General Certificate of Secondary Education

Engineering

Specimen Mark Scheme

Unit 1: Written Paper

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Set and published by the Assessment and Qualifications Alliance.
The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).

1 (a) Label the five main parts of the lawnmower.

1 mark for each of the following:

A petrol engine / motor / power unit
B fuel tank (or either word on its own)
C handle / controls / throttle / accelerator / switch
D cutting blade / roller / or blade on its own or cutter on its own
E guard / casing / cover / drive train

(5 marks)

(b) State the purpose of the labelled parts B, C and E.

Statements which convey a similar meaning to the following:

Part B to hold the fuel which provides the power to drive the motor

(2 marks)

Part C to enable the operator to control the machine safely and comfortably

(2 marks)

Part E to cover the chain which connects the engine to the Cutter

(2 marks)

(6 marks)

(c) (i) State one advantage and one disadvantage of this type of lawnmower.

Advantage the petrol engine allows the lawnmower to be used anywhere or to provide a high power output for cutting large lawns

(2 marks)

Disadvantage it makes a lot of noise (or pollution) which is environmentally unfriendly

(2 marks)

(4 marks)

(ii) Using notes and sketches, briefly explain how the rotating cutter is powered.

A description which includes the following marking points:

- Engine driven through clutch
- Drives cutter and roller through chain
- Operator opens throttle to make it cut and closes throttle to stop it
- Rotating blade feeds grass over a stationary cutting blade to cut grass

(4 marks)

Notes

(1 mark)

Labels

(2 marks)

Quality of sketches

(7 marks)

(d) Most of the components of the lawnmower on page 3 are made from low carbon steel (mild steel). Give two reasons why this material is suitable.

Up to 2 marks for each reason such as:

- Low carbon steel is tough and strong and will put up with the rough use of a petrol mower

(2 marks)

- Low carbon steel is easily shaped into the parts for the lawnmower

(2 marks)

- Low carbon steel is chemically resistant and will not be damaged by petrol or oil

(2 marks)

- Comparatively low cost

(2 marks)

(4 marks)

2 (a) Identify two ways in which new technology is used in products of this type.

2 marks for each of 2 ways in which technology is used such as:

- Plastics materials used for the body
  (2 marks)
- Powerful electric motor used to lift the body and to cut
  (2 marks)
- Hovercraft principle used to make it run smoothly over rough ground
  (2 marks)
- High speed cutters used to make small cuttings which do not need to be collected
  (2 marks)
- Safety interlocks and thermal cut outs
  (2 marks)

(4 marks)

(b) This type of lawnmower can be fitted with different types of cutting blades as shown below. Give one advantage, with the reason, for the use of each type of blade.

1 mark per advantage such as:

Metal blade

- Will cut most things (1 mark)
- Stays sharp longer (1 mark)

1 mark per advantage such as:

Plastics blade

- Safer in use – less likely to cut operator (1 mark)
- No need to sharpen – just replace (1 mark)
- Cannot conduct electricity (1 mark)

1 mark per reason such as:

Metal blade

- Steel is tough and will not crack (1 mark)
- Steel is hard so it stays sharp (1 mark)

1 mark per advantage such as:

Plastics blades

- Safer because it is light in weight (1 mark)
- Pivot allows it to deflect (1 mark)
- Designed for easy replacement (1 mark)
- No need to re-sharpen (1 mark)

(4 marks)

(c) Discuss the health and safety issues for the user of the different types of lawnmower blade.

Candidates are expected to provide an answer which would cover the following points (other equivalent points will also be accepted):

Metal blades

- Risk of injury from sharp metal blades as they are made
- Risk of eye damage in cutting and grinding operations
- Heavy components tools could injure feet
- Risk of entanglement in rotating machinery / tools

Plastics blades

- Could be burnt by Hot plastics ejected from moulding machine
- Hot machinery used in moulding could get burnt
- Fumes from heated plastics can be inhaled

Each point would need to be discussed.

One point provided, with limited discussion. Response is poorly structured / structure is unclear and has numerous errors in grammar, punctuation and spelling – 1 mark

Two points provided, with limited discussion of each; or one well considered point. Response is structured and contains a small number of errors in grammar, punctuation and spelling – 2 marks

Three points discussed or two well considered points. Response is well structured, considers both types of blade, with few of errors in grammar, punctuation and spelling evident – 3 marks

Four points discussed or three well considered points. Response is very well structured, considers both types of blade and shows a good grasp of grammar, punctuation and spelling – 4 marks

(4 marks)

3 (a) Fill in the following table to identify four main operations (in the correct order) needed to make the component. The first one has been done for you.

Up to 12 marks for:

1 cutting the blanks out guillotine cutting metal sheet into strips and then into individual pieces using stops to guide
(3 marks)

2 Drilling or punching holes punch and press or drill and bits description of the hole forming using a jig
(3 marks)

3 folding the brackets using bending bars fitting blanks into jig and bending
(3 marks)

4 finishing deburring tool removing sharp edges or painting
(3 marks)

(9 marks)

(b) Identify one safety issue during the making of the bracket and describe how it could be avoided.

Issue such as:

Risk of cutting handle sharp sheets with gloves
(3 marks)

Risk of eye injury wear safety glasses
(3 marks)

(3 marks)

(c) Describe one technique which could be used to ensure that all the brackets are the same size.

Description which describes how jigs and fixtures are used to set components against stops to ensure that the process happens in exactly the same place each time.
Simple description with information missing or inaccurate 1 mark
Complete and accurate description 2 marks

(2 marks)

4 (a) Identify the following components from the illustrations below.

(i) Resistor

(1 mark)

(ii) Spring

(1 mark)

(iii) Set screw (or bolt)

(1 mark)

(iv) Switch

(1 mark)

(v) Rivet

(1 mark)

(5 marks)

(b) Identify the following components from the symbol shown.

(i) Fuse

(1 mark)

(ii) Switch

(1 mark)

(iii) Centre Line

(1 mark)

(iv) Threaded hole

(1 mark)

(4 marks)

5 (a) (i) State one suitable metal.

Low carbon steel

(1 mark)

(1 mark)

(ii) Give two reasons for selecting this metal.

It is strong and tough as well as comparatively cheap

(2 marks)

(2 marks)

(b) Copper is commonly used as the conductor in electrical cables. State one advantage and one disadvantage of the use of copper for this purpose.

Advantage

- Good electrical conductor (2 marks)
- Resistant to corrosion (2 marks)
- Bends repeatedly without breaking (2 marks)

Disadvantage

- Expensive metal (2 marks)
- Targeted by thieves (2 marks)
- Heavy to work with when installing (2 marks)

(2 marks)

(c) **The cases of mobile phones are often manufactured from plastics materials. Describe how the properties of plastics contribute to this choice.**

Points such as:

- Lighter than metals so easier to carry in pocket
(2 marks)
- Warmer to touch so more comfortable to hold
(2 marks)
- Readily moulded into complex shapes so cheaper to process
(2 marks)
- Can be recycled
(1 mark)

(2 marks)

6 **A PVC rod is often used for curtain rails. Use notes and sketches to describe how a PVC rod could be extruded.**

Sketch of moulding machine showing

- Hopper for pellets (1 mark)
- Heating system (1 mark)
- Rotating ram (1 mark)
- Mould (1 mark)
- Method of ejecting component (1 mark)

Marks up to 4 for the information in the sketch as above,
2 for quality of sketch

(6 marks)