

# **Design and Technology**

General Certificate of Secondary Education **1957/06**

Systems and Control Technology: Paper 6 Pneumatics

## **Mark Scheme for June 2010**

---

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by Examiners. It does not indicate the details of the discussions which took place at an Examiners' meeting before marking commenced.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2010

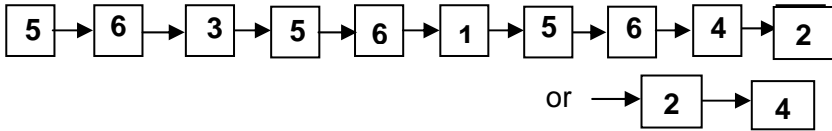
Any enquiries about publications should be addressed to:

OCR Publications  
PO Box 5050  
Annesley  
NOTTINGHAM  
NG15 0DL

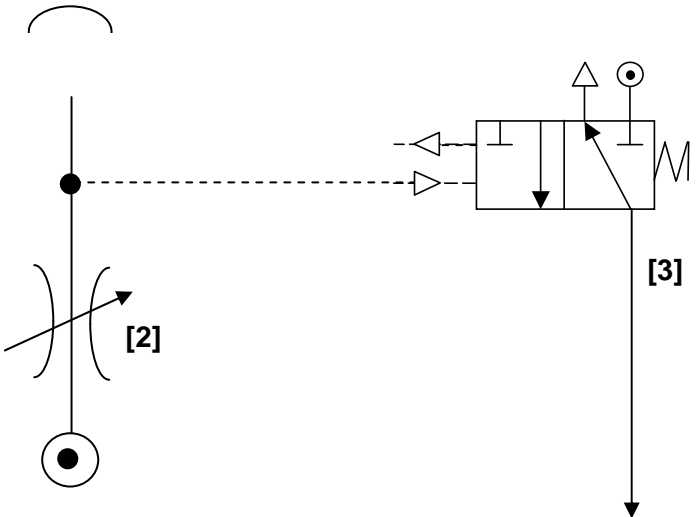
Telephone: 0870 770 6622  
Facsimile: 01223 552610  
E-mail: [publications@ocr.org.uk](mailto:publications@ocr.org.uk)

| Question |         | Expected Answers   | Rationale              | Marks              |
|----------|---------|--|------------------------|--------------------|
| 1        | (a)     | Accuracy of drawing, Able to copy and paste components. Quicker to draw complex designs. Easy to save and draw images. Make changes to existing drawings more easily, symbol library                                 | Any three – no repeats | [1] + [1]<br>+ [1] |
|          | (b)     | To help evaluate the integrity of the circuit. To test the flow. To test the viability of different components. To find problems and solve them through simulation. Actual components not needed (therefore cheaper) | Any two – no repeats   | [1] + [1]          |
|          | (c)     | Loss of workforce, and the need to retrain for the new technology.   |                        | [1] + [1]          |
|          | (d) (i) | A magnetic ring attached to the piston   |                        | [1]                |
|          | (ii)    | Feedback is provided to the computer when the magnetic piston ring closes the reed switch which is sensed by the computer input.   |                        | [2]                |
|          |         |  |                        |                    |

| Question |     | Expected Answers   | Rationale                       | Marks |
|----------|-----|--|---------------------------------|-------|
| 2        | (a) | Fixed to piston rod [1]<br>Locked on piston rod [1]<br>Connects to leg [1]<br>Free movement of leg [1]<br>Communication [1]              | Clear illustration for (1) mark | [5]   |
|          | (b) | Fixed to end of cylinder(1)<br>Connected to mounting lug (1)<br>Free movement of cylinder(1)<br>Retained on lug (1)<br>Communication (1) | Clear illustration for (1) mark | [5]   |
|          |     |  |                                 |       |

| Question |     | Expected Answers  | Rationale | Marks |
|----------|-----|---|-----------|-------|
| 3        | (a) | The legs must be identical otherwise when the back is lifted one leg may not clear the ground or when the walking mechanism is operating the legs may not work in unison. |           | [2]   |
|          | (b) |   |           | [8]   |
|          |     |   |           |       |

| Question |     | Expected Answers   | Rationale | Marks |
|----------|-----|--|-----------|-------|
| 4        | (a) | <p>Calculate the minimum air supply required to rotate the camera and light.</p> $r = D/2 = (10/2) = 5 \quad (1)$ $F = P \times A$ $20 = P \times \pi \times 5^2 \quad (1)$ $P = 20 / \pi \times 5^2 \quad (1)$ $P = 0.25 \text{ N/mm}^2 \quad (1)$ <p>Minimum air supply pressure = 0.25 N/mm<sup>2</sup> (1)</p> |           | [5]   |
|          | (b) | The minimum pressure calculated was based on the full area of the Piston (1) but on the instroke the area of the piston rod must be Considered (1). The result is that there is less area for the pressure to act on (1) so less force produced (1).   |           | [4]   |
|          | (c) | Increase the air supply pressure.  |           | [1]   |
|          |     |  |           |       |

| Question | Expected Answers   | Rationale  | Marks   |
|----------|--|--|---------|
| 5 (a)    |    | <p>Diaphragm valve<br/>In and out (1)<br/>Normally exhaust (1)<br/>Flips to main air (1)</p> <p>Restrictor (1)<br/>On correct air line with an arrow (1)</p> | [5]     |
| (b)      | <p>With no obstruction detected, air will escape through the air bleed, [1] and the diaphragm valve will stay relaxed, [1] and there will be no supply to the rest of the circuit. [1] When an obstruction is detected the air bleed is blocked, [1] this switches the valve and it supplies main air to the rest of the circuit. [1]</p> <p>Accept: 'This makes the robot reverse'.</p> |  | max [5] |

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**14 – 19 Qualifications (General)**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
**is a Company Limited by Guarantee**  
**Registered in England**  
**Registered Office; 1 Hills Road, Cambridge, CB1 2EU**  
**Registered Company Number: 3484466**  
**OCR is an exempt Charity**



**OCR (Oxford Cambridge and RSA Examinations)**  
**Head office**  
**Telephone: 01223 552552**  
**Facsimile: 01223 552553**