

Motion

Mark Scheme 5

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Motion
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 5

Time Allowed: 70 minutes

Score: /58

Percentage: /100

1 Ignore upthrust throughout this question

(a) paper:

drag / air resistance / friction (upwards) (seen anywhere in (a)) B
 drag /air resistance / friction = weight / force of gravity B1
 no resultant (force) / forces balance / upwards force = downwards force
AND no acceleration B1

coin:

weight / force of gravity (always) bigger than air resistance
 OR force down bigger than force up
 OR air resistance hasn't time / distance to equal weight B1

(b) fall at same speed / acceleration / rate, ignore fall at same time)
 hit bottom at same time/together)
 paper now accelerates (all the way)) any 1 B1
 paper no longer flutters side-side)
 they/paper NOT coin fall(s) faster)
 the paper (ignore coin) hits sooner)
 NOT constant speed/rate [5]

2 (a) (i) $(v - u)/t$ OR v/t OR $8/3$ C1
 2.7 m/s^2 A1

(ii) ma OR $42 \times$ answer from (i) OR $42 \times 8/3$ C1
 $110/112 \text{ N}$ e.c.f. A1

(iii) (distance in 1st 3 secs =) 12 m OR (dist in last 3 secs =) 88 m C1
 use of area of trapezium OR area of "top" triangle C1
 7.7 m/s A1

(b) longer time to top speed)
 longer total time)
 lower top speed)
 lower finishing speed) any 2 B1+B1
 specific/all speeds lower (**not** speed decreases))
 less slope/less acceleration (in first section))
 greater slope/greater deceleration in 2nd section)

[Total: 9]

- 3 (a) (i) straight line OR constant gradient / slope OR
change in speed with time constant OR speed proportional to time B1
- (ii) increase in velocity / time OR $a = v/t$, symbols, words or numbers C1
0.75 m/s² A1
- (b) (i) decreases OR acceleration slows (down) NOT 'it slows down' C1
- (ii) equal to forward / downward force / force down slope OR
constant / maximum OR (giving) no resultant force C1
equal to component of weight (down slope) A1
- (iii) 1 graph starting at origin B1
curved from start AND decreasing gradient AND
horizontal final part B1
- 2 label A on any correct curved region B1
label B on horizontal region B1 [10]
- 4 (a) (i) v/t or $(v-u)/t$ or 28.5/3 or his correct ratio C1
9.3 to 9.5 m/s² A1
- (ii) area under graph or $0.5 \times 3 \times 28.5$ or $\frac{1}{2}b \times h$ C1
42 to 44 m (allow reasonable e.c.f.) A1
- (iii) 15 m/s B1
- (b) (plastic ball larger so) upward force/air resistance/drag more (or vice versa for rubber ball)
IGNORE wind resistance B1
rubber ball, this force not big enough to balance weight/gravity (force) B1
plastic ball, upward force/air resistance big enough to balance/equal weight/gravity
(force) B1
- (c) mg or 0.05×10 or 50×10 accept 9.8 or 9.81 instead of 10 C1
0.5 N or 0.49N or 0.4905N nothing else A1

[10]

5 (a) (i)	7(.0 s)	A1	
(ii)	PQ or 0 – 2s or other correct description	A1	
	distance = av. speed x time or area under graph	C1	
	distance $11 \times 2 \text{ m} = 22 \text{ m}$	A1	4
(b) (i)	deceleration (now) uniform (test 2)	B1	
	slower/lower (average) value/value between that of PQ and QR/takes longer (or values) time to come to rest.	B1	
(ii)	deceleration = change in speed/time or $15/8$	C1	
	value = 1.9 m/s^2	A1	4
(c) (i)	graph shows constant acceleration	B1	
	force = ma (and m is also constant) so force is constant	B1	
(ii)	towards the centre of the motion/circle	A1	

[11]

Accept D & E
marked on time
axis
No labels -1

6 a	BD correct, (straight line i.e. constant acceleration)	B1	
	DE correct, (constant speed or slightly reducing speed only)	B1	
	EF correct, (speed reduced to zero, gradient steeper than BD)	B1	3
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b(i)	force = 2 (N)	C1	
	work = $(2 \times 0.6) = 1.2 \text{ J}^*$	A1	2
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(ii)	k.e. = $0.5mv^2$	C1	
	= $0.5 \times 0.2 \times 2.5 \times 2.5$	C1	
	= 0.625 J^*	A1	3
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c	velocity - vector, speed scalar	B1	
	direction changes so velocity changes	B1	2
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d	work done against friction	B1	
	(more)friction on EF	B1	
	(k)e. changed to heat	B1	
	less k.e. changed to p.e.	B1	3
		M3	*