ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

MARKING SCHEME

JUNE 2013

PHYSICS **9188/3**

(a) (i)

Random error	Systematic error	
- due to judgement by experimenter	- due to faulty apparatus	B1
~~- cannot be eliminated~~	- ~~can be eliminated~~	~~B1~~
- causes measured values to fluctuate about a mean value	- causes measured values to be incorrect by the same size in the same direction	B1 Max 2

Any plausible distinctions

(ii) 1. Measure the diameter several times along the wire and find the average value

2. As taking many readings and finding average value reduces random error, the readings are precise. B1

- As the zero – error was not taken into account, the readings are not accurate B1

(b) (i) 1. The force acts on the earth / Table / book. A1

2. - They are equal in magnitude B1
- They are both gravitational B1
Max 1

(ii) S (weight = mg = 0,7 × 9.81) = 6.87 N A1

(iii) No effect / Effect is neglible A1
From F = ma mass of Earth (m), is very large M1

(c) (i) Gravitional force per unit mass / g = $\frac{Force}{Mass}$ B1

(ii) 1. $g = 9.81 Nkg^{-1}$ ~~(m/s^2)~~ A1

2. Gravitational potential $\bar{\phi} = -gh = -9.81 \times 5$ C1

(A) $\phi = -\frac{GM}{r} = \frac{-49,05 Jkg^{-1}}{(-6.67\times10^{-11} \times 6\times10^{24}) \div (6.4\times10^{6} + 5)}$ A1

(iii) - work is done on the point mass as it is pulled from infinity to the point by attractive gravitational force. B1

(d) (i) Motion in which the acceleration is directly proportional to displacement from a fixed point and it is always directed towards the fixed point / motion which satisfies the equation $a = -w^2x$ (terms defined) B1

(ii) $x = -x_0 \cos\left(\frac{2\Pi}{T}\right)t = -2\times10^{-2}\cos 0,75\Pi$ (ignore minus sign) C1

$= 0,014$ m A1

damping ; air resistance

(iii) Since air resistance affects the amplitude of the oscillating system, it must be shielded from air resistance B1 B1

(a) Mechanical energy is conserved; / Kinetic energy is conserved B1

Momentum is conserved

Bodies separate after collision; B1

(b) Distance travelled during reaction time $x = ut$

$$x_1 = 15 \times 0.3 = 4.5 \text{ m} \quad \text{C1}$$

using $v^2 = u^2 - 2ax_2$ *where* x_2 = *distance travelled after breaking.*

$$x_2 = \frac{u^2 - v^2}{2a} = \frac{15^2 - 0^2}{2 \times 4{,}5} \quad \text{C1}$$

$$= 25 \text{ m} \quad \text{A1}$$

Distance from stop line $= (x_1 + x_2) - 20$ C1

$$= (25 + 4{,}5) - 20 \quad \text{C1}$$

$$= \underline{9.5 \text{ m}} \quad \text{A1}$$

(c) Since 29.5 m > 20 m he stops after passing the stopline A/W B1

An accident may occur. (e.c.f) A1

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3 (a) (i) Resistance of a body to change its dynamic state B1

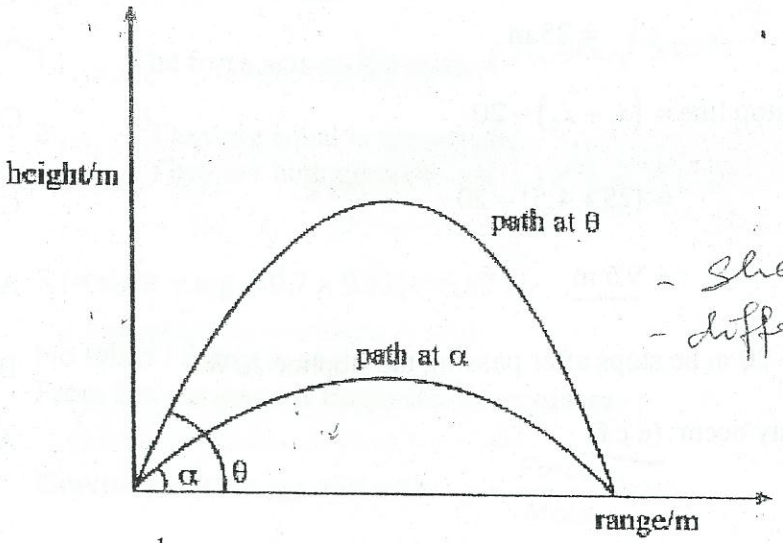
(ii) Velocity is rate of change of displacement. B1
Reject : rate of change of displacement with time.

(b) (i) 1. $R_\theta = \dfrac{v^2 \sin 2\theta}{g}$ C1

$R_{30} = \dfrac{v^2 \sin 60}{g} / R_{60} = \dfrac{v^2 \sin 120}{g}$ C1

$R_{30} = R_{60} = \dfrac{V^2\sqrt{3}}{2g}$ A0

2. B2



- Shape B1
- different amplitudes B1

(ii) $S = ut + \dfrac{1}{2}at^2$

$-4{,}905 = -\dfrac{1}{2}(9{,}81)t^2$ C1

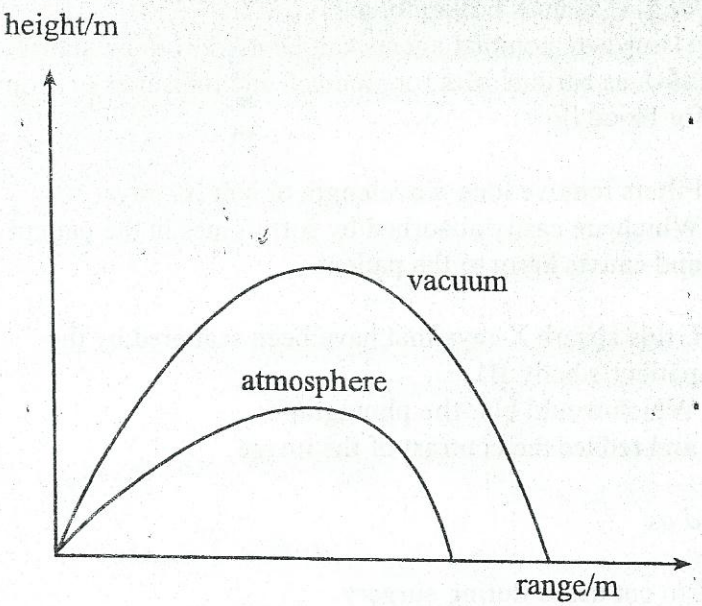
$\therefore t = 1\text{ s}$

Range $= v.t\cos\theta\ ,\theta = 0$

$20{,}000 = v.1$ (P) $20\ ms^{-1}$

$v = 20{,}000\ \text{ms}^{-1}$ A1

(c)



B2

OR

The atmosphere has air resistance that reduces the range and maximum height.

B1
B1
[Max 2]

4	(a)	1.	- Cases in which contrast between tissues is clear using X-rays (such as broken bones).	B1
			- Also where contrast agents can be used to show actual / (such as barium salts for stomach and intestines or iodine for blood flow).	B1
		2.	- Filters remove long wavelength or soft X - rays	B1
			Which are easily absorbed by soft tissues in the patient	B1
			and causes harm to the patient.	B1
			- Grids absorb X-rays that have been scattered by the patient's body B1	
			Which would blur the photograph	B1
			and reduce the contrast of the image.	B1
	(b)	*Lasers are used as*		
		(i)	Scalpel to cut tissue during surgery.	A1
		(ii)	The light is focused on required target and the high energy in it cuts the spot.	B1
			OR	
		(i)	a coagulator to seal blood vessels.	A1
		(ii)	The high heat energy content causes the tissue in the region cut to shrink and harden, closing the blood vessels.	B1 [Max 2]