# Motion

## Mark Scheme 2

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|---|---|
| Level | IGCSE |
| Subject | Physics |
| ExamBoard | CIE |
| Topic | General Physics |
| Sub-Topic | Motion |
| Paper Type | (Extended) Theory Paper |
| Booklet | Mark Scheme 2 |

**Time Allowed:** **63 minutes**

**Score:** **/52**

**Percentage:** **/100**

1 **(a) (i)** $a = (v - u) \div t$ OR $a = \Delta v \div t$ in any form OR in words in any form
AND with correct numbers substituted B1

**(ii)** Straight line from origin to point (3.2 s, 32 m / s)

**(iii)** Area under graph OR $\frac{1}{2} \times 3.2 \times 32$
OR $s = \frac{1}{2} at^2$ OR $\frac{1}{2} \times 10 \times 3.2^2$ C1
51 m A1

**(b) (i)** Air resistance increases B1

**(ii)** Graph line Y under graph line X B1
Graph has decreasing gradient B1
Graph extends to value of $t$ greater than 3.5 s and greater than X B1

**[Total: 8]**

2 **(a) (i)** decreases / <u>average</u> speed 2 m / s B1

**(ii)** constant / speed 0.8 m / s B1

**(b)** negative B1

**(ii)** zero B1

**(c)** uses $v = d / t$ in any form or $d / t$ C1

(av. vel = 50 / 40 =) 1.3 m / s or 1.25 m / s A1

**[Total: 6]**

3 **(a) (i)** A marked between $t = 0$ and $t = 6.0\,s$ B

**(ii)** B marked between $t$ 6.0 s and $t = 7.0\,s$ B

**(iii)** C marked on clearly curved section before $t = 14\,s$ B

**(b) (i)** ($a$ =)$\Delta v / t$ **OR** 30 / 1 **OR** 15 / 0.5 etc. **OR** triangle on graph / tangent

(**ignore** – sign) $25\,m/s^2 < a < 35\,m/s^2$ A1

**(ii)** ($F$ =)$ma$ **OR** 750 × 30 e.c.f. from **(b)(i)** C1

$2.2 / 2.25 / 2.3 \times 10^4$ N e.c.f. from **(b)(i)** A1

**(c)** acceleration / rate of change of speed is zero **OR** speed is constant **OR** air resistance / backwards force equal and opposite to driving / forwards force B1

**[Total: 8]**

4 **(a** A increasing speed
B constant speed
C stationary B2
Note: one mark lost for e.e.o.o.

**(b)** D increasing acceleration
E constant acceleration
F constant speed B2
Note: one mark lost for e.e.o.o.

**(c)** ($a$ =) $\Delta v / t$ **OR** $(v–u) / t$ **OR** 10.5 / 1.5
$= 7.0\,m/s^2$ A1

**(ii)** ($a$ =) 0 ($m/s^2$) B

**(iii)** upward and downward forces equal **OR** no resultant force
**OR** forces equal and opposite **OR** forces balanced
**OR** weight (of body) = tension (in rope) B1

**[Total: 8]**

5 **(a) (i)** $10\,m/s^2$ ignore sign B1

**(ii)** (same as) acceleration (of rocket at B) **OR** gravitational acceleration B1

**(b)** same area B1
area represents distance travelled B1

distance up = distance down
**OR** overall displacement = 0
**OR** area above = distance up **AND** area below = distance below B1

**(c)** any three from:
- all of graph below *x*-axis after B
- final section horizontal and above CD **AND** gradient always $\leqslant 0$
- continuous graph from B until time > at DE
- new area not clearly different from old B3

**[Total: 8]**

6 **(a) (i)** (gradient =) 10 ($m/s^2$) B

**(ii)** any linking of gradient to acceleration of freefall **OR** gravitational field strength B1

**(b)** gradient decreases B1

**(c)** speed / velocity stays constant **OR** terminal velocity / speed
no resultant force **OR** forces cancel / balance

**(d)** initially gradient steeper B1
graph lower in second half of BC B1
horizontal final section **and** lower than CD B1

**[Total: 8]**

| | | | |
|---|---|---|---|
| 7 | **(a** | underline or circle force | B1 |
| | | underline or circle velocity | B1 |
| | **(b)** | 4.07 – 4.1 (s) | B1 |
| | **(ii)** | $(v - u)/t$ OR $\Delta v/t$ OR in words OR use of 40 ÷ (ans. to **(b)(i)**) OR other correct values from graph | C1 |
| | | answer between 9.7 and 10 $m/s^2$ or m/s/s | A1 |
| | **(iii)** | area under graph OR ½ $(u + v)t$ OR ½ × 40 × (ans. to **(b)(i)**) OR $s = ut + ½at^2$ OR $v^2 = u^2 + 2as$ OR numbers substituted | C |
| | | 82 m | A1 |
| | **(c)** | graph continues in straight line to 6 s | B1 |

**[Total 8]**