

ERRATUM NOTICE

General Certificate of Education
June 2007
Advanced Level Examination



**GENERAL STUDIES (SPECIFICATION A)
Unit 5 Science, Mathematics and Technology**

GSA5

Wednesday 13 June 2007 1.30 pm to 3.00 pm

Instructions to Invigilators

Before the start of the examination please ask candidates to amend their question papers as follows.
(Please read out this message twice to ensure understanding.)

Turn to page 10, question 2.1, final sentence.

At the end of the final sentence amend the question mark to a full stop.

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Wednesday 13 June 2007 1.30 pm to 3.00 pm

For this paper you must have:

- an objective test answer sheet
- an 8-page answer book
- a Data Booklet for Questions 1.5 to 1.12 (enclosed)
- a black ball-point pen.

You may use a calculator.

Time allowed: 1 hour 30 minutes

Instructions

- Use a black ball-point pen for recording your answers to Questions 1.1 to 1.20 on your objective test answer sheet.
- Use blue or black ink or ball-point pen for answering **one** question from Questions 2.1 to 2.6.
- Write the information required on the front of your answer book for Question 2. The *Examining Body* for this paper is AQA. The *Paper Reference* is GSA5.
- Answer **all of** Question 1 (1.1 to 1.20) using the answer sheet provided **and one** question from Questions 2.1 to 2.6 in your separate answer book.
- For each item in Question 1 there are several alternative responses. When you have selected the response which you think is the best answer to a question, mark this response on your answer sheet.
- Do all rough work in your answer book, **not** on your answer sheet.

Information

- The maximum mark for this paper is 45.
- This paper consists of **two** questions.
Question 1 contains 20 objective test questions based on a variety of exercises in spatial and mechanical relations. Each question carries 1 mark. You will not lose marks for wrong answers.
- **Question 2** consists of six alternative essay questions (2.1 to 2.6). 25 marks are allocated to your essay.

QUESTION 1

Answer **Questions 1.1 to 1.20**

Answer **Questions 1.1 to 1.20** by choosing the answer represented by the letter **A, B, C** or **D** that you think best.

Questions 1.1 to 1.4

Belts and pulleys

Figures 1 to 4 show a driving pulley (on the left of each picture) rotating anticlockwise. This is connected to a driven pulley (on the right hand side of each picture) by a series of standard or crossed belts. The two intermediate pulleys in the centre of each figure are connected to the driving and the driven pulleys as shown, so that the intermediate pulleys are not capable of independent movement. Each intermediate pulley consists of a large and a small wheel rigidly fixed together.

Throughout the diagrams, the larger pulleys are twice the diameter of the smaller pulleys.

Figure 1

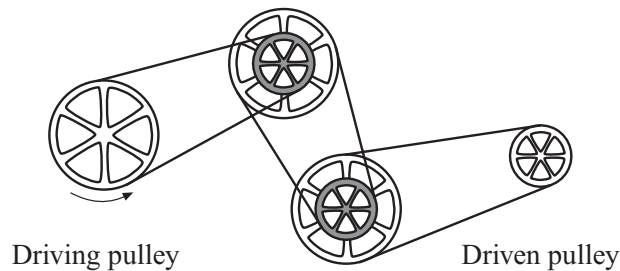


Figure 2

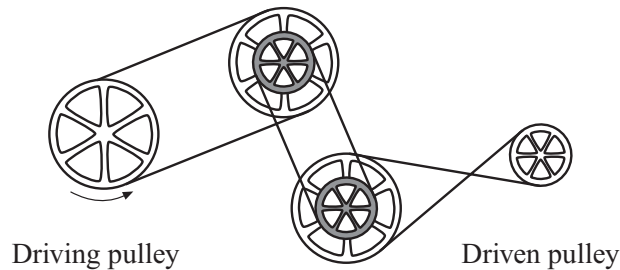


Figure 3

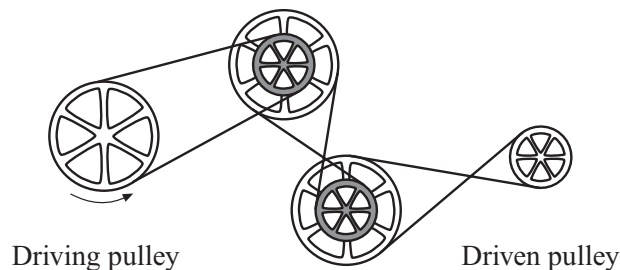
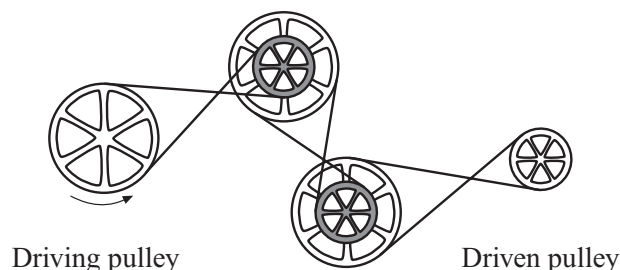


Figure 4



1.1 The figure that shows all the pulleys turning anticlockwise is

- A **Figure 1.**
- B **Figure 2.**
- C **Figure 3.**
- D **Figure 4.**

1.2 The figure that shows two pulleys turning clockwise and two pulleys turning anticlockwise is

- A **Figure 1.**
- B **Figure 2.**
- C **Figure 3.**
- D **Figure 4.**

1.3 The two intermediate pulleys are rotating at the same rate and in the same direction in

- A **Figure 1.**
- B **Figure 2.**
- C **Figure 3.**
- D **Figure 4.**

1.4 Each of the following is true for the figures **except**

- A a crossed belt changes the direction of rotation of the next pulley in line.
- B a standard belt gives the same direction of rotation to the next pulley in line.
- C the belts may be arranged so that the driving and driven pulleys have the same speed.
- D the relative sizes of the diameters determines the speed of the next pulley in line.

Questions 1.5 to 1.12

Read paragraphs 1 to 7 and **Figures 5 and 6** on **Electric Sewing Machines** in the separate data booklet and answer **Questions 1.5 to 1.12** which follow.

1.5 The sewing machine of **Figure 5** could best be described as a device that is

- A mechanical.
- B electro-mechanical.
- C electronic.
- D computerised.

1.6 The sewing machine of **Figure 5** is driven by an electric motor and the transmission features each of the following **except**

- A levers.
- B a clutch.
- C cogs and cams.
- D a drive belt.

Turn over ►

-
- 1.7 The main function of the bevel gears shown in **Figure 5** is to
- A allow the drive to turn through a right angle.
 - B rotate the feed dog.
 - C move the needle up and down.
 - D provide a reverse gear for the needle.
- 1.8 The toothed belt (paragraph 4 of the text in the data booklet) couples a pair of cogs that could have the following numbers of teeth.
- A 20 and 9
 - B 21 and 10
 - C 22 and 11
 - D 21 and 11
- 1.9 The synchronisation of the machine may be altered by each of the following **except**
- A the speed of the motor.
 - B teeth missing from cogs.
 - C wear on the toothed belt.
 - D the bevel gears becoming separated.
- 1.10 The machine in **Figure 6** produces chain stitches at eight inches of finished fabric per second and twelve stitches to the inch. This results, roughly, in the following number of stitches per minute.
- A 60
 - B 600
 - C 6 000
 - D 60 000
- 1.11 Each of the following is a characteristic of a chain-stitch (**Figure 6**) **except** for
- A the looping hook moves once every stitch.
 - B quick execution of stitching.
 - C the stitches look the same from above and below.
 - D the stitches are easily unravelled.
- 1.12 The simplest way to move the fabric backwards is to
- A adjust the feed dog linkage.
 - B cross the belt from motor to upper shaft.
 - C cross the toothed belt between upper and lower shafts.
 - D reverse the electric motor.

Turn over for the next question

Turn over ▶

Questions 1.13 to 1.20

Symmetrical Tile Patterns

A symmetrical tile pattern may be generated by repeated reflection of a basic motif downwards and sideways as shown in **Figure 7**.

Figure 7

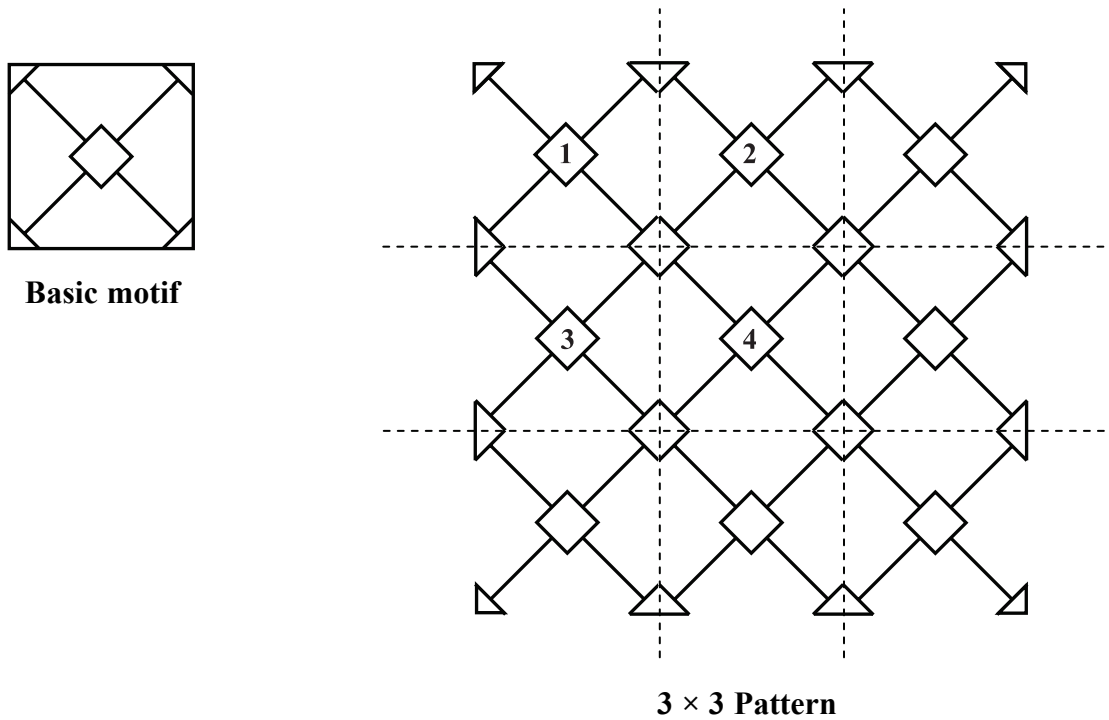
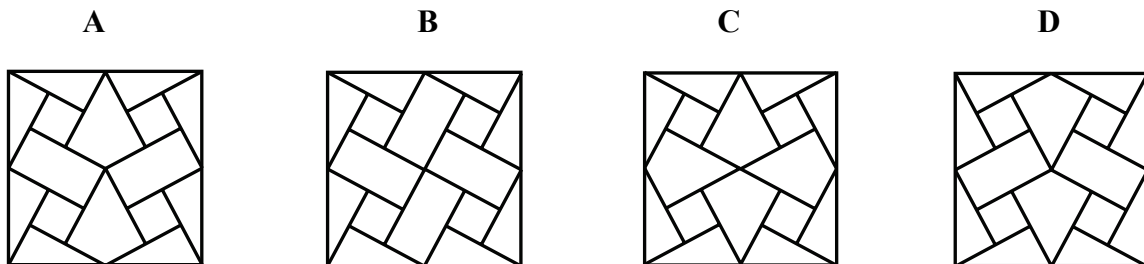


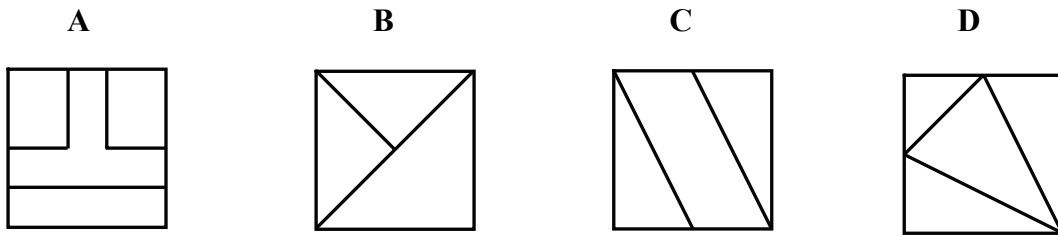
Figure 7 shows the pattern after repeated reflection of the motif in the dotted mirror lines shown.

Notice that the motifs in positions 1, 2, 3 and 4 appear to be all the same. This is not always the case.

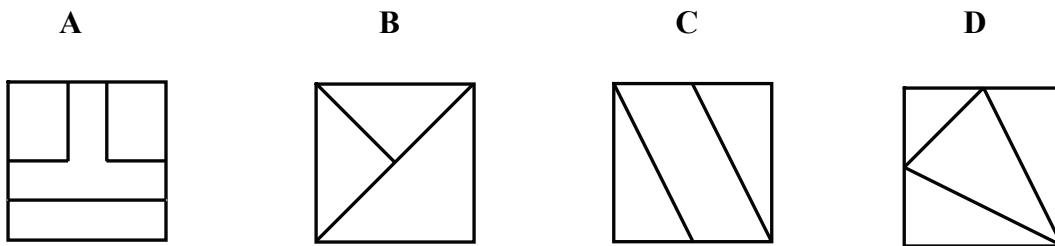
1.13 Which of the following 2×2 design patterns follows the rule given in **Figure 7**?



1.14 For which of the following motifs will positions **1** and **4** (see **Figure 7**) appear to be the same?



1.15 Which of the following motifs has rotational symmetry?



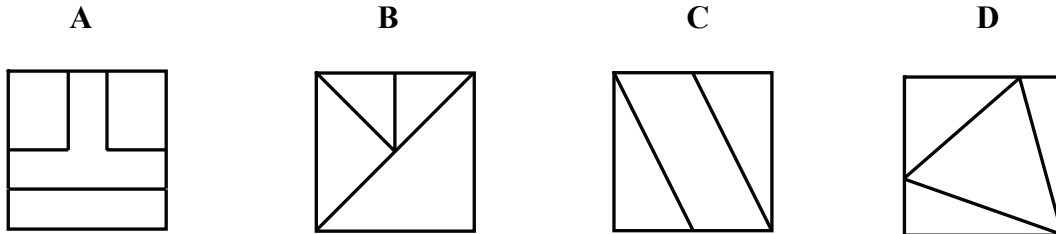
Turn over for the next question

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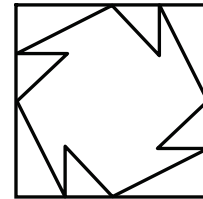
Questions 1.16 to 1.18

A chiral reflection occurs when an object and its reflected image can be exactly superimposed. An achiral reflection is the opposite and occurs when an object and its reflected image are left and right handed and hence cannot be superimposed.

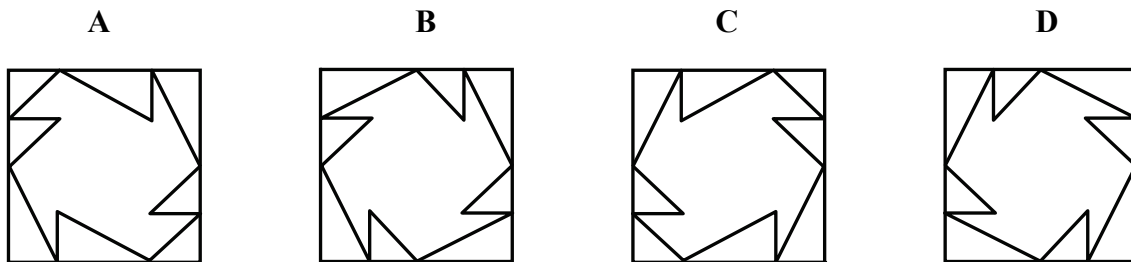
1.16 Which of the following motifs gives a chiral reflection?



1.17 This diagram shows the left hand version of an achiral reflection.



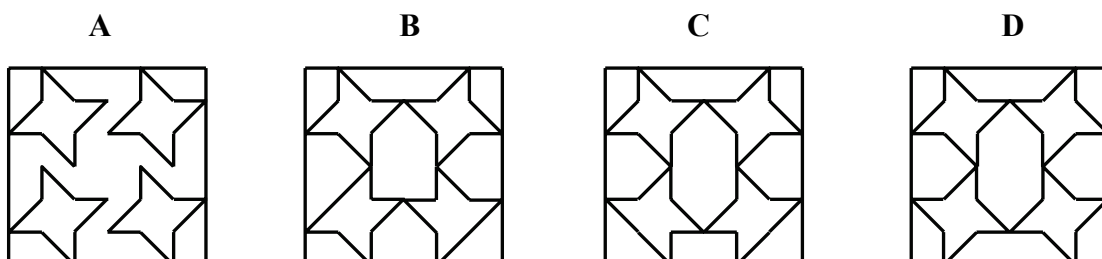
The right hand version is



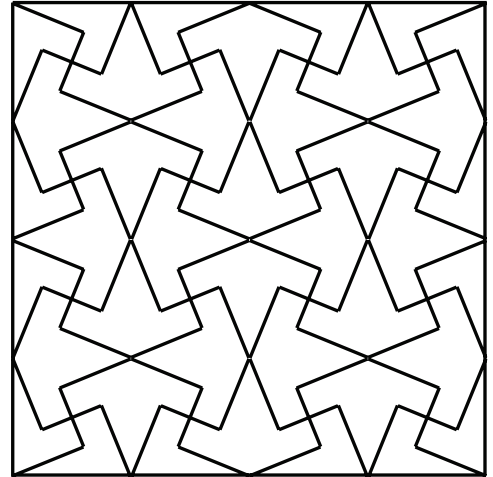
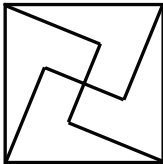
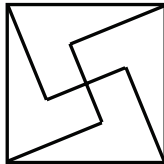
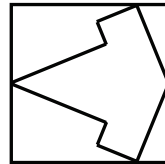
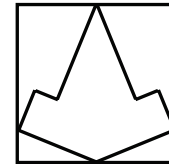
1.18 Which of the following gives an achiral reflection?

- A** an isosceles triangle
- B** an equilateral triangle
- C** a regular pentagon
- D** a parallelogram

1.19 Which of the following 2×2 patterns is generated by the reflection of this motif?



1.20 For the 4 x 4 design pattern shown in the diagram, the basic motif following the rule given in **Figure 7** is

**A****B****C****D**

END OF QUESTION 1

Turn over for Question 2

Turn over ▶

QUESTION 2

Answer **one** of Questions **2.1** to **2.6** in English.

Each question carries 25 marks.

Answer this question in a **separate** answer book. Label this answer book **GSA5 Question 2**.

Include relevant science and include examples to illustrate your answer wherever appropriate.

Write your answer in continuous prose as if you are addressing the intelligent general reader. You will be marked on your ability to use good English, to organise information clearly and to use specialist vocabulary where appropriate.

2.1 “Britain is sleepwalking into a surveillance society.”

Outline a range of technologies used by governmental and commercial organisations which gather and retain information about individuals, and explain in detail one such technology.

Consider the extent to which such technologies are a benefit to society or a threat to personal privacy and individual liberty?

2.2 The ‘precautionary principle’ argues that the development of scientific or technological advances should be restricted if there is a possibility of damage to individuals or the environment.

Discuss how far this principle should be applied in relation to **two** of the following: reproductive human cloning; nanotechnology; nuclear energy; genetically modified food; mobile telephone systems.

2.3 An ‘Earth-like’ planet has recently been identified in a star system 21 500 light years away.

Identify and explain the conditions that are assumed to be necessary for a planet to support life.

2.4 What is meant by the term ‘superbug’? Explain how superbugs such as MRSA develop.

Explain the scientific measures needed to reduce the impact of superbugs on the health of the population, and consider their political and economic implications.

2.5 Discuss the scientific and ethical arguments for **and** against the use of non-human animals in scientific experiments.

2.6 In Britain, we throw away 4.6 million tonnes of waste packaging from food products each year.

Explain why so much food packaging is used, and why it is so difficult to dispose of in an environmentally acceptable manner.

Discuss the effectiveness of policies designed to reduce, reuse and recycle domestic waste.

END OF QUESTIONS

There are no questions printed on this page

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GSA5



Data Booklet

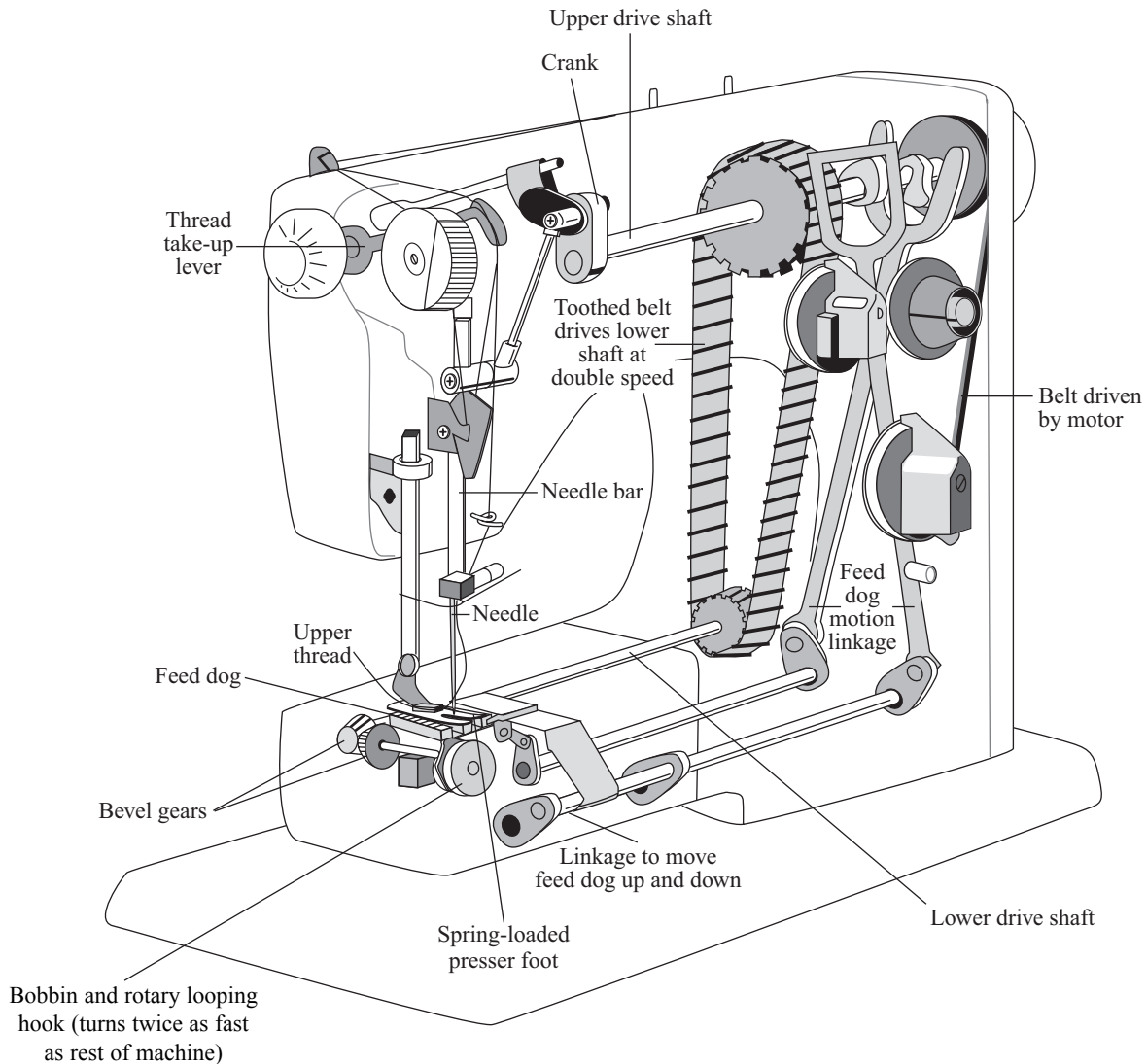
Data Booklet for use with **Questions 1.5 to 1.12**

 PASSAGE AND FIGURES FOR QUESTIONS 1.5 TO 1.12

Electric Sewing Machines

(1) **Figure 5** shows a typical home sewing machine powered by an electric motor. The motor is not shown but a belt from the motor is shown turning the upper drive shaft.

Figure 5: Electric Sewing Machine

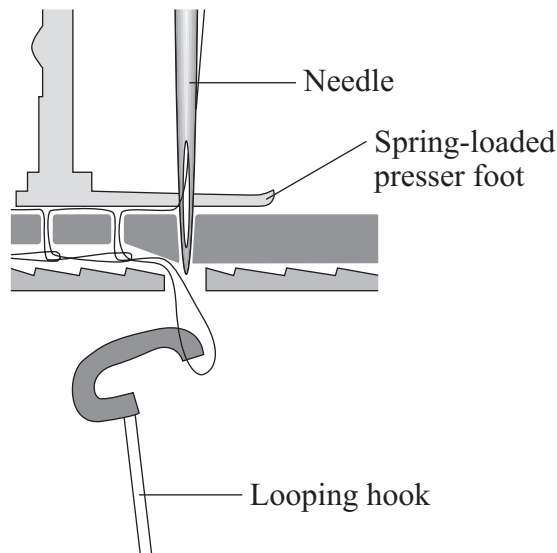


(2) The end of the upper drive shaft turns a crank that pulls the needle up and down and also moves the thread take-up lever. Moving synchronously with the needle bar, the thread take-up lever lowers to create enough slack for a loop to form under the fabric. It then pulls up to tighten the loop after it is released from the rotary looping hook.

(3) The upper drive shaft also moves linkages that operate the feed dog. The fabric is advanced at each stitch by the feed dog, a toothed bar under the fabric, gripping it by pressing up against a smooth spring-loaded presser foot. The motion is in four parts – up, forward, down, back.

- (4) The upper drive shaft also uses a toothed belt to drive the lower drive shaft, in this case with a gear ratio of 2:1. The end of this lower shaft is connected to a pair of identical bevel gears which connect to the bobbin and rotary looping hook.
- (5) Some sewing machines use chain-stitch.

Figure 6: Chain Stitch



- (6) With chain-stitch (see **Figure 6**) the needle enters the fabric, pulling a loop of thread through with it. The needle then withdraws slightly, but friction against the fabric prevents the thread from withdrawing, so that it broadens out into a loop under the fabric. A looping hook comes across and catches the thread, after which the needle withdraws fully and the fabric moves on one stitch length.
- (7) The looping hook holds the loop under the fabric in a position so that when the needle descends again, it passes through the held loop before forming a new loop which is caught in turn by the looping hook.

END OF DATA BOOKLET

There are no data printed on this page