

Mark Scheme (Results)

January 2012

Principal Learning

Manufacturing & Product Design
MP301 Paper 01

Manufacturing Business Principles

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1	<p>1 mark identification, 1 mark expansion (x 2)</p> <ul style="list-style-type: none"> • An example of key business function (1) an example of a support function (1) • Support functions fulfil secondary roles (1) that are not critical to the business (1) • Key business functions can be directly attributed to manufacturing operations (1) and add value (1) • Key business functions are involved in operations such as production (1) whereas support functions fulfil roles such as security or cleaning (1) • Key business functions are usually fulfilled by employees of the business (1) whereas support functions are often carried out by sub-contractors (1) <p style="text-align: right;">(1 x 2) (1 x 2)</p>	(4)

Question Number	Answer	Mark
2	<p>1 mark for identification, 1 mark for expansion to a maximum of 2 marks:</p> <ul style="list-style-type: none"> • It will normally employ more than 50 people (1) and less than 250 people (1) • The business would normally have specific premises rather than being home based (1) however the business would not occupy a large industrial site (1) • They have a specialisation/niche market (1) unlikely to require mass production (1) • They can respond quickly to changes in the market (1) as they are likely to have a flexible manufacturing system (1) • Relatively large turnover (1) requiring published accounts (1) • Medium size enterprises are often components in the supply chain (1) supporting large scale manufacturing (1) • Unlikely to be a Plc(1) but could have a small number of shareholders (1) <p>Any other suitable answer</p> <p>2 low responses – 1 mark only (max 3 marks) e.g. <i>A medium sized manufacturing enterprise is larger than a micro/small enterprise but smaller than a large-scale manufacturer (1).</i></p> <p><i>No marks for characterising a feature as 'medium'</i></p> <p>No repetition</p> <p style="text-align: right;">(3 x 2)</p>	(6)

Question Number	Indicative Content	
3	<p> Planning Scheduling Liaison with design, purchasing, logistics etc. Tooling, machinery, specialist equipment Test runs of production of new products Meeting deadlines Maximising production efficiency Responsible to senior management Maintaining a safe working environment Managing budgets Managing staff appraisals Meeting specification </p> <p> <u>Model Answer</u> A production manager is responsible for planning (1) and scheduling (1) production of the product/s. He/she works closely with design (1) to ensure tooling (1), machinery (1) and specialist equipment (1) are in place in order for new products to be produced (1). The production manager will also take overall responsibility for the allocation of production staff (1) in order to meet deadlines (1) and maximise efficiency (1). They will also be responsible to the board of directors/senior management (1). They would be expected to ensure a safe working environment for colleagues (1) and ensure production budgets are managed effectively (1). </p>	
Level	Mark	
	0	No rewardable material
1	1-2	Limited understanding of the role of the production manager demonstrated with one or two responsibilities described
2	3-4	Clear understanding of the role of the production manager demonstrated with three or four responsibilities described
3	5-6	Comprehensive understanding of the role of the production manager demonstrated with five or more responsibilities described

Question Number	Indicative Content	
4	<p>Leadership is needed because it: ensures income generation/growth promotes increased competitiveness ensures long term sustainability secures employment negates the effects of globalisation leads to innovation in products/processes leads to the development of high value added products helps minimise environmental impact provides motivation to employees</p> <p><u>Model answer</u> Effective leadership is necessary to secure the long term future of a company (1) as well as the sustainability (1) and increased competitiveness of the business (1). This will require the consideration of the effects of globalisation (1) and support innovation (1). Leadership can require risk taking (1) to generate income/growth (1) by developing new technologies (1) and high value added products (1).</p>	
Level	Mark	
	0	No rewardable material
1	1-2	Limited understanding of requirements for leadership with 1 or 2 points highlighted
2	3-4	Clear understanding of requirements for leadership with 3 or 4 points highlighted
3	5-6	Comprehensive understanding of requirements for leadership with 5 or 6 points highlighted

Question Number	Answer	Mark
5(a)	<p>1 mark for identification, 1 mark for expansion</p> <ul style="list-style-type: none"> • Increase in the price of goods (1) over a pre-determined period of time (1) • The general reduction in purchasing power of currency (1) as represented by a given price index (1) • For example: Increase in the cost of raw materials (1) which affects the price of the final product (1) • For example: Increase in the cost of labour (1) which is often passed on to the customer (1) <p>Accept any other suitable answer</p>	(1 x 2) (2)

Question Number	Indicative content	
5(b)	<p>Costs of raw materials can increase rapidly Increase in price can affect sales/competitiveness Profits can be reduced as other costs rise Salaries will need to rise It will affect long term forecasting Raw materials/salaries/energy costs etc</p> <p><u>Model Answer</u> Increases in inflation can affect the profitability of the business (1) and can lead to higher product prices (1). The business costs for the enterprise increase in several areas. Inflation rate increases have a greater effect on manufacturers (1) they can lead to increases in costs (1) including raw material costs (1). This can lead to an erosion of profits (1) however if prices are increased (1) to maintain profits (1) competitiveness can be affected (1) if other producers are able to maintain their current prices (1). Pressure to increase salaries/wages will be increased (1) as price instability is generally not beneficial for manufacturers (1). Increases in the price of general costs such as energy and support services will affect the overall business costs (1).</p>	
Level	Mark	
	0	No rewardable material
1	1-2	Limited understanding of the effect of the rate of inflation with one or two examples given
2	3-4	Clear understanding of the effect of the rate of inflation demonstrated with three or four examples given
3	5-6	Comprehensive understanding of the effect of the rate of inflation demonstrated with five or more examples given

Question Number	Indicative content	
6(a)	<p>Cost to dispose of harmful products Cost of separating parts Recyclable Non-recyclable Transportation Landfill tax Recycling cost Safe disposal cost Dangerous/poisonous compounds Cost incurred at design/development stage Legal requirement</p> <p><u>Model Answer</u> Disassembly costs can affect the profitability of the business (1) they refer to the cost of separating (1) parts and sorting into recyclable (1) and non-recyclable (1). This can include transportation (1) and handling costs (1). Other increased costs can include disposal costs and extra taxes (1) such as landfill taxes (1) charges for the safe disposal of poisonous (1) or dangerous compounds (1). They can also incur recycling costs if difficult and costly to recycle (1).</p>	
Level	Mark	
	0	No rewardable material
1	1-2	Limited understanding of the effects of disassembly/disposal with one or two examples given
2	3-4	Clear understanding of the effects of disassembly/disposal demonstrated with three or four examples given
3	5-6	Comprehensive understanding of the effects of disassembly/disposal demonstrated with five or more examples given

Question Number	Indicative Content	
6(b)	Cheaper raw material Access to raw materials Tax incentives Greater profits Less punitive environmental/social legislation Carbon footprint Decrease waste Technical factors Model Answer Using new technology (1) or developing new techniques (1), to use materials more efficiently (1), can lead to leaner manufacturing and production (1). By using materials that are recyclable, possibly from disassembly, the car manufacturer might benefit from reduced raw material costs (1) and greater availability of materials (1). Legislation may reward the company for reducing its carbon footprint (1) recycling within the manufacturing facility will reduce waste costs (1) and make for more efficient use of raw material (1) making for greater profits (1).	
Level	Mark	
	0	No rewardable material
1	1-2	Limited understanding of the use of recycled materials in reducing costs demonstrated with one or two valid reasons cited
2	3-4	Clear understanding of the use of recycled materials in reducing costs demonstrated with three or four valid reasons cited
3	5-6	Comprehensive understanding of the use of recycled materials in reducing costs demonstrated with five or more reasons cited

Question Number	Answer	Mark
7	1 mark for identification, and 1 mark for expansion to a maximum of 2 marks each <ul style="list-style-type: none"> • Will lead to the cost of borrowing money increasing (1) leading to increased business costs (1) • May result in delaying purchasing essential machinery (1) leading to maintenance costs (1) • May lead to cash flow issues (1) affecting the sustainability of the business (1) • Sales could be affected (1) as consumers have less disposable income (1) Any other suitable answer from manufacturer or consumer viewpoint <div style="text-align: right;">(2 x 2)</div>	(4)

Question Number	Answer	Mark
8(a)	<p>1 mark for identification, 1 mark for expansion to a maximum of 2 marks:</p> <ul style="list-style-type: none"> • A business plan is a statement of the aims of the business (1) including estimates of financial performance (1) • Planning investment strategy (1) using indicators such as costs, revenues, cash flow etc. (1) • A business plan considers the marketing approach/considerations for current products (1) including increasing the promotion of products where growth is anticipated (1) • A business plan considers the strategy for reducing production/promotion (1) for products that are seen to be in decline or due for replacement (1) • Planning increases/decreases in physical resources (1) such as new premises, increased staffing etc. (1) <p>Any other suitable answer</p>	<p>(1 x 2) (2)</p>

Question Number	Answer	Mark
8(b)	<p>1 mark for identification, 1 mark for expansion to a maximum of 2 marks:</p> <ul style="list-style-type: none"> • Research and development is vital to the continued sustainability of a manufacturing enterprise (1) through the use of developed materials/processes/technologies/innovative products (1) • By developing new or improved products a manufacturer can stay ahead of the competition (1) and maintain/increase its customer base (1) • Reputation for developing new technologies (1) which can be licensed to other manufacturers (1) <p>Any other suitable answer</p>	<p>(1 x 2) (2)</p>

Question Number	Answer	Mark
9(a)	<p>1 mark for identification, and 1 mark for expansion to a maximum of 2 marks each</p> <ul style="list-style-type: none"> • Allow goods to be produced quicker (1) and more efficiently (1) • More reliable (1) costing less to maintain (1) • Less downtime (1) improved productivity (1) • Uses material more efficiently (1) resulting in less waste (1) • Less energy use (1) resulting in lower energy bills (1) • Less operators required (1) reduced labour cost (1) <p>Any other suitable answer</p>	(2 x 2) (4)

Question Number	Indicative Content	
9(b)	<p>Lean manufacture JIT Reduced waste Kaizan TQM U shaped lines Poke Yoke Multi skilling</p> <p>Model Answer By investing in lean manufacture techniques (1) and continuous improvements/kaizan (1) production efficiency is improved. Other features such as JIT (just in time) (1) and mistake proofing/poke yoke reduce waste and time in production (1) thus increasing profits (1) and reducing costs (1). Having flexible multi-skilled staff (1) working in efficient U shaped production lines (1) increases efficiency and reduces waste (1). Introducing six sigma (1) and TQM (1) improves quality (1) and thus reduces costs.</p>	
Level	Mark	
	0	No rewardable material
1	1-2	Limited knowledge demonstrated of efficiency methods with one or two elements highlighted/discussed
2	3-4	Clear knowledge and understanding demonstrated of efficiency methods with three or four elements highlighted/discussed
3	5-6	Comprehensive knowledge and understanding demonstrated of efficiency methods with five or more elements highlighted/discussed

Question Number	Answer	Mark
10	<p>1 mark for identification and 1 mark for expansion to a maximum of 2 marks.</p> <p>Financial risk assessment is an assessment by an internal or external agency/ auditor (1) which makes a judgement on the financial health/viability of a business/investment (1)</p> <p>Any other suitable answer</p> <p style="text-align: right;">(1 x 2)</p>	(2)

Question Number	Answer	Mark
11 (a)	<p>1 mark for identification and 1 mark for expansion to a maximum of 2 marks (x2).</p> <ul style="list-style-type: none"> • Over specification of the product (1) adding unnecessary value by manufacturing to a quality higher than is required (1) • Movement of operator (1) without performing a manufacturing operation (1) • Storage (1) over any given length of time (1) • Any transportation of product (1) over any given distance (1) <p>Any other suitable answer that relates to non value adding operations that don't contribute to additional profit/add cost/add time to production.</p> <p style="text-align: right;">(2 x 2)</p>	(4)

Question Number	Indicative Content	
11(b)	<p>Whole business approach Relies on assuring quality at all stages of production Does not rely on inspection Customer led Management driven Reduces scrap costs Prevents unnecessary operations adding value to faulty products Aims to achieve 100% customer satisfaction Requires training/developing all staff to participate in improving quality</p> <p><u>Model Answer</u> TQM is a whole business approach (1) led by customers (1) and focussed on 100% customer satisfaction (1) it seeks to incorporate quality checks (1) and quality improvement (1) into every stage of the business/manufacturing process (1). This is achieved by training/developing staff (1) to check for quality issues (1) rather than relying on inspection (1) at the end of the process(1). Consequently there are less defects (1) and processes that add value (1) are not carried out on products that are faulty (1) or out of tolerance (1) which therefore influences profitability (1). The key to its success is that it is a management focus (1) that becomes custom and practice (1) within the organisation and informs all business decisions and operations (1).</p>	
Level	Mark	
	0	No rewardable material
1	1-2	Limited knowledge demonstrated of how TQM influences profitability with one or two elements highlighted/discussed
2	3-5	Clear knowledge and understanding demonstrated of how TQM influences profitability with three or four elements highlighted/discussed
3	6-8	Comprehensive knowledge and understanding demonstrated of how TQM influences profitability with five or more elements highlighted/discussed

Question Number	Answer	Mark
12	<p>1 mark for identification and 1 mark for expansion to a maximum of 2 marks.</p> <ul style="list-style-type: none"> • The period of time (1) for a return on a capital outlay/investment (1) • The time it takes to recoup (1) the invested money (1) <p>Accept any other suitable answer</p>	(1 x 2) (2)

Question Number	Answer	Mark
13(a)	$(110\,000 - 22\,000) / 5$ (1) $= \text{£}17\,600$ (1)	(2 x 1) (2)

Question Number	Answer	Mark												
13(b)	<p>Allow for error carried forward from 13(a).</p> <table border="1"> <thead> <tr> <th></th> <th>Liabilities (£)</th> <th>Assets (£)</th> </tr> </thead> <tbody> <tr> <td>Machine at cost</td> <td>110 000</td> <td></td> </tr> <tr> <td>Accumulated depreciation</td> <td>$(17\,600 \times 3) = \text{£}52\,800$</td> <td></td> </tr> <tr> <td>Machine at net book value</td> <td></td> <td>$110\,000 - 52\,800 = \text{£}57\,200$</td> </tr> </tbody> </table> <p>One mark for each correct value in the correct cell (allowing for error carried forward)</p>		Liabilities (£)	Assets (£)	Machine at cost	110 000		Accumulated depreciation	$(17\,600 \times 3) = \text{£}52\,800$		Machine at net book value		$110\,000 - 52\,800 = \text{£}57\,200$	(2 x 1) (2)
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Question Number	Answer	Mark
14(a)(i)	<p>ROI = (benefits/costs) x 100 (1)</p> <p>Product M $= (71\,000/106\,000) \times 100 = 67\%$ (1)</p> <p>Product N $= (60\,000/75\,000) \times 100 = 80\%$ (1)</p> <p>1 mark correct working, 1 mark per correct answers</p>	(3 x 1) (3)

Question Number	Answer	Mark
14(a)(ii)	<p>Product N (1)</p> <p><i>If the answer in 14(a)(i) is incorrect, allow follow through if the answer to 14(a)(ii) is an appropriate interpretation.</i></p>	(1)

Question Number	Answer	Mark
14(b)(i)	<p>Payback periods = costs/monthly benefits (1)</p> <p>Product M: Monthly benefits = $71\,000/12 = 5917$ Payback period = $106\,000/5917 = 18$ months (1)</p> <p>Product N: Monthly benefits = $60\,000/15 = 4000$ Payback period = $75\,000/4000 = 19$ months (1)</p> <p>1 mark correct working, 1 mark per correct answers</p> <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
14(b)(ii)	<p>Product M (1)</p> <p><i>If the answer in 14(b)(i) is incorrect, allow follow through if the answer to 14(b)(ii) is an appropriate interpretation.</i></p>	(1)

Question Number	Answer	Mark
14(c)	<p>Product N should be selected because it has significantly better ROI (1) and almost the same payback time (1) 1 mark for each point noted</p> <p><i>If the answers in 14(a)(ii) or 14(b)(ii) are incorrect, allow follow through up to 2 marks if the answer to 14(c) is an appropriate explanation</i></p> <p style="text-align: right;">(2 x 1)</p>	(2)

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