



General Certificate of Secondary Education **Engineering** **(Double Award) 3871**

Unit 3

Mark Scheme

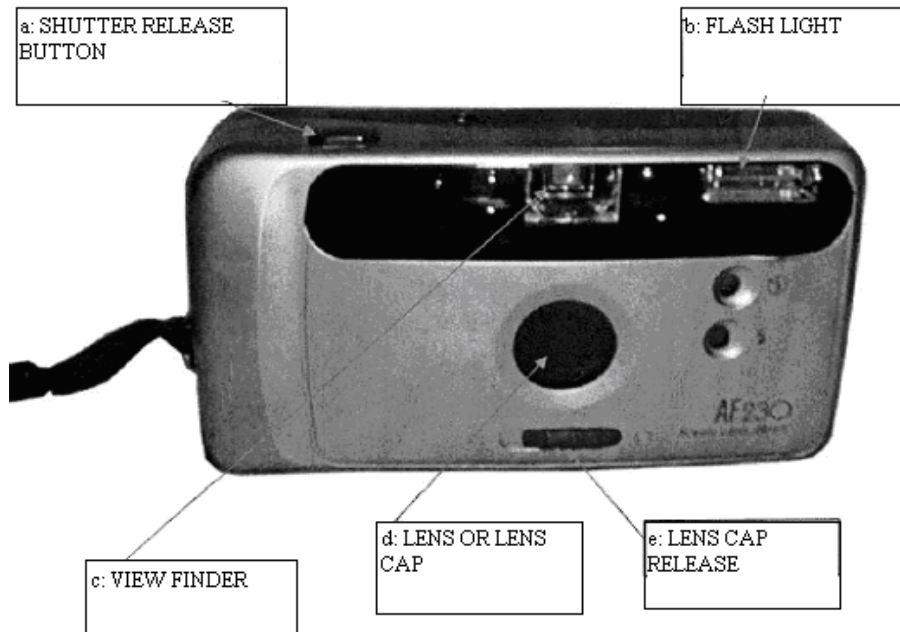
2008 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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.

1 This question is about investigating products

- (a) A compact camera is shown below. Complete the labels below by identifying the parts of the camera.**



- (a)** 1 mark for answers such as “button”, lever, etc
- (b)** 1 mark for answers such as “flash” or “lamp”
- (c)** 1 mark for answers such as “view”, “viewer”
- (d)** 1 mark for answers such as “lens” or “lens cap” or “lens cover” etc
- (e)** 1 mark for answers such as “lens cap lever or release”

(5 marks)

- (b) State the function of part c.**

Function of part c: to enable the photographer to see what will be in the photograph, or to compose the picture, or similar answer.
1 mark for a simple statement (e.g. to see through), 2 marks for a more developed answer relating to viewing for the purpose of picture composition

(2 marks)

- (c) (i) Describe the purpose of part d.**

Explanation of how the component marked d is used or which states directly what is its purpose, 2 marks:
The lens cap protects the lens when not in use.
“Lens cap covers the lens” – 1 mark (description)

(2 marks)

(ii) Explain how parts d and e work together.

Description of how the parts work together such as lens cover switches camera on and exposes lens, such as electronic or mechanical linkage.

- Lens cover acts as a switch
- Electronic or mechanical linkage described

For 2 marks a full description is required.

(2 marks)

**2 This question is about the technology used to make photographs.
Describe how film and digital cameras carry out the same processes using different technologies.**

Up to 1 mark per description as follows:

Process	Film	Digital
capturing an image	Chemical change takes place in coating on a plastic film when exposed to light.	Electronic signal from the light sensitive device is stored digitally on a memory card (random access memory)
method of storing an image	Image is stored on the film itself.	The digital image is stored on a CD or hard disk.
finding the image for later use	The film or negative has to be found and sent off for processing.	The image file has to be located and then it can be displayed on a computer screen and manipulated using software
producing an image on paper	The image is transferred to light sensitive paper using an enlarger in a dark room, and then chemically processed to develop and fix the image.	The digital image can be printed onto special photograph paper – or even ordinary paper on a computer printer

(8 marks)

3 This question is about the use of new technology in engineered products.

(a) Explain, with an annotated sketch, how a digital camera is connected to a computer or printer.

Up to 2 marks for an **illustrated explanation** of a connection between camera and computer. One mark for sketch, one mark for explanation.

(2 marks)

(b) Describe two examples of how a computer is used to adjust a digital image.

Two examples of how a computer is used to adjust a digital image such as: red eye reduction, rotation, cropping, colour adjustment, sharpening, to resize etc.

(2 marks)

(c) Explain one factor that will effect the quality of a digital print.

Factors such as: paper grade, print definition, printer matrix, pixel size etc. Explanation required for 2 marks.

(2 marks)

4 **This question is about transferring images.
Images often need to be sent between two different places, for
example from London to New York.**

**(a) Describe two methods that are used to send digital images and
give a benefit for using each method.**

Up to 4 marks relevant examples (2 marks for each) such as:
Attachment to email, posting CD (DVD), microdrive etc and relevant
advantages such as speed of transfer for attachment, security for CD
etc.

1 mark for each benefit for just stating the benefit, 2 marks for
explaining each point

(4 marks)

**(b) Give a benefit of transferring a digital image compared to a
traditional photograph.**

2 marks for answers which show the benefit such as: speed of display,
accessibility (e.g. You tube, my space), ease of manipulation

1 mark for an unexplained answer such as cost, e-mail

(2 marks)

5 This question is about the impact of technology.

- (a) State the engineering sector where digital cameras are made.**

1 mark for "electronics" or "electrical"

(1 mark)

- (b) Describe two advantages to the consumer of using a digital camera over a film camera.**

A description which includes the following marking points:

- Can see photograph immediately
- Can delete and reuse immediately
- Can look at photographs before printing...
- ...and can make sure image is what is required before printing (deleting poor copies)
- No need for chemicals
- Do not need to continually buy new film
- Can print and store at home on computer

1 mark per point made up to a maximum of 2 marks.

(2 marks)

- (c) State three changes which have resulted from the increased use of digital cameras.**

An explanation which includes the following points:

- Reduced demand for printing and processing – can be done at home
- Reduced the need for chemicals with environmental and health issues
- Required new equipment to print digital images
- Need to have internet connection to allow customers to submit images digitally via email

Up to 1 mark for each point up to a maximum of 3 marks.

(3 marks)

- (d) Identify one chemical substance that is used in photographic film processing and explain its function.**

One chemical such as developer fixer identified (accept specific chemical names or general names)

Description of functions, such as fixer stops chemical process

1 mark per point made up to a maximum of 3 marks

(3 marks)

(e)

(i) Describe how using film and photographic paper has an impact on the environment.

Impact on environment:

- Chemicals to be disposed of when used
- Waste paper to be disposed of
- Water used in the process
- Waste water polluted by chemicals

1 mark per point made up to a maximum of 2 marks

(2 marks)

(ii) Explain how this situation has been improved by using digital photography.

1 mark per point made up to 3 marks for points such as:

- No water used in the process
- No chemicals to be disposed of
- Less paper wasted since only good photos get printed
- Printer cartridges can be recycled
- Photographs need not be printed.

(3 marks)

(f) Described how the increasing use of digital technology has affected the type and size of the workforce in the film processing industry.

Up to 3 marks for describing effects such as:

- Reduction in employment in photo labs and traditional camera manufacture
- but staff in camera shops etc need re-training and people are buying new cameras, which has affected number of staff required.
- Increased employment in electronic manufacture
- Increased automation etc

1 mark for each point or 2 or 3 marks for a more fully explained answer

(3 marks)

6 This question is investigating products.

A single use camera is manufactured from the components and assemblies shown in the photograph below.



(a) Explain how industrial manufacturing techniques could be used to assemble the single use camera.

Description of a cell or line process such as:

- Components in bins around workplace
- Illustrated instructions to refer to
- Workspace designed for this task
- Jigs and fixtures to aid assembly
- Tools required to hand
- Sub assemblies made and passed on
- Tests at appropriate points in assembly
- Robotic methods
- Conveyor

1 mark per point made up to a maximum of 4 marks.

(4 marks)

(b) (i) State two material properties needed for a plastic lens.

Two relevant properties of a material such as:

- Transparent
- Heat softening (thermoplastic)
- Hard enough to resist scratching

1 mark per relevant property up to a maximum of 2 marks.

(2 marks)

(ii) Describe the process for manufacturing the lens from a plastics material.

4 marks for explanation of injection moulding which includes points such as:

- Plastic pellets loaded into hopper
- Heated pellets under pressure
- Ram used to force into a mould
- Mould exactly the right size and shape with smooth surfaces
- Cooled and ejected

1 mark per point made up to a maximum of 4 marks.

If it is the incorrect technique process (such as blow moulding) a maximum of 3 marks depending on the quality of the answer.

(4 marks)

(c) The single use camera can be ‘reloaded’ after use. This is done when the camera is returned, and the used film is removed for processing. The photograph below shows the components ready for re-assembly.

Explain how Computer Aided Manufacturing (CAM) techniques could be used to load the film and re-assemble the camera.

Up to 6 marks for an explanation of a computerised system such as:

- Manual loading of cameras onto conveyer belt
- Automatic feed into light proof container
- Motor to engage and rewind film
- Sensors to locate camera
- Stops to locate and hold components
- Robotic arm to remove camera back
- Chute to capture film and remove for processing
- Robot arm to insert new film and replace cover
- Eject to operator to test and replace battery

1 mark per point made up to a maximum of 6 marks.

(6 marks)

7

**This question is about new components.
A digital camera contains the components listed below. Describe
the function of each of the following.**

(a) image sensor

Description of image sensor which includes:

- Digital electronic component
- Light sensitive
- a matrix of sensors
- Matrix detects light on each point
- Feeds out electronic value for each point.

One mark per point up to a maximum of 2 marks.

(2 marks)

(b) motor drive

Description of motor drive which includes:

- To move lens
- Convert electronic signal into motion
- Allows camera to focus
- Allows zoom function
- Allow retraction of lens for protection.

One mark per point up to a maximum of 2 marks.

(2 marks)

(c) microprocessor

Description of microprocessor which includes:

- Controls function of camera
- Carries out programmed instruction
- Controls storage of photos
- Extracts image from sensor
- Controls lens and shutter

One mark per point up to a maximum of 2 marks

(2 marks)

(d) actuator

Description of actuator which includes:

- Converts electronic signal into motion
- Controls shutter
- Allows photo to be taken.

One mark per point up to a maximum of 2 marks.

(2 marks)

(e) programme stored in Read Only Memory (ROM)

Description of programme which includes:

- Step by step instructions
- Stored in memory
- Controls how the camera functions
- Cannot be altered.

One mark per point made up to a maximum of 2 marks.

(2 marks)

(f) display screen

Description of display screen which includes:

- Digital electronic component
- Light emitting screen
- Allows photos to be displayed
- Immediate review of photograph.

One mark per point up to a maximum of 2 marks.

(2 marks)

(g) memory card

Description of memory card which includes:

- Digital electronic component
- Stores photos as files
- Random access memory
- Can be re-used
- Can be connected directly to a computer.

One mark per point up to a maximum of 2 marks.

(2 marks)

(h) Random Access Memory (RAM)

Description of random access memory which includes:

- Digital electronic component
- Temporary store of data
- Can be erased
- Can be rewritten.

One mark per point up to a maximum of 2 marks.

(2 marks)

8 This question is about using materials including smart materials.

- (a) (i) Identify a suitable specific material from which the camera body could be made.**

One mark for a suitable thermo-plastics material

(1 mark)

- (ii) Complete the table below to state two properties of the material, and a reason for its importance. An example has been completed for you.**

Property	Reason for the importance
<i>Opaque</i>	<i>Won't let light through</i>

One mark per property and one mark per reason such as density – easy to carry since light weight impact resistant, surface finish, colour, etcetera.

(4 marks)

- (b) Describe how the material would be tested to ensure that it does not let light through.**

Description of a method of testing opaqueness such as hold up to light for 1 mark, directional rotation, different wavelength light, etcetera for extra mark.

(3 marks)

- (c) Some smart materials react to temperature. Describe one example where a material that reacts to temperature is used in a product.**

Description of how reaction to temperature is used in a product such as changing colour to indicate when toothbrush has been used for long enough etcetera.

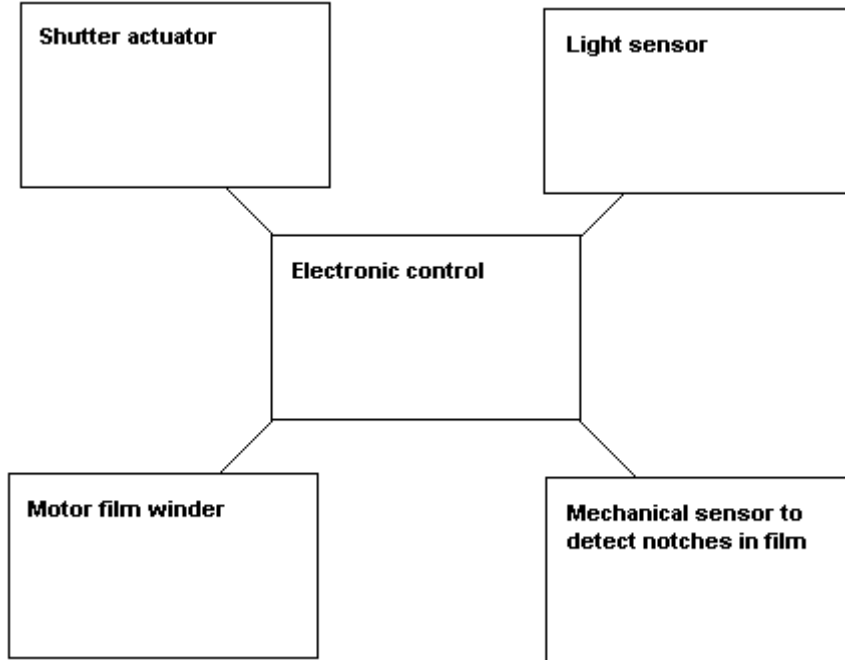
1 mark for simply stating the material.

(2 marks)

9

**This question is about the use of technology in products.
Explain, using notes and sketches, how a shutter and motor drive work together in a motorised film camera. Include any sensors and actuators which would be used.**

8 marks for explanation such as:



including the following points in either graphical or word form:

- shutter cannot operate until film moved on
- film moves after photo taken
- sensor to detect film position
- sensor to detect light level
- electronic control

2 marks per relevant point made in either graphical or note form up to a maximum of 8 marks.

Up to 2 marks depending upon the quality of the drawing.

(Information conveyed) (8 marks)
(Quality of drawing) (2 marks)
(10 marks)