If in any process a by-product is obtained automatically or incidentally, then ...concerned process account is credited by the value of by-product.

Finished Product. The output received after the completion of the individual process is the ...ished product of the concerned process account, but for the next process it is in the form of ...r material. On these materials after the last process is completed then only the finished ...oduct is achieved. In each process (leaving the last process) the quantity produced is shown ...different ways :

(i) *When entire units produced in a process are sent to next process.* If the entire output is ...nsferred to the next process then it is credited with the entire quantity and cost of production ...the process where it was produced.

(ii) *When a part of output is transferred to next process and a part is retained.* When some ...rt of the output is retained and sent to warehouse whereas the remaining part is sent to next ...ocess, then cost of both the transfers and their quantity will be credited to the process account ...here it was produced.

...rocess Accounts without Process Loss

***...lustration* 1**

A product passes through three processes, Process A, Process B and Process C, to completion. The ...oduction of the commodity was 1,000 tonne. The costs were as follows :

	Process A	*Process B*	*Process C*
	₹	₹	₹
...laterial	3,000	1,500	1,500
...abour	1,500	3,000	5,250
...anufacturing Expenses	1,500	4,500	5,250

Assume that there was no work-in-progress either at the beginning or at the end. Show the process ...sts for each process and the total cost of the finished product.

...olution

Process-A Account
(Production : 1,000 tonne)

Particulars	*Cost per Tonne*	*Total Cost*	*Particulars*	*Cost per Tonne*	*Total Cost*
	₹	₹		₹	₹
To Materials	3.00	3,000	By Process B A/c (Output transferred)	6.00	6,000
To Labour	1.50	1,500			
To Manufacturing Expenses	1.50	1,500			
	6.00	6,000		6.00	6,000

Process-B Account

Particulars	Cost per Tonne	Total Cost	Particulars	Cost per Tonne	Total Cost
	₹	₹		₹	₹
To Process A A/c	6.00	6,000	By Process C A/c	15.00	15,000
To Materials	1.50	1,500	(Output transferred)		
To Labour	3.00	3,000			
To Manufacturing Expenses	4.50	4,500			
	15.00	15,000		15.00	15,000

Process-C Account

Particulars	Cost per Tonne	Total Cost	Particulars	Cost per Tonne	Total Cost
	₹	₹		₹	₹
To Process B A/c	15.00	15,000	By Finished Stock A/c	27.00	27,000
To Materials	1.50	1,500	(Output transferred)		
To Labour	5.25	5,250			
To Manufacturing Expenses	5.25	5,250			
	27.00	27,000		27.00	27,000

Illustration 2

An article has to undergo three different processes before it becomes ready for sale. From the following information find out cost of production per unit of that article showing cost per item, if 200 units of article were manufactured upto 31st December, 2010 :

Expenses of 200 units of article are :

	Manufacturing Process	Refining Process	Finishing Process
	₹	₹	₹
Material	2,000	1,000	750
Labour	1,500	2,500	1,000
Direct Expenses	400	200	300

The indirect expenses for the period amount to ₹ 6,000 in the factory out of which ₹ 2,000 is attributable to this product. There was no stock at the end in any process. The indirect expenses should be allocated to each process on the basis of labour.

Solution

Manufacturing Process Account
(Output : 200 units of article)

Particulars	Cost per unit	Amount	Particulars	Cost per unit	Amount
	₹	₹		₹	₹
To Material	10.00	2,000	By Refining Process A/c	22.50	4,500
To Labour	7.50	1,500			
To Direct Expenses	2.00	400			
To Indirect Expenses	3.00	600			
	22.50	4,500		22.50	4,500

Refining Process Account
(Output : 200 units of article)

Particulars	Cost per unit	Amount	Particulars	Cost per unit	Amount
	₹	₹		₹	₹
To Maunfacturing Process Account	22.50	4,500	By Finishing Process A/c	46.00	9,200
To Material	5.00	1,000			
To Labour	12.50	2,500			
To Direct Expenses	1.00	200			
To Indirect Expenses	5.00	1,000			
	46.00	9,200		46.00	9,200

Finishing Process Account
(Output : 200 units of article)

Particulars	Cost per unit	Amount	Particulars	Cost per unit	Amount
	₹	₹		₹	₹
To Refining Process A/c	46.00	9,200	By Finished Stock A/c	58.25	11,650
To Material	3.75	750			
To Labour	5.00	1,000			
To Direct Expenses	1.50	300			
To Indirect Expenses	2.00	400			
	58.25	11,650		58.25	11,650

Note : The Indirect expenses of ₹ 2,000 have been allocated to the three processes in the proportion of direct labour 3 : 5 : 2 (₹ 1,500 : 2,500 : 1,000).

Illustration 3

A particular brand of phenyle passes through three important processes. In a particular week 500 bottles were produced. The cost books show the following informations :

	Process I	Process II	Process III
	₹	₹	₹
Materials	4,500	2,000	1,500
Labour	3,000	2,500	2,500
Direct Expenses	1,000	500	1,000
Cost of Bottles	—	2,000	—
Cost of Corks	—	—	250

in proportion of labour

The indirect expenses for the period were ₹ 1,600. The by-products were sold for ₹ 350 (Process II) and the residue was sold for ₹ 250 (Process III). Prepare Process Accounts.

Solution

Process-I Account
(Output 500 Bottles)

Particulars	₹	Particulars	₹
Materials	4,500	By Process II @ ₹ 18.20 per bottle	9,100
Labour	3,000		
Direct Expenses	1,000		
Indirect Expenses $\left(\frac{1,600 \times 6}{16}\right)$	600		
	9,100		9,100

Process-II Account

(Output 500 Bottles)

Particulars	₹	Particulars	₹
To Process I	9,100	By Sale of by-products	350
To Materials	2,000	By Process III @ ₹ 32.50 per bottle	16,250
To Labour	2,500		
To Direct Expenses	500		
To Indirect Expenses $\left(\frac{1,600 \times 5}{16}\right)$	500		
To Cost of Bottles	2,000		
	16,600		16,600

Process-III Account

(Output 500 Bottles)

Particulars	₹	Particulars	₹
To Process II	16,250	By Sale of residue	250
To Materials	1,500	By Finished Stock @ ₹ 43.50 per bottle	21,750
To Labour	2,500		
To Direct Expenses	1,000		
To Indirect Expenses $\left(1,600 \times \frac{5}{16}\right)$	500		
To Cost of Corks	250		
	22,000		22,000

WASTAGE AND ITS TREATMENT

The term 'wastage' in the wider usage includes waste, scrap and spoilage which go to reduce the quantity content of the product. The wastage may be of two types : (I) Normal wastage and (II) Abnormal wastage.

TREATMENT OF NORMAL WASTAGE

Normal wastage is one which is incidental to production due to unavoidable reasons and it also results due to inherent nature of the particular process and is uncontrollable in shorter period of time and is within standard limit. This normal wastage generally occurs due to evaporation, shrinkage, breakages, spoilage for various reasons. While fixing the standard, a study of the past performances and the wastage in the immediate previous years is necessary.

Treatment in Accounts. The normal wastage reduces the quantity of output. As this loss is borne by the production, the cost per unit of output goes up to that extent. If there is any saleable scrap, it is sold and the realised amount is credited to the process account. If the wastage does not fetch any value, the quantity of wastage is recorded in the quantity column and nil figure is shown in the amount column. It is to say, that the normal losses are ultimately borne by the good units of production.

Normal Loss having No Realisable Value

Illustration 4

A product is obtained through three processes, *viz.*, P, Q, R. The details are as below :

Particulars	P	Q	R
Raw Materials Introduced Units	2,000	—	—
Purchased Cost of Raw Materials per Unit (₹)	25	—	—
Other Materials (Direct) (₹)	5,000	3,000	2,000
Direct Wages (₹)	12,000	12,000	15,000
Direct Expenses (₹)	1,600	1,792	2,092
Normal Loss (% of input)	8%	5%	2%

Indirect Expenses of ₹ 12,000 shared in the ratio of 5 : 4 : 3.

Prepare process accounts and determine the cost per unit in each process.

Process-P Account

Particulars	Units	Amount	Particulars	Units	Amount
		₹			₹
To Raw Materials @ ₹ 25	2,000	50,000	By Normal Loss (8% of 2,000 units)	160	—
To Materials		5,000			
To Direct Wages		12,000	By Process Q A/c @ ₹ 40 per unit	1,840	73,600
To Direct Expenses		1,600			
To Indirect Expenses ($\frac{5}{12} \times 12,000$)		5,000			
	2,000	73,600		2,000	73,600

Process-Q Account

Particulars	Units	Amount	Particulars	Units	Amount
		₹			₹
To Process P A/c	1,840	73,600	By Normal Loss (5% of 1,840 units)	92	—
To Materials		3,000			
To Direct Wages		12,000	By Process R A/c @ ₹ 54 per unit	1,748	94,392
To Direct Expenses		1,792			
To Indirect Expenses ($\frac{4}{12} \times 12,000$)		4,000			
	1,840	94,392		1,840	94,392

Process-R Account

Particulars	Units	Amount	Particulars	Units	Amount
		₹			₹
To Process Q A/c	1,748	94,392	By Normal Loss (2% of 1,748 units)	35	
To Materials		2,000			
To Direct Wages		15,000	By Finished Stock A/c @ ₹ 68 per unit	1,713	1,16,484
To Direct Expenses		2,092			
To Indirect Expenses ($\frac{3}{12} \times 12,000$)		3,000			
	1,748	1,16,484		1,748	1,16,484

Normal Loss having Realisable Value of Scrap

Illustration 5

The cost of production of 200 units is ₹ 2,800 are : Materials ₹ 1,500; Labour ₹ 1,000 and expenses ₹ 300. The normal wastage comprising scrap is 10% and it is sold @ ₹ 5 per unit. Find out the cost of remaining units and show the process account.

Solution

Process Account

Particulars	Units	Amount	Particulars	Units	Amount
		₹			₹
To Materials	200	1,500	By Normal Wastage @ ₹ 5 per unit	20	100
To Labour		1,000			
To Expenses		300	By Cost of Production @ ₹ 15 per unit	180	2,700
				200	2,800
	200	2,800			

Normal Loss : A Part having Realisable Value and a Part having no Realisable Va and Entire Output is transferred to Next Process

Illustration 6

The product of a manufacturing concern passes through two processes A and B and then to Finis Stock. It is ascertained on the basis of past experience that in each process 2% of the total weight pr is lost and 10% is scrap which from process A and B realises ₹ 100 per kg and ₹ 150 per kg respectiv The process figures are as follows :

	Process A	*Proces*
	₹	
Materials Consumed in kg	1,000	
Cost of Materials per kg	120	
Wages	17,500	2
Manufacturing Expenses	5,380	10,0
		5,3

Prepare Process Accounts, showing the cost of the output of each process and the cost per kg.

Solution

Process-A Account

Particulars	*kg*	₹	*Particulars*	*kg*	
To Materials @ ₹ 120 per kg	1,000	1,20,000	By Loss in Weight		
To Wages		17,500	(2% of 1,000 kg)	20	
To Manufacturing Expenses		5,380	By Sale of Scrap		
			(10% of 1,000 kg)	100	10,0
			By Process B A/c		
			@ ₹ 151 per kg	880	1,32,8
	1,000	1,42,880		1,000	1,42,8

Process-B Account

Particulars	*kg*	₹	*Particulars*	*kg*	
To Process A A/c (Transfer)	880	1,32,880	By Loss in weight		
To Materials Consumed	70	14,000	(2% of 950 kg)	19	
To Wages		10,000	By Sale of Scrap		
To Manufacturing Expenses		5,342	(10% of 950 kg)	95	14,25
			By Finished Stock A/c		
			@ ₹ 177 per kg	836	1,47,97
	950	1,62,222		950	1,62,22

Illustration 7

At the end of process A carried on in a factory during the week ending 30th June, 2010, the numbe of units produced was 850 excluding 50 units damaged at the end of the process. The damaged units realise ₹ 15 per unit as scrap. A normal wastage of 10% occurs during the process the wastage realised ₹ 4 pe unit. A unit of raw material Cost ₹ 10. The other expenses for the week were as follows :

	₹
Wages	6,000
Power	2,000
General Overhead	1,000

40% of the output is sold so as to show a profit of $16\frac{2}{3}$ % on the selling price, the rest of the output is transferred to Process B. Prepare Process 'A' A/c.

Output 850 units
Damaged units 50 units
Total output 900 units

Wastage 10% = $\frac{900 \times 10}{90}$ 100 units

Input 1,000 units

Process-A Account

Particulars	Units	₹	Particulars	Units	₹
Raw Materials @ ₹ 10 per unit	1,000	10,000	By Wastage (10% of 1,000 units)	100	400
Wages		6,000	By Sale of scrap @ ₹ 15 per unit	50	750
Power		2,000	By Sales (40%)	340	8,568
General Overhead		1,000	By Process B A/c (60%)	510	10,710
P & L (Profit on Sales)		1,428			
	1,000	20,428		1,000	20,428

Selling Price of By-products and to Prepare By-products A/c

Illustration 8

The product of a company passes through two processes A and B. The product of the first process, after wastage and by-product, becomes the raw materials for the second process. All by-products are sold direct from the factory. The following information is obtained from the factory records :

	Process A	Process B
Raw Materials	2,000 ton at ₹ 40 per ton	—
Wages	₹ 50,000	₹ 40,000
Factory Overhead	60% of wages	75% of wages
Wastages	20 ton	40 ton
Sales of by-products	80 ton at cost plus 25%	110 ton at cost plus 20%

Prepare accounts for process A and B product accounts and show the cost per ton at each process and profit on the sale of the by-products.

Solution

Process-A Account

Particulars	Ton	₹	Particulars	Ton	₹
To Raw Materials	2,000	80,000	By Wastage	20	—
To Wages		50,000	By Process A's By-product A/c	80	6,464
To Factory Overhead (60% of wages)		30,000	By Process B A/c @ ₹ 80.81 per ton	1,900	1,53,536
	2,000	1,60,000		2,000	1,60,000

Process-A's By-Product Account

Particulars	Ton	₹	Particulars	Ton	₹
To Process A A/c	80	6,464	By Sales	80	8,080
To P & L A/c (25% of ₹ 6,464)		1,616			
	80	8,080		80	8,080

Process-B Account

Particulars	Ton	₹	Particulars	Ton	₹
To Process A A/c	1,900	1,53,536	By Wastage	40	
To Wages		40,000	By Process B's By-product A/c	110	
To Factory Overhead (75% of wages)		30,000	By Finished goods @ ₹ 120.18 per ton	1,750	
	1,900	2,23,536		1,900	

Process-B's By-Product Account

Particulars	Ton	₹	Particulars	Ton	₹
To Process B A/c	110	13,220	By Sales	110	
To P & L a/c (20% of ₹ 13,220)		2,644			
	110	15,864		110	

Working Note :

1. Cost of By-Product A $= \frac{1,60,000}{1,980} \times 80 =$ ₹ 6,464
2. Cost of By-Product B $= \frac{2,23,536}{1,860} \times 110 =$ ₹ 13,220

Normal Loss : Certain part completely Unrecoverable and partly Recoverable and part of Output transferred to Next Process and a part transferred to Warehouse

Illustration 9

A manufacturer produces certain goods through three processes. Profit is not included in the proces transfer but goods in godown are sold at cost *plus* 25% profit. In each process 5% of weight put in is los and 20% is scrapped which from Process A and B realises ₹ 20 per ton and from Process C ₹ 5 per ton. Th details of production of three processes are given below :

	Process A		Process B		Process C	
	Ton	₹	Ton	₹	Ton	₹
Materials	1,000	10,000	550	15,000	200	2,000
Wages	—	4,000	—	2,000	—	6,000
Expenses	—	6,000	—	3,000	—	2,000
Passed to next Process		60%		80%		–
Carried to godown		40%		20%		100%

Prepare Process Accounts and Godown Account.

Solution

Process 'A' Account

Particulars	Ton	₹	Particulars	Ton	₹
To Materials	1,000	10,000	By Loss in Weight (5% of 1,000 ton)	50	–
To Wages		4,000	By Sale of Scrap (20% of 1,000 ton @ ₹ 20 per ton)	200	4,000
To Expenses		6,000	By Godown A/c (40%)	300	6,400
			By Process B A/c (60%) (Cost per ton ₹ 21.33)	450	9,600
	1,000	20,000		1,000	20,000

Total Goods Produced = 1,000 – 50 – 200 = 750 Ton
Total Cost in Process A = 20,000 – 4,000 = ₹ 16,000

$$\text{Cost per ton} = \frac{16,000}{750} = ₹\ 21.33$$

$$\text{Output transferred to Godown} = \frac{750 \times 40}{100} = 300 \text{ Ton}$$

Process 'B' Account

Particulars	Ton	₹	Particulars	Ton	₹
To Transfer from Process A	450	9,600	By Loss in Weight (5% of 1,000 Ton)	50	—
To Materials	550	15,000	By Sale of Scrap (20% of 1,000 ton @ ₹ 20 per Ton)	200	4,000
To Wages	—	2,000	By Godown A/c (20%)	150	5,120
To Expenses	—	3,000	By Process C (Cost per ton ₹ 34.13) (80%)	600	20,480
	1,000	29,600		1,000	29,600

Total Goods Produced = 1,000 – 250 = 750 Ton
Total Cost in Process B = 29,600 – 4,000 = ₹ 25,600

$$\text{Cost per ton} = \frac{25,600}{750} = ₹\ 34.13$$

$$\text{Output transferred to Godown} = \frac{750 \times 20}{100} = 150 \text{ Ton}$$

Process 'C' Account

Particulars	Ton	₹	Particulars	Ton	₹
To Transfer from Process B	600	20,480	By Loss in Weight (5% of 800 Ton)	40	—
To Materials	200	2,000	By Sale of Scrap (20% of 800 Ton @ ₹ 5 per Ton)	160	800
To Wages	—	6,000	By Godown A/c (Cost per ton ₹ 49.47)	600	29,680
To Expenses	—	2,000		800	30,480
	800	30,480			

Godown Account

Particulars	Ton	₹	Particulars	Ton	₹
To Process A A/c	300	6,400	By Sales A (Cost + 25%)	300	8,000
To Process B A/c	150	5,120	By Sales B (Cost + 25%)	150	6,400
To Process C A/c	600	29,680	By Sales C (Cost + 25%)	600	37,100
To Profit	—	10,300			
	1,050	51,500		1,050	51,500

***Illustration* 10**

On the basis of the following information prepare Process Accounts and a Statement of Profit :

	Process I	*Process II*	*Process III*
Raw Material used	1,000 Ton	—	—
Cost per ton	₹ 200	—	—
Manufacturing Wages & Expenses	₹ 87,500	₹ 34,500	₹ 10,710
Weight lost	5%	10%	20%
Scrap (Sales price ₹ 50 per ton)	50 ton	30 ton	51 ton
Sale price of output per ton	₹ 350	₹ 500	₹ 800

Management expenses were ₹ 17,500 and selling expenses ₹ 10,000. Two-third of the output of process I and one-half of the output of process II are transferred to next process and the balance are sold. The entire output of process III is sold.

Solution

Process-I Account

Particulars	*Ton*	₹	*Particulars*	*Ton*	₹
To Raw material used (1,000 × ₹ 200)	1,000	2,00,000	By Loss of Weight (5% of 1,000 Ton)	50	
To Manufacturing Wages & Exp.	—	87,500	By Sale of Scrap (50 Ton × ₹ 50)	50	2,500
			By Transfer to Warehouse (1/3)	300	95,000
			By Process II A/c (2/3) @ ₹ 316.67 per ton	600	1,90,000
	1,000	2,87,500		1,000	2,87,500

Process-II Account

Particulars	*Ton*	₹	*Particulars*	*Ton*	₹
To Process I A/c	600	1,90,000	By Loss of Weight (10% of 600 Ton)	60	
To Manufacturing Wages & Exp.	—	34,500	By Sale of Scrap (30 Ton × ₹ 50)	30	1,500
			By Transfer to Warehouse (1/2)	255	1,11,500
			By Process III A/c (1/2) @ ₹ 437.25 per ton	255	1,11,500
	600	2,24,500		600	2,24,500

Process-III Account

Particulars	*Ton*	₹	*Particulars*	*Ton*	₹
To Process II A/c	255	1,11,500	By Loss of Weight (20% of 255 Ton)	51	
To Manufacturing Wages & Exp.	—	10,710	By Sale of Scrap (51 Ton × ₹ 50)	51	2,550
			By Transfer to Warehouse @ ₹ 782.09 per ton	153	1,19,660
	255	1,22,210		255	1,22,210

Statement of Profit

	₹	₹
Sales Price of Output :		
Process I = 300 Ton × ₹ 350	1,05,000	
Process II = 255 Ton × ₹ 500	1,27,500	
Process III = 153 Ton × ₹ 800	1,22,400	3,54,900
Less : Cost of Production in each Process :		
Process I = 300 Ton	95,000	
Process II = 255 Ton	1,11,500	
Process III = 153 Ton	1,19,660	3,26,160
	Gross Profit	28,740
Less : Management Expenses	17,500	
Selling Expenses	10,000	27,500
	Net Profit	1,240

TREATMENT OF ABNORMAL WASTAGE

Abnormal wastage is one which is in excess of the normal wastage, arising due to abnormal causes or due to unforeseen factors. A cause which is not common to production, or the occurrence which is not to be generally experienced in the ordinary course of production, is an abnormal cause. The defective materials, sickness of machines, managerial carelessness, natural calamity, fire, machine-breakdown etc., are the examples of the causes of abnormal wastage.

Treatment in Accounts : The loss on account of abnormal wastage is not borne by production, and by Profit and Loss Account. 'Abnormal Wastage A/c' is debited and Process A/c is credited with the cost of abnormal wastage. If this wastage is sold in the market, Abnormal Wastage A/c is credited with the realised price and the balance is transferred to the P. & L. A/c.

The cost of abnormal loss can be calculated by using the following formula:

$$\text{Cost of Abnormal Loss} = \frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Abnormal Loss in Units}$$

Illustration 11

The cost records show the following expenses of manufacturing 200 units of Product X in a process : Materials ₹ 4,000, Labour ₹ 1,500, Overheads ₹ 500.

The standard normal wastage in production is 10% and it can be sold in the market at ₹ 15 per unit. The actual production is 150 units due to gross carelessness of the workers. Show the treatment of wastage in the Process Account and prepare Abnormal Wastage A/c.

Solution

Process Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Materials	200	4,000	By Normal Wastage A/c (10% of 200 units)	20	300
To Direct Labour		1,500	By Abnormal Wastage A/c	30	950
To Other Expenses		500	By Cost of Production @ ₹ 31.67 per unit	150	4,750
	200	6,000		200	6,000

∵ The cost of (200 – 20) 180 units = (6,000 – 300) ₹ 5,700

∴ $\text{Cost of Abnormal Wastage} = \frac{5,700 \times 30}{180} = ₹\ 950$

∴ $\text{Cost of Production} = \frac{5,700 \times 150}{180} = ₹\ 4,750$

If 30 units of abnormal wastage can be sold @ ₹ 15 per unit, the net loss of ₹ 950 – 450 = ₹ 500 only will be transferred to P. & L. A/c.

Abnormal Wastage Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process A/c	30	950	By Cash A/c (Sale of Scrap @ ₹ 15 each)	30	450
			By Costing P. & L. A/c		500
	30	950		30	950

Normal Wastage Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process Account	20	300	By Cash A/c (Sales)	20	300
	20	300		20	300

Illustration 12

The Imperial Manufacturing Company's product passes through two distinct processes A and B, then to Finished Stock. It is known from past experience that wastage occurring in the processes is under :

In process A 5% of the units entering the process.

In process B 10% of the units entering the process.

The Scrap Value of the wastage in Process A is ₹ 8 per 100 units and in Process B is ₹ 10 per units.

The process figures are :

	Process A	*Process*
	₹	
Materials Consumed	3,000	
Wages	3,500	1,50
Manufacturing Expenses	1,000	2,00
		1,00

5,000 units were brought into process A costing ₹ 2,500.

The outputs were :

Process A	4,700 Units
Process B	4,150 Units

Prepare Process Cost Accounts showing the cost of the output. Also show Abnormal Wast Accounts.

Solution

Process-A Account

Particulars	*Units*	₹	*Particulars*	*Units*	
To Units introduced	5,000	2,500	By Normal Wastage A/c		
To Materials		3,000	(5% of 5,000 units @ ₹ 8		
To Wages		3,500	per 100 units)	250	2
To Manufacturing Expenses		1,000	By Abnormal Wastage A/c	50	10
			By Process B A/c		
			@ ₹ 2.10 per unit	4,700	9,87
	5,000	10,000		5,000	10,00

*The Value of abnormal wastage in Process A is calculated as follows:

Normal output is 5,000 – 250 = 4,750 units

Normal cost is ₹ 10,000 – 20 = ₹ 9,980

$$\text{Cost of Abnormal Wastage} = \frac{9,980}{4,750} \times 50 = ₹\ 105$$

As the abnormal wastage is sold for ₹ 4, therefore, the amount of loss to be transferred to Profit Loss Account shall be ₹ 105 – 4 = ₹ 101.

Abnormal Wastage Account (Process-A)

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process A A/c	50	105	By Cash A/c (Sale of Scrap		
			@ ₹ 8 per 100 units)	50	4
			By P. & L. A/c—Loss		
			transferred		101
	50	105		50	105

Process-B Account

Particulars	Units	₹	Particulars	Units	₹
ocess A A/c	4,700	9,875	By Normal Wastage A/c		
terials		1,500	(10% of 4,700 units @ ₹ 10		
ges		2,000	per 100 units)	470	47
anufacturing Expenses		1,000	By Abnormal Wastage A/c	80	271
			By Finished Stock A/c		
			@ ₹ 3.39 per unit	4,150	14,057
	4,700	14,375		4,700	14,375

The value of abnormal wastage in Process B is calculated as follows:

The normal cost of 4,230 units is ₹ 14,328

Cost of Abnormal Wastage = $\frac{14,328}{4,230} \times 80 =$ ₹ 271

The abnormal wastage will realise ₹ 8, therefore, the loss transferable shall be ₹ 271 – 8 = ₹ 263.

Abnormal Wastage Account (Process-B)

Particulars	Units	₹	Particulars	Units	₹
Process B A/c	80	271	By Cash A/c (Sale of Scrap @ ₹ 10 per 100 units)	80	8
			By P. & L. A/c—Loss transferred		263
	80	271		80	271

bnormal Effectiveness or Abnormal Gain

The normal wastage is an estimate only. The actual wastage may be more or less than the ormal wastage. If the actual wastage is more than the normal, it is known as the abnormal astage, but if the actual wastage is less than the normal wastage, it is known as the 'Abnormal ffectiveness' or the 'Abnormal Gain'.

The abnormal gain is also calculated in the same way as the abnormal wastage is calculated. The only difference is that the abnormal effectiveness is shown on the debit side of the process account, while the abnormal wastage is shown on the credit side of this account.

***Illustration* 13**

The cost records show the following costs of producing 200 units of a product in a process :

	₹
Materials	4,000
Direct Labour	1,500
Other Expenses	500

The normal wastage is 10% of the units and this wastage can be sold in the market at ₹ 15 per unit. The actual production was 190 units. Prepare process account, abnormal effectiveness account and normal wastage A/c.

Solution

Process Account

Particulars	*Units*	₹	*Particulars*	*Units*	
To Materials	200	4,000.00	By Normal Wastage (10% of		
To Direct Labour		1,500.00	200 units of ₹ 15 per unit)	20	300
To Other Expenses		500.00	By Cost of Output		
To Abnormal Effectiveness A/c	10	316.67*	@ ₹ 31.67 per unit	190	6,016
	210	6,316.67		210	6,316

* The cost of 200 units is ₹ 6,000. After deducting the value of normal wastage, the cost of 180 units remains ₹ 5,7
In this very proportion, the cost of 190 units will be ₹ 6,016.67, and the cost of 10 units will be ₹ 316.67,
follows :

$$\text{Cost of Abnormal Effectiveness} = \frac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Abnormal output}$$

$$= \frac{5,700}{180} \times 10 = ₹\ 316.67$$

Abnormal Effectiveness Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Normal Wastage A/c	10	150.00	By Process A/c	10	316.67
To Costing P & L A/c		166.66			
	10	316.66		10	316.67

Normal Wastage Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process A/c	20	300	By Cash A/c (Sale of Scrap)	10	150
			By Abnormal Wastage A/c (Transfer)	10	150
	20	300		20	300

Working Notes : The process account has been credited with ₹ 300 of the normal wastage 20 units. But these 20 units cannot be sold and cannot fetch ₹ 300, because the actual wastage is that of 10 units, and not that of 20 units. So, these 10 units can be sold for ₹ 150 only. Therefore, the process account has been extra credited with ₹ 300 – 150 = ₹ 150. So, the real gain of the abnormal effectiveness is ₹ 316.66 – 150 = ₹ 166.67.

As the process account has been extra credited with ₹ 150, the following entry will be passed :

Abnormal Effectiveness A/c Dr. 150
To Normal Wastage A/c 150

If there is abnormal wastage in one process but abnormal effectiveness in the other, only the net balance of the two should be carried to the Profit and Loss Account.

Illustration 14

Following details relate to process C which is the last process :

	Units	₹
Transfer from Process 'B'	4,000	9,000
Transfer from Process 'C' to Finished stock	3,240	
Direct Wages		2,000
Direct Materials		3,000

Factory overheads are 400% of direct materials. Normal wastage is 20% of units entered. Scrap value is ₹ 5 per unit. You are required to prepare :

(i) Process C Account, (ii) Normal Wastage Account, (iii) Abnormal Effectiveness Account

Process-C Account

Particulars	Units	₹	Particulars	Units	₹
To Process 'B' A/c	4,000	9,000	By Normal wastage A/c (20% of 4,000 units @ ₹ 5 per unit)	800	4,000
To Direct materials		3,000			
To Direct wages		2,000			
To Factory overheads		12,000	By Finished goods stock A/c @ ₹ 6.875 p.u.	3,240	22,275
To Abnormal Effectiveness A/c	40	275			
	4,040	26,275		4,040	26,275

Normal Units = 4,000 − 800 = 3,200

Units of A. E. = 3,240 − 3,200 = 40

Normal Expenditure = 26,000 − 4,000 = ₹ 22,000

Cost of Abnormal Effectiveness = $\frac{22,000 \times 40}{3,200}$ = ₹ 275

Normal Wastage Account

Particulars	Units	₹	Particulars	Units	₹
To Process C A/c	800	4,000	By Abnormal effectiveness A/c	40	200
			By Cash A/c (Sales)	760	3,800
	800	4,000		800	4,000

Abnormal Effectiveness Account

Particulars	Units	₹	Particulars	Units	₹
To Normal Wastage A/c	40	200	By Process C A/c	40	275
To Costing P & L A/c		75			
	40	275		40	275

Process Account with Abnormal Wastage and Abnormal Gain

***Illustration* 15**

The product of a manufacturing concern passes through two processes A and B and then to finished stock. It is ascertained that in each process 5% of the total weight is lost and 10% is scrap which from processes A and B realises ₹ 80 per tonne and ₹ 200 per tonne, respectively.

The following are the figures relating to both the processes :

	Process A	*Process B*
Materials (tonne)	1,000	70
Cost of materials (₹ per tonne)	125	200
Wages (₹)	28,000	10,000
Manufacturing expenses (₹)	8,000	5,250
Output (tonne)	830	780

Prepare Process Cost Accounts showing cost per tonne of each process. There was no stock in any process.

Solution

Process-A Account

Particulars	Tonne	₹	Particulars	Tonne	₹
To Materials	1,000	1,25,000	By Loss in Weight (5% of 1,000 tonne)	50	—
To Wages		28,000	By Normal Loss A/c (10% of 1,000 tonne @ ₹ 80 per tonne)	100	8,000
To Manufacturing Expenses		8,000	By Abnormal Wastage A/c*	20	3,600
			By Transfer to Process B A/c @ ₹ 180 per tonne	830	1,49,400
	1,000	1,61,000		1,000	1,61,000

* Value of abnormal effectiveness = $\frac{₹\ 1,61,000 - ₹\ 8,000}{1,000 - (50 + 100)} \times 20$ = ₹ 3,600

Process-B Account

Particulars	*Tonne*	₹	*Particulars*	*Tonne*	
To Transfer from Process A A/c	830	1,49,400	By Loss in Weight (5% of 900 tonne)	45	
To Materials	70	14,000	By Normal Loss A/c (10% of 900 tonne @ ₹ 200 per tonne)	90	18,000
To Wages		10,000	By Transfer to Finished Stock A/c @ ₹ 210 per tonne	780	1,63,800
To Manufacturing Exp.		5,250		915	1,81,800
To Abnormal Effectiveness A/c*	15	3,150			
	915	1,81,800			

*Value of abnormal effectiveness $= \frac{₹\ 1,78,650 - ₹\ 18,000}{900 - (45 + 90)} \times 15 = ₹\ 3,150$

***Illustration* 16**

The product of a company passes through three distinct processes to completion. They are known as A, B and C. From past experience it is ascertained that wastage is incurred in each process as under :

Process A 2%; Process B 5%; Process C 10%.

In each case the percentage of wastage is computed on the number of units entering the process concerned.

The wastage of each process possesses a scrap value. The wastage of process A and B is sold at ₹ 5 per 100 units and that of process C at ₹ 20 per 100 units.

The output of each process passes immediately to the next process and the finished units are passed from process C into stock.

The following information is obtained :

	Process A	*Process B*	*Process C*
	₹	₹	₹
Materials consumed	6,000	4,000	2,000
Direct labour	8,000	6,000	3,000
Manufacturing Exps.	1,000	1,000	1,500

20,000 units have been issued to process A at a cost of ₹ 10,000. The output of each process has been as under :

Process A 19,500; Process B 18,800; Process C 16,000.

There is no work-in-progress in any process.

Prepare Process Accounts and the calculations should be made to the nearest rupee.

Solution

Process-A Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Units Introduced	20,000	10,000	By Normal Wastage A/c (2% of 20,000 units)	400	20
To Materials		6,000	By Abnormal Wastage A/c	100	127
To Direct Labour		8,000	By Process B A/c @ ₹ 1.2745 per unit	19,500	24,853
To Manufacturing Expenses		1,000			
	20,000	25,000		20,000	25,000

Process-B Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process A A/c	19,500	24,853	By Normal Wastage A/c (5% of 19,500 units)	975	49
To Materials		4,000	By Process C A/c @ ₹ 1.93277 per unit	18,800	36,336
To Labour		6,000			
To Manufacturing Expenses		1,000			
To Abnormal Effectiveness A/c	275	532			
	19,775	36,385		19,775	36,385

Process-C Account

Particulars	Units	₹	Particulars	Units	₹
ess B A/c	18,800	36,336	By Normal Wastage A/c (10% of 18,800 units)	1,880	376
aterials		2,000	By Abnormal Wastage A/c	920	2,309
Direct Labour		3,000	By Finished Stock A/c @ ₹ 2.50944 per unit	16,000	40,151
fg. Expenses		1,500		18,800	42,836
	18,800	42,836			

Process A : Cost of abnormal wastage :

Units Issued	20,000	Cost ₹ 25,000
Less : Normal Wastage	400	Sold for ₹ 20
	∵ 19,600 units cost	₹ 24,980
	∴ 100 unit cost	₹ $\frac{24,980 \times 100}{19,600}$ = ₹ 127 approx.

Process B : The cost of abnormal effectiveness is ascertained as follows :

	19,500 units cost	₹ 35,853
	(–) 975 units ,,	49
	∵ 18,525 units cost	₹ 35,804
	∴ 275 ,, ,,	$\frac{275 \times 35,804}{18,525}$ = ₹ 532 approx.

Process C : The cost of abnormal wastage is ascertained as follows :

	18,800 units cost	₹ 42,836
Less : Normal Wastage	1,880 units sold for	₹ 376
	∵ 16,920 units cost	₹ 42,460
	∴ 920 ,, ,,	$\frac{920 \times 42,460}{16,920}$ = ₹ 2,309 approx

PROCESS HAVING OPENING & CLOSING STOCKS

ustration 17

From the following figures, show the cost of the three processes of manufacture. The production of ch process is passed on to the next process immediately on completion:

	Process A	*Process B*	*Process C*
Wages and Materials (₹)	30,400	12,000	29,250
Works Overhead (₹)	5,600	5,250	6,000
Production in units	36,000	37,500	48,000
Stock (units from preceding process) 1st July, 2010		4,000	16,500
Stock (units from preceding process) 31st July, 2010		1,000	5,500

olution

Process-A Account

Particulars	Units	₹	Particulars	Units	₹
To Wages and Materials	36,000	30,400	By Production @ ₹ 1 per unit transferred to Process B A/c	36,000	36,000
To Works Overhead	—	5,600		36,000	36,000
	36,000	36,000			

Process-B Account

Particulars	Units	₹	Particulars	Units	₹
To Opening Stock @ ₹ 1 p. u.	4,000	4,000	By Wastage	1,500	—
To Process A Production	36,000	36,000	By Production @ ₹ 1.50 per unit transferred to Process C A/c	37,500	56,250
To Wages and Materials		12,000	By Closing Stock @ ₹ 1 p. u.	1,000	1,000
To Works Overhead		5,250		40,000	57,250
	40,000	57,250			

पिछले Rate पर पिछले वाले ने supply की & Next Process में वही Rate लगा।

Process-C Account

Particulars	*Units*	₹	*Particulars*	*Units*	
To Opening Stock @ ₹ 1.50 p. u.	16,500	24,750	By Wastage	500	
To Process B Production	37,500	56,250	By Production @ ₹ 2.25 per unit	48,000	1,08,000
To Wages and Materials		29,250	By Closing Stock @ ₹ 1.50 p. u.	5,500	8,250
To Works Overhead		6,000		54,000	1,16,250
	54,000	1,16,250			

Note : Both the opening and closing stock units are from the preceding process, so both have been valued at Production Cost of the preceding process.

***Illustration* 18**

The information given below is extracted from books of a factory producing a commodity in the manufacture of which three processes are involved. Prepare Process Cost Accounts showing the cost, output and the cost per unit at each stage of manufacture assuming that :

(i) The operations in each process are completed daily.

(ii) The value at which the units are to be charged to processes two and three, is the cost per unit of processes one and one plus two respectively.

	Process 1	*Process* 2	
	₹	₹	
Direct Wages	7,500	15,000	19,500
Machine Expenses	4,200	3,600	3,600
Factory Oncost	3,300	4,650	2,700
Raw Material Consumed	24,000	—	—
	Units	Units	Units
Production (Gross)	2,750	—	—
Wastage	150	210	200
Stock 1st April, 2009	—	250	500
Stock 31st March, 2010	—	440	100

Solution

Process-1 Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Raw Material Consumed	2,750	24,000	By Wastage	150	—
To Direct Wages		7,500	By Process 2 Account @ ₹ 15 per unit	2,600	39,000
To Machine Expenses		4,200			
To Factory Oncost		3,300			
	2,750	39,000		2,750	39,000

Process-2 Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Opening Stock @ ₹ 15 per unit	250	3,750	By Wastage	210	—
To Process 1 A/c	2,600	39,000	By Process 3 A/c @ ₹ 27 per unit	2,200	59,400
To Direct Wages		15,000	By Closing Stock @ ₹ 15 per unit	440	6,600
To Machine Expenses		3,600			
To Factory Oncost		4,650			
	2,850	66,000		2,850	66,000

Process-3 Account

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Balance b/d @ ₹ 27 per unit	500	13,500	By Wastage	200	—
To Process 2 A/c	2,200	59,400	By Finished Stock A/c @ ₹ 40 per unit	2,400	96,000
To Direct Wages		19,500	By Closing Stock @ ₹ 27 per unit	100	2,700
To Machine Expenses		3,600			
To Factory Oncost		2,700			
	2,700	98,700		2,700	98,700

Notes : (i) Production (Gross) in Process 1 represents input.

(ii) Wastage in each process has been assumed to be normal wastage.

JOINT PRODUCTS AND BY-PRODUCTS

Joint Products

In certain industries, two or more than two products of equal significance and value are produced simultaneously in a process. Such products are called 'Joint Products'. Motor spirit, kerosene oil, fuel oil, lubricating oil, wax, tar and asphalt are the examples of joint products produced from crude petroleum.

'*Cost Accountants' Handbook*' defines joint products as "Two or more products separated in the course of the same processing operations, usually requiring further processing, each product emerging in such proportion that no single product can be designated as a major product."

So joint products are those which :

A. are produced in the same process, with the same materials,

B. are separated in the course of same process,

C. are comparatively of the same importance and value, and

D. require further processing to finish them into more useful and valuable products.

Joint Products and Co-products

Joint products and co-products are used synonymously in common parlance, but technically there is a distinction between the two. The joint products are like twins born of the same mother at the same time, while co-products are two or more products which are contemporaneous but which do not emerge from the same material in the same process. For instance, timber boards made from different trees are co-products but not the joint products because they are made not from one tree but from different trees. In an automobile industry, motor cars, jeeps, trucks, scooters, etc., are co-products. It depends on the choice of the manufacturer whether to produce more of cars or more jeeps. This is not the case with joint products as the products do necessarily emerge here in the same process.

By-products

'*Cost Accountants' Handbook*' defines by-products as "Products recovered from materials discarded in a main process, or from the production of some major product, where the material value is to be considered at the time of severance from the main product."

So by-products are those which :

A. come forth as a result of the production of the main product,

B. are produced from the discarded material or the scrap of the main product,

C. are of less importance or value as compared to that of main product, and

D. possess a value which can be obtained by the sale thereof.

The examples of by-products are the following :

In Dairy industries, Butter or Cheese is the main product, but butter-milk is the by-product.

In an Oil refinery, Petrol is the main product, while sulphur, chemical fertilisers, and bitumen are the by-products.

In Sugar industry, Sugar is the main product and molasses is the by-product.

By-products and Secondary Products

Both the by-product and the secondary product are subsidiary products. By-product arises with the main product, but the secondary product does not arise out of the same process. The term 'Secondary' is a relative term and is used to compare the relative importance with any primary product whether it may or may not be the product arising out of the same processing operation.

Distinction between Joint Product and By-product

From the above study, it is clear that :

(1) Joint products are of the equal economic importance, while the by-products are of lesser importance;

(2) Joint products are produced all together in a process, while the by-products produced from the scrap or the discarded materials of the main product;

(3) Joint products are not produced just incidentally, their production is definite, by-products emerge incidentally also.

(4) Joint products require further processing, while the by-products generally do require to be processed any further.

Apportionment of Joint Costs

The main point in the accounting for costs in case of joint products and by-products is apportionment of joint costs. There are common costs incurred in both the cases upto the p of separation, and after this split-off point the independent costs are debited to each of th more so, to the joint products where further processing is required in the form of indepen products. As the joint products become independent products after the split-off point, eac them may behave like a main product and have its by-product.

The concept of joint costs, separate cost, Joint products and By-products can be illustra with the help of following chart :

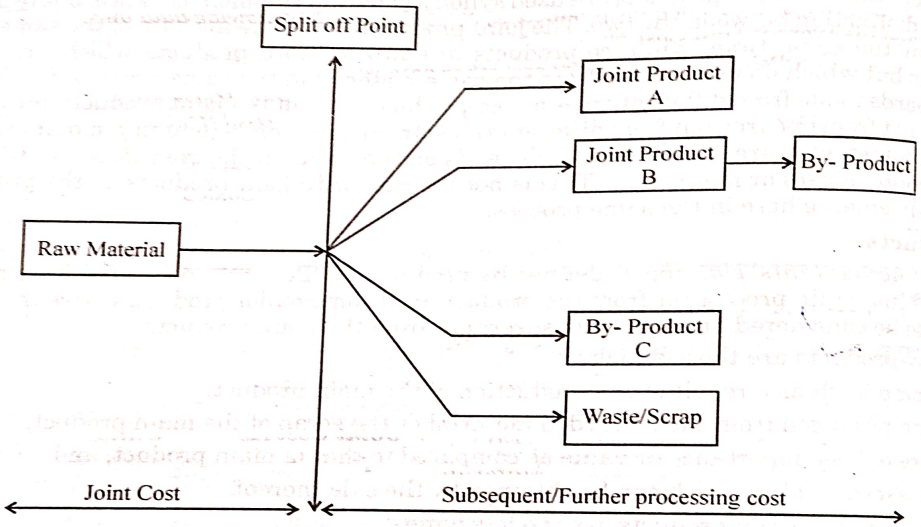

Fig. 1. Joint and By-Products & Costing

In relation to the apportionment of joint costs, there may be three possibilities as follow

(i) Where two or more products are simultaneously produced and there is no by-produ

(ii) Where there are both joint products as well as by-products; and

(iii) Where there is a main product and a by-product.

Methods of Apportionment of Joint Costs

The following are the methods used to apportion the joint costs :

1. Physical Measurement or Physical Unit Method,
2. Average Unit Cost Method,
3. Market Price Method,
4. Sale Value Method, and
5. Point-value or Survey Method.

1. Physical Measurement or Physical Unit Method

The joint cost, under this method, is apportioned to the joint products on the basis of some suitable physical coefficient contained in the products. For instance, the joint cost may be apportioned in proportion to the raw materials contained in each product. If two products, *viz.*, 'A' and 'B' are made of a chemical powder where 'A' uses 40% of the powder while 'B' uses 60% powder, the joint cost can be apportioned in the ratio of 40 : 60. The physical coefficient may be expressed in weight, volume, calories etc. This method is, however, not suitable where there is no common coefficient, *i.e.*, where one product is liquid and another is gas and so there is no common physical unit. Secondly, where there is little relationship of the cost to the physical contents, this method is not to be advocated.

2. Average Unit Cost Method

This is a very simple method. Under this method, the total pre-separation cost is divided by the total units produced for all the products. This gives the average cost per unit of the output as a whole. This method is good for application where the units are uniform and standardised. It fails if all the products cannot be expressed in the same physical unit.

***Illustration* 19**

Apportion the joint cost of joint products X, Y and Z from the following data under (a) Physical Unit Method and (b) Average Unit Cost Method :

Pre-separation Point cost is ₹ 90,000 and other data is:

Product	*Raw Materials Used (Units)*	*Unit Produced*
X	12,000	3,000
Y	30,000	2,000
Z	18,000	1,000
	60,000	6,000

Solution

(a) *Physical Unit Method :*

Cost per unit of raw materials used = ₹ 90,000 ÷ 60,000 units = ₹ 1.50

Apportionment of Joint Cost

Product	*Raw Material Used (Units)*	*Cost per Unit of Raw Material*	*Joint Cost Apportioned*	*Units Produced*	*Cost per Unit*
		₹	₹		₹
X	12,000	1.50	18,000	3,000	6.00
Y	30,000	1.50	45,000	2,000	22.50
Z	18,000	1.50	27,000	1,000	27.00
	60,000		90,000	6,000	

(b) *Average Unit Cost Method* :

Average Cost per Unit = $\frac{₹\ 90,000}{\text{Units } 6,000}$ = ₹ 15.00

Apportionment of Joint Cost

Product	*Units*	*Rate per Unit*	*Joint Cost Apportioned*
		₹	₹
X	3,000	15	45,000
Y	2,000	15	30,000
Z	1,000	15	15,000
	6,000		90,000

3. Market Price Method

Under this method, the pre-separation cost is apportioned on the basis of market price of the products. If 'A', 'B' and 'C' are three joint products and their market prices are ₹ 500, ₹ 400 and ₹ 300 respectively per unit on completion, and if the joint cost, *i.e.*, pre-separation cost of these products is ₹ 6,000, then the separation costs would be ₹ 2,500, ₹ 2,000 and ₹ 1,500 respectively.

The market price may be any of the following :

(1) Market value of the products at the split-off point; or

(2) Market price of the products in the finished stage.

The market price here means the price at which the products can be purchased in the market.

4. Sale Value Method

Under this method, the joint cost is apportioned in proportion to the total sale price of each product. In determining the sale value, both the selling price and the quantity sold are important. So the apportionment can be done on the basis of sale value of the products also. This method is simple but it is difficult to ascertain the sale value at the split-off point when the products are in a semi-finished state. Secondly, the market prices are subject to rapid fluctuations in several cases.

The sale value may be any of the following :

(i) Selling price at the split-off point, or

(ii) Sale value at the split-off point, or

(iii) Sale value after further processing, or

(iv) Net realisable value.

The net realisable value refers to the sale value of the product as reduced by the estimated net profits, direct selling and distribution expenses and further processing cost after split off point.

***Illustration* 20**

The data are as follows:

Product	*Units Produced*	*Selling Price per Unit*
		₹
X	3,000	10
Y	2,000	20
Z	1,000	40

Apportion the pre-separation Joint Cost ₹ 44,000.

Solution

At Sale Value Basis :

Product	*Units of Output*	*Selling Price per Unit*	*Total Sale Value*	*Apportioned Joint Cost (Ratio 3 : 4 : 4)*	*Cost per Unit*
	No.	₹	₹	₹	₹
X	3,000	10	30,000	12,000	4.00
Y	2,000	20	40,000	16,000	8.00
Z	1,000	40	40,000	16,000	16.00
	6,000		1,10,000	44,000	

***Illustration* 21**

A company manufactures two joint products X and Y. During the year 600 units of X and 400 units of Y were manufactured and sold in the market at ₹ 8 and ₹ 10 per unit respectively. The joint cost of these products at the split-off point was ₹ 6,400 and further processing costs were ₹ 300 and ₹ 500 respectively. Apportion the joint cost.

Solution Product	Output Units	Selling Price per Unit	Sales	Further Processing Cost ₹	Net Sale Value (4 – 5) ₹	Ratio (9 : 7)	Joint Cost Apportioned ₹
	2	3	4	5	6	7	8
X	600	8	4,800	300	4,500	9/16	3,600
Y	400	10	4,000	500	3,500	7/16	2,800
					8,000		6,400

Illustration 22 (Apportionment on the basis of Net Realisable Value or Working back from Sales to an estimated cost)

The joint expenses of three products A, B and C are as follows:

	₹
Materials	12,000
Labour	8,000
Overheads	5,000
	₹ 25,000

Subsequent processing costs are as under :

	A	B	C
	₹	₹	₹
Materials	1,500	1,000	1,200
Labour	1,000	800	600
Overheads	500	200	200
	3,000	2,000	2,000
Total Sales	₹ 20,000	15,000	8,000
Estimated Profit on Sales	30%	20%	25%

Prepare statement of apportionment of joint cost and necessary Accounts.

Solution

Statement of Apportionment of Joint Cost

	A	B	C,
	₹	₹	₹
Sales	20,000	15,000	8,000
Less : Profit 30%, 20%, 25%	6,000	3,000	2,000
Total Cost	14,000	12,000	6,000
Less : Separate Expenses	3,000	2,000	2,000
Share in Joint Expenses	11,000	10,000	4,000

Joint Cost Account

	₹		₹
To Materials	12,000	By A Product A/c	11,000
To Labour	8,000	By B Product A/c	10,000
To Overheads	5,000	By C Product A/c	4,000
	25,000		25,000

'A' Product Account

	₹		₹
To Share in Joint Cost	11,000	By Sales	20,000
To Materials	1,500		
To Labour	1,000		
To Overheads	500		
Cost of Production	14,000		
To Profit 30% on Sales	6,000		
	₹ 20,000		₹ 20,000

'B' Product Account

	₹		₹
To Share in Joint Cost	10,000	By Sales	
To Materials	1,000		
To Labour	800		
To Overheads	200		
Cost of Production	12,000		
To Profit 20% on Sales	3,000		
	₹ 15,000		₹

'C' Product Account

	₹		₹
To Share in Joint Cost	4,000	By Sales	
To Materials	1,200		
To Labour	600		
To Overheads	200		
Cost of Production	6,000		
To Profit 25% on Sales	2,000		
	₹ 8,000		₹

5. Point-Value or Survey Method

This method is based on the underlying idea that the difference in the costs of joint products arises due to certain factors affecting the quantity and quality contents of the products. These factors may be quality of materials used, labour operations performed, time taken for the operations, direct charges incurred, if any, on each, technical difficulties faced, etc. These factors are given weightage in terms of point-values to each product depending upon the factors contained in it, and the apportionment of joint costs is made on the basis of these point-values of each.

In order to assign point-values of the different factors, a survey is necessary of the production methods. Sometimes, factors affecting marketing of the products are also taken into consideration, and so a survey is made of the marketing conditions also to assign point-values.

***Illustration* 23**

Pre-separation Costs :

	₹
Materials	5,000
Wages	4,000
Overheads	1,000
Total	₹ 10,000

Production :

Product X	200 Units
Y	400 "
Z	700 "

The points of value assigned to X, Y and Z products are 5, 2 and 1 respectively. Apportion the Joint Cost.

Solution

Product	*Unit*	*Points of Value*	*Total Value* (2 × 3)	*Joint Cost Apportioned* (10 : 8 : 7) ₹	*Cost per Unit* ₹
1	2	3	4	5	6
X	200	5	1,000	4,000	20
Y	400	2	800	3,200	8
Z	700	1	700	2,800	4
Total	1,300		2,500	10,000	

COST DETERMINATION OF BY-PRODUCTS

In some industries, some other products are automatically manufactured along with main duct. These products are called as By-products or Joint products.

By-products : The term by-products is generally used to denote one or more products of ively small value that are produced simultaneously with a product of greater value. The duct of greater value is called the main product. For example, cotton seeds in the production otton, shells from cocoa beans, bagasse and molasses from sugar production are incidentally duced and thus become by-products.

counting Methods of By-products

How the accounting of by-products should be done for a determining process cost, it depends on the nature of by-product. By-products may be classified into two groups :

(1) *By-products of small value.* The selling price of some by-products is very low as compared main product and they do not require further processing. They are sold in the same shape or m in which they are obtained. The amount realised by the sale of the by-products may be alt in any one of the following two ways :

(a) It may be taken as a pure profit and credited to the costing profit and loss account. The rocess cost of main product should not be affected by this amount of by-product.

Or

(b) It may be credited to that process account in which the by-product has arisen. Due llowance should by made for any handling charges or expenses incurred in effecting the sale f the by-product.

The second method is more popular since correct cost may be determined by this method. That is why this method is used more.

(2) *By-products of considerable value*. Where the by-products are of considerable value, it will be proper to find out the exact cost of by-product. This requires apportionment of joint cost of the products upto the split-off joint. The cost of the by-product upto the 'split-off' point will be debited to a by-product account and credited to the main product or the relevant process account. Any cost of further processing the by-product is debited to the by-product account. This account will be credited with the sale proceeds of the by-product and any profit or loss will be transferred to the costing Profit and Loss Account.

***Illustration* 24**

A factory produces chemical 'R' and in the course of its manufacture a by-product 'S' is produced which is made saleable after a separate process. For the month of February 2010 cost data are as under :

	Joint Expenses	*Separate Expenses*	
		'R'	*'S'*
	₹	₹	₹
Materials	1,92,000	73,600	7,800
Wages	1,17,000	76,800	26,420
Overheads	34,500	15,000	5,440

The output for the month was 1,420 ton of R and 490 ton of S and sales value of 'S' averaged ₹ 240 per ton. Assuming 50% estimated profit on sales value of by-product 'S', show the cost per ton of product R.

Solution

		₹
Share of By-product 'S' in Joint Expenses :		
Sales Value (₹ 240 × 490)	1,17,600	
Less : Estimated Profit 50%		58,800
Total Cost		58,800

Less :	Separate Expenses :		
	Materials	7,800	
	Wages	26,420	
	Overheads	5,440	
		Share in Joint Expenses	39,660
	Cost per Ton of 'S' $= \frac{58,800}{490} =$ ₹ 120		19,140

'R' Main Product Account

	₹		₹
To Joint Expenses :		By 'S' By-product A/c	19,140
Materials	1,92,000	By Balance c/d	3,24,360
Wages	1,17,000		
Overheads	34,500		
	3,43,500		3,43,500
To Balance b/d	3,24,360		
To Separate Expenses :		By Cost of Production	
Materials	73,600	@ $\frac{₹\ 4,89,760}{1,420} =$ ₹ 344.90 per ton	4,89,760
Wages	76,800		
Overheads	15,000		
	4,89,760		4,89,760

'S' By-Product Account

	₹		₹
To 'R' Main Product A/c	19,140	By Cost of Production @ ₹ 120 per ton	58,800
To Materials	7,800		
To Wages	26,420		
To Overheads	5,440		
	58,800		58,800
To Cost of Production	58,800	By Sales : 490 Ton @ ₹ 240 per ton	1,17,600
To Profit 50% on Sales	58,800		
	1,17,600		1,17,600

***Illustration* 25**

Product A yields by-product B. The joint expenses of manufacture are—Materials ₹ 20,000; Labour ₹ 10,000; Oncost is half of labour charges. Subsequent expenses are as follows :

	A	*B*
	₹	₹
Materials	10,000	5,000
Labour	15,000	10,000
Oncost	4,000	3,000
Selling price	—	30,000
Estimated profit on sale	—	25%

Prepare Process Accounts and show the apportionment of joint expenses.

Solution

Total Joint Expenses :

	₹
Materials	20,000
Labour	10,000
Indirect Expenses (50% of Labour)	5,000
	35,000

Allocation of Joint Expenses

	B Product
	₹
Sales	30,000
Less : Profit (25% on Sales)	7,500
Total Cost	22,500
Less : Separate Expenses (5,000 + 10,000 + 3,000)	18,000
Share in Joint Expenses	4,500

Product-A Account

	₹		₹
To Joint Expenses :			
Materials	20,000	By 'B' By-Product A/c	4,500
Labour	10,000	By Balance c/d	30,500
Oncost	5,000		
	35,000		35,000
To Balance b/d	30,500	By Cost of Production	59,500
To Materials	10,000		
To Labour	15,000		
To Oncost	4,000		
	59,500		59,500

By-Product 'B' Account

	₹		₹
To Product A A/c	4,500	By Sales	30,000
To Materials	5,000		
To Labour	10,000		
To Oncost	3,000		
	22,500		
To Profit	7,500		
	30,000		30,000

(3) The cost incurred on by-product after split-off point and profit estimated on sale of by-product, both should be deducted from the sales value of by-product and balance remaining is credited to process account. This is known as *Reverse Cost Method or Net Value Method.*

***Illustration* 26** (*Where Balance Cost is equal to Joint Cost*)

Two by-products X and Y are produced in the course of manufacture of product A. Their expenses are as follows:

	Joint Expenses	*Subsequent Separate Expenses*		
		A	X	Y
	₹	₹	₹	₹
Materials	800	200	100	80
Labour	1,000	300	125	100
Overhead	600	300	100	192
	2,400	800	325	372

Selling prices are : A—₹ 3,000; X—₹ 1,000 and Y—₹ 800. The estimated profits are 20%, 17.5% and 16% on the turnover respectively. Prepare separate accounts showing the cost of each product.

Solution

Apportionment of Joint Expenses

	A	*X*
	₹	₹
Selling price	3,000	1,000
Profit on turnover (A 20%, X 17.5 and Y 16%)	600	175
Total Cost	2,400	825
Less : Separate Expenses	800	325
Joint Expenses (Net Values)	1,600	500

The actual joint expenses of ₹ 2,400 will be apportioned in the ratio of net values 16 : 5 : ; So, the share of joint expenses will be A—₹ 1,600; B—₹ 500; C—₹ 300.

A (Main Product) Account

	₹		₹
To Joint Expenses :		By X By-product A/c	
Materials	800	By Y By-product A/c	
Labour	1,000	By Balance c/d	
Separate	600		
	2,400		
To Balance b/d	1,600	By Sales	
To Separate Expenses :			
Materials	200		
Labour	300		
Overheads	300		
Cost of Production	2,400		
To Profit	600		
	₹ 3,000		₹

X (By-product) Account

	₹		₹
To A (Main Product) A/c	500	By Sales	
To Materials	100		
To Labour	125		
To Overheads	100		
Cost of Production	825		
To Profit	175		
	₹ 1,000		₹

Y (By-product) Account

	₹		₹
To A (Main Product) A/c	300	By Sales	
To Materials	80		
To Labour	100		
To Overhead	192		
Cost of Production	672		
To Profit	128		
	₹ 800		₹

***Illustration* 27**

In a manufacturing concern in a certain period Product. A yields by-products B and C. The joint expenses of the manufacture are :

Materials ₹ 10,200; Labour ₹ 11,500 and Oncost ₹ 7,500

Subsequent expenses are as under :

	A	B	C
	₹	₹	₹
Materials	2,500	1,200	1,400
Labour	1,900	1,600	2,000
Oncost	1,500	900	1,050
	₹ 5,900	3,700	4,450

Selling prices are : A = ₹ 30,000; B = ₹ 20,000; C = ₹ 15,000. Estimated profits on turnover are : A = 40%; B = 30%; C = 25%.

Show how would you apportion the joint expenses of manufacture and prepare necessary accounts.

Solution

Apportionment of Joint Expenses

	A	B	C
	₹	₹	₹
Selling Price	30,000	20,000	15,000
Less : Estimated Profit	12,000	6,000	3,750
Total Costs	18,000	14,000	11,250
Less : Total Separate Expenses	5,900	3,700	4,450
Share in Joint Expenses (₹ 29,200)	12,100	10,300	6,800

A (Main Product) Account

	₹		₹
To Joint Expenses :		By B By-product A/c	10,300
Materials	10,200	By C By-product A/c	6,800
Labour	11,500	By Balance c/d	12,100
Oncost	7,500		
	29,200		29,200
To Balance b/d	12,100	By Cost of Production c/d	18,000
To Separate Expenses :			
Materials	2,500		
Labour	1,900		
Oncost	1,500		
	18,000		18,000
To Cost of Production b/d	18,000	By Sales	30,000
To Profit	12,000		
	30,000		30,000

B (By-product) Account

	₹		₹
To A (Main Product) A/c	10,300	By Cost of Production c/d	14,000
To Materials	1,200		
To Labour	1,600		
To Oncost	900		
	14,000		14,000
To Cost of Production b/d	14,000	By Sales	20,000
To Profit	6,000		
	20,000		20,000

C (By-product) Account

	₹		
To A (Main Product) A/c	6,800	By Cost of Production c/d	
To Materials	1,400		
To Labour	2,000		
To Oncost	1,050		
	11,250		
To Cost of Production b/d	11,250	By Sales	
To Profit	3,750		
	15,000		

***Illustration* 28** (*Where Balance Cost is more than Joint Cost*)

A factory producing article X also yields Y and Z as by-products. The joint cost of manufacture is:

	Total ₹
Materials	
Labour	
Factory and Office overheads	

Subsequent separate costs are as under :

		₹	₹	₹
Material		1,500	1,300	1,000
Labour		200	150	100
Factory and Office overheads		800	550	400
	Total ₹	2,500	2,000	1,500
Sales Value		20,000	15,000	10,000
Estimated profits on sales values		30%	25%	20%

Assume that selling and distribution expenses are in proportion to sales values.

Show how would you propose to apportion the joint cost of manufacture and prepare the necessary accounts of X, Y and Z.

Solution

Apportionment of Joint Cost

	X	*Y*	*Z*	*Total*
	₹	₹	₹	₹
Sales Values	20,000	15,000	10,000	45,000
Less : Profit	6,000	3,750	2,000	11,750
	(30%)	(25%)	(20%)	
	14,000	11,250	8,000	33,250
Less : Subsequent cost	2,500	2,000	1,500	6,000
Estimated Joint Costs (Net Values)	11,500	9,250	6,500	27,250

The difference between ₹ 27,250 and the joint cost ₹ 20,000, *i.e.*, ₹ 7,250 is that of selling and distribution cost which is further apportioned in the ratio of sales values in the three products as under :

	X	*Y*	*Z*	*Total*
	₹	₹	₹	₹
Estimated Joint Costs	11,500	9,250	6,500	27,250
Less : Selling & Distribution Cost	3,222	2,417	1,611	7,250
Share in Joint Cost*	8,278	6,833	4,889	20,000

X (Main Product) Account

	₹		₹
To Joint Expenses :			
Materials	10,000	By Y (By-product) A/c	6,833
Labour	2,000	By Z (By product) A/c	4,889
Factory & Office overheads	8,000	By Balance c/d	8,278
	20,000		20,000
To Balance b/d	8,278	By Sales	20,000
To Separate Expenses :			
Materials	1,500		
Labour	200		
Factory & Office overheads	800		
To Selling & Distribution Exp.	3,222		
To Profit	6,000		20,000
	20,000		

Y (By-product) Account

	₹		₹
To X (Main Product) A/c	6,833	By Sales	15,000
To Materials	1,300		
To Labour	150		
To Overheads (Factory & Office)	550		
To Selling & Distribution Exp.	2,417		
To Profit on Y Product	3,750		
₹	15,000	₹	15,000

Z (By-product) Account

	₹		₹
To X (Main Product) A/c	4,889	By Sales	10,000
To Materials	1,000		
To Labour	100		
To Overheads (Factory & Office)	400		
To Selling & Distribution Exp.	1,611		
To Profit on Z Product	2,000		
₹	10,000	₹	10,000

* In this Illustration "the Selling and Distribution Expenses" are apportioned in the ratio of sales values; hence (27,250 – 20,000) = ₹ 7,250 has been considered the selling and distribution expenses and the same has been apportioned in the ratio of sales values. If the same would not have been mentioned in the illustration, then the joint cost ₹ 20,000 would have been divided in the ratio of 11,500 : 9,250 : 6,500

	X	*Y*	*Z*	*Total*
	₹	₹	₹	₹
Estimated Joint Cost	11,500	9,250	6,500	27,250
Actual Joint Cost (1,150 : 925 : 650)	8,440	6,789	4,771	20,000
Excess Cost—Selling and Distribution Exp.	₹ 3,060	2,461	1,729	7,250

***Illustration* 29**

A by-product 'Beta' is derived in the course of manufacturing a product 'Alpha'. The by-product is further processed for sale. From the following data available from the records, prepare an account showing the cost per kg of product 'Alpha' and the by-product 'Beta'. The quantities produced during the period under consideration were : 'Alpha' 100 kg and 'Beta' 50 kg. The selling price of Beta was ₹ 120 per kg on which the profit earned was estimated at 30%.

***Illustration* 31**

In an oil refinery the product passes through three different processes. The following information is available for the month of January, 2010 :

	Crushing	*Refining*	*Finishing*
	₹	₹	₹
Raw materials (500 ton of copra)	2,25,000	—	—
Wages	8,000	5,900	5,875
Power	1,200	1,000	1,500
Sundry materials	500	1,900	—
Factory Expenses	600	1,000	950

Cost of drums for storing finished oil was ₹ 21,025. 200 ton of cake were sold for ₹ 15,000 and 275 ton of crude oil were obtained. Sundry by-product of the crushing processes fetched ₹ 900. By-product after refining the oil was sold for ₹ 900 (20 ton) and 250 ton of refined oil were obtained. 240 ton of finished oil were stored in drums and 10 ton were sold for ₹ 1,200.

The establishment expenses for the period amounted to ₹ 3,500 which are to be charged to the three processes in proportion of 3 : 2 : 2. Prepare the Process Accounts.

Solution

Crushing Process Account

Particulars	*Ton*	₹	*Particulars*	*Ton*	₹
To Raw materials	500	2,25,000	By Sale of cake	200	15,000
To Wages		8,000	By Sale of Sundry By-product	25	900
To Power		1,200	By Cost of crude oil produced		
To Sundry materials		500	(cost per ton ₹ 803.27)	275	2,20,900
To Factory expenses		600			
To Establishment expenses		1,500			
	500	2,36,800		500	2,36,800

Refining Process Account

Particulars	*Ton*	₹	*Particulars*	*Ton*	₹
To Cost of crude oil	275	2,20,900	By Sale of By-product	20	900
To Wages		5,900	By Loss of weight in refining	5	—
To Power		1,000	By Cost of refined oil produced		
To Sundry expenses		1,900	(cost per ton ₹ 923.20)	250	2,30,800
To Factory expenses		1,000			
To Establishment expenses		1,000			
	275	2,31,700		275	2,31,700

Finishing Process Account

Particulars	*Ton*	₹	*Particulars*	*Ton*	₹
To Cost of refined oil	250	2,30,800	By Sales	10	1,200
To Wages		5,875	By Cost of finished oil produced		
To Power		1,500	(cost per ton ₹ 995.50)	240	2,38,925
To Factory expenses		950			
To Establishment expenses		1,000			
	250	2,40,125		250	2,40,125
To Cost of finished oil	240	2,38,925	To Cost of finished oil stored		
To Cost of drums for storing		21,025	in drums cost per ton		
			₹ 1,083.13 (approx.)	240	2,59,950
	240	2,59,950		240	2,59,950

... the following particulars were obtained from the records of Puja Refinery :

	Oil No. 1	Oil No. 2
	₹	₹
Production of Crude Oil :		
Materials	20,000	16,000
Wages	400	300
Steam	120	120
Sale of by-products	520	420
Refining :		
Materials	1,000	500
Wages	500	300
Steam	100	100
Sale of by-products	800	700

	₹
Blending :	
Wages	2,000
Steam	200
Packing Materials	800

Rent, rates, etc. amounted to ₹ 6,000; these are to be apportioned equally to each process and in reduction of crude oil, in the ratio of 1 : 1 between Oil No. 1 and Oil No. 2 and in the case of refining in the ratio of 3 : 2 between Oil No. 1 and Oil No. 2. In the case of blending, the whole proportionate amount is to be charged. Prepare Process Account from the above details.

Solution

Crushing Process (Production of Crude Oil)

Particulars	*Oil No. 1*	*Oil No. 2*	*Particulars*	*Oil No. 1*	*Oil No. 2*
	₹	₹		₹	₹
To Materials	20,000	16,000	By Sale of By-products	520	420
To Wages	400	300	By Refining Process	21,000	17,000
To Steam	120	120			
To Rent, Rates, etc. (1/3 of ₹ 6,000 allocated in 1 : 1 ratio)	1,000	1,000			
	21,520	17,420		21,520	17,420

Refining Process

	₹	₹		₹	₹
To Crushing Process	21,000	17,000	By Sale of By-products	800	700
To Materials	1,000	500	By Blending Process	23,000	18,000
To Wages	500	300			
To Steam	100	100			
To Rent, Rates, etc. (1/3 of ₹ 6,000 in the ratio of 3 : 2)	1,200	800			
	23,800	18,700		23,800	18,700

Blending Process Account

	₹		
To Refining Process :		By Finished Stock	46,000
Oil No. 1	23,000		
Oil No. 2	18,000		
To Wages	2,000		
To Steam	200		
To Packing Materials	800		
To Rent, Rates, etc. (1/3 of ₹ 6,000)	2,000		
	46,000		46,000

THEORETICAL QUESTIONS

(I) Long Answer Questions

1. Describe the general features of process costing. Name three industries where process costing ca be applied.
2. Explain the working of Process Costing and give the salient features of the system. For which kind of business is Process Costing suitable?
3. Define Normal wastage, Abnormal wastage and Abnormal effectiveness and explain their effects o the ascertainment of cost of an article. How will they be treated in process cost accounts?
4. Define and explain the terms 'joint product' and 'by-product'. Enumerate the methods which may b employed in costing 'joint products'.
5. Explain Normal wastage, Abnormal wastage and Abnormal effectiveness. How should these be deal in process cost accounts?
6. What are Joint Products? Enumerate the methods which may be used in joint products in cos determination.

(II) Short Answer Questions

1. Name the industries where Process Costing is applied.
2. What are the characteristics of Process Costing?
3. What do you understand by Abnormal Wastage and Abnormal Effectiveness ?
4. Differentiate between Job Costing and Process Costing.
5. What is Inter-Process Profit?
6. Differentiate between Joint Product and By-Product.
7. What are joint and by-products?
8. How is the cost of abnormal loss units is calculated?
9. Explain two general principles of process costing.
10. Define Process Costing Method.
11. What are by-products? How are they valued in cost accounting?

NUMERICAL QUESTIONS

(I) Short Calculation Questions

1. The Cost of Production of 200 units is ₹ 5,600. The normal wastage is 10% and is sold as scra @ ₹ 10 per unit. Find out the Cost per unit of remaining units.

   Ans. ₹ 30 per unit.

2. Total Cost of 200 units is ₹ 6,000. The normal wastage in production process is 10% and can be sol at ₹ 15 per unit. Actual production is 150 units. Find out the units and cost of abnormal wastage.

   Ans. 30 units, ₹ 950

3. Cost of 10 units of abnormal effectivess is ₹ 320. Selling rate of normal wastage is ₹ 15 per unit. What amount will be transferred from Abnormal Effectiveness A/c to Costing P & L A/c.

   Ans. ₹ 170.

14

PROCESS COSTING : INTER-PROCESS PROFITS

INTER-PROCESS PROFIT : MEANING

Generally, the output of one process is transferred to another on cost basis. Similarly, goods manufactured in the final process is also transferred at cost to Finished Stock A/c. But sometimes it is desirable by a manufacturing concern to value goods processed by each process at a price corresponding to the market price of comparable goods. Thus profit or loss made by each process is revealed and the efficiency of a process is not affected by the efficiency or inefficiency of a previous process. The market price of the goods processed being generally higher than the cost of the process, each process account will show some profit. This profit is termed as inter-process profit.

It should be remembered that percentage profit may be calculated at cost as well as at transfer price but it requires due precaution. For example, if product is to be transferred after charging a profit of 20% on cost, it means that the product costing ₹ 100 will be transferred at a price of ₹ 120. On the other hand, if 20% profit is to be charged at transfer price, it means that the product costing ₹ 80 will be transferred at a price of ₹ 100. In this context application of formula may be understood as follows :

Percentage of Profit at Cost or at Transfer Price : The amount of profit in both the conditions of transfer is determined by applying the following formula :

(1) *If percentage of profit is given on cost*

then $$\text{Profit} = \%\text{ of Profit} \times \frac{\text{Cost}}{100}$$

(2) *If the profit percentage is given on transfer price*

then $$\text{Profit} = \frac{\%\text{ of Profit} \times \text{Cost}}{100 - \%\text{ of Profit}}$$

ADVANTAGES OF INTER-PROCESS PROFIT

(1) *Knowledge of Efficiency of Each Process* : It provides the knowledge of efficiency or inefficiency of every process since the manufacturing cost of each process is compared with market value. By doing so it can be seen whether the cost is more or less than the market.

(2) *Comparative Study of Different Processes* : It provides an opportunity of comparative study of cost and profit shown by each process and it can motivate the incharge of each process to reduce its cost.

(3) *Knowledge of Profitability of Each Process* : It is necessary to know profitability of each process. Profitability is different from profit earning. If a process has capacity to earn profit @80% and it is earning only 50%, the system will be considered defective.

(4) *Secrecy of Actual Cost* : This system maintains secrecy about actual cost of each process.

(5) *Decision of Purchasing vs. Manufacturing* : By comparing the cost and profit in each process, the producer may take decision about purchasing the goods from market or manufacturing in his own factory.

LIMITATIONS OF INTER-PROCESS PROFIT

(1) *Imaginary Profit* : Inter-process profit is only a book or imaginary profit and it is not actual profit because in inter-process transfer the goods is not actually sold.

(2) *Unrealised Profit* : If there are opening and closing stocks in different processes, the valuation will include unrealised profit and actual profit will not be known unless adjustments are made for unrealised profit.

(3) *Lack of True Financial Position* : Under this situation Balance Sheet does not depict the true financial position because the disclosed profit contains the part of profit included in the value of closing stock in each process and the finished goods stocks at the end of the accounting period.

Solution of Problem : Stock Reserve Account

If inter-process profit is charged in transfer of goods from one process to next process, it becomes necessary to open 'Stock Reserve Account' in order to maintain accuracy and correctness in accounting system. The profit included in stocks is transferred to this account and while showing closing stock in Balance Sheet, the balance of Stock Reserve Account is deducted from therein.

***Illustration* 1**

The following are the details in respect of process X and Y of a processing factory :

	Process X	*Process Y*
	₹	₹
Materials	10,000	
Labour	10,000	14,000
Overheads	4,000	10,000

The output of process X is transferred to process Y at a price calculated to give a profit of 20% on the transfer price and the output of process Y is charged to finished stock at a profit of 25% on the transfer price. The sales department realised ₹ 1,00,000 for the finished goods received from process Y. You are asked to show process accounts and total profits assuming there were no opening and closing work-in progress.

Solution

Process X Account

Particulars	₹	*Particulars*	₹
To Materials	10,000	By Process Y A/c	30,000
To Labour	10,000		
To Overheads	4,000		
To Profit (20% on Transfer Price)	6,000		
	30,000		30,000

$$\text{Profit} = \frac{\text{Total Cost} \times \text{Percent of Profit}}{100 - \text{Percent of Profit}}$$

$$= \frac{24{,}000 \times 20}{100 - 20} = \frac{24{,}000 \times 20}{80} = ₹\ 6{,}000$$

Process Y Account

To Process 'X' A/c	30,000	By Finished Stock A/c	72,000
To Labour	14,000		
To Overheads	10,000		
To Profit (25% on Transfer Price)	18,000		
	72,000		72,000

$$\text{Profit} = \frac{(30,000 + 14,000 + 10,000) \times 25}{100 - 25} = \frac{54,000 \times 25}{75} = ₹\ 18,000$$

Finished Stock Account

Particulars	₹	*Particulars*	₹
To Process 'Y' A/c	72,000	By Sales	1,00,000
To Profit	28,000		
	1,00,000		1,00,000

Total Profit :

Process X = ₹ 6,000
Process Y = ₹ 18,000
Finished Stock = ₹ 28,000
₹ 52,000

Illustration 2

The product of a factory passes through two processes for completion. The processes are known as 'A' and 'B'. After leaving process B the product is sent to Finished Stock.

The output of process 'A' is charges to process 'B' at a profit of 20% on the transfer price and the output of process B is charged to finished stock on a similar basis.

At 31st December, 2010 the following information with regard the processes is ascertained :

	Process A	*Process B*
	₹	₹
Stock—1st January, 2010	1,100	1,500
Materials consumed	14,500	6,075
Direct labour	11,400	16,000
Overheads	8,180	3,500
Stock—31st December, 2010	1,800	2,800

Finished product in stock on 1st January, 2010 was valued at ₹ 1,000 and at 31st December, 2010 at 1,500. Sales amounting to ₹ 95,000 were during the year.

All process stocks have been valued at prime cost to the process concerned. Show the process accounts nd finished stock account and ascertain the total profit ignoring the reserve for unrealised profits.

olution

Process 'A' Account

Particulars	₹	*Particulars*	₹
To Opening Stock	1,100	By Process B A/c	41,725
To Materials Consumed	14,500		
To Direct Labour	11,400		
	27,000		
Less : Closing Stock	1,800		
Prime Cost	25,200		
To Overheads	8,180		
Total Cost	33,380		
To Profit (20% on Transfer Price)	8,345		
	41,725		41,725

$$\text{Calculation of Profit} = \frac{\text{Total Cost} \times \text{Rate of Profit}}{100 - \text{Rate of Profit}}$$

$$\frac{33,380 \times 20}{100 - 20} = \frac{33,380 \times 20}{80} = ₹\ 8,345$$

Process 'B' Account

Particulars	₹	Particulars	₹
To Opening Stock	1,500	By Finished Stock	82,500
To Process 'A' A/c	41,725		
To Materials Consumed	6,075		
To Direct Labour	16,000		
	65,300		
Less : Closing Stock	2,800		
Prime Cost	62,500		
To Overheads	3,500		
Total Cost	66,000		
To Profit (20% on Transfer Price)	16,500		
	82,500		82,500

Calculation fo Profit $= \frac{66,000 \times 20}{100 - 20} = \frac{66,000 \times 20}{80} =$ ₹ 16,500

Finished Stock Account

Particulars	₹	Particulars	₹
To Opening Stock	1,000	By Sales	95,000
To Process 'B' A/c	82,500	By Closing Stock	1,500
To Profit	13,000		
	96,500		96,500

Inter Process Profit-Accounting Process
Or
Computation of unrealised profit included in the Closing Stock of the process and accounting treatment

Under this method, the output of first process after charging certain profit is transfered to second process and the output of second process after charging cetain profit is again transferred to third process. But in every process there remains certain stock which includes the part of profit of previous process. Thus profit included in the stock by previous process, is known as unrealised profit. Therefore, at the end of year the amount of profit included in the closing stock should be computed and the provision for unrealised profit should be made from the amount of total profit. The following entry will be done for this purpose.

P & L A/c Dr.
To Provision for Unrealised Profit

By making this provision, the net real profit of the business is determined, stock is also shown at cost and the statement of affairs shows the correct position.

It is worth mentioning that in case of inter-process profit, the accounts may be prepared by any of the following two methods :

(a) *General Method* : Under this method, the process accounts are prepared in normal format showing the full amount of inter-process profit in the relevant process account. Thereafter, the amount of unrealised profit, actual profit and valuation of stock at cost is calculated. The amount of unrealised profit can be calculated either by giving detailed clarifications or with the help of formula. The formula for this purpose is as follows :

$$= \frac{\text{Total Profit upto Previous Processes} - \text{Reserve upto Previous Processes}}{\text{Total Cost of Current Process}} \times \text{Closing stock of current process}$$

Note : 1. This formula can be applied only where there is no opening stock.
2. Total cost in this formula means total cost before deducting the amount of closing stock.
3. This formula is applied in each process separately.

(b) Columnar Method : Under this method, the accounting treament will be as follows :

(1) In every process account, three columns, *i.e.*, total, cost and profit are made in both debit and credit side.

(2) However, the closing stock is written in credit side but in question for the purpose of convenience, the closing stocks are deducted from debit side of process account. But this rule is not applicable in the case of finished stocks.

(3) For the purpose of showing closing stock after deducting from process account, we have to determine the cost and profit separately so that they can be shown in three columns. For the purpose of calculating cost of stock, we have to see that at what level the valuation of stock has been made *(i.e.*, prime cost or total cost). The valuation of cost of closing stock is made by the following formula :

$$\text{Cost of Stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Value of closing stock}$$

Cost = Total of the cost column before closing stock

Total = Total of the total column before closing stock

(4) The profit included in stock is determined after deducting the cost calculated by above formula from the total value of closing stock and which is written in the profit column :

Profit = Value of closing stock – Cost of closing stock

Illustration 3

A product passes through three processes to completion. These processes are known as A, B and C. The output of each process is charged to the next process at price calculated to give a profit of 20% on the transfer price. The output of process C is charged to finished stock on a similar basis.

There was no partly-finished work in any process on December 31, on which date the following information was obtained :

	Process A	*Process B*	*Process C*
	₹	₹	₹
Materials consumed	4,000	6,000	2,000
Labour	6,000	4,000	8,000
Stock, on December 31	2,000	4,000	6,000

Stocks in each process were valued at Prime Cost.

There was no stock in hand on January 1st and the question of overhead was ignored. Of the goods passed into finished stock, ₹ 4,000 remained in hand on December 31, and the balance has been sold for ₹ 36,000. Show Process Account and calculate reserve for unrealised profits.

Solution

First Method

Process 'A' Account

Particulars	₹	*Particulars*	₹
To Materials	4,000	By Stock	2,000
To Labour	6,000	By Process B—Output transferred	10,000
To Profit (25% at cost, *i.e.*, 20% on transfer price)	2,000		
	₹ 12,000		₹ 12,000

Process 'B' Account

Particulars	₹	*Particulars*	₹
To Transfer from Process 'A'	10,000	By Stock	4,000
To Materials	6,000	By Process C—Output transferred	20,000
To Labour	4,000		
To Profit (25% at cost)	4,000		
	₹ 24,000		₹ 24,000

Process 'C' Account

Particulars	₹	*Particulars*	₹
To Transfer from Process 'B'	20,000	By Stock c.	6,000
To Materials	2,000	By Finished Stock—Output transferred	30,000
To Labour	8,000		
To Profit (25% at cost)	6,000		
	₹ 36,000		₹ 36,000

Finished Stock Account

Particulars	₹	*Particulars*	₹
To Transfer from Process 'C'	30,000	By Sales	36,000
To Profit	10,000	By Stock c.	4,000
	₹ 40,000		₹ 40,000

From the above accounts, it appears that the following profits have been made :

	₹
Process 'A'	2,000
Process 'B'	4,000
Process 'C'	6,000
Finished Stock	10,000
Total Profit including unrealised profit	₹ 22,000

The above profits are imaginary and unrealised. So a reserve for unrealised profits contained in the closing stocks in each process is created as follows :

Calculation of Reserve	*Amount of Reserve*
	₹
Process 'A' : As the closing stock is valued at cost, no reserve is necessary	Nil
Process 'B' : The stock has been valued at prime-cost in this process, and the prime-cost of ₹ 20,000 is composed of :	
Transferred from Process 'A' (A की अपनी Cost) ₹ 10,000	
Cost of Material & Labour of Process 'B' (अपनी Cost) ₹ 10,000	
₹ 20,000 — Ratio 1 : 1 (10,000 : 10,000)	
The amount of ₹ 10,000 of 'B' Process is valued at cost only and so it does not include any profit. The other amount of ₹ 10,000 coming from 'A' includes profit at 20%.	
The stock of 'B' amounts to ₹ 4,000. It will be assumed that half of it is related to 'A', and the other half to 'B', as the Prime cost of ₹ 20,000 is composed of half share of each.	
So half of 'A' stock, *i.e.*, ₹ 2,000 includes profit which is to be provided for.	
So 2,000 × 20%	400
Process 'C' : The Prime cost of this process is composed of :	
Transferred from 'B' Process ₹ 20,000	
Material & Labour cost of 'C' Process ₹ 10,000	
₹ 30,000 (2 : 1)	
So 2/3 of the stock of ₹ 6,000 comes from 'B', which includes profit. The remaining 1/3 of 'C' is valued at cost and it does not include any profit. So 20% reserve on ₹ 4,000 (being 2/3 of ₹ 6,000) is required to be made. The reserve amounts to ₹ 800.	
By deducting ₹ 800 from ₹ 4,000, the amount comes to ₹ 3,200. But this amount of ₹ 3,200 is not the sole cost of 'B'. Half of it was derived from 'A' which included 20% profit. So 1/2 × 3,200 × 20% = ₹ 320 should also be reserved. Thus a total reserve of ₹ 800 + 320 = ₹ 1,120 is to be created.	1,120

Finished Stock Account. Its stock is made up of the stocks of Process 'A', 'B', and 'C'. The stock to this account came from 'C'. So 20% on ₹ 4,000 of stock i.e., ₹ 800 is to be provided for.

Balance of stock of ₹ 3,200 is based on the Prime cost of 'C'. The Prime cost of 'C' was ₹ 2,000, of which 2/3 was from 'B' and it included profit. So 3,200 × 2/3 × 20% = ₹ 427 is to be provided for. The 2/3 of ₹ 3,200 was ₹ 2,133. So deducting ₹ 427 from ₹ 2,133 the amount comes to ₹ 1,706. This figure includes half the share of stock from 'A'. So 1,706 × 1/2 × 20% = ₹ 170 is to be provided for. Thus, reserve of ₹ 800 + 427 + 170 = ₹ 1,397 is to be made.

Total Reserve of all Processes & Finished Stock 1,397
₹ 2,917

Unrealised Profit :

	₹
Profit as shown by the accounts	22,000
Less : Reserve for unrealised profits	2,917
Actual Profit	₹ 9,083

Evaluation of Closing Stock for Balance Sheet

		₹
Process 'A'	(4,000 – 400)	2,000
Process 'B'	(6,000 – 1,120)	3,600
Process 'C'	(4,000 – 1,397)	4,880
Finished Stock A/c		2,603
	Total	₹ 13,083

Note : The following formula may also be applied for the calculation of reserve for unrealised profit :

$$\text{Reserve} = \frac{\text{Total Profit upto Previous Process} - \text{Reserve upto Previous Process}}{\text{Total Cost of Current Process}} \times \text{Closing Stock}$$

On the basis of this formula reserve in the above illustration will be calculated as follows :

$$\text{Process B} = \frac{2,000 - \text{Nil}}{20,000} \times 4,000 = \frac{2,000}{20,000} \times 4,000 \quad ₹\ 400$$

$$\text{Process C} = \frac{(2,000 + 4,000) - 400}{30,000} \times 6,000 = \frac{5,600}{30,000} \times 6,000 \quad ₹\ 1,120$$

$$\text{Finished Stock} = \frac{(2,000 + 4,000 + 6,000) - (400 + 1,120)}{30,000} \times 4,000$$

$$= \frac{12,000 - 1,520}{30,000} \times 4,000 = \frac{10,480}{30,000} \times 4,000 \quad ₹\ 1,397$$

₹ 2,917

Alternative Solution

Process 'A' Account

	Total	*Cost*	*Profit*		*Total*	*Cost*	*Profit*
	₹	₹	₹		₹	₹	₹
To Materials	4,000	4,000	—	By Process B A/c			
To Labour	6,000	6,000	—	Transfer	10,000	8,000	2,000
Total	10,000	10,000	—				
Less : Closing Stock c/d	2,000	2,000	—				
Prime Cost	8,000	8,000	—				
To Gross Profit 25% on Cost	2,000	—	2,000				
₹	10,000	8,000	2,000	₹	10,000	8,000	2,000
To Stock b/d	2,000	2,000	—				

Process 'B' Account

	Total	Cost	Profit		Total	Cost	Profit
	₹	₹	₹		₹	₹	
To Process 'A' : Transfer	10,000	8,000	2,000	By Process C A/c Transfer	20,000	14,400	5,600
To Materials	6,000	6,000	—				
To Labour	4,000	4,000	—				
Total	20,000	18,000	2,000				
Less: Closing Stock c/d	4,000	3,600	400				
Prime Cost	16,000	14,400	1,600				
To Gross Profit 25% on Cost	4,000	—	4,000				
₹	20,000	14,400	5,600	₹	20,000	14,400	5,600
To Stock b/d	4,000	3,600	400				

Process 'C' Account

	Total	Cost	Profit		Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Process 'B' : Transfer	20,000	14,400	5,600	By Finished Stock A/c : Transfer	30,000	19,520	10,480
To Materials	2,000	2,000	—				
To Labour	8,000	8,000	—				
Total	30,000	24,400	5,600				
Less: Closing Stock c/d	6,000	4,880	1,120				
Prime Cost	24,000	19,520	4,480				
To Gross Profit : 25% on Cost	6,000	—	6,000				
₹	30,000	19,520	10,480	₹	30,000	19,520	10,480
To Stock b/d	6,000	4,880	1,120				

Finished Stock Account

	Total	Cost	Profit		Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Process 'C' A/c : Transfer	30,000	19,520	10,480	By Sales	36,000	16,917	19,083
Less : Stock c/d	4,000	2,603	1,397				
	26,000	16,917	9,083				
To Gross Profit	10,000	—	10,000				
₹	36,000	16,917	19,083	₹	36,000	16,917	19,083
To Stock b/d	4,000	2,603	1,397				

(i) Calculation of unrealised Profit on Closing Stock

It can be calculated with the help of following formula :

$$\text{Cost of Stock} = \frac{\text{Cost column}}{\text{Total column}} \times \text{Stock}$$

Process 'A' : No Profit

Process 'B' : $\text{Cost} = \frac{18,000}{20,000} \times 4,000 = ₹\ 3,600$

$\text{Profit} = 4,000 - 3,600$ ₹ 400

Process 'C' :

$$\text{Cost} = \frac{24,000}{30,000} \times 6,000 = ₹4,880$$

$$\text{Profit} = 6,000 - 4,880 = ₹\ 1,120$$

Finished Stock A/c Cost $\frac{19,520}{30,000} \times 4,000 = ₹\ 2,603$

$$\text{Profit} = 4,000 - 2,603 = ₹\ 1,397$$

(b) Actual Profit Realised

Process	Notional Profit	Unrealised Profit	Actual Gross Profit
	₹	₹	₹
Process A	2,000	—	2,000
Process B	4,000	400	3,600
Process C	6,000	1,120	4,880
Finished Stock	10,000	1,397	8,603
	22,000	2,917	19,083

Illustration 4

A product passes through two processes A & B. Output of Process A is transferred to Process B at a transfer price including 20% profit and finished output of Process B is similarly transferred to finished stock account at cost *plus* 25% profit. There was no stock in process of work-in-progress in either process on 31st December, 2010. On this very date, the following information was available:

	Process A	Process B
	₹	₹
Materials Consumed	16,400	48,800
Wages	23,600	31,200
Closing Stock	8,000	24,000

Out of the finished stock a portion remained in hand valued at ₹ 36,000 and the balance was sold for ₹1,16,000. Question of opening stock and oncost has to be ignored. Prepare Process Account and show how much profit ought to be credited to Profit & Loss Account?

Solution

Process 'A' Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Materials used	16,400	16,400	—	By Process B	40,000	32,000	8,000
To Wages	23,600	23,600	—				
	40,000	40,000	—				
Less : Closing Stock	8,000	8,000	—				
	32,000	32,000	—				
To Profit (25% on cost)	8,000	—	8,000				
	40,000	32,000	8,000		40,000	32,000	8,000

Process 'B' Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Process 'A' A/c	40,000	32,000	8,000	By Finished Stock A/c	1,20,000	89,600	30,400
To Materials	48,800	48,800	—				
To Wages	31,200	31,200	—				
	1,20,000	1,12,000	8,000				
Less : Closing Stock	24,000	22,400	1,600				
	96,000	89,600	6,400				
To Profit (25% on cost)	24,000	—	24,000				
	1,20,000	89,600	30,400		1,20,000	89,600	30,400

Finished Stock Account

Particulars	*Total*	*Cost*	*Profit*	*Particulars*	*Total*	*Cost*	*Profit*
	₹	₹	₹		₹	₹	
To Process 'B' A/c	1,20,000	89,600	30,400	By Sales	1,16,000	62,720	53,2
Less : Closing Stock	36,000	26,880	9,120				
	84,000	62,720	21,280				
To Profit	32,000	—	32,000				
	1,16,000	62,720	53,280		1,16,000	62,720	53,2

Total Profit (8,000 + 24,000 + 32,000) 64,0

Unrealised Profit in Stocks :

Process 'A' : Nil

Process 'B' : $\text{Cost of Stock} = \frac{1,12,000 \times 24,000}{1,20,000}$

$= ₹\ 22,400$

Unrealised Profit $24,000 - 22,400 = ₹\ 1,600$

Finished Stock : $\text{Cost of Stock} = \frac{89,600}{1,20,000} \times 36,000$

$= ₹\ 26,880$

Unrealised Profit $= 36,000 - 26,880 = ₹\ 9,120$

Total Unrealised Profit 10,72

Profit taken to P & L 53,28

Illustration 5

The manufacturing operations of Kapoor Ltd. involve three distinct processes in connection with the same unit. The output of process 'P' is charged to process 'Q' at a profit of 25% oncost, and the output of process 'Q' is charged to process 'R' on similar basis. The completed product is transferred into stock at a price which gives process 'R' a profit of 25%.

From the following particulars prepare Process Accounts and Finished Goods Account :

Particulars	*Processes*		
	P	*Q*	*R*
	₹	₹	₹
Material consumed	14,000	21,000	7,000
Labour	21,000	14,000	28,000
Closing stock	7,000	14,000	21,000

Stock in each process has been valued at prime cost. Sales for the year amounted to ₹ 1,26,000. Closing stock of finished goods amounted to ₹ 14,000. Show also the actual realised profit to be taken to the credit of Profit and Loss Account.

Solution

Process 'P' Account

	₹		₹
To Material consumed	14,000	By Closing Stock	7,000
To Labour	21,000	By Process 'Q' A/c	35,000
To Profit (25% on cost)	7,000		
	42,000		42,000

Process 'Q' Account

	₹		₹
To Process 'P' A/c	35,000	By Closing Stock	14,000
To Material	21,000	By Process 'R' A/c	70,000
To Labour	14,000		
To Profit (25% on cost)	14,000		
	84,000		84,000

Process 'R' Account

	₹		₹
To Process 'Q' A/c	70,000	By Closing Stock	21,000
To Material	7,000	By Finished Stock A/c	1,05,000
To Labour	28,000		
To Profit (25% on cost)	21,000		
	1,26,000		1,26,000

Finished Stock Account

	₹		₹
To Process 'R' A/c	1,05,000	By Sales	1,26,000
To Profit	35,000	By Closing Stock	14,000
	1,40,000		1,40,000

Calculation of profit included in the closing stock :

Process 'P' : No profit, as the stock has been priced on actual cost.

In Process 'Q' : $\frac{(7,000 - 0) \times 14,000}{70,000}$ = ₹ 1,400

In Process 'R' : $\frac{(7,000 + 14,000) - (1,400) \times 21,000}{1,05,000}$ = ₹ 3,920

In finished goods A/c : = $\frac{(7,000 + 14,000 + 21,000) - (1,400 + 3,920) \times 14,000}{1,05,000}$ = ₹ 4,890

Profit shown by finished stock A/c :

	= 7,000 + 14,000 + 21,000 + 35,000 =	₹ 77,000
Less :	Reserved unreceived profit = 1,400 + 3,920 + 4,890 =	₹ 10,210
	Actual profit received	₹ 66,790

Illustration 6

A product passes through three processes, *viz.*, A, B and C and then is transferred to Finished Stock. The output of Process A is transferred to Process B at a profit of 25% on transfer price and the output of Process B and C is transferred at a profit of 20% each on the transfer price.

The following information was obtained as on 31st December:

	Process A	*Process B*	*Process C*	*Finished Stock*
	₹	₹	₹	₹
Opening Stock	5,000	6,000	4,000	15,000
Direct Materials	10,000	10,500	15,000	—
Direct Wages	7,500	7,500	8,000	—
Works Overhead	7,000	3,000	20,000	—
Closing Stock	2,500	3,000	2,000	7,500
Inter-process Profit for Opening Stock	—	1,000	1,000	5,500

Stocks in the process are valued at Prime Cost. The finished stock has been valued at the price at which it was received from Process C. Sales of the finished stock amounted to ₹ 1,75,000.

You are required to (a) prepare the Process Accounts and Finished Stock A/c showing profit element at each stage, (b) compute the actual realised profit, and (c) show stock valuation for B/S purpose.

Solution

Process Accounts and Finished Stock Accounts showing Profit :

Process 'A' Account

Particular	*Total*	*Cost*	*Profit*	*Particular*	*Total*	*Cost*	*Profit*
	₹	₹	₹		₹	₹	
To Opening Stock b/d	5,000	5,000	—	By Process 'B' A/c : Transfer	36,000	27,000	
To Materials	10,000	10,000	—				
To Wages	7,500	7,500	—				
	22,500	22,500	—				
Less : Closing Stock	2,500	2,500	—				
Prime Cost	20,000	20,000	—				
To Overhead	7,000	7,000	—				
	27,000	27,000	—				
To Gross Profit : 33⅓% on Cost	9,000	—	9,000				
₹	36,000	27,000	9,000	₹	36,000	27,000	9,000
To Stock b/d	2,500	2,500	—				

Process 'B' Account

Particulars	*Total*	*Cost*	*Profit*	*Particulars*	*Total*	*Cost*	*Profit*
	₹	₹	₹		₹	₹	
To Opening Stock b/d	6,000	5,000	1,000	By Process 'C' A/c : Transfer	75,000	50,500	24,500
To Process 'A' : Transfer	36,000	27,000	9,000				
To Materials	10,500	10,500	—				
To Wages	7,500	7,500	—				
	60,000	50,000	10,000				
Less : Closing Stock	3,000	2,500	500				
Prime Cost	57,000	47,500	9,500				
To Overhead	3,000	3,000	—				
	60,000	50,500	9,500				
To Gross Profit : 25% on Cost	15,000	—	15,000				
	75,000	50,500	24,500		75,000	50,500	24,500
To Stock b/d	3,000	2,500	500				

Process 'C' Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Opening Stock b/d	4,000	3,000	1,000	By Finished Stock —Transfer	1,50,000	95,000	55,000
To Process 'B' :							
Transfer	75,000	50,500	24,500				
To Materials	15,000	15,000	—				
To Wages	8,000	8,000	—				
	1,02,000	76,500	25,500				
Less : Closing Stock c/d	2,000	1,500	500				
Prime Cost	1,00,000	75,000	25,000				
To Overhead	20,000	20,000	—				
	1,20,000	95,000	25,000				
To Gross Profit :							
25% on Cost	30,000	—	30,000				
	1,50,000	95,000	55,000		1,50,000	95,000	55,000
To Stock b/d	2,000	1,500	500				

Finished Stock Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Opening Stock b/d	15,000	9,500	5,500	By Sales	1,75,000	99,750	75,250
To Process 'C' :							
Transfer	1,50,000	95,000	55,000				
	1,65,000	1,04,500	60,500				
Less : Closing Stock	7,500	4,750	2,750				
	1,57,500	99,750	57,750				
To Gross Profit	17,500	—	17,500				
	1,75,000	99,750	75,250		1,75,000	99,750	75,250
To Stock b/d	7,500	4,750	2,750				

(i) *Calculation of Profit on Closing Stock* :

Process 'A' : Nil

Process 'B' $= \frac{50,000}{60,000} \times 3,000 = ₹\ 2,500$

Profit $= 3,000 - 2,500 = ₹\ 500$

Process 'C' $= \frac{76,500}{1,02,000} \times 2,000 = ₹\ 1,500$

Profit $= 2,000 - 1,500 = ₹\ 500$

Finished Stock A/c = $\frac{1,04,500}{1,65,000} \times 7,500 = ₹\ 4,750$

Profit = 7,500 – 4,750 = ₹ 2,750

(ii) *Actual Realised Profit*

		Notional Profit	*Unrealised Profit*		*Actual Profit*
			Opening Stock	*Closing Stock*	
		₹	₹	₹	
Process	'A'	9,000		(–) —	9,00
	'B'	15,000	(+) 1,000	(–) 500	15,50
	'C'	30,000	(+) 1,000	(–) 500	30,50
Finished Stock		17,500	(+) 5,500	(–) 2,750	20,25
		71,500	(+) 7,500	(–) 3,750	75,25

(iii) *Valuation of Closing Stock for Balance Sheet* :

Process 'A'	2,50
Process 'B'	2,50
Process 'C'	1,50
Finished Stock	4,75
	11,25

(iv) *Verification* :

	A	B	C	Total
Cost of All Processes	₹ 88,500 (24,500 + 21,000 + 43,000)			
(+) Cost of Opening Stock	22,500 (5,000 + 5,000 + 3,000 + 9,500)			
	1,11,000			
(–) Cost of Sale	99,750			
Cost of Closing Stock	₹ 11,250			

Illustration 7

A Ltd. produces a product which passes through two processes before completion. Following data are available :

	Process I	*Process II*	*Finished Stock*
	₹	₹	₹
Opening stock	7,500	9,000	22,500
Direct material	15,000	15,750	—
Direct wages	11,200	11,250	—
Factory overheads	10,500	4,500	—
Closing stock	3,700	4,500	11,250
Inter-process Profit including Opening stock	—	1,500	8,250

Output of Process I is transferred to Process II at 25% profit on the transfer price, output of Process II is transferred to finished stock at 20% profit on transfer price. Stocks in process are valued at prime cost. Sales during the period are ₹ 1,40,000.

Prepare Process and Finished Stock Accounts and show the profit at each stage.

Process I Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
Opening stock	7,500	7,500	—	By Process II A/c	54,000	40,500	13,500
D. materials	15,000	15,000	—				
D. wages	11,200	11,200	—				
	33,700	33,700	—				
Less : Closing stock	3,700	3,700	—				
Prime cost	30,000	30,000	—				
Factory overheads	10,500	10,500	—				
Total cost	40,500	40,500	—				
Gross Profit (25% on Transfer price)	13,500	—	13,500				
	54,000	40,500	13,500		54,000	40,500	13,500

Process II Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
Opening stock	9,000	7,500	1,500	By Finished stock A/c	1,12,500	75,750	36,750
Process I A/c	54,000	40,500	13,500				
D. materials	15,750	15,750	—				
D. wages	11,250	11,250	—				
	90,000	75,000	15,000				
Less : Closing stock	4,500	3,750	750				
Prime cost	85,500	71,250	14,250				
Factory overheads	4,500	4,500	—				
	90,000	75,750	14,250				
Gross Profit (20% on Transfer price)	22,500	—	22,500				
	1,12,500	75,750	36,750		1,12,500	75,750	36,750

Finished Stock Account

Particulars	Total	Cost	Profit	Particulars	Total	Cost	Profit
	₹	₹	₹		₹	₹	₹
To Opening stock	22,500	14,250	8,250	By Sales	1,40,000	82,500	57,500
To Process II A/c	1,12,500	75,750	36,750				
	1,35,000	90,000	45,000				
Less : Closing stock	11,250	7,500	3,750				
	1,23,750	82,500	41,250				
To Gross Profit	16,250	—	16,250				
	1,40,000	82,500	57,500		1,40,000	82,500	57,500

THEORETICAL QUESTIONS

(I) Long Answer Questions

1. What is inter-process profit ? What are the objectives and disadvantages of this concept ? Sugges alternative method by which the objectives can be achieved without corresponding disadvantage
2. What do you mean by Inter-Process Profit ? How actual profit is calculated ? Explain with exampl
3. What do you understand by the term 'inter-process profit' ? What is the utility of transfering th output of one process to another process at more than cost ?

(II) Short Answer Questions

1. What is Inter- Process Profit ?
2. State the formula for the calculation of unrealised profit.

NUMERICAL QUESTIONS

Valuation of Closing Stock at Prime Cost and Calculation of Unrealised Profit

1. A product passes through two processes A and B. Output of A is transferred to process B at cost plu 25% profit and finished output is similarly transferred to Finished Stock Account at cost plus 25% profit. There was no work-in-progress in either process on 31st December. On this date, the followin further information was available:

	Process A	*Process B*
	₹	₹
Materials consumed	8,000	24,000
Wages	12,000	16,000
Closing Stock (valued at prime cost)	4,000	12,000

Out of the finished stock, a portion remained at hand valued at ₹ 18,000 and the balance was sol for ₹ 58,000. Prepare the Process and Finished Stock Accounts. Question of overhead should b ignored and assume that there was no opening stock. Find out reserve for unrealised profit.

Ans. Process A : Cost ₹ 16,000; Profit ₹ 4,000; Transfer Price ₹ 20,000.
Process B : Cost ₹ 48,000; Profit ₹ 12,000; Transfer Price ₹ 60,000.
Finished Stock : Sales ₹ 58,000; Profit ₹ 16,000
Reserve for Unrealised Profit Process A Nil, Process B ₹ 800, Finished Stock ₹ 4,560.

2. A product passes through three processes before it is completed. The output of each process is charge to the next process at a price so that a profit of 20% on transfer price may be earned. The output o Process III is charged to finished stock after adding 25% profit on cost. There was no work-in-progres on 31st December. On the same date other information were available as follows :

	Process I	*Process* II	*Process* III
	₹	₹	₹
Direct Materials	40,000	10,000	8,000
Direct Wages	30,000	20,000	40,000
Closing Stock	10,000	13,000	19,000

Out of the finished stock, excepting a portion valuing ₹ 10,000, the balance was sold for ₹ 2,20,00 Prepare Process Accounts and Finished Goods Account. Ignore overheads and opening stock. Als calculate the amount of reserve for unrealised profit.

Ans. Process I : Cost ₹ 60,000; Profit ₹ 15,000; Transfer Price ₹ 75,000
Process II : Cost ₹ 92,000; Profit ₹ 23,000; Transfer Price ₹ 1,15,000
Process III : Cost ₹ 1,44,000; Profit ₹ 36,000; Transfer Price ₹ 1,80,000
Finished Stock : Profit ₹ 50,000
Reserve for unrealised Profit : Process II—₹ 1,857; Process III—₹ 4,213.
Finished Stock : ₹ 3,774; Total ₹ 9,844.

3. A product passes through two processes to completion *viz.*, A and B. The output of process A is charge to process B at a price, calculated to give a profit of 20% on the transfer price and the output of proces B is charged to finished goods account at a price calculated to give a profit of 25% on the transfer price. The following information is shown as on 31st December (there was no partly finished work in any process on 31st December) :

	Process A	*Process B*
	₹	₹
Materials	10,000	30,000

Labour	14,000	25,000
Stock on 31st December	4,000	11,000

Of the output transferred to finished stock costing ₹ 15,000 remained unsold at the end of accounting period and the balance realised ₹ 1,40,000.

Show : (a) Process Accounts and total profits,

(b) Value of closing stocks for Balance Sheet purpose.

Ans. Actual profit ₹ 85,859.37; Closing Stock for B/S ₹ 24,859.37; Reserve ₹ 5,140.63.

Opening & Closing Stock but no Calculation of Unrealised Profit

The product of a company is completed through two processes—A and B then transferred to finished goods. Transfer is made from process A to B at a profit of 25% on transfer price and from process B to finished goods at a profit of 20% on transfer price.

The following information is available for the year ended 31st December, 2010.

	Process A	*Process B*
	₹	₹
Stock on 1st Jan. 2010	3,200	2,000
Materials Consumed	6,400	2,700
Direct Labour	12,500	8,500
Overheads	2,500	1,700
Stock on 31st December, 2010	2,100	900

Stock of finished goods on 1st January, 2010 was ₹ 10,200 and on 31st December, 2010 ₹ 6,200. Sales during the year was ₹ 68,400.

Prepare process accounts and finished goods account. Ignore reserve for unrealised profit.

[Ans. Profit of process A ₹ 7,500 Profit of process B ₹ 11,000; Profit on sale of finished goods ₹ 9,400.]

Opening & Closing Stock and Calculation of Unrealised Profit

A certain product passes through three processes before it is transferred to finished stock. The following information is obtained for the month of December :

	Process I	*Process II*	*Process III*	*Finished Stock*
	₹	₹	₹	₹
Opening Stock	2,000	12,000	10,000	25,000
Direct Materials	13,000	20,000	40,000	—
Direct Wages	10,000	10,500	50,000	—
Production Overhead	10,000	25,000	25,000	—
Closing Stock	5,000	6,000	32,000	33,000
Profit % on Transfer Price to the next process	20%	25%	10%	—
Inter-Process Profit for Opening Stock	—	2,000	2,800	10,000

Stocks in process are valued at prime cost and finished stock has been valued at the price at which it was received from process III. Sales during the period were ₹ 8,00,000. Prepare process accounts showing profit element at each state.

[Ans. Process I ₹ 7,500, Process II ₹ 33,000, Process III ₹ 25,000 Finished stock 5,58,000; Reserve for Uneralised Profit in closing stock : Process II. ₹ 712, Process III ₹ 6,150; Finished stock ₹ 8,812; Actual Profit ₹ 6,22,626]