

# Engineering Questions by Topic

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Higher Level

Question 6

Polymers

50 Marks



# 1996 Question 6

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- (a) Name and explain the main polymerisation mechanisms when forming polymers.
- (b) Explain any three of the following terms:  
glass transition temperature; crystalline; promoters and copolymer.
- (c) With reference to (i) chemical bonding and (ii) structure; name and explain the three main polymer groups.
- (d) Describe using diagrams, the production processes for any two of the following plastic products:
- (i) refuse bins;
  - (ii) bottle caps;
  - (iii) garden hose.

Indicate the nature of the plastic used in each case.

# 1997 Question 6

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(a) Distinguish between the structure of:

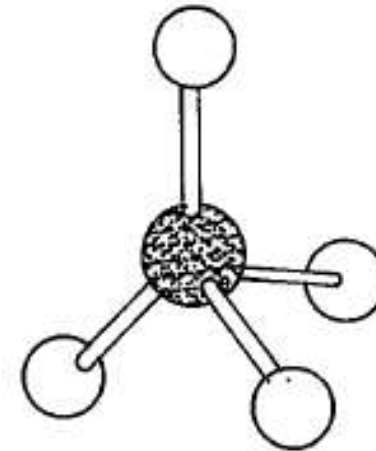
- (i) an amorphous polymer;
- (ii) a crystalline polymer.

Outline the effects of these structures on the properties of plastics.

(b) Explain each of the following terms:

- (i) Vulcanisation;
- (ii) Parison;
- (iii) Secondary bonding;
- (iv) Covalent bonding.

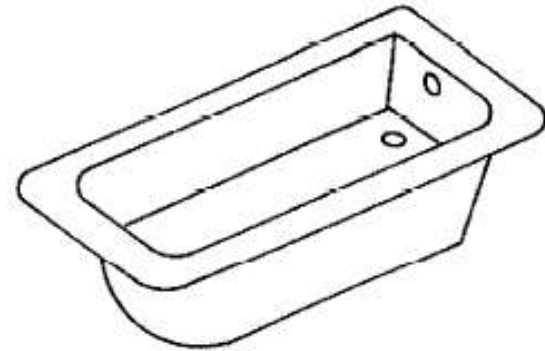
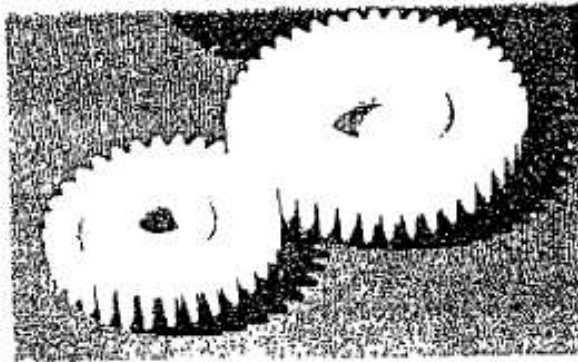
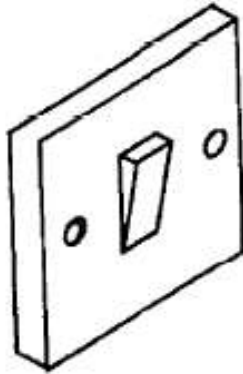
(c) Compare Compression Moulding with Injection Moulding.



# 1998 Question 6

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(a) Select any two plastic items below:



Describe each selected in terms of (i) polymer type used (ii) properties and (iii) manufacturing process.

(b) Choose any four of the terms below and explain their meaning:

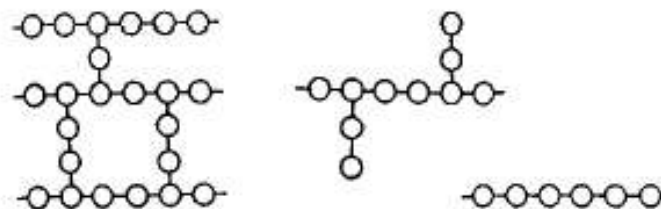
(i) cross linking; (ii) laminate; (iii) elastomeric; (iv) GRP; (v) dielectric; (vi) calendaring.

(c) Describe the *addition polymerization* process.

# 1999 Question 6

(a) Three polymer chain structures are shown. Describe these structures using the following guidelines:

- (i) Name and characteristics;
- (ii) Properties and bond type;
- (iii) Polymerisation type;
- (iv) Examples of polymers with these structures.



(b) Describe the principles and main features of the moulding process shown diagrammatically.



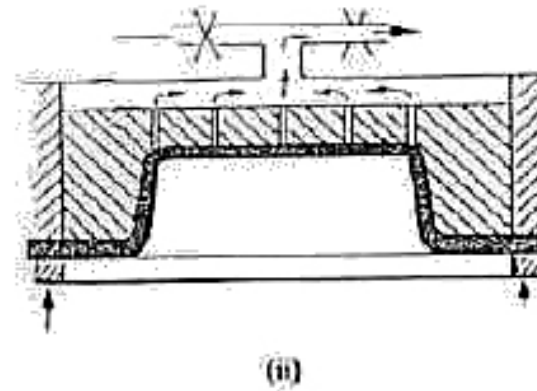
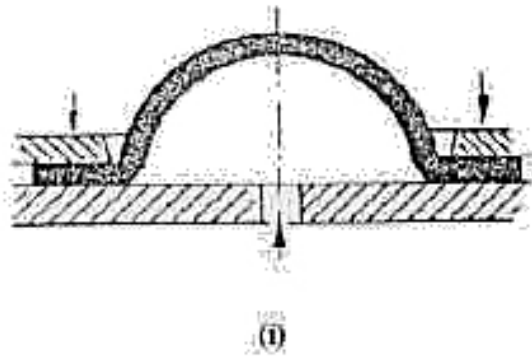
(c) State the purpose of any two of the following in the production of polymers:

- (i) Catalysts;
- (ii) Promoters;
- (iii) Inhibitors;
- (iv) Fillers.

# 2000 Question 6

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- (a) Two methods of forming plastics using air are shown diagrammatically below. Name and compare both methods.





## 2000 Question 6 cont.

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- (b) Describe with the aid of diagrams the process of *addition polymerisation*.
- (c) Explain any three of the following terms:
- (i) Copolymer;
  - (ii) Amorphous;
  - (iii) PVC;
  - (iv) GRP.



# 2001 Question 6

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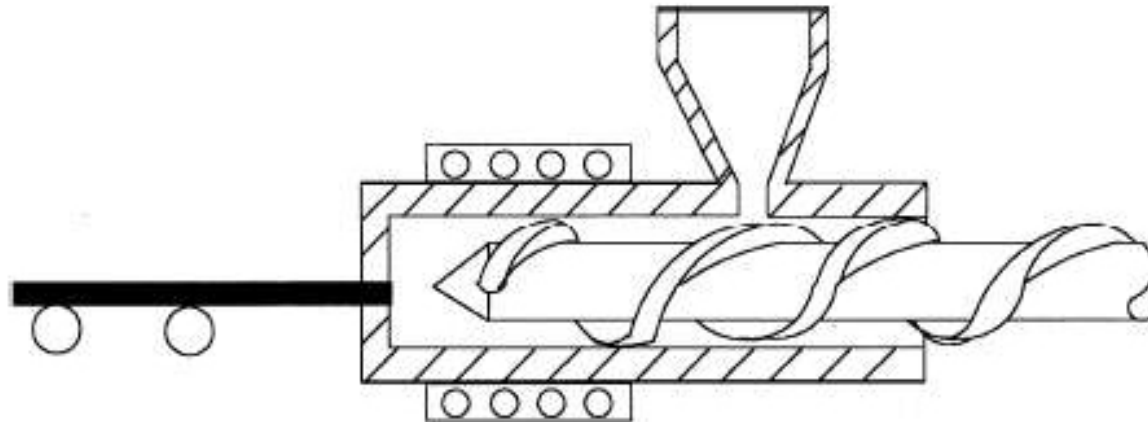
- (a) Explain the type of polymerisation which occurs in the production of **each** of the following.
- (i) Bakelite;
  - (ii) Polyvinylchloride;
  - (iii) Polyethylene.
- (b) Describe the main differences between thermoplastics and thermosets under the following guidelines.
- (i) Chemical bonding;
  - (ii) Properties;
  - (iii) Internal structures.



# 2001 Question 6 cont.

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- (c) Describe, using the following guidelines, the process of extrusion shown below.
- (i) Equipment used;
  - (ii) Process;
  - (iii) A typical end product.



# 2002 Question 6

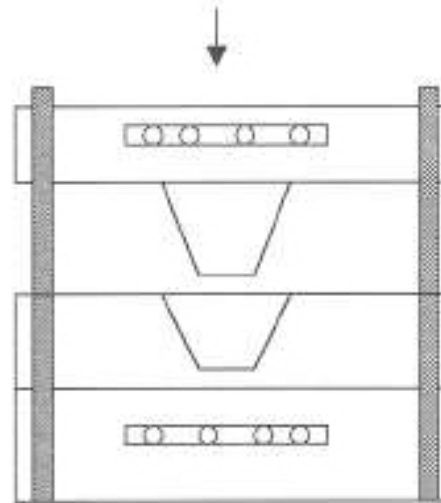
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(a) State the function of any three of the following in relation to polymers.

- (i) Stabilisers;
- (ii) Catalysts;
- (iii) Promoters;
- (iv) Inhibitors.

(b) Identify and describe the polymer manufacturing process shown below using the following guidelines:

- (i) Name and applications;
- (ii) Operational process.





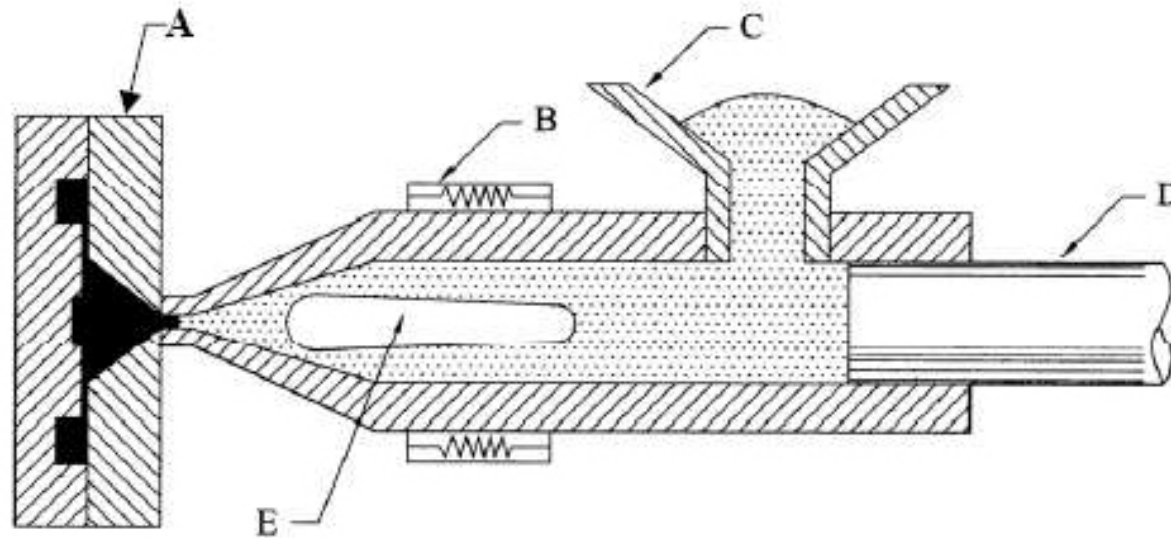
## 2002 Question 6 cont.

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- (c) Distinguish between addition polymerisation and co-polymerisation.

# 2003 Question 6

- (a) Describe the process shown in the diagram below using the following guidelines:
- Principle of operation;
  - Identify **one** component produced;
  - Name the parts A, B, C, D and E.





## 2003 Question 6 cont.

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(b) Explain any two of the terms:

- (i) Parison;
- (ii) Monomer;
- (iii) Vulcanisation;
- (iv) Catalyst.

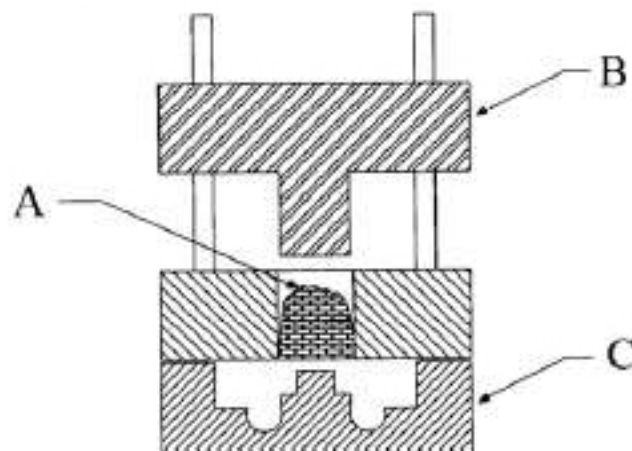
(c) Discuss the three main polymer groups with reference to the following:

- (i) Chemical bonding;
- (ii) Internal structure;
- (iii) Properties.

# 2004 Question 6

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- (a) Describe, with the aid of a diagram, the addition polymerisation process.
- (b) Describe the process shown in the diagram below using the following guidelines:
- Name and describe the principle of operation;
  - Identify **one** component produced;
  - Name the parts A, B and C.





## 2004 Question 6 cont.

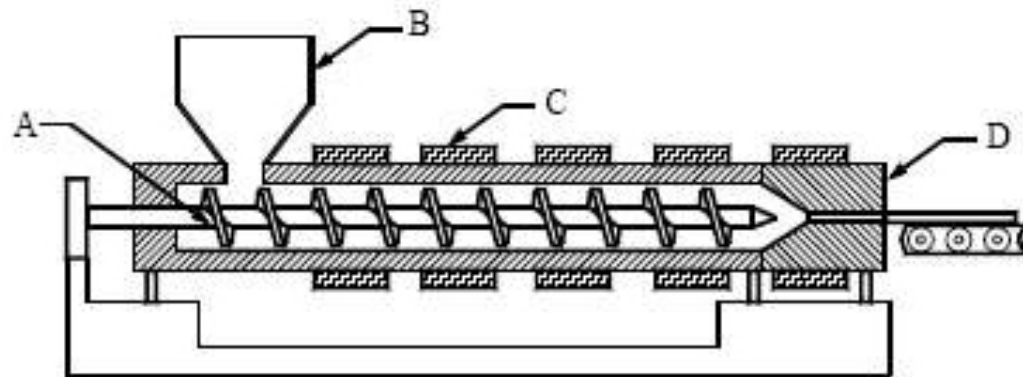
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- (c) Explain any three of the following in relation to polymers:
- (i) Van der Waals forces;
  - (ii) Crosslinking;
  - (iii) Co-polymerisation;
  - (iv) Filler;
  - (v) GRP.

# 2005 Question 6

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- (a) Describe the process shown in the diagram below using the following guidelines:



- (i) Name and describe the principle of operation;
- (ii) Identify **one** component produced;
- (iii) Name parts A, B, C and D.





## 2005 Question 6 cont.

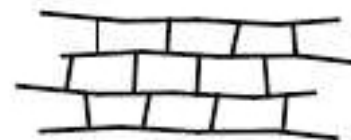
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(b) Differentiate between **any two** of the following:

- (i) Thermoplastic and thermosetting polymers;
- (ii) Crystalline polymer and amorphous polymer;
- (iii) Natural and synthetic rubber;
- (iv) Condensation polymer and co-polymer.

(c) With reference to the internal polymer structure shown, answer **all** of the following:

- (i) Identify the structure;
- (ii) Explain the chemical bonding;
- (iii) State **two** properties of a polymer having this structure.





# 2006 Question 6

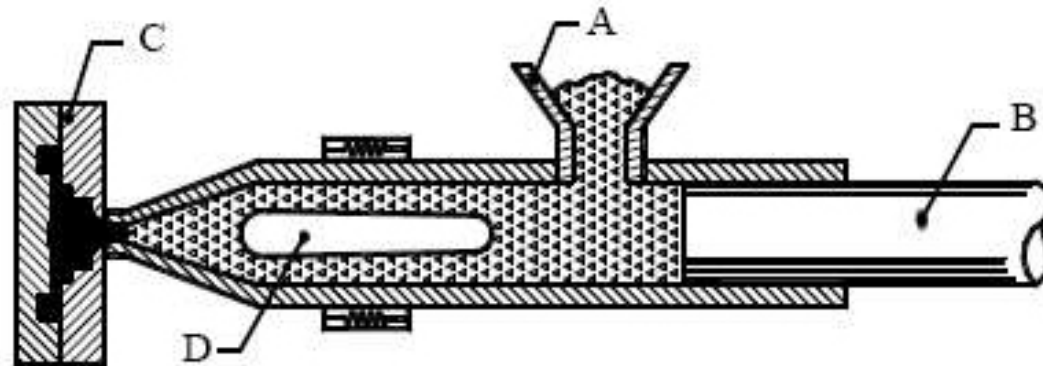
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- (a) Distinguish between thermoplastics and thermosetting plastics under each of the following guidelines:
- (i) Chemical bonding;
  - (ii) Polymerisation process;
  - (iii) Internal structure;
  - (iv) Properties.
- (b) State the function of **any three** of the following in relation to polymers:
- (i) Filler;
  - (ii) Stabiliser;
  - (iii) Catalyst;
  - (iv) Foaming agent.

## 2006 Question 6 cont.

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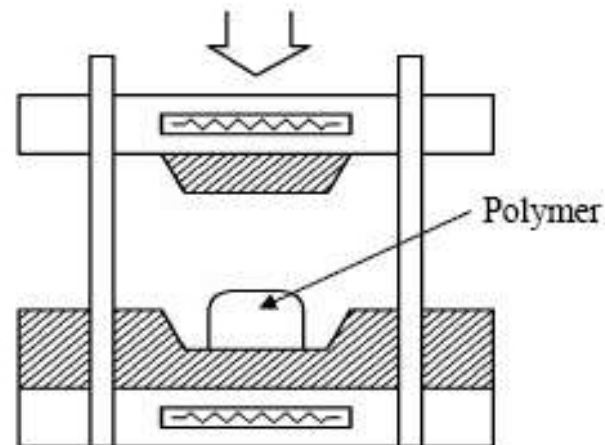
- (c) Describe the process shown in the diagram below using the following guidelines:
- (i) Name and describe the principle of operation;
  - (ii) Identify **one** component produced;
  - (iii) Name parts A, B, C and D.



# 2007 Question 6

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- (a) Describe the polymer moulding process shown in the diagram below using the following guidelines:
- Name the moulding process and describe the principle of operation;
  - Identify **one** component produced.





## 2007 Question 6 cont.

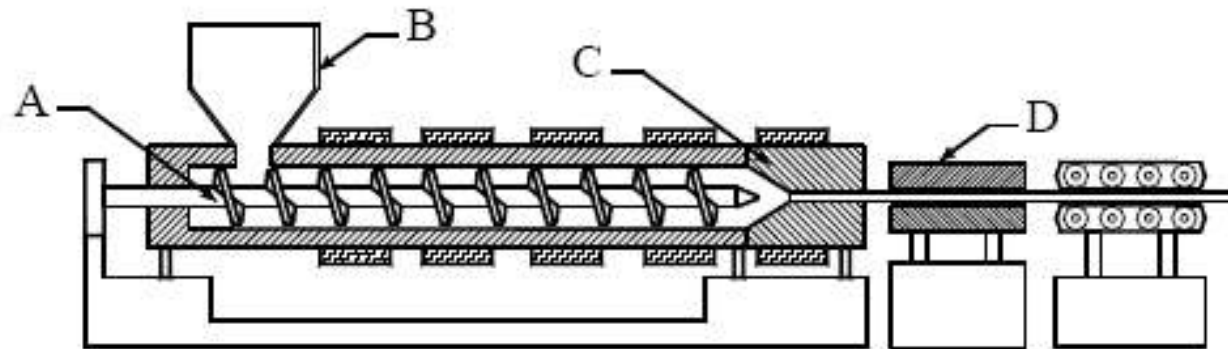
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- (b) Polymers are chemically produced and then processed with other materials to improve their properties. State clearly the function of **any two** of the following additives:
- (i) Pigments;
  - (ii) Plasticisers;
  - (iii) Lubricants.
- (c) Explain **any three** of the following in relation to polymers:
- (i) Condensation polymerisation;
  - (ii) Extrusion;
  - (iii) Elastomers;
  - (iv) Van der Waal's forces;
  - (v) Monomer.

# 2008 Question 6

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- (a) Describe the process shown in the diagram using the following guidelines:



- (i) Name and describe the principle of operation;
- (ii) Identify the function of **any three** of the parts A, B, C and D;
- (iii) Identify **one** component produced by this process.



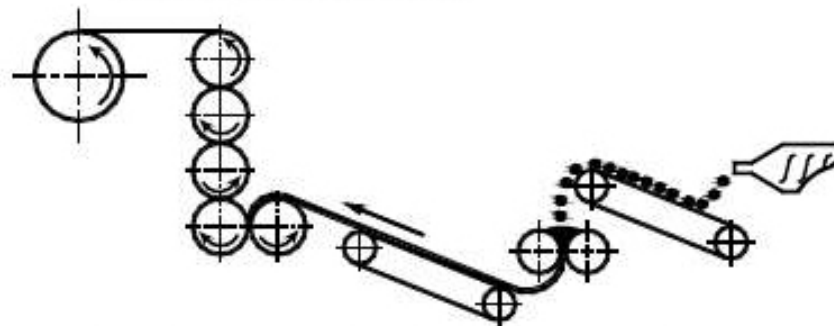
## 2008 Question 6 cont.

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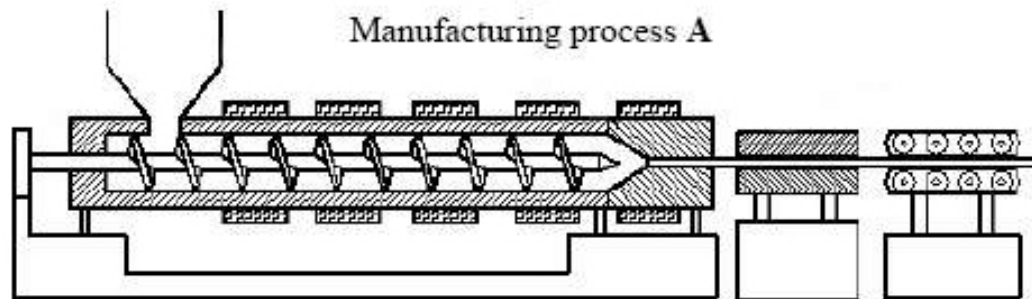
- (b) Distinguish between thermoplastics and thermosetting plastics making reference to each of the following:
- (i) Chemical bonding;
  - (ii) Polymerisation process;
  - (iii) Properties.
- (c) Explain any three of the following in relation to polymers:
- (i) Transfer moulding;
  - (ii) GRP;
  - (iii) Cross linking;
  - (iv) Laminate;
  - (v) Polymer filler materials.

# 2009 Question 6

- (a) Two polymer manufacturing processes are shown at **A** and **B** below.
- Name **both** processes.
  - Identify **one** component produced by **each** process.
  - Describe the principle of operation of manufacturing process **A** or of manufacturing process **B**.



Manufacturing process A



Manufacturing process B





## 2009 Question 6 cont.

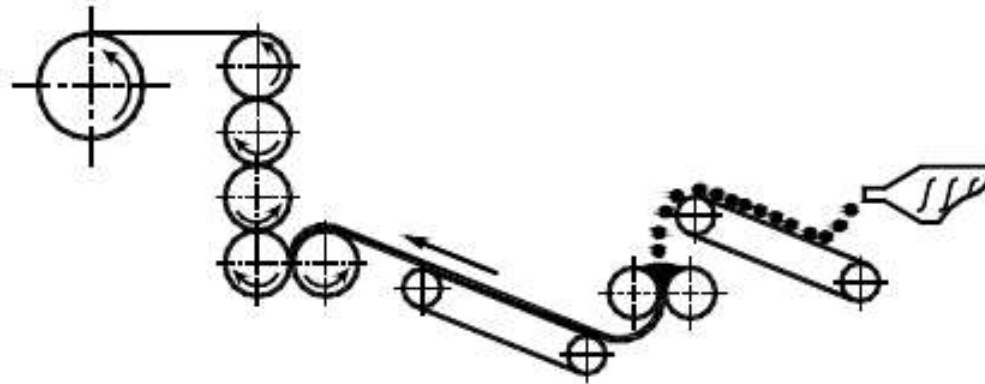
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- (b) Identify and describe the type of polymerisation that will produce polyethylene.
- (c) Explain any three of the following in relation to polymers:
- (i) Blow moulding;
  - (ii) Elastomer;
  - (iii) Catalyst;
  - (iv) Co-polymer;
  - (v) Thermosetting plastic.

# 2010 Question 6

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(a) A polymer manufacturing process is shown below.



- (i) Name the process and describe the principle of operation;
  - (ii) Identify **one** component produced by this process.
- (b) Differentiate between thermoplastics and thermosetting plastics, making reference to:
- (i) Chemical bonding;
  - (ii) Internal structure;
  - (iii) Properties.



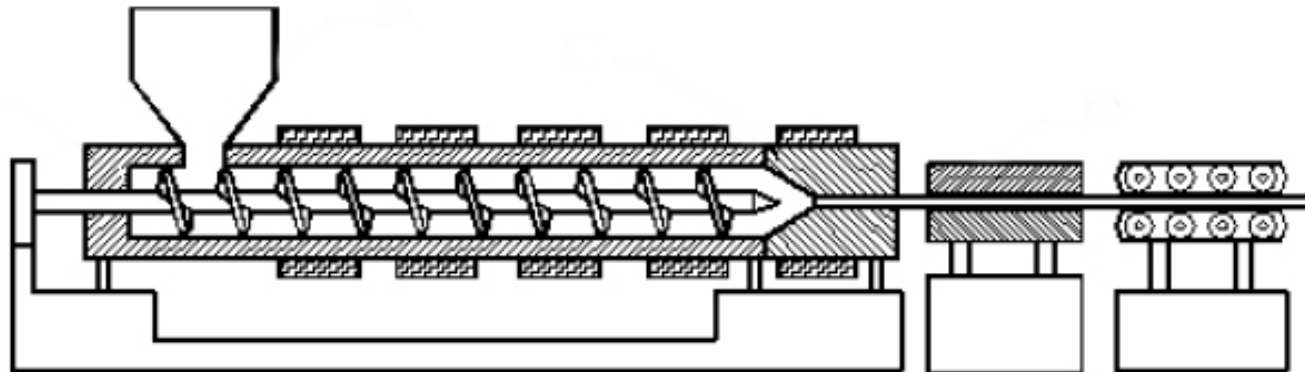
## 2010 Question 6 cont.

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- (c) Explain any three of the following in relation to polymers:
- (i) Stabiliser;
  - (ii) Glass transition temperature;
  - (iii) Condensation polymerisation;
  - (iv) Elastomer;
  - (v) Elastic memory in acrylic sheet.

# 2011 Question 6

- (a) (i) Describe, with the aid of diagrams, the addition polymerisation process.
- (ii) Name **one** polymer material produced by addition polymerisation.
- (b) With reference to the polymer manufacturing process shown in the diagram, answer **each** of the following:



- (i) Name the process **and** describe the principle of operation;
- (ii) State the type of polymer used in this process;
- (iii) Identify **one** component produced by this process.



# 2011 Question 6 cont.

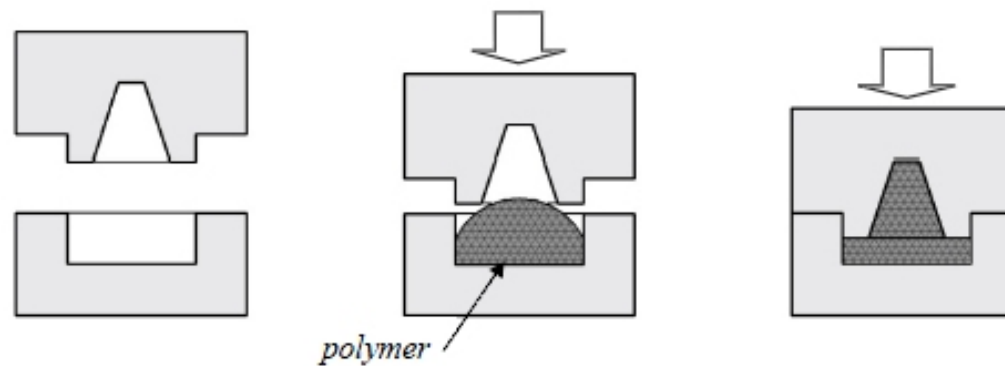
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- (c) Explain the function of **any three** of the following polymer additives:
- (i) Plasticiser;
  - (ii) Filler;
  - (iii) Lubricant;
  - (iv) Stabiliser;
  - (v) Pigment.

# 2012 Question 6

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- (a) With reference to the polymer manufacturing process shown in the diagrams below, answer the following:



- (i) Name the process **and** describe the principle of operation.
- (ii) State the type of polymer used in this process.
- (iii) Identify **one** component that could be produced using this process.



# 2012 Question 6 cont.

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(b) Distinguish between *thermoplastics* and *thermoset plastics* using **each** of the following headings:

- (i) Polymerisation process;
- (ii) Chemical bonding;
- (iii) Internal structure;
- (iv) Properties.

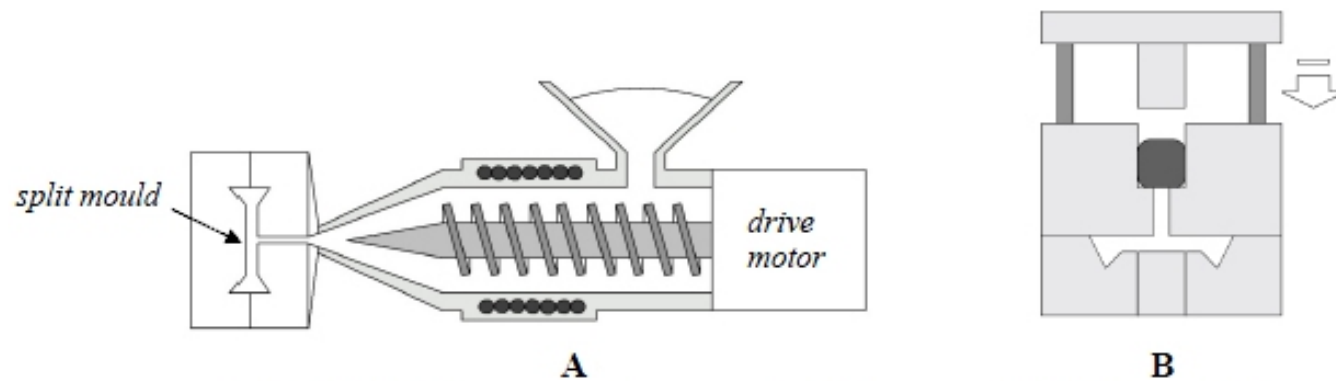
(c) Explain in detail **any three** of the following:

- (i) Elastomer;
- (ii) Catalyst;
- (iii) Blow moulding;
- (iv) GRP;
- (v) Laminate.

# 2013 Question 6

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(a) Two polymer manufacturing processes are shown at A and B below.



- (i) Which of the processes shown at A and B is most suitable for the manufacture of an electrical plug casing?
- (ii) Outline the reasons why the process selected is the most suitable for the manufacture of an electrical plug casing.
- (iii) Explain **one** reason for using the split mould in manufacturing process A.

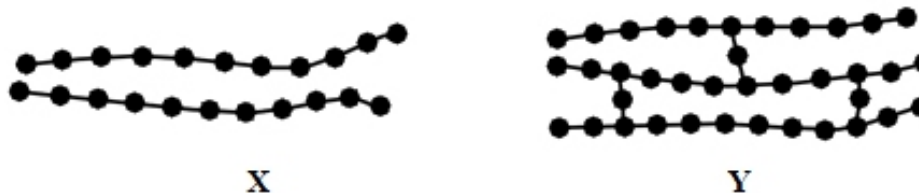




## 2013 Question 6 cont.

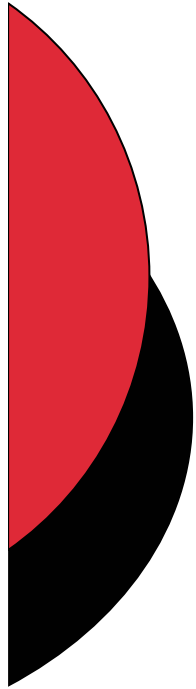
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- (b) Select **any three** of the following and distinguish between:
- (i) Condensation polymerisation and addition polymerisation;
  - (ii) Plasticiser and stabiliser;
  - (iii) Extrusion and compression moulding;
  - (iv) Natural and synthetic rubber.
- (c) Two internal polymer structures X and Y are represented below.



With reference to the two polymer structures at X and Y:

- (i) Name each structure;
- (ii) Identify **one** polymer associated with each structure;
- (iii) State **two** properties associated with each structure.



# 2013 Question 6 cont.

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