9

Process Costing

Process Costing

9

Learning Outcomes

After completing this chapter you should be able to:

- compare and contrast job, batch, contract and process costing;
- prepare ledger accounts for process costing systems.

9.1 Introduction

In this chapter, you will learn about another costing method: process costing. Process costing is used by organisations where a number of production processes are involved and the output of one process is the input to a later process, this continuing until the final product is completed. Examples of industries where process costing might be applied are food processing, chemicals and brewing. The final product is said to be homogeneous (i.e., each unit is identical and cannot be distinguished from another unit) and is usually manufactured for inventory from which sales are made to customers. Unlike job costing, the product is not customer specific and the range of products available is likely to be limited, but it is likely that the customer base will be large.

9.2 Process accounts

When using process costing, the process is the collection point for costs incurred. This means that materials and labour costs will be identified with the particular process to which they relate. The method is best explained by a simple example.

Example

During August a processing company incurred the following costs in its three processes:

	Process 1	*Process 2*	*Process 3*
	£	£	£
Direct materials	6,000	4,000	9,000
Direct labour	1,000	2,000	3,000
Direct expenses	2,000	3,000	4,000
Production overhead	1,000	2,000	3,000

The quantities of input and output were as follows:

	Process 1	*Process 2*	*Process 3*
	kg	kg	kg
Input	500	200	300
Output	500	700	1,000

The input quantities shown above do not include the output from the previous process. The output from process 1 is transferred to process 2, which in turn transfers its output to process 3 which after further processing results in the final product.

The process accounts will appear as follows:

Process 1

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	500	20.00	10,000
Labour		1,000				
Expenses		2,000				
Overheads		1,000				
	500	10,000		500		10,000

Process 2

	kg	£		kg	£/kg	£
Process 1	500	10,000	Output	700	30.00	21,000
Materials	200	4,000				
Labour		2,000				
Expenses		3,000				
Overheads		2,000				
	700	21,000		700		21,000

Process 3

	kg	£		kg	£/kg	£
Process 2	700	21,000	Output	1,000	40.00	40,000
Materials	300	9,000				
Labour		3,000				
Expenses		4,000				
Overheads		3,000				
	1,000	40,000		1,000		40,000

You should note the layout of the process account. It is a ledger account with debit and credit entries, but it is different from financial accounting ledger accounts because it includes other columns. On the debit side, there is a column for the quantity as well as the values,

and on the credit side as well as the quantity column there is a column showing the cost per unit. The value per unit of output is calculated by dividing the cost by the number of units.

When preparing process accounts, it is important that the quantity columns are completed first and balanced *before* attempting to value the units. This example was a simple one, but as this chapter progresses and introduces more complications you will see why this technique is recommended.

Note too that the total cost of process 1 is attributed to its output and that this is then transferred to process 2. This procedure is repeated in process 2. The output from process 3 is finished goods.

9.3 Losses in process

The majority of process industries expect there to be a loss in the production process.

A certain amount of loss is expected and therefore unavoidable and this is referred to in cost accounting terminology as a *normal loss*.

This loss may occur through evaporation or may be a form of defective production. The extent of the normal loss may be estimated using past records and experience. As a loss, the only value that the organisation can derive from it is its scrap value (if it has any). It is therefore considered good practice to regard the net cost (after deducting any scrap sale proceeds if applicable) of producing the normal loss as a cost of the process and to attribute it to the remaining units. The following example of a single process shows how this is achieved.

The costs of the process are as follows:

	Process 1
	£
Direct materials	6,000
Direct labour	1,000
Direct expenses	2,000
Production overhead	1,000

The input quantity was 500 kg and the expected or normal loss was 10 per cent of input. Actual output was 450 kg. The process account would appear as follows:

Process 1

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	450	22.22	10,000
Labour		1,000	Normal loss	50	–	–
Expenses		2,000				
Overheads		1,000				
	500	10,000		500		10,000

The total costs of the process (£10,000) have been attributed to the output of 450 kg. This has the effect of increasing the cost per kg of good output to compensate for the cost of producing the unavoidable normal loss.

If the normal loss could be sold for scrap at a value of £5 per kg, then this would reduce the net cost of producing the normal loss. The effect of this on the entries in the process account is as follows:

Process 1

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	450	21.67	9,750
Labour		1,000				
Expenses		2,000	Normal loss	50	5.00	250
Overheads		1,000				
	500	10,000		500		10,000

Note now the credit side of the process account shows the scrap value of the normal loss. The net cost of the process is reduced by the £250 scrap value to £9,750 and this is attributed to the output. The effect is to reduce the cost per kg of the output to £21.67.

The double entry for the normal loss is usually made in a scrap account.

Scrap account

	kg	£		£
Process 1 – normal loss	50	250	Receivable/cash	250

9.4 Abnormal losses and gains

We have seen that the normal loss is an estimate of the loss expected to occur in a particular process. This estimate may be incorrect and a different amount of loss may occur.

If the actual loss is greater than the normal loss then the excess loss is referred to as an *abnormal loss*.

If the actual loss is less than the normal loss then the difference is referred to as an *abnormal gain*.

The following example illustrates the calculations and entries in the process account when an abnormal loss occurs.

Example

Input 500 kg of materials costing	£6,000
Labour cost	£1,000
Expenses cost	£2,000
Overhead cost	£1,000

Normal loss is estimated to be 10 per cent of input.
Losses may be sold as scrap for £5 per kg.
Actual output was 430 kg.

The process account is shown below.

Remember that, earlier in the chapter, we recommended that you should insert the units into the process account first, and then balance them off. In this example, this results in a balancing value on the credit side of 20 kg, which is the abnormal loss.

Process account

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	430	21.67	9,317
Labour		1,000	Normal loss	50	5.00	250
Expenses		2,000	Abnormal loss	20	21.67	433
Overheads		1,000				
	500	10,000		500		10,000

The valuation per kg of £21.67 is calculated as follows:

$$\frac{\text{Cost incurred} - \text{scrap value of normal loss}}{\text{Expected output}} = \frac{£10,000 - £250}{450} = £21.67$$

The abnormal loss units are valued at the same rate per unit as the good output units. The normal loss is valued at its scrap value only.

The next step is to prepare the scrap and abnormal loss accounts. These are shown below.

Scrap account

	£		£
Process – normal loss	250	Receivable/cash: (50 + 20) × £5	350
Abnormal loss transfer	100		
	350		350

The scrap balance now represents the total of 70 kg scrapped, with a total scrap value of £350.

Abnormal loss account

	£		£
Process	433	Scrap account: 20 × £5	100
		Income statement	333
	433		433

The resulting balance on the abnormal loss account is the net cost of producing an excess loss (i.e., after deducting the scrap sale proceeds). It has now been highlighted separately for management attention, and the balance is transferred to the income statement.

If the actual loss is smaller than the amount expected, then an abnormal gain is said to have occurred. The abnormal gain is the extent to which the loss is smaller than expected. If we consider the same example again, except that the actual output achieved was 470 kg, we can see that the following process account results. Remember to balance the units column first. The normal loss is the same, because the input is the same.

Process account

	kg	£		kg	£/kg	£
Materials	500	6,000	Output	470	21.67	10,183
Labour		1,000				
Expenses		2,000	Normal loss	50	5.00	250
Overheads		1,000				
Abnormal gain	20	433				
	520	10,433		520		10,433

Note that the balancing value in the quantity column is now on the debit side. It represents the abnormal gain. The calculation of the cost per unit remains the same, but now there is an additional entry on the debit side.

Exercise 9.1

Following the principles that you have learned so far, attempt to produce the scrap and abnormal gain accounts yourself, before you look at the accounts which follow.

Solution

Scrap account

	£		£
Process – normal loss	250	Bank/receivables: (50 − 20) × £5	150
		Abnormal gain	100
	250		250

Abnormal gain account

	£		£
Scrap	100	Process	433
Income statement	333		
	433		433

Note that the balance carried down in the scrap account is only £150. This represents the cash available from the sale of the loss. The loss which actually occurred was only 30 kg.

In the abnormal gain account the balance of £333 represents the net benefit of producing a smaller loss than expected (this is after deducting the scrap sale proceeds which would have been received if the normal loss had occurred).

9.5 Closing work in progress: the concept of equivalent units

To calculate a unit cost of production it is necessary to know how many units were produced in the period. If some units were only partly processed at the end of the period, then these must be taken into account in the calculation of production output. The concept of equivalent units provides a basis for doing this. The work in progress (the partly finished units) is expressed in terms of how many equivalent complete units it represents. For example, if there are 500 units in progress which are 25 per cent complete, these units would be treated as the equivalent of 500, 25% = 125 complete units.

A further complication arises if the work in progress has reached different degrees of completion in respect of each cost element. For example, you might stop the process of cooking a casserole just as you were about to put the dish in the oven. The casserole would probably be complete in respect of ingredients, almost complete in respect of labour, but

most of the overhead cost would be still to come in terms of the cost of the power to cook the casserole.

It is common in many processes for the materials to be added in full at the start of processing and for them to be converted into the final product by the actions of labour and related overhead costs. For this reason, labour and overhead costs are often referred to as conversion costs.

Conversion cost is the 'cost of converting material into finished product, typically including direct labour, direct expense and production overhead'. *CIMA Terminology*

To overcome the problem of costs being incurred at different stages in the process, a separate equivalent units calculation is performed for each cost element. An example will help to make this clear. For simplicity, losses have been ignored. These will be introduced in the next example.

Example

Input materials	1,000 kg @ £9 per kg
Labour cost	£4,800
Overhead cost	£5,580
Outputs	Finished goods: 900 kg
	Closing work in progress: 100 kg

The work in progress is completed:

100% as to material
60% as to labour
30% as to overhead

Now that you are beginning to learn about more complications in process costing, this is a good point to get into the habit of producing an input/output reconciliation as the first stage in your workings. This could be done within the process account, by balancing off the quantity columns in the way that we have done so far in this chapter. However, with more complex examples it is better to have total quantity columns in your working paper and do the 'balancing off' there.

In the workings table which follows, the first stage is to balance the input and output quantities, that is, check that the total kg input is equal to the total kg output. Then, each part of the output can be analysed to show how many equivalent kg of each cost element it represents.

				Equivalent kg to absorb cost		
Input	kg	*Output*	*kg*	*Materials*	*Labour*	*Overhead*
Materials	1,000	Finished goods	900	900	900	900
		Closing WIP	100	(100%) 100	(60%) 60	(30%) 30
	1,000		1,000	1,000	960	930
		Costs		£9,000	£4,800	£5,580
		Cost/eq. unit		£9	£5	£6

For the equivalent unit calculations there is a separate column for each cost element. The number of equivalent units is found by multiplying the percentage completion by the number of kg in progress. For example, equivalent kg of labour in progress is 100 kg × 60% = 60 equivalent kg.

The number of equivalent units is then totalled for each cost element and a cost per equivalent unit is calculated.

These costs per equivalent unit are then used to value the finished output and the closing work in progress.

The process account is shown below, together with the calculation of the value of the closing work in progress. Note that this method may be used to value the finished output, but it is easier to total the equivalent unit costs (£9 + £5 + £6) and use the total cost of £20 multiplied by the finished output of 900 kg.

Closing WIP valuation		£
Materials	100 equivalent units × £9	900
Labour	60 equivalent units × £5	300
Overheads	30 equivalent units × £6	180
		1,380

Process account

	kg	£		kg	£/kg	£
Materials	1,000	9,000	Finished goods	900	20.00	18,000
Labour		4,800	WIP	100	13.80	1,380
Overheads		5,580				
	1,000	19,380		1,000		19,380

The next example follows the same principles but it includes process losses. Work through the equivalent units table carefully and ensure that you understand where each figure comes from.

Example: Closing work in progress

Data concerning process 2 last month was as follows:

Transfer from process 1	400 kg at a cost of	£2,150
Materials added	3,000 kg	£6,120
Conversion costs		£2,344
Output to finished goods		2,800 kg
Output scrapped		400 kg
Normal loss		10 per cent of materials added in the period

The scrapped units were complete in materials added but only 50 per cent complete in respect of conversion costs. All scrapped units have a value of £2 each.

There was no opening work in progress, but 200 kg were in progress at the end of the month, at the following stages of completion:

80 per cent complete in materials added
40 per cent complete in conversion costs

You are required to write up the accounts for the process.

Solution

The first step is to produce an input/output reconciliation as in the last example. Notice that the losses are not complete. You will need to take account of this in the equivalent units columns. And remember that the normal loss units do not absorb any of the process costs. They are valued at their scrap value only, so they must not be included as part of the output to absorb costs.

				Equivalent kg to absorb cost		
				Process 1	*Materials*	*Conversion*
Input	*kg*	*Output*	*kg*	*transfer*	*added*	*costs*
Process 1 transfer	400	Finished goods	2,800	2,800	2,800	2,800
Material added	3,000	Normal loss	300	–	–	–
		Abnormal loss[1]	100	100	100	50
		Work in progress	200	200	160	80
	3,400		3,400	3,100	3,060	2,930
		Costs		£	£	£
		Incurred in period		2,150	6,120	2,344
		Scrap value of normal loss[2]		(600)		
				1,550	6,120	2,344
		Cost per unit	£3.30	0.50	2.00	0.80

Notes:

1. The abnormal loss is inserted in the output column as a balancing figure. Losses are 50 per cent complete in conversion costs. Therefore, the 100kg of abnormal loss represents 50 equivalent complete kg in respect of conversion costs.
2. By convention, the scrap value of normal loss is usually deducted from the first cost element.

For each cost element the costs incurred are divided by the figure for equivalent kg produced. For example, the cost per kg for materials added = £6,120/3,060 = £2 per kg.

The unit rates can now be used to value each part of the output. For example, the 160 equivalent kg of materials added in the work in progress are valued at 160 × £2 = £320. The 80 equivalent kg of conversion costs in work in progress are valued at 80 × £0.80 = £64.

Valuation	*Total*	*Process 1 transfer*	*Materials added*	*Conversion costs*
	£	£	£	£
Finished goods	9,240	1,400	5,600	2,240
Abnormal loss	290	50	200	40
Work in progress	484	100	320	64

It is now possible to draw up the relevant accounts using these valuations of each part of the process output.

Exercise 9.2

See if you can complete the process accounts before looking at the rest of the solution. Remember that the normal loss is valued at its scrap value.

Solution

Process 2 account

	kg	£		kg	£
Process 1	400	2,150	Finished goods	2,800	9,240
Materials added	3,000	6,120	Normal loss	300	600
Conversion costs		2,344	Abnormal loss	100	290
			Work in progress	200	484
	3,400	10,614		3,400	10,614

Abnormal loss account

	£		£
Process 2	290	Scrap account	200
		Income statement	90
	290		290

Scrap account

	£		£
Process 2	600	Bank/receivables: (300 + 100) × £2	800
Abnormal loss account	200		
	800		800

9.6 Previous process costs

A common problem that students experience when studying process costing is understanding how to deal with previous process costs. An important point that you should have grasped by now is that production passes through a number of sequential processes. Unless the process is the last in the series, the output of one process becomes the input of the next. A common mistake is to forget to include the previous process cost as an input cost in the subsequent process.

You should also realise that all of the costs of the previous process (materials, labour and overhead) are combined together as a single cost of 'input material' or 'previous process costs' in the subsequent process.

In the workings for the example in Section 9.5, we assumed that the work in progress must be 100 per cent complete in respect of Process 1 costs. This is also an important point to grasp. Even if the Process 2 work had only just begun on these units, there cannot now be any more cost to add in respect of Process 1. Otherwise the units would not yet have been transferred out of Process 1 into Process 2.

9.7 Opening work in progress

Opening work in progress consists of incomplete units in process at the beginning of the period. Your syllabus requires you to know how to value work in progress using the average cost method. With this method, opening work in progress is treated as follows:

1. The opening work in progress is listed as an additional part of the input to the process for the period.
2. The cost of the opening WIP is added to the costs incurred in the period.
3. The cost per equivalent unit of each cost element is calculated as before, and this is used to value each part of the output. The output value is based on the average cost per equivalent unit, hence the name of this method.

The best way to see how this is done is to work through some examples. The last two examples in this chapter include some opening work in progress. Work through them carefully, and try to learn the layout of the working paper so that you can use it quickly to do any workings that you need in the assessment. It will save you valuable time!

Example: Opening work in progress

The following information is available for Process 3 in June:

			Degree of completion and cost					
			Process 2 input		*Materials added in Process 3*		*Conversion costs*	
	Units	*Cost*						
		£	%	£	%	£	%	£
Opening WIP	100	692	100	176	60	300	30	216
Closing WIP	80		100		70		35	
Input costs:								
Input from process 2	900	1,600						
Materials added in process 3		3,294						
Conversion costs		4,190						

Normal loss is 10 per cent of input from process 2; 70 units were scrapped in the month, and all scrap units realise £0.20 each.

Output to the next process was 850 units.

You are required to complete the account for process 3 in June.

Solution

As before, the first step is to complete an input/output reconciliation and then to extend this to calculate the number of equivalent units for each cost element.

				Equivalent units to absorb cost		
				Process 2 input	*Materials added*	*Conversion costs*
Input	*Units*	*Output*	*Units*			
Opening WIP[1]	100	To process 4	850	850	850	850
Process 2[2]	900	Normal loss	90	–	–	–
		Abnormal gain[3]	(20)	(20)	(20)	(20)
		Closing WIP[4]	80	80	56	44
	1,000		1,000	910	886	874
		Costs		£	£	£
		Opening WIP[5]		176	300	216
		Input costs		1,600	3,294	4,190
		Normal loss value		(18)		
				1,758	3,594	4,406
			£	£	£	£
		Cost per unit	11.029	1.932	4.056	5.041
		Evaluation[6]				
		To process 4	9,375	1,642	3,448	4,285
		Abnormal gain	(221)	(39)	(81)	(101)
		Closing WIP	604	155	227	222

Notes:

1. The opening WIP is included as part of the input in the input/output reconciliation. The degree of completion of the opening WIP is not relevant, because we are going to average its cost over all units produced in the period.
2. Note that we are not told the quantity of material added because it does not affect the number of basic units processed.
3. The number of units scrapped is less than the normal loss. There is thus an abnormal gain.

4. The equivalent units of closing WIP takes account of the degree of completion for each cost element.
5. The opening WIP is included in the statement of costs, so that its value is averaged over the equivalent units produced in the period.
6. In the evaluation section, the unit rate for each cost element is multiplied by the number of equivalent units in each part of the output. These values can then be used to complete the process account.

Process 3 account

	Units	£		*Units*	£
Opening WIP	100	692	Process 4	850	9,375
Process 2	900	1,600	Normal loss	90	18
Materials added		3,294	Closing WIP	80	604
Conversion costs		4,190			
Abnormal gain	20	221			
	1,020	9,997		1,020	9,997

Exercise 9.3

To give yourself some extra practice, draw up the abnormal gain account and the scrap account.

Solution

Abnormal gain account

	£		£
Scrap stock (20 × £0.20)	4	Process 3	221
Income statement	217		
	221		221

Scrap account

	£		£
Normal loss	18	Bank/receivable: (90 − 20) × £0.20	14
		Abnormal gain	4
	18		18

9.8 Process costing: a further example

You must try to get as much practice as possible in preparing process cost accounts, and you will find it much easier if you use a standard format for the working papers. Although you will not be required to reproduce the workings in the assessment, for your own benefit you need to work quickly through the available data to produce the required answer.

Work carefully through the next example – or better still try it for yourself before looking at the suggested solution. Notice that the scrapped units are not complete. You will need to take account of this in the equivalent units calculations.

Example

The following information is available for process 2 in October:

			Degree of completion and cost					
			Process 1 input		*Materials added in process 2*		*Conversion costs*	
	Units	*Cost*						
		£	%	£	%	£	%	£
Opening WIP	600	1,480	100	810	80	450	40	220
Closing WIP	350		100		90		30	
Input costs:								
Input from process 1	4,000	6,280						
Materials added in process 2		3,109						
Conversion costs		4,698						

Normal loss is 5 per cent of input from process 1.
300 units were scrapped in the month. The scrapped units had reached the following degrees of completion.

Materials added	90%
Conversion cost	60%

All scrapped units realised £1 each.
Output to the next process was 3,950 units.
You are required to complete the account for process 2 and for the abnormal loss or gain in October.

Solution

The first step is to prepare an input/output reconciliation to see if there was an abnormal loss or abnormal gain. This is found as a balancing figure in the output column.

				Equivalent units to absorb cost		
				Process 1 input	*Materials added*	*Conversion costs*
Input	*Units*	*Output*	*Units*			
Opening WIP	600	To process 3	3,950	3,950	3,950	3,950
Process 1	4,000	Normal loss	200	–	–	–
		Abnormal gain	100	100	90	60
		Closing WIP	350	350	315	105
	4,600		4,600	4,400	4,355	4,115
		Costs		£	£	£
		Opening WIP		810	450	220
		Input costs		6,280	3,109	4,698
		Normal loss value		(200)		
				6,890	3,559	4,918
			£	£	£	£
		Cost per unit	3.578	1.566	0.817	1.195
		Evaluation				
		To process 3	14,133	6,186	3,227	4,720
		Abnormal loss	303	157	74	72
		Closing WIP	931	548	257	126

Process 2 account

	Units	£		*Units*	£
Opening WIP	600	1,480	Process 3	3,950	14,133
Process 1	4,000	6,280	Normal loss	200	200
Materials added		3,109	Abnormal loss	100	303
Conversion costs		4,698	Closing WIP	350	931
	4,600	15,567		4,600	15,567

Abnormal loss account

	£		£
Process 2	303	Scrap account	100
		Income statement	203
	303		303

Scrap account

	£		£
Normal loss	200	Bank/receivables: (200 + 100) × £1	300
Abnormal loss	100		
	300		300

9.9 Contrasting process costing and specific order costing

Now that you have a clear picture of how process costing works you are in a position to think about the differences between process costing and specific order costing methods.

> Remember that *specific order costing* is the collective term for the costing methods that you learned about in the last chapter: job, batch and contract costing.

Process costing can be contrasted with specific order costing methods such as job, batch and contract costing in a number of ways:

- since there is a continuous flow of identical units, individual cost units cannot be separately identified in a process costing environment. In a specific order costing environment, each cost unit is different from all others;
- costs incurred are averaged over the units produced in a process costing system. In contrast to a specific order costing system, it is not possible to allocate costs to specific cost units;
- each cost unit usually undergoes the same process or sequence of processes. In specific order costing environments, each cost unit often involves different operations or processes, depending on the customer's requirements;
- in process costing environments, items are usually produced to replenish inventory, rather than for a specific customer's requirements.

9.10 Summary

Having read this chapter, the main points that you should understand are as follows.

1. The process costing method is appropriate for organisations that produce a continuous flow of identical units. The costs incurred are averaged over the number of units produced in the period in order to determine the cost per unit.

2. There may be more than one process involved in process costing. The output of one process becomes the input of the next process in the sequence.
3. A normal loss is the expected level of loss for the period. The normal loss does not absorb any process costs. If it is saleable it is valued at its scrap value, otherwise the normal loss will have zero value.
4. The scrap value of the normal loss is conventionally deducted from the cost of the first cost element in the analysis, which is usually either materials cost or previous process cost.
5. If losses are greater than the normal loss, the extra loss is called an abnormal loss. If losses are lower than the normal loss the difference is called an abnormal gain.
6. Abnormal losses and gains are valued at the same unit rate as good output. Their scrap values do not affect the main process account but are accounted for in a separate abnormal loss or abnormal gain account.
7. Where there are incomplete units in the process at the end of the period, that is, when there is closing work in progress, it is necessary to determine the number of equivalent units of production in order to calculate the production cost per unit.
8. There are a number of ways in which process costing can be contrasted with specific order costing methods such as job, batch and contract costing.

Revision Questions

9

Question 1 Multiple choice

1.1 Process B had no opening WIP. 13,500 units of raw material were transferred in at £4.50 per unit. Additional material at £1.25 per unit was added in process. Labour and overheads were £6.25 per completed unit and £2.50 per unit incomplete. If 11,750 completed units were transferred out, what was the closing WIP in process B?

(A) £ 77,625
(B) £14,437.50
(C) £141,000
(D) £21,000

1.2 In a process account, abnormal losses are valued:

(A) at their scrap value.
(B) at the same rate as good production.
(C) at the cost of raw materials.
(D) at good production cost less scrap value.

1.3 A chemical process has a normal wastage of 10 per cent of input. In a period, 2,500 kg of material were input and there was an abnormal loss of 75 kg.
What quantity of good production was achieved?

(A) 2,175 kg
(B) 2,250 kg
(C) 2,325 kg
(D) 2,475 kg

1.4 In process costing, where losses have a positive scrap value, when an abnormal gain arises the abnormal gain account is:

(A) credited with the normal production cost of the abnormal gain units.
(B) debited with the normal production cost of the abnormal gain units and credited with the scrap value of the abnormal gain units.
(C) credited with the normal production cost of the abnormal gain units and debited with the scrap value of the abnormal gain units.
(D) credited with the normal production cost of the abnormal gain units and credited with the scrap value of the abnormal gain units.

Data for questions 1.5–1.7

X plc makes one product, which passes through a single process. Details of the process are as follows:

Materials: 5,000 kg at 50 p per kg
Labour: £800
Production overheads 200% of labour

Normal losses are 20 per cent of input in the process, and without further processing any losses can be sold as scrap for 30 p per kg.

The output for the period was 3,800 kg from the process.

There was no work in progress at the beginning or end of the period.

1.5 What value will be credited to the process account for the scrap value of the normal loss?

(A) £300
(B) £530
(C) £980
(D) £1,021

1.6 What is the value of the abnormal loss?

(A) £60
(B) £196
(C) £230
(D) £245

1.7 What is the value of the output?

(A) £3,724
(B) £4,370
(C) £4,655
(D) £4,900

Data for questions 1.8–1.10

A product is manufactured as a result of two processes, A and B. Details of process B for the month of August were as follows:

Materials transferred from process A	10,000 kg valued at £40,500
Labour costs	1,000 hours @ £5.616 per hour
Overheads	50% of labour costs
Output transferred to finished goods	8,000 kg
Closing work in progress	900 kg

Normal loss is 10 per cent of input and losses do not have a scrap value.

Closing work in progress is 100 per cent complete for material, and 75 per cent complete for both labour and overheads.

1.8 What is the value of the abnormal loss (to the nearest £)?

(A) Nil
(B) £489
(C) £544
(D) £546

1.9 What is the value of the output (to the nearest £)?

(A) £39,139
(B) £43,488
(C) £43,680
(D) £43,977

1.10 What is the value of the closing work in progress (to the nearest £)?

(A) £4,403
(B) £4,698
(C) £4,892
(D) £4,947

Data for questions 1.11 and 1.12

The following data relates to a process for the latest period:

Opening work in process	1,000 litres valued at £1,500
Input	30,000 litres costing £15,000
Conversion costs	£10,000
Output	24,000 litres
Closing work in process	3,500 litres

Losses in process are expected to be 10 per cent of period input. They are complete as to input material costs but are discovered after 60 per cent conversion. Losses have a scrap value of £0.20 per litre.

Closing work in process is complete as to input materials and 80 per cent complete as to conversion.

1.11 The number of material-equivalent units was:

(A) 24,000
(B) 28,000
(C) 30,000
(D) 31,000

1.12 The number of conversion-equivalent units was:

(A) 27,100
(B) 27,300
(C) 28,000
(D) 30,100

Data for questions 1.13 and 1.14

PP Ltd makes one product, which passes through a single process. The details of the process for period 2 were as follows.

There were 400 units of opening work in progress, valued as follows:

Material	£49,000
Labour	£23,000
Production overheads	£3,800

No losses are expected in the process.

During the period, 900 units were added to the process, and the following costs occurred:

Material	£198,000 (900 units)
Labour	£139,500
Production overheads	£79,200

There were 500 units of closing work in progress, which were 100 per cent complete for material, 90 per cent complete for labour and 40 per cent complete for overheads. No losses were incurred in the process.

PP Ltd uses weighted average costing.

1.13 How many equivalent units are used when calculating the cost per unit in relation to labour?

(A) 450
(B) 850
(C) 1,250
(D) 1,300

1.14 The value of completed output for the period was

(A) £171,555
(B) £201,500
(C) £274,488
(D) £322,400

Question 2 Short objective-test questions

2.1 When the actual loss in a process is less than the expected loss for the period, there is an:

abnormal loss ☐
abnormal gain ☐

2.2 Input to a process last period was 5,000 kg. There was no opening work in progress but 800 kg were in process at the end of the period. Normal loss is 20 per cent of input. During the period, 4,100 kg were transferred to the next process.

(a) During the period, there was an:
abnormal loss ☐
abnormal gain ☐
(b) The abnormal loss/gain amounted to ☐ kg

2.3 Last period, an abnormal gain of 50 kg arose in process 1. Normal loss was 400 kg. The cost of good output from process 1, after allowing for the abnormal gain, was £3.50 per kg. Scrap from process 1 can be sold for £0.20 per kg.

The scrap account in respect of process 1 for the period is shown below.

Scrap account

	£		£
Process 1	**A**	Abnormal gain	**B**
		Balance c/d	**C**

The values to be entered as A, B and C in the scrap account are:

A ☐ B ☐ C ☐

2.4 In process 2 at the end of a period, 200 units are in progress. They are 100 per cent complete in respect of materials, 50 per cent complete in respect of labour and 20 per cent complete in respect of overhead. The cost of an equivalent complete unit for the period was £4 for materials, £3 for labour and £2 for overhead. Complete the following table to show the value of the work in progress at the end of the period.

	Equivalent units in progress	*Valuation £*
Materials		
Labour		
Overhead		

2.5 In the following process, all losses were fully processed and scrap units from the process can be sold for £3 per unit.

The values to be entered as A and B in the process account below are:
A [ ] B [ ]

Process account [extract]

	Units	£
Finished goods	4,000	88,000
Normal loss	90	**A**
Abnormal loss	50	**B**

Data for questions 2.6 and 2.7

T makes one product in a single process. Details for last period are as follows.

Opening work in process = 300 units valued as follows.

	£
Material cost	1,296
Conversion cost	462

900 units were added during the period and costs incurred were as follows.

	£
Material cost	3,960
Conversion cost	1,890

At the end of the period, there were 200 units of work in process that had reached the following degree of completion.

Material cost	100%
Conversion cost	60%

No losses occur in the process and weighted average costing is used.

2.6 How many equivalent units will be used when calculating the cost per unit in relation to conversion cost?

[ ]

2.7 To the nearest £, what was the value of the work in process at the end of the period?

£ ☐

Question 3 Process costing

A firm operates a process, the details of which for the period were as follows:

- There was no opening work in progress.
- During the period, 8,250 units were received from the previous process at a value of £453,750, labour and overheads were £350,060 and material introduced was £24,750.
- At the end of the period, the closing work in progress was 1,600 units, which were 100 per cent complete in respect of materials, and 60 per cent complete in respect of labour and overheads.
- The balance of units were transferred to finished goods.

Requirements

(a) The number of equivalent units of labour and overheads produced during the period was ☐

(b) In the process account for the period, the following values will be credited:

(i) finished goods value: £ ☐

(ii) closing work in progress value: £ ☐

Question 4 Process costing with abnormal losses

Chemical Processors manufacture Wonderchem using two processes – mixing and distillation. The following details relate to the distillation process for a period:

No opening work in progress	
Input from mixing	36,000 kg at a cost of £166,000
Labour for period	£43,800
Overheads for period	£29,200

Closing WIP of 8,000 kg, which was 100 per cent complete for materials and 50 per cent complete for labour and overheads.

The normal loss in distillation is 10 per cent of fully complete production. Actual loss in the period was 3,600 kg, fully complete, which was scrapped.

Requirements

(a) The abnormal loss for the period was ☐ kg.

(b) The number of equivalent kg produced during the period was:

materials: ☐ equivalent kg.
labour and overhead: ☐ equivalent kg.

(c) (i) The value of the abnormal loss is £ ☐

(ii) (*Tick the correct box*): This value is entered in the process account as a:

debit ☐
credit ☐

(d) The values to be credited in the process account in respect of the following outputs for the period are:

finished goods £ ☐
normal loss £ ☐
closing work in progress £ ☐

Question 5 Process costing with opening work in progress

A company operates an expensive processing plant to produce a single product from one process. At the beginning of October, 3,400 completed units were still in the processing plant awaiting transfer to finished goods. They were valued as follows:

	£	
Direct material	25,500	
Direct wages	10,200	
Production overhead	20,400	(200% of direct wages)

During October, 37,000 further units were put into process and the following costs charged to the process:

	£
Direct materials	276,340
Direct wages	112,000
Production overhead	224,000

A total of 36,000 units were transferred to finished goods and 3,200 units remained in work in progress at the end of October, which were complete as to material and half complete as to labour and production overhead. The normal level of scrap (1,200 units) occurred during the process.

Requirements

(a) The number of equivalent units produced during the period was:

materials ☐
labour and overhead ☐

(b) The value of the outputs from the process during the period was:

finished goods £ ☐
closing work in progress £ ☐

Question 6 Process account

Complete the following account for process 3 last period. The work in progress was complete as to materials and 50 per cent complete as to labour and overhead.

Process 3 account

	Units	£		*Units*	£
Process 2 input	2,000	8,000	Finished goods	1,800	
Labour and overhead		3,800	Work in progress	200	
	2,000	11,800		2,000	11,800

Solutions to Revision Questions

9

Solution 1

For some of these multiple-choice questions you will need to use some fairly extensive workings. In the assessment, you will not be awarded marks for the workings, but do not be tempted to rush them: they are an important part of answering the question, and they will be of no use to you if you cannot read them!

1.1 Answer: (B)

Closing WIP in process B = (13,500 − 11,750) units = 1,750 units

Unit value = £4.50 + £1.25 + £2.50 = £8.25

Closing WIP value = £8.25 × 1,750 = £14,437.50

1.2 Answer: (B)

Abnormal losses are valued at the same rate as good production, so that their occurrence does not affect the cost of good production.

1.3 Answer: (A)

	kg
Input	2,500
Normal loss (10%)	(250)
Abnormal loss	(75)
Good production	2,175

1.4 Answer: (C)

The abnormal gain account shows the net benefit of the abnormal gain. The scrap value must be debited to the abnormal gain account to allow for the 'forgone' scrap value of the normal loss units which did not arise.

1.5 Answer: (A)

Normal loss 5,000 kg × 20% = 1,000 kg @ 30 p = £300

1.6 Answer: (C)

Abnormal loss	kg
Input	5,000
Normal loss	(1,000)
Output	(3,800)
Abnormal loss	200

Production costs	£
Materials	2,500
Labour	800
Production overheads	1,600
	4,900

$$\text{Cost per kg} = \frac{£4,900 - £300}{4,000^*} = £1.15 \text{ per kg}$$

*Output 3,800 + abnormal loss 200 = 4,000 kg
Abnormal loss £1.15 × 200 kg = £230.

1.7 Answer: (B)

Value of output = £1.15 × 3,800 kg = £4,370.

Equivalent unit table for 1.8–1.10

			Materials		*Labour/overheads*
	Units	*%*	*EU*	*%*	*EU*
Output	8,000	100	8,000	100	8,000
Normal loss	1,000		–		–
Abnormal loss	100	100	100	100	100
Closing work in progress	900	100	900	75	675
Total equivalent units	10,000		9,000		8,775
Costs			£40,500		£8,424
Equivalent unit cost			£4.50		£0.96

1.8 Answer: (D)

Value of abnormal loss = 100 × (£4.50 + £0.96) = £546.

1.9 Answer: (C)

Value of output = 8,000 × (£4.50 + £0.96) = £43,680.

1.10 Answer: (B)

Closing work in progress:	£
900 × £4.50	4,050
675 × £0.96	648
	4,698

1.11 Answer: (B)

Workings for 1.11 are shown as part of solution 1.12.

1.12 Answer: (A)

				Equivalent litres		
Input	*Litres*	*Output*	*Litres*	*Input material*		*Conversion costs*
Opening WIP	1,000	Finished output	24,000	24,000		24,000
Input	30,000	Normal loss	3,000	–		–
		Abnormal loss	500	500	(60%)	300
		Closing WIP	3,500	3,500	(80%)	2,800
	31,000		31,000	28,000		27,100

1.13 Answer: (C)

Workings are shown as part of solution 1.14.

1.14 Answer: (D)

Equivalent units table

		Materials		*Labour*		*Production o/h*	
Description	*Units*	*%*	*EU*	*%*	*EU*	*%*	*EU*
Output	800	100	800	100	800	100	800
Closing WIP	500	100	500	90	450	40	200
EU			1,300		1,250		1,000
			£		£		£
Costs – Period			198,000		139,500		79,200
Opening WIP			49,000		23,000		3,800
Total cost			247,000		162,500		83,000
Cost per equivalent unit			190		130		83

Value of completed output = 800 × (£190 + £130 + £83) = £322,400.

Solution 2

2.1 When the actual loss in a process is less than the expected loss for the period, there is an *abnormal gain.*

2.2

	kg
Transferred to next process	4,100
Normal loss (20% × 5,000)	1,000
Closing work in process	800
Abnormal gain	**(900)**
	5,000

2.3 A £80; B £10; C £70.

Scrap account

	£		£
Process 1 – normal loss (400 kg × £0.20)	**80**	Abnormal gain (50 × £0.20)	**10**
		Balance c/d	**70**
	80		**80**

2.4

	Equivalent units in progress	*Valuation £*
Materials	**200** (×£4)	800
Labour	**100** (×£3)	300
Overhead	**40** (×£2)	80
		1,180

2.5 A £270; B £1,100.

Process account [extract]

	Units		£
Finished goods	4,000		88,000
Normal loss	90	(×£3)	**270**
Abnormal loss	50	(×£22*)	**1,100**

*Abnormal loss units are valued at the same rate as good output (£88,000/4,000 = £22).

2.6 Number of equivalent units of conversion cost = 1,120.
Workings are shown as part of solution 2.7.

2.7 Value of work in process at the end of the period = £1,128.

Equivalent units table

Since no losses occur in the process, output can be calculated as follows.
Output = 300 units opening WIP + 900 units input – 200 units closing WIP = 1,000 units

		Materials		*Conversion cost*	
Description	*Units*	*%*	*EU*	*%*	*EU*
Output	1,000	100	1,000	100	1,000
Closing WIP	200	100	200	60	120
			1,200		1,120
			£		£
Costs incurred in period			3,960		1,890
Opening WIP			1,296		462
Total cost			5,256		2,352
Cost per equivalent unit			4.38		2.10

Value of closing WIP = (200 × £4.38) + (120 × £2.10) = £1,128.

Solution 3

- You can use the standard layout for the working paper that you should have become accustomed to when working through this chapter. You can then pick out the relevant parts that you need for your answers.
- There are no losses, therefore the question is quite straightforward.
- The transfer to finished goods is calculated as follows: 8,250 units input, less 1,600 units in progress, equals 6,650 units to finished goods.

(a) 7,610

(b) (i) £691,600

(ii) £136,960

Workings:

				Equivalent units produced		
Input	*Units*	*Output*	*Units*	*Previous process*	*Materials added*	*Labour and o/h*
Previous process	8,250	Finished goods	6,650	6,650	6,650	6,650
		Closing WIP	1,600	1,600	1,600	960 (60%)
	8,250	Equiv. units produced	8,250	8,250	8,250	7,610
		Costs	£	£	£	£
		Period costs		453,750	24,750	350,060
		Cost per equiv. unit	104	55	3	46
		Valuation				
		Finished goods	691,600			
		Closing WIP	136,960	88,000 (1,600 × £55)	4,800 (1,600 × £3)	44,160 (960 × £46)

Solution 4

- Read the question carefully. The normal loss calculation is based on the completed production rather than on the more usual basis of input to the process.
- The losses are completely processed, therefore you can use the total cost per unit to value the abnormal loss.

(a) The abnormal loss for the period was 800 kg.

Workings:

	kg
Input	36,000
Less: Closing WIP	(8,000)
Production	28,000
Normal loss: 10% × 28,000 kg	2,800
Actual loss	3,600
∴ Abnormal loss	800

(b) Materials: 33,200 equivalent kg.
Labour and overhead: 29,200 equivalent kg.

(c) (i) £6,000
(ii) Credit.

(d) Finished goods: £183,000
Normal loss: £0
Closing work in progress: £50,000
Workings:

				Equivalent units		
			Total	*Material*	*Labour*	*Overhead*
Input	kg	*Output*	kg	kg	kg	kg
From mixing	36,000	Finished goods	24,400	24,400	24,400	24,400
		Abnormal loss	800	800	800	800
			25,200	25,200	25,200	25,200
		Normal loss	2,800	–	–	–
		Closing WIP:				
		Material (100%)	8,000	8,000		
		Labour (50%)			4,000	
		Overheads (50%)				4,000
			36,000	33,200	29,200	29,200
		Cost (£)	239,000	166,000	43,800	29,200
		Cost per unit *(£)*	7.50	5.00	1.50	1.00
		Evaluation (£)				
		Finished goods	183,000			
		Abnormal loss	6,000			
		Closing WIP	50,000	40,000	6,000	4,000

Solution 5

- There is opening work in progress to deal with in this question, so you will probably find it easiest to use the full working schedule, beginning with an input/output reconciliation. Although you will not be awarded any marks for these workings, they will help you to achieve the required 100 per cent accuracy.
- Do not be confused by the fact that the opening work in progress consists of complete units. Simply deal with it using the method that you learned in this chapter, that is include it as part of the input and include its value in the cost section of your working schedule.

(a) Materials: 39,200
Labour and overhead: 37,600.

(b) Finished goods: £628,200
Closing work in progress: £40,240.

Workings:

Input	*Units*	*Output*	*Units*	*Equivalent units produced* *Materials*	*Labour*	*Overhead*
Opening WIP	3,400	Finished goods	36,000	36,000	36,000	36,000
Further units	37,000	Normal loss	1,200	–	–	–
		Closing WIP	3,200	3,200	1,600	1,600
	40,400		40,400	39,200	37,600	37,600
		Cost	£	£	£	£
		Opening WIP	56,100	25,500	10,200	20,400
		Period costs	612,340	276,340	112,000	224,000
			668,440	301,840	122,200	244,400
		Cost per unit	17.45	7.70	3.25	6.50
		Evaluation				
		Finished goods	628,200			
		Closing WIP	40,240	24,640	5,200	10,400

Solution 6

- You will need to prepare a statement of equivalent units and calculate the cost per equivalent unit.
- There are no losses to be accounted for, so all of the cost incurred is to be divided over the completed units and the units in progress.
- Be accurate with your workings. Although they will not be awarded marks, they will help you to achieve the necessary 100 per cent accuracy.

Input	*Units*	*Output*	*Units*	*Equivalent units to absorb cost* *Materials*	*Labour/OH*
Process 2 input	2,000	Finished goods	1,800	1,800	1,800
		Closing WIP	200	200	(50%) 100
	2,000		2,000	2,000	1,900
		Costs	£	£	£
		Incurred in period		8,000	3,800
		Cost per unit	6	4	2
		Evaluation			
		Finished goods (1,800 × £6)	10,800		
		Closing WIP	1,000	800	200

Process 3 account

	Units	£		*Units*	£
Process 2 input	2,000	8,000	Finished goods	1,800	10,800
Labour and overhead		3,800	Work in progress	200	1,000
	2,000	11,800		2,000	11,800