

# Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCE  
in Design & Technology (6RM02/01) Paper 1

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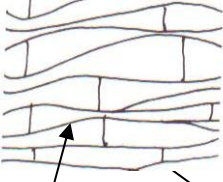
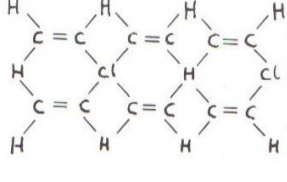
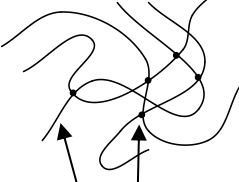
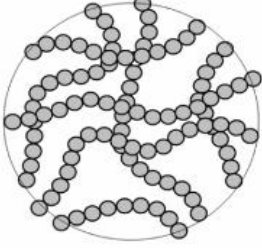
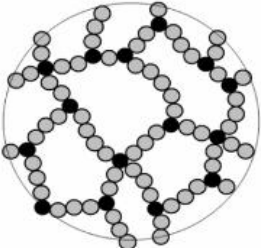
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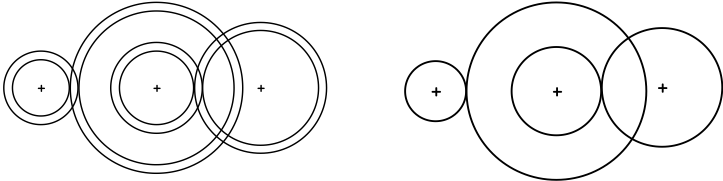
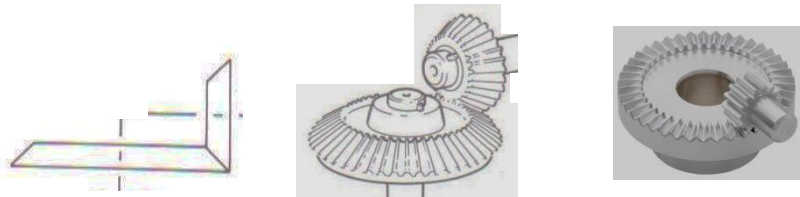
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## General Marking Guidance

- 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(a)	<p>The following two features clearly visible in a diagram in any of the following forms:-</p> <ul style="list-style-type: none"> <li>• Polymer strands (1)</li> <li>• Cross linked strands (not just overlapping strands). (1)</li> </ul> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Polymer strands      Cross links / Covalent bonds</p> </div> <div style="text-align: center;">  <p>Award 2 marks for an interlinked molecular diagram such as this regardless of the letters.</p> </div> <div style="text-align: center;">  <p>Polymer strands      Dots show cross links</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>Overlapping strands should be awarded only 1 mark</p> </div> <div style="text-align: center;">  <p>Stands that clearly link should be awarded 2 marks</p> </div> </div> <p style="text-align: right; margin-right: 50px;">(2 x 1)</p>	(2)
1(b)	<p>Any six of the following points:-</p> <ol style="list-style-type: none"> <li>1. Sufficiently strong / stiff / rigid / tough / hard. (1)</li> <li>2. Plasticity / malleability / easily or quickly moulded / manufactured / mass produced. (1)</li> <li>3. Cheap polymer / economic. (1)</li> <li>4. Non porous / water resistant / chemical resistant. (1)</li> <li>5. Hygienic / non-toxic. (1)</li> <li>6. Heat resistant to 100<sup>o</sup>c / food temperatures. (1)</li> <li>7. Recyclable. (1) (Do not accept 'environmentally friendly')</li> <li>8. Thermal / heat insulator. (1)</li> <li>9. Smooth surface finish. (1)</li> </ol> <p style="text-align: right;">(6 x 1)</p>	(6)
<b>Total for question</b>		<b>8</b>

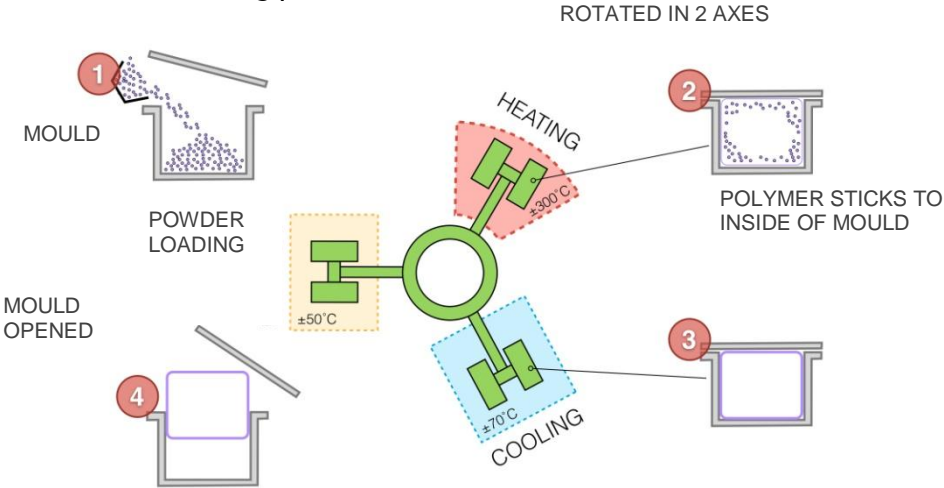
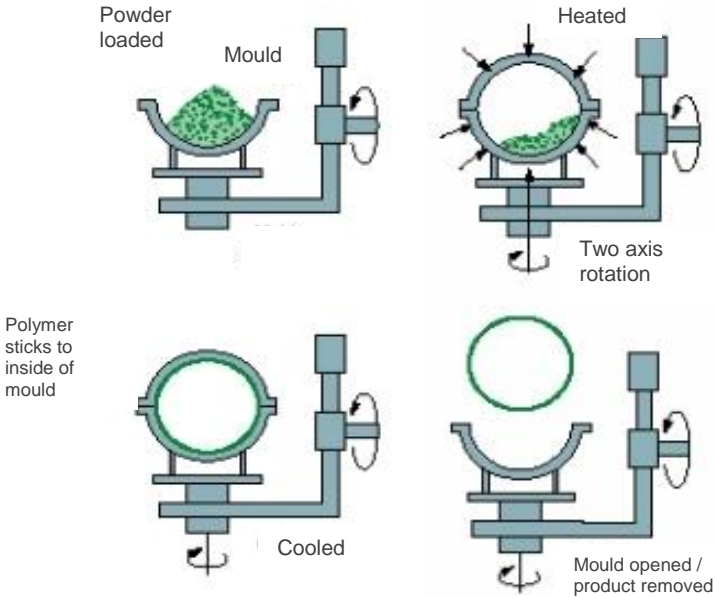
Question Number	Answer	Mark
2(a)	Any of the following gear types:- <ul style="list-style-type: none"> <li>• Spur / rack and pinion/ bevel / mitre / worm / crown / helical / internal / hypoid / herringbone / planetary. (1)</li> </ul> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>
2(b)	The following two features shown in either form of diagram:- <ol style="list-style-type: none"> <li>1. Two or more meshed pairs of gears. (1)</li> <li>2. Two gears on the same axle / two concentric gears. (1)</li> </ol> <div style="text-align: center;">  </div> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>
2(c)	Any two of the following linked points as an explanation:- <ol style="list-style-type: none"> <li>1. It gives a larger or smaller gear ratio / mechanical advantage (1)</li> <li>2. Gives a greater change in the power / speed of the output (1)</li> <li>3. More compact / takes up a smaller space (1)</li> <li>4. As the gears overlap each other / some gears are on the same axle / reducing the size of the product it is being used in. (1)</li> </ol> <p>Do not accept directional changes.</p> <p style="text-align: right;">(1 x 2)</p>	<b>(2)</b>
2(d)	The following gear system clearly shown and named:- <ol style="list-style-type: none"> <li>1. A sketch in either pictorial or symbolic format which shows bevel / mitre / crown &amp; face gears transferring motion through 90°. (1)</li> <li>2. Mitre / bevel / crown and face gear named. (1)</li> </ol> <div style="text-align: center;">  </div> <p style="text-align: right;">(1 x 2)</p>	<b>(2)</b>
<b>Total for question</b>		<b>7</b>

Question Number	Answer	Mark
3(a)	<p>Either of the following answers:-</p> <ol style="list-style-type: none"> <li>1. Cast iron / iron / cast steel (1) <i>Do not accept steel on its own.</i></li> <li>2. Aluminium (1)</li> <li>3. Brass (1)</li> </ol> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>
3(b)	<p>Award only one advantage and one disadvantage from the following:-</p> <p><b><u>Advantages</u></b></p> <ol style="list-style-type: none"> <li>1. Reduces / prevents corrosion / rust / oxidation / increases weather resistance (1)</li> <li>2. Increases lifetime / durability (1)</li> <li>3. Reduced maintenance / re-painting costs (1)</li> </ol> <p><b><u>Disadvantages</u></b></p> <ol style="list-style-type: none"> <li>4. Difficult to separate for recycling. (1)</li> <li>5. Increased number of manufacturing processes / materials / costs (1)</li> <li>6. Difficult to weld (1)</li> </ol> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>
3(c)	<p>Any three of the following points with a valid linked explanation:-</p> <ol style="list-style-type: none"> <li>1. Sufficient strength (1) to resist breaking (1)</li> <li>2. Plasticity / Malleability / flexibility (1) so the wire can bend and not snap. (1)</li> <li>3. Ductility (1) so the wire can be drawn out / stretches into long lengths during manufacture. (1)</li> <li>4. Fatigue (1) so the wire can be bent many times without fracturing (<i>although it will fracture eventually</i>). (1)</li> <li>5. Soft (1) making it easy to cut / trim to length (1)</li> <li>6. Creep resistant (1) so it resists being deformed under constant forces / connections will remain tight for long periods. (1)</li> </ol> <p>Do not accept functional / physical properties such as good conductor, corrosion resistant, light weight, durable etc.</p> <p style="text-align: right;">(3 x 2)</p>	<b>(6)</b>
3(d)	<p>Any two of the following points:-</p> <ol style="list-style-type: none"> <li>1. It will become brittle / less tough (1)</li> <li>2. It will eventually crack / snap / break. (1)</li> <li>3. It will become hot (1)</li> <li>4. It will become stronger / resist more force / more resistant to denting / less ductile / less malleable (1)</li> </ol> <p>Do not accept 'it will become hard' as this is explicit in the process name.</p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>
<b>Total for question</b>		<b>11</b>

Question Number	Answer	Mark
<b>4(a)</b>	Any five of the following points:- <ol style="list-style-type: none"> <li>1. Timber can be seasoned much faster / more timber seasoned / keep up with demand. (1)</li> <li>2. It kills insects / diseases. (1)</li> <li>3. Not affected by seasons and weather / consistent conditions / more predictable / reliable. (1)</li> <li>4. Can reduce moisture content to more precise / lower levels. (1)</li> <li>5. Consistent moisture content throughout the timber. (1)</li> <li>6. Less space needed for the same throughput of timber. (1)</li> <li>7. Very stable timber produced / less likely to warp, twist, split. (1)</li> <li>8. Cheaper method of seasoning (1)</li> </ol> <p style="text-align: right;">(5 x 1)</p>	<b>(5)</b>
<b>4(b)</b>	Any two of the following with a linked relevant explanation:- <ol style="list-style-type: none"> <li>1. Pine is easier / less force needed to work / cut (1) as it is straight grained / softer / so the product can be made quicker / as a student is still developing their skills (1)</li> <li>2. Safer to work with (1) as dust it not as harmful/carcinogenic (1)</li> <li>3. Pine grows faster (1) so is more sustainable / readily available (1)</li> <li>4. Pine blunts tooling less quickly (1) reduces maintenance/tooling costs (1)</li> <li>5. Pine is a lighter weight (1) so the product could be carried more easily (1)</li> <li>6. Pine is better suited to outdoor applications (1) as it will warp / twist less (1)</li> </ol> <p style="text-align: right;">(2 x 2)</p>	<b>(4)</b>
<b>Total for question</b>		<b>9</b>

Question Number	Answer	Mark
5(a)	<p>Any three of the following risks with a linked relevant control measure:-</p> <p><b>Risks:</b></p> <ol style="list-style-type: none"> <li>1. Repetitive strain injury / pains due to repetitive movements / Carpel tunnel syndrome (1)</li> <li>2. Aches (muscular) due to being in one / an uncomfortable position / poor posture for long periods of time (1)</li> <li>3. Headaches (1)</li> <li>4. Eye strain (1)</li> <li>5. Obesity (1)</li> </ol> <p><b>Control Measures:</b></p> <ol style="list-style-type: none"> <li>6. Change position regularly (1)</li> <li>7. Take regular short breaks / get fresh air (1)</li> <li>8. Medication (1)</li> <li>9. Use anti-glare glasses / filters / adjust brightness &amp; contrast appropriately (1)</li> <li>10. Ensure appropriate environment lighting (1)</li> <li>11. Exercise / stretch regularly (1)</li> <li>12. Use adjustable chair / lumbar support / leg support / head rest (1)</li> <li>13. Use adjustable monitor position (1)</li> <li>14. Use ergonomic keyboard / mouse / wrist support / pad (1)</li> </ol> <p style="text-align: right;">(3 x 2)</p>	<b>(6)</b>
5(b)	<p>Any of the following with a linked relevant explanation also from the following:-</p> <ol style="list-style-type: none"> <li>1. Prototypes are made faster / work through the night / 24/7 (1)</li> <li>2. Prototypes are made more accurately / higher quality / reduced errors (1)</li> <li>3. Prototypes can be more complex / intricate / finely detailed (1)</li> <li>4. Changes / edits are easier to produce (1)</li> <li>5. More modifications / variations can be considered (1)</li> <li>6. Better testing / analysis / judgements / decisions made (1)</li> <li>7. Improved outcomes are developed (1)</li> <li>8. Reduced development time / time to market / meet customer demand / satisfaction / increased competitiveness (1)</li> <li>9. Saves money (due to reduced labour / materials / energy / resources) (1)</li> </ol> <p style="text-align: right;">(4 x 2)</p>	<b>(8)</b>
<b>Total for question</b>		<b>14</b>



Question Number	Answer	Mark
6(a)	<p>Any of the following points stated in written form or clearly identified in any appropriate form of diagram:-</p> <ol style="list-style-type: none"> <li>1. Release agent added. (1)</li> <li>2. Powder / granules / pellets / liquid / loaded. (1)</li> <li>3. Mould closed / mould (1)</li> <li>4. Mould heated / heater / melted plastic. (1)</li> <li>5. Mould undergoes 2 axes of rotation / turns in many directions. (1) <b>(Not just rotated as this is in the name)</b></li> <li>6. Polymer sticks to all inside surfaces of mould / spreads evenly around the walls / hollow shape is formed. (1)</li> <li>7. Mould cooled / cooling equipment / fans / water. (1)</li> <li>8. Remove moulding from mould. (1)</li> </ol> <p>Max 3 marks if wrong process described.</p>   <p style="text-align: right;">7 x 1)</p>	(7)

6(b)	Any four of the following:- <ol style="list-style-type: none"> <li>1. Generates a hollow / sealed one piece shape / no joints. (1)</li> <li>2. Moulds are cheaper / quicker / simpler to manufacture. (1)</li> <li>3. Viable for short / batch production runs. (1)</li> <li>4. Enables larger mouldings. (1)</li> <li>5. Less waste material / no sprues or runners needed. (1)</li> <li>6. Tougher mouldings / mouldings are stress free / less likely to split or crack. (1)</li> <li>7. Wall thickness can be changed without altering the mould. (1)</li> <li>8. No draw angle is needed. (1)</li> <li>9. Quicker to change polymer colour between mouldings. (1)</li> </ol> <p style="text-align: right;">(4 x 1)</p>	<b>(4)</b>
<b>Total for question</b>		<b>11</b>

Question Number	Answer	Mark
7	Any ten of the following points, but at least one disadvantage must be included:- <p><b><u>Advantages</u></b></p> <ol style="list-style-type: none"> <li>1. Employees in departments have a supplier-customer relationship with other departments / improved communications. (1)</li> <li>2. Employees are engaged in continuous improvement / encouraged to suggest improvements / take initiatives / simplify tasks. (1)</li> <li>3. Employees are responsible for the quality of their own work. (1)</li> <li>4. Employees are placed in teams. (1)</li> <li>5. Improved worker moral / workers feel valued / happy / good job satisfaction / pride. (1)</li> <li>6. Less employee absence. (1)</li> <li>7. Employees are more motivated (1)</li> <li>8. Employees are more productive / more efficient. (1)</li> <li>9. Employees are empowered to make decisions / given more responsibility. (1)</li> <li>10. Employees have improved health &amp; safety / working conditions. (1)</li> <li>11. Employees have increased job security. (1)</li> <li>12. Opportunities for further training / increased skill levels. (1)</li> <li>13. Opportunities for internal promotion. (1)</li> <li>14. Employees receive competitive pay / improved standard of living. (1)</li> </ol> <p><b><u>Disadvantages</u></b></p> <ol style="list-style-type: none"> <li>15. Some employees may be put under additional stress / pressure / expected to work harder. (1)</li> <li>16. Some employees are reluctant to embrace changes. (1)</li> <li>17. Some may leave the business / become unemployed. (1)</li> </ol> <p style="text-align: right;">(10 x 1)</p>	<b>(10)</b>
<b>Total for question</b>		<b>10</b>