C. B. MUTERO (101)

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

MARKING SCHEME

NOVEMBER 2009

PHYSICS **9188/3**

1 (a) (i) Product of force and displacement / AW — B1

Accept: Weight as force on body
Accept Eqn with symbols defined.

(ii) $F = mg$ / kg — B1

$\therefore \Delta p = mg\Delta h$ (g and Δh or $h_2 - h_1$ or Any symbol defined as h must seen) — B1

(iii) $h_1 = \frac{0.75}{2} = 0.375$ / $h_1 = h_2 \sin 30°$ or $0.75 \sin 30°$ — C1

length from edge $= \frac{1.061}{2}$

$= 0.530$ m — C1

$h_2 = 0.53 \sin 75°$

$= 0.512$ m

$\therefore \Delta h = 0.512 - 0.375$

$= 0.137$ m — C1

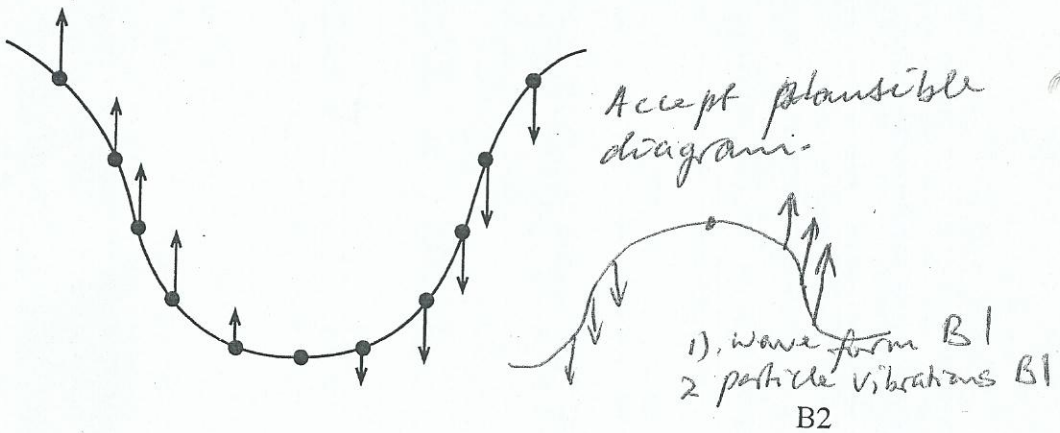
$\Delta mgh = 3.0 \times 0.137 \times 9.81$

$= 4.03$ J Accept 4.04 J. — A1

(b) (i) particles vibrate perpendicular to direction of travel in transverse ~~B1~~
particles vibrate parallel to direction of travel in longitudinal. B1

transverse waves can be polarised. / Longitudinal wave cannot be polarized. B1

(ii)



B2

as particles vibrate; B1
they pass on energy to next particles B1

Adjacent particles not in phase/adjacent particles not at same displacement / AW. B1

(c) (i) first three pairs B3

(ii) $v = \frac{J}{c}$ B1

No marks for Wrong Physics for mixing units with physical qties.

$= \frac{Nm}{AS} = \frac{(kgms^{-2})m}{As}$ B1

$= kgm^2A^{-1}s^{-3}$ B1

2 (a) (i) $F = \frac{GM_1M_2}{r^2}$ / r defined as distance between point masses or distance between centres of m_1 and m_2 - or m_1 and m_2 shld be particles.

terms explained correctly B1

(ii) <u>similarity</u>

inverse square law applies/
involve particles/Newton's third law applies / Involve force btwn ptcles (in contact) B1

<u>difference</u>

Gravitational Law deals with masses Coloumb's law deals with charges.
attractive forces only for gravitation either attractive or repulsive for Coulomb's law. Gravitational law deals with gravitational force while Coloumb's deals with electrostatic forces. B1

(b) gravitational effect negligible at infinite B1

Accept: At infinity Potential energy = 0.

$W = GMm\left(\frac{1}{\infty} - \left(-\frac{1}{r_E}\right)\right)$ OR

$= +6.67 \times 10^{-11} \times 6 \times 10^{24} \times 5 \times \frac{1}{6.4 \times 10^6}$ B1

$= 3.1 \times 10^8$ J A1

(c) $mrw^2 = \frac{GM_Em}{r^2}$ B1

$\frac{4\pi^2}{T^2} = \frac{GM_E}{r^3}$

$r = \sqrt[3]{\frac{GM_ET^2}{4\pi^2}}$ B1

$T = 24 \times 3\,600$ / Correct substitution of T. B1

Result is $r = 574\sqrt[3]{GM_E}$ AO

3 (a) (i) Rate of change of angular displacement / AW B1
Accept equation with terms defined.

(ii) Difference in angular displacement between particles oscillating B1
Angle by which one particle lags/leads. / AW

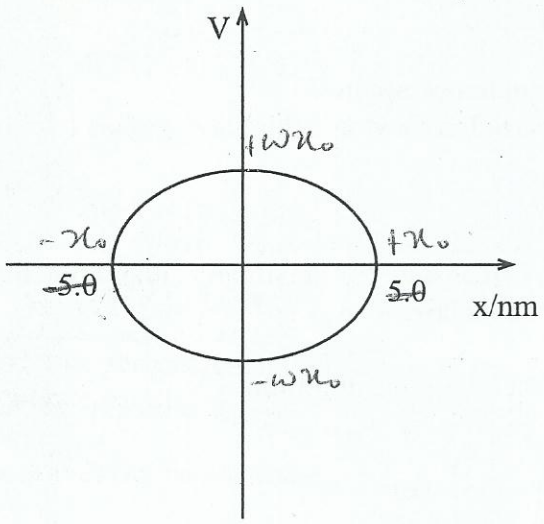
(b) (i) B is leading A1
because at t = 0 displacement of B is zero and that of A is negative. M1

(ii) Phase difference $\phi = \frac{t}{T} \times 2\pi$ C1

$= \frac{(1.3-0.5)}{2\mu} \times 2\pi$ or $\left(\frac{1,35-0,50}{2}\right) \times 2\pi$ C1

$= 2.5$ rad A1

(c) Accept: $0,8\pi$ rad or $\frac{4}{5}\pi$ rad or 2.67 rad / 2.7 rad.



Shape B1
Amplitude labelled B1
Axes labelled B1

4 (a) product of mass and velocity B1

impulse is product of force and time / Change in momentum B1

(b) Action and reaction are equal and opposite / AW. B1

time of collision the same / $\frac{m_1v_1 - m_1u_1}{t} = \frac{m_2v_2 - m_2u_2}{t}$ B1

$\therefore$ magnitude of impulse the same $m_1v_1 - m_1u_1 = m_2u_2 - m_2v_2$ B1
Accept situation of bodies sticking together.

Impulse is change in momentum B1

$\therefore m_1v_1 + m_2v_2 = m_2u_2 + m_1v_1$ A0

(c) use conservation of momentum

$14 \times 3\,500 - 2\,000 \times 20 = 5\,500\ V$

$V = 1.64$ m/s C1

E_k before impact

$= \frac{1}{2} \times 3500 \times 14^2 + \frac{1}{2} \times 2000 \times 20^2$ C1

$= 343\,000 + 400\,000$

$= 743\,000J$

Ek after $= \frac{1}{2} \times 5500 \times 1.64^2 = 7396J$ Accept 7 363,64J or 7 364J. C1

Change in Ek = 743 000 – 7 396 Accept 743 000 – 7364

$= 7.36 \times 10^5$ J or 7 35 636, 3636J A1

7, 36×10^5 J