VIVEKANANDA COLLEGE
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NAAC ACCREDITED 'A' GRADE

Topic: Joint Product & By Product

Course Title: B.Com (UNDER CBCS SYSTEM)
Paper: Cost & Mgt Accounting-2

Unit: 01

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Practical Problems: Exercise on Joint Product & By Product

1. One tonne of raw material put into a common process yield four joint products P, Q, R and S, their weight being 63 kgs., 117 kgs., 180 kgs. and 540 kgs. respectively. The balance in weight is considered as normal wastage.

   Based on the total processing cost of ₹ 20,000 per tonne of raw material input, you are required to apportion the joint cost to products P, Q, R and S. ***[CS (Final) — Adapted]***

   Ans. *Apportionment of joint cost (on the basis of output) : P- ₹ 1,400 ; Q- ₹ 2,600 ; R- ₹ 4,000 ; S- ₹ 12,000 ; Total input - 1,000 kgs.*

2. ABC Ltd. produces three products, X, Y and Z. The products are processed further. Pre-separation costs are apportioned on the basis of weight of output of each joint product.

   The following data are provided for month just concluded:

   Cost incurred up to separation point ₹ 10,000.

	Product X	Product Y	Product Z
Output (in litres)	100	70	80
	₹	₹	₹
Cost incurred after separation point	2,000	1,200	800

Selling price per litre:

After further processing	50	80	60
At pre-separation point (estimated)	25	70	45

You are required to:

(i) Prepare a statement showing profit or loss made by each product using the present method of apportionment of pre-separation cost.

(ii) Advise the management whether, on purely financial consideration, the products are to be processed further. *[CMA (Inter)]*

Ans.: (i) Profit : X – (₹ 1,000), Y – ₹ 1,600, Z – ₹ 800; (ii) Product X & Z should be further processed and Product Y should be sold at the point of separation. Profit at the point of separation : X – ₹ 500, Y – (₹ 500), Z – ₹ 400.

3. During the month of April, 2005, 10,000 litres of product X and 12,000 litres of product Y were manufactured jointly by incurring following costs :

	₹
Direct materials	26,000
Direct labour	10,000
Variable overheads	8,000
Fixed overheads	22,000

Sales value:

X - 10,000 litres @ ₹ 5.20 per litre

Y- 12,000 litres @ ₹ 3.00 per litre

(i) Allocate the joint cost to products X and Y under following three alternative methods :

(a) On the basis of quantity produced and sold;

(b) On the basis of sales value;

(c) Variable costs on the basis of quantity produced and fixed costs on the basis of contribution.

(ii) Also determine the profit margin for product X and product Y under the above three methods. *[CS (Final) — Adapted]*

Ans.: (i) (a) X- ₹ 30,000, Y - ₹ 36,000; (b) X - ₹ 39,000, Y - ₹ 27,000; (c) X - ₹ 36,000, Y - ₹ 30,000. (ii) As a % on sales : (a) X - 42.30%, Y-Nil; (b) X-25%, Y-25%; (c) X-30.77%, Y-16.67%.

4. In manufacturing the main product A, a company processes the resulting waste material into two by-products M1, and M2. Using the method of working back from sales value to estimated cost, you are required to prepare a comparative profit and loss statement of the three products from the following data:

(i) Total cost up to separation point was ₹ 1,36,000.

	A	M1	M2
	₹	₹	₹
(ii) Sales (all production)	3,28,000	32,000	48,000

(iii)	Cost after separation	—	9,600	14,400
(iv)	Estimated net profit as a % of sales value	—	20%	30%
(v)	Estimated selling expenses as a % of sales value	20%	20%	20%

[CMA (Inter) — Adapted]

Ans. *Profit: A- ₹ 1,45,600, M1 - ₹ 6,400, M2 - ₹ 14,400, Total ₹ 1,66,400; % of profit on sales : A- 44.40%, M1 - 20%, M2- 30%, Total - 40.80%.*

5. A factory is engaged in the production of a chemical BOMEX and in course of its manufacture, a by-product BRUCIL is produced, which after further processing has a commercial value. For the month of April, 2013, the following are the summarised cost data :

	Joint Expenses	Separate Expenses	
	₹	BOMEX	BRUCIL
No. of units produced		2,000	2,000
		₹	₹
Materials	1,00,000	6,000	4,000
Labour	50,000	20,000	18,000
Overheads	30,000	10,000	6,000
Selling price per unit		98	34
Estimated profit per unit on sale of BRUCIL			4

The factory uses reverse cost method of accounting for by-products whereby the sales value of by-products after deduction of the estimated profit, post separation costs and selling & distribution expenses relating to the by- products is credited to joint process cost account.

You are required to prepare statements showing:—

(i) The joint cost allocable to Bomex and Brucil.

(ii) The product-wise and overall profitability of the factory for April, 2013.

[CA (Inter)— Adapted]

Ans. *(i) Share of joint cost : Bomex – ₹ 1,48,000, Brucil – ₹ 32,000; (ii) Profit : Bomex – ₹12,000, Brucil – ₹ 8,000, Overall – ₹ 20,000.*

6. B. Ltd. manufactures product A which yields two by-products B and C. The actual joint expenses of manufacture for a period were ₹ 8,000. It was estimated that the profits on each product as a % of sales would be 30% , 25%, and 15%, respectively. Subsequent expenses were:

	A	B	C
	₹	₹	₹
Materials	100	75	25
Direct wages	200	125	50
Overheads	150	125	75
	450	325	150
Sales value	6,000	4,000	2,500

Prepare a statement showing the apportionment of joint expenses of manufacture over the different products. Also presume that selling expenses are apportioned over the products as a % on sales. *[Delhi Univ. B.Com.(Hons.)—Adapted]*

Ans. Total selling expenses: ₹ 400; Apportioned selling expenses (in the ratio of sales): A- ₹ 192, B-₹ 128, C-₹ 80; Apportioned joint cost: A- ₹ 3,558, B-₹ 2,547, C-₹ 1,895.

7. Jahanara Ltd. produces 2,00,000, 30,000 25,000, 20,000 and 75,000 units of its five products A, B, C, D and E respectively in a manufacturing process and sells them at ₹ 17, ₹ 13, ₹ 8, ₹ 10 and ₹ 14 per unit respectively. Except product D, remaining products can be further processed and then can be sold at ₹ 25, ₹ 17, ₹ 12 and ₹ 20 per unit in case of A, B, C and E respectively.

Raw material costs ₹ 35,90,000 and other manufacturing expenses cost ₹ 5,47,000 in the manufacturing process which are absorbed on the basis of their net realisable value. The further processing costs of A, B, C and E are ₹ 12,50,000, ₹ 1,50,000, ₹ 50,000 and ₹ 1,50,000 respectively. Fixed costs are ₹ 4,73,000.

You are required to prepare the following in respect of the coming year:

(a) Statement showing income forecast of the company assuming that none of its products are to be further processed.

(b) Statement showing income forecast of the company assuming that products A, B, C and E are to be processed further.

Can you suggest any other production plan whereby the company can maximise its profits. If yes, then submit a statement showing income forecast arising out of adoption of that plan.

[CA (Inter) — Adapted]

Ans. Apportionment of joint cost : A - ₹ 26,25,000, B- ₹ 2,52,000, C- ₹ 1,75,000, D - ₹ 1,40,000, E- ₹ 9,45,000. (a) ₹ 6,30,000; (b) ₹ 13,00,000. Suggested plan: To sell B & D at the point of split-off and A, C & E to process further; Then profit ₹ 13,30,000.

8. A company processes a raw material in its Department 1 to produce three products, *viz.* A, B and X at the same split-off stage. During a period, 1,80,000 kg. of raw materials were processed in Department 1 at a total cost of ₹ 12,88,000 and the resultant output of A, B and X were 18,000 kg., 10,000 kg. and 54,000 kg. respectively. A and B were further processed in Department 2 at a total cost of ₹ 1,80,000 and ₹ 1,50,000 respectively. X was further processed in Department 3 at a cost of ₹ 1,08,000. There is no waste in further processing. The details of sales effected during the period were as under:

	A	B	X
Quantity sold (kg.)	17,000	5,000	44,000
Sales value (₹)	12,24,000	2,50,000	7,92,000

There were no opening stocks. If these products were sold at split-off stage, the selling prices of A, B and X would have been ₹ 50, ₹ 40 and ₹ 10 per kg. respectively.

Required:

(i) Prepare a statement showing the apportionment of joint costs to A, B and X.

(ii) Present a statement showing the cost per kg. of each product indicating joint cost, further processing cost and total cost separately.

(iii) Prepare a statement showing the product-wise and total profit for the period.

(iv) State with supporting calculations as to whether any or all the products should be further processed or not. *[CA (Inter) — Adapted]*

Ans. *(i) Apportioned joint cost (on the basis of sales value): A-₹ 6,30,000, B - ₹ 2,80,000, X- ₹ 3,78,000. (ii) Total cost per kg. : A - ₹45, B - ₹43, C - ₹9. (iii) Profit: A - ₹4,59,000, B - ₹35,000, C - ₹3,96,000. (iv) B should not be processed further, but A & X should be processed further.*

9. Roja Ltd. in the course of refining crude oil obtains four Joint products A, B, C and D. The total cost till the split-off point was ₹ 97,600. The output and sales in the year 1990 were as follows :

Product	Output (Gallons)	Sales (₹)	Separate costs (₹)
A	5,00,000	1,15,000	30,000
B	10,000	10,000	6,000
C	5,000	4,000	–
D	9,000	30,000	1,000

You are required to:

(i) Calculate the net income for each of the products if the joint costs are apportioned on the basis of sales value of the different products.

(ii) What would be the net income of the company from each product if it decides to sell the products at the split-off point itself @ A-15 paise, B-50 paise, C- 80 paise and D - ₹ 3 per gallon?

(iii) In case the company expects to operate at the same level of production and sales in the year 1991, could the company increase the net income by altering its processing decisions? If so, what would be the expected overall net income? Which product should be processed further and which would be sold at split-off? Assume that all costs incurred after the split-off are variable. *[CS (Inter) — Adapted]*

Ans.: *(i) A - ₹17,000, B - ₹800, C - ₹800, D - ₹5,800; (ii) A - ₹9,054, B - ₹603, C - ₹483, D - ₹3,260; (iii) B & C should be sold at split-off and A & D should be processed further.*

1 Statement showing apportionment of Joint Cost among the Joint Product P, Q, R and S for the Period (Physical unit Method)

Products	Output (Kg)	Basis of Apportionment.	Sh. of Joint Cost.
P	63	$20,000 \times \frac{63}{900} =$	1,400.
Q	117	$20,000 \times \frac{117}{900} =$	2,600
R	180	$20,000 \times \frac{180}{900} =$	4,000
S	540	$20,000 \times \frac{540}{900} =$	12,000
Total output	900		20,000
Normal wastage	100.		NIL
Total Input	1,000		20,000

Working note – (a) Here wastage of 100 kgs. is purely a normal loss. Its cost is charged over the good Joint Products as Joint Products

(b) The basis of apportionment of Common Cost for a Joint Product.

$$\text{Joint Product} = \frac{\text{Particular output}}{\text{Total output}} \times \text{Total Joint Cost.}$$

2 i) Statement showing Profit for 3 Joint Products.

Particulars.	Total (₹)	Joint Products X (₹)	Y (₹)	Z (₹)
Sales.	15,400.	100 × 50 = 5,000	70 × 80 = 5,600	80 × 60 = 4,800
Pre separation Cost apportioned on weight basis (100 : 70 : 80)	10,000	$100 \times \frac{100}{250}$ = 4,000	$100 \times \frac{70}{250}$ = 2,800	$100 \times \frac{80}{250}$ = 3,200
Post Separation Cost	4,000	2,000	1,200	800
Total cost	14,000	6,000	4,000	4,000
Profit (Sales – T-Cost)	1,400	(1,000)	1,600	800

ii) Statement showing Profitability of Joint Product.

Product	Incremental Revenue	Incremental Cost	Incremental Profit / Loss.
X	100 × (50 – 30) = 2,000	2,000	500
Y	70 × (80 – 70) = 700	1,200	(500)
Z	80 × (60 – 45) = 1200	800	400.
			400

Hence Products X & Z should be Processed and sold at the Point of Separation. Y should be

3 (a) Statement showing Apportionment of Joint Cost on the basis of weight & Profit.

Product	Production wt.	Apportionment of J. Cost (26+10+8+22)=66	Sales.	% Profit/Loss.	
X	10,000	$66,000 \times \frac{10,000}{22,000} = 30,000$	$10,000 \times 5.2 = 52,000$	$\frac{22,000}{52,000} \times 100 = 42.30\%$	22,000
Y	12,000	$66,000 \times \frac{12,000}{22,000} = 36,000$	$12,000 \times 3 = 36,000$	—	—
	22,000	66,000	88,000.		22,000

(b) Statement showing apportionment of J. Cost on the basis of Sales value & Profit

Product	Sales	Apportionment of Joint Cost on Sales value	Profit/Loss.	% of Profit on sale
X	$10,000 \times 5.2 = 52,000$	$66,000 \times \frac{52,000}{88,000} = 39,000$	13,000	$\frac{13,000}{52,000} \times 100 = 25\%$
Y	$12,000 \times 3 = 36,000$	$66,000 \times \frac{36,000}{88,000} = 27,000$	9,000	$\frac{9,000}{36,000} \times 100 = 25\%$
	88,000	66,000	22,000	

(c) Statement showing Apportionment of Marginal Cost on the basis of weight & Fixed Cost on the basis of Contribution.

Products	Production wt.	Sales.	Apportionment M.C on 10 : 12.	Contribution.	Apportionment of F. Cost	Profit	% of Profit
X	10,000	52,000	$44,000 \times \frac{10}{22} = 20,000$	$52,000 - 20,000 = 32,000$	$22,000 \times \frac{32}{44} = 16,000$	$32,000 - 16,000 = 16,000$	$\frac{16,000}{52,000} \times 100 = 30.76\%$
Y	12,000	36,000	$44,000 \times \frac{12}{22} = 24,000$	$36,000 - 24,000 = 12,000$	$22,000 \times \frac{12}{44} = 6,000$	$12,000 - 6,000 = 6,000$	$\frac{6,000}{36,000} \times 100 = 16.67\%$
	22,000	88,000	44,000.	44,000	22,000	22,000	

4 Statement showing apportionment of Joint Costs.

Particulars.	By Product M_1		M_2	
Sales value		32,000		48,000
Less: Estimated Net Profit	32,000 × 20%	6,400	48,000 × 30%	14,400
Estimated Total Cost		25,600		33,600
Less: Estimated selling exp.	32,000 × 20%	6,400	48,000 × 20%	9,600
		19,200		24,000
Less: Cost after separation.		9,600		14,400
Share of Joint Cost.		9,600		9,600

∴ Joint Cost of Main Product A = 1,36,000 − (9600 + 9600)
= 1,16,800.

Comparative Profit & Loss Statement of Main Product & By Product.

	Total (₹)	Main Product A	By Product M1	By Product M2
Sales.	4,08,7kg	3,28,kg	32,kg	48,kg.
Cost before separation.	1,36,kg	1,16,800	960	960
Cost after separation.	24,kg.	—	960	14,400.
Cost of Production —	1,60,kg	1,16,8kg (3,28,kg × 20%)	19,200	24,kg.
Selling Exp. a	81,6kg	65,600	6,400	9,600.
Cost of Sales.	2,41,600	1,82,400	25,600	33,600
Profit = (Sales − Cost of Sales)	1,66,400	1,45,600	6,400	14,400.

BOMEX BRUCIL

5 Statement showing Joint Cost chargeable to the By Product BRUCIL for the month of April' 2013.

Sales − (2000 × 34)		68,000
Less:- Estimated Profit on Sale − (2000 × 4)		8,kg
Cost of Sales / Total Cost		60,kg.
Less:- Selling & Distribution Exp.		—
Total Profit cost / Works Cost		60,kg
Less:- Exp. after separation.		
Mat.	4,kg	
Lab.	18,kg	
O/h.	6,kg	28,kg
Joint Cost or Pre-separation Cost →		32,kg

Statement showing Joint Cost allocable to the main Product Bomex for the month of April - 2013.

Total / Joint Cost for both Products:—		
Mat.	1,00,kg	
Lab.	50,kg	
O/h	30,kg	
		1,80,kg
Less:- Sh. of Joint Cost of Brucil		32,kg
Sh. of Joint Cost of Main Product BOMEX →		1,48,kg

Statement showing Product wise & Overall Profitability

	BOMEX	BRUCIL	Total
Sales - (Bomex 2kg×98, Brucil = 2kg×34)	1,96,kg	68,kg	2,64,kg
Sh. of Joint cost	1,48,kg	32,kg	1,80,kg
Post Separation Cost			
Mat.	6,kg	4,kg	10,kg
Lab.	20,kg	18,kg	38,kg
O/h	10,kg	6,kg	16,kg
W. Cost / COP	1,84,kg	60,kg	2,44,kg
Add:- Selling & Distribution Exp.	—	—	—
Cost of Sales / Total cost	1,84,kg	60,kg	2,44,kg
Profit / Loss = (Sales − T. Cost)	12,kg	8,kg	20,kg

6 Cal. of Selling Exp.

Sales (6000 + 4000 + 2500)		12,500
Less: Estimated Profit [(6000 × 30%) + (4000 × 25%) + (2500 × 15%)]		3175
Total Cost		9,325
Less: Post Separation Exp (450 + 325 + 150)		925
		8,400
Less: Joint Cost		8,000
Selling Exp.		400

Apportionment of Selling Exp. in the ratio of Sales:-

A	$400 \times \frac{6000}{12500}$	192
B	$400 \times \frac{4000}{12500}$	128
C	$400 \times \frac{2500}{12500}$	80
		400.

Statement showing apportionment of Joint Cost.

Particulars.	Total (₹)	Product A		Product B		Product C	
Sales.	12,500	6000		4000		2500	
Less:- Estimated Profit	3175	6000 × 30%	1800	4000 × 25%	1000	2500 × 15%	375
T. Cost	9,325		4,200		3,000		2,125
Less:- Selling Exp.	400		192		128		80
Less:- Post Separation Exp	925		450		325		150
Joint Cost.	8,000		3558		2,547		1,895

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Joint Cost = 35,95,000 + 5,47,000 = 41,37,000

apportioned Joint Cost on net realisable value

	A	B	C	D	E	Total.
Sales.	2000 × 25 = 50,00,000	30,000 × 17 = 5,10,000	25,000 × 12 = 3,00,000	20,000 × 10 = 2,00,000	75,000 × 20 = 15,00,000	75,10,000
Less:- further Process Cost	12,50,000	1,50,000	50,000	—	1,50,000	16,00,000
Net realisable value	37,50,000	3,60,000	2,50,000	2,00,000	13,50,000	59,10,000
Joint Cost	$41,37,000 \times \frac{37,50,000}{59,10,000}$ = 26,25,000	$41,37,000 \times \frac{3,60,000}{59,10,000}$ = 2,52,000	$41,37,000 \times \frac{2,50,000}{59,10,000}$ = 1,75,000	$41,37,000 \times \frac{2,00,000}{59,10,000}$ = 1,40,000	$41,37,000 \times \frac{13,50,000}{59,10,000}$ = 9,45,000.	41,37,000

i) Statement showing income forecast of 1th Com. assuming that none of its Products are to be further Processed:—

	A	B	C	D	E	Total
Sales	2,00,000×17 = 34,00,000	30,000×13 = 3,90,000	25,000×8 = 2,00,000	20,000×10 = 2,00,000	75,000×14 = 10,50,000	52,40,000
less Joint Cost	26,25,000	21,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Excess revenue over joint cost.	7,75,000	1,38,000	25,000	60,000	1,05,000	11,03,000
less: Fixed Cost						4,73,000
Profit.						6,30,000

ii) Statement showing income forecast of 1th Com. assuming that Product A, B, C & E are further Processed—

	A	B	C	D	E	Total
Sales -	50,00,000	5,10,000	3,00,000	2,00,000	15,00,000	75,10,000
less: Joint Cost	26,25,000	21,52,000	1,75,000	1,40,000	9,45,000	41,37,000
less:- Further Proces Cost. →	12,50,000	1,50,000	50,000	—	1,50,000	16,00,000
Excess of Rev. over Cost	11,25,000	1,08,000	75,000	60,000	4,05,000	17,73,000
less:- F. Cost						4,73,000
Profit						13,00,000

Comment:— On Comparison of figure of Profit it is clear that the best production plan will be to sell A, C and E after further processing and B and D at the split off Point. The Profit of the suggested plan will be 13,30,000

i.e [(11,25,000 + 1,38,000 + 75,000 + 60,000 + 4,05,000) − 4,73,000]

8 i) Statement showing apportionment of Joint Cost

Product	A	B	X	Total.
output (kg)	18,000	10,000	54,000	
Sales value at Split off Point	(18,000×50) 9,00,000	(10,000×40) = 4,00,000	(54,000×10) = 5,40,000	18,40,000
Joint Cost apportioned in sales value at split off Point	12,88,000 × 9,00,000 / 18,40,000 = 6,30,000	12,88,000 × 4,00,000 / 18,40,000 = 2,80,000	12,88,000 × 5,40,000 / 18,40,000 = 3,78,000	12,88,000

ii) Statement showing Cost Per kg. of each Product.

	A		B		X	
Joint Cost Per kg.	6,30,000 / 18,000	= 35	2,80,000 / 10,000	= 28	3,78,000 / 54,000	= 7
Further Proces Cost/kg	180000 / 18000	= 10	1,50,000 / 10,000	= 15	1,08,000 / 54,000	= 2
Total Cost Per kg.		45		43		9

iii) Statement of Profit :—

	A	B	X	Total
Sales value	12,24,000	2,150,000	7,92,000	22,66,000
Add :- clo. stock	(1000×45) 45,000	5000×43 2,15,000	1000×9 90,000	3,50,000
Value of Production	12,69,000	4,65,000	8,82,000	26,16,000
Sh. of Joint Cost	6,30,000	2,80,000	3,78,000	12,88,000
Further Processing cost	1,80,000	1,50,000	1,08,000	4,38,000
	8,10,000	4,30,000	4,86,000	17,26,000
Profit	4,59,000	35,000	3,96,000	8,90,000

iv) Statement showing Incremental Revenue and Cost.

	A	B	C
S.P. after further Processing	12,24,000 / 17000 = 72	3,50,000 / 5000 = 50	7,92,000 / 44000 = 18
Less S.P per kg at Split off Point	50	40	10
Incremental S.P	22	10	8
Less further Proc Cost Per kg.	10	15	2
Increment Profit (Loss) Per kg	12	(5)	6

Comment :— Since Product B does not give any Profit on further Processing, it should be sold at Split off Point without further Processing.

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i) Net Income of each Product when Joint Cost are apportioned on Sales value basis —

Product	Sales value (₹)	Separate Cost (₹)	S.V at Split off Point	Apportioned Joint Cost	Net Income
A	1,15,000	30,000	85,000	97,600 × 85000/122000 = 68,000	17,000
B	10,000	6,000	4,000	97,600 × 4000/122000 = 3,200	800
C	4,000	—	4,000	97,600 × 4000/122000 = 3,200	800
D	30,000	1,000	29,000	97,600 × 29000/122000 = 23,200	5,800
	1,59,000	37,000	1,22,000	97,600	24,400

ii) Net Income of each Product if sold at Split off Point —

Product	Quantity	S.P/P.U	S.V. at Split off Point	Allocated Joint Cost	Net Income
A	5,100	0.15	5100×0.15 = 765	97,600 × 765/1111 = 65,946	9,054
B	100	0.50	100×0.5 = 50	976 × 500/111000 = 4,396	604
C	500	0.80	500×0.8 = 400	976 × 4000/111000 = 3517	483
D	900	3.00	900×3 = 2700	976 × 27000/111000 = 23,741	3259
	5,241		1111	97,600	13,400

(iii) Additional net income by altering the processing decision.

Product	S.V. after further Process	S.V. at Split off Pnt	Incremental S.V	Separate cost	Incremental Gain/Loss
A	1,15,000	75,000	40,000	30,000	10,000
B	10,000	5,000	5,000	6,000	(1,000)
C	4,000	4,000	—	—	—
D	30,000	27,000	3,000	1,000	2,000
	1,59,000.	1,11,000.	48,000	37,000	11,000.

Comment:- Product B & C should be sold at Split off Point. Product A & D should be sold after further Processing.