Physical Quantities & Units Mark Scheme 2

Level	International A Level
Subject	Physics
Exam Board	CIE
Торіс	Physical Quantities & Units
Sub Topic	
Paper Type	Theory
Booklet	Mark Scheme 2
Time Allowed:	83 minutes
Score:	/69
Percentage:	/100
A* A	B C D E U
>85% '77.5%	70% 62.5% 57.5% 45% <45%

1	(a	force	e: kg m s ⁻²		A1	l [1]
	(b)	(i)	I^2 : A ² <i>l</i> : m x: m K: kg m s ⁻² A ⁻²		C1 A1	l I [2]
		(ii)	curve of the correct shape (for inverse proportionality) clearly approaching each axis but never touching the axis		M1 A1	[2]
	(iii)	curving upwards and through origin		A	[1]
2		(a)	spacing = 380 or 3.8 \times 1a ² pm	B1	[1]	
		(b) time = 24 × 3600 time = 0.086 (0.0864)Ms	B1	[1]	
		(C	time = distance I speed = $\frac{1.5 \times 10^{11}}{2 \times 10^8}$	Cl		
			= 500 (s) = 8.3min	A1	[2]	
		(d) momentum and weight	B1	[1]	
		(e) (i) arrow to the right of plane direction {about 4° to 24°)	B1	[1]	
			(ii) scale diagram drawn or use of cosine formula $, l = 250^2 + 36^2 - 2 \times 250 \times 36 \times \cos 45^\circ$ or resolving $v = [(36\cos 45^\circ)^2 + (250 - 36\sin 45^\circ)^2]^{12}$ resultant velocity= 226 (220- 240 for scale diagram)ms- ¹ allow one mark for values 210 to 219 or 241 to 250 ms- ¹	СІ		
			or use of formula ($v = 51068$) $v = 230$ (.226)ms ⁻¹	A1	[2]	

1

3	(a	(i)	V units: m ³ (allow metres cubed or cubic metres)	A1		[1]
		(ii)	Pressure units: kg m s ⁻² / m ² (allow use of $P = \rho gh$) Units: kg m ⁻¹ s ⁻²	M1 A0		[1]
	(b)) V / Cle C =	t units: m ³ s ⁻¹ ar substitution of units for P, r ⁴ and l = $\frac{\pi P r^4}{8V t^{-1} l} = \frac{\text{kgm}^{-1} \text{s}^{-2} \text{m}^4}{\text{m}^3 \text{s}^{-1} \text{m}}$	B1 M1		
		Uni (8 ɗ	ts: kg m ⁻¹ s ⁻¹ or π in final answer –1. Use of dimensions max 2/3)	A1		[3]
4	(a)) sca	alar has magnitude/size, vector has magnitude/size and direction		B1	[1]
	(b)) ac (- ⁻	celeration, momentum, weight 1 for each addition or omission but stop at zero)		B2	[2]
	(c)) (i)	horizontally: 7.5 cos 40° / 7.5 sin 50° = 5.7(45) / 5.75 <u>not</u> 5.8 N		A1	[1]
		(ii)	vertically: $\sin 40^{\circ} / 7.5 \cos 50^{\circ} = 4.8(2) N$		A1	[1]
	(d) eit or T ₁ T ₂ (al	<i>her</i> correct shaped triangle correct labelling of two forces, three arrows and two angles correct resolving: $T_2 \cos 40^\circ = T_1 \cos 50^\circ$ $T_1 \sin 50^\circ + T_2 \sin 40^\circ = 7.5$ = 5.7(45) (N) = 4.8 (N) <i>low</i> ± 0.2 N for scale diagram)	((M1 A1 B1) B1) A1 A1	[4]

5	(a	scal vect	ar has only magnitude or has magnitude and direction	B1 B1	[2]
	(b)	kine	tic energy, mass, power all three underlined	B1	[1]
	(c)	(i)	$s = ut + \frac{1}{2} at^{2}$ 15 = 0.5 × 9.81 × t^{2} T = 1.7 s	C1 A1	[2]
			if $g = 10$ is used then -1 but only once on paper		
		(ii)	vertical component v_v : $v_v^2 = u^2 + 2as = 0 + 2 \times 9.81 \times 15$ or $v_v = u + at = 9.81 \times 1.7(5)$ $v_v = 17.16$ resultant velocity: $v^2 = (17.16)^2 + (20)^2$ $v = 26 \text{ ms}^{-1}$	C1 C1 A1	[3]
			If <i>u</i> = 20 is used instead of <i>u</i> = 0 then 0/3 Allow the solution using: initial (potential energy + kinetic energy) = final kinetic energy		
		(iii)	distance is the actual path travelled displacement is the straight line distance between start and finish points (in that direction) / minimum distance	B1 B1	[2]
6	(a	ler an	igth, current, temperature, amount of substance, (luminous intensity) y three, 1 each	B3	[3]
	(b) (i)	<i>F</i> : kg m s ⁻² ρ : kg m ⁻³ <i>v</i> : m s ⁻¹	B1 B1 B1	[3]
		(ii)	some working e.g. kg m s ⁻² = m ² kg m ⁻³ (m s ⁻¹) ^k hence $k = 2$	M1 A1	[2]

asherrana@chemistryonlinetuition.com

7	(a	(i)	scalar quantity has magnitude (allow size) vector quantity has magnitude and direction	B1 B1	[2]
		(ii)	 temperature: scalar acceleration: vector resistance: 	B1 B1 B1	[1] [1] [1]
	(b)	eith	er triangle / parallelogram with correct shape tension = 14 .3N (allow ± 0.5 N)	C1 A	[3]
		or or or	$(if > \pm 0.5N but \le \pm 1N, allow 1 mark)$ $R = 25 \cos 35^{\circ}$ $T = R \tan 35^{\circ}$ T = 14.3N $T = 25 \sin 35^{\circ}$ T = 14.3N R and T resolved vertically and horizontally leading to $T = 14.3N$	((C1) (A1) ((A1) (C2) (A1)	
8	(a	all	low $0.05 \mathrm{mm} \rightarrow 0.15 \mathrm{mm}$		[1]
	(b) all	low 0.25s \rightarrow 0.5s	В	[1]
	(c) all	low $8N \rightarrow 12N$	В	[1]
		ig	nore number of significant figures		

9	10 ⁻⁹		B1
	с	I	B1
	mega	[B1
	tera	E	B1 [4]

10	(a	e.g. time (s), current (A), temperature (K), amount of substance (mol), luminous intensity (cdl) <i>1 each, max 3</i>			
	(b)	density = mass / volu unit of density: unit of acceleration: unit of pressure:	$ \begin{array}{l} \text{Ime} \\ \text{kg m}^{-3} \\ \text{m s}^{-2} \\ \text{kg m}^{-3} \text{ m s}^{-2} \text{ m} \\ \text{kg m}^{-1} \text{ s}^{-2} \end{array} $	C1 C1 C1 B1 B1	[5]

(allow 4/5 for solution in terms of only dimensions)



<u>CHEMISTRY ONLINE</u> — TUITION —