ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MARKING SCHEME

* Omission of units:- penalise one per question. Indicate 'ECF' where mark is award for omission of units.

NOVEMBER 2012

Rubric:- candidates answers all questions.
- mark all and record all
- delete lost scored question and write 'Rubric Infringement'

=> Transcription error.
- penalise where the error occurs
- follow working. If correct award remaining marks.

- Error carried forward.
- discredite where the error occurs.
- If the answer is used in the next part question correctly, award marks with 'ECF'.

NICS 9188/3

Credit:- Concept needed in last question

1 (a) (i) A frictional force is a force that opposes relative motion between bodies in contact (Reject formula) B1

(ii) friction = $\mu_s N = \mu_s$ mg where N = mg (Accept R for N) A1
Accept μ.

(iii) 1. By Newton first Law, granite block resists to start to move when already at rest; A/W (Concept of inertia) B1

* Block will not shift forward

If friction > inertial force, the block will move forward. A/W. (a < μg) A1 B1

2. Block will resist to stop when already in motion. (Concept of inertia) B1

~~Remains stationery (when it was at rest)~~ Will shift forward (a > μg). B1

(b) The forces between people and the buildings is very small (compared to earth's gravity) B1

The masses are small compared to the mass of the Earth. B1

(c) (i) Amplitude of oscillation $x_0 = 0.2$m / Ignore negative sign A1

(ii) Maximum potential energy = 1.5J

Potential energy = $\frac{1}{2}m\omega^2 A^2$ B1

$\therefore \frac{1}{2}m\omega^2 A^2 = 1.5$

$\omega^2 = \frac{1.5}{\frac{1}{2}(4)(0.2)^2}$ B1

$\omega = \sqrt{\frac{1.5}{0.08}}$

$T = \frac{2\lambda}{\omega}$

$T = \frac{2\lambda}{\sqrt{\frac{1,5}{0,08}}}$

T = 1,45 s (A) 1s

(d) (i) The effect where a system to oscillate is driven at a frequency very close to its natural frequency if displaced. A/W B1

At resonance amplitude is maximum B1

(ii) Fundamental frequency $fo = \frac{4V}{\lambda}$

depth of well $h = \frac{V}{4\,fo} = \frac{350}{4 \times 7.0}$ C1

$= \underline{\underline{12{,}5\text{m}}}$ A1

(e) (i) Base units of resistance = Base units of $\frac{V}{I}$

$[V] = \frac{(\text{kgms}^{-2})(\text{m})}{\text{s}(\text{A})}$ C1

$= \text{kgm}^2\text{s}^{-3}\text{A}^{-2}$ $\text{kgm}^2\text{A}^{-2}\text{S}^{-3}$ A1

(ii) Base units of Young Modulus = Base units $\frac{Fl}{Ae}$

$= \frac{(\text{kgms}^{-2})(\text{m})}{\text{m}^2(\text{m})}$ C1

$= \text{kgm}^{-1}\text{s}^{-2}$ A1

B1 B1

2 (a) Total linear momentum is conserved provided no external forces act on the system. / AW.

(b) (i) 1. change in momentum = $6.0 \times 10^{-2} \times 27 - 0$

= 1.62 Ns

2. force = $\frac{\text{change in momentum}}{\text{time}}$ / $\frac{m(v-u)}{t}$

= $\frac{1.6\text{Ns}}{30 \times 10^{-3}\text{ s}}$

= 54N (Accept 53 N)

3. $s = ut + \frac{1}{2}at^2$

$2.5 = 0 + \frac{1}{2}at^2$

$2.5 = 0 + \frac{1}{2} \times 9.81t^2$

t = 0.713 / 0,714

$R = u \times t$

= 27 x 0.713 Accept 2 sig fig

= 19.3 m

(ii) (Total) momentum is conserved / AW

Kinetic energy is not conserved / AW.

(iii) Some of the kinetic energy is lost as sound, heat

Reject: kinetic energy is
kinetic energy is lost

3 (a) Electrons are emitted by thermionic emission; B1

and are accelerated by an electric field/AW; B1

in a vacuum; B1

The fast electrons interact with target metal which changes their direction of Motion/AW; B1

Description / Diagramatically Mark 3 marks. On diagram look for vacuum and stream of electrons from cathode to a

(b) visible light 4×10^{-7} m to 7×10^{-7} m B1

x-rays 10^{-9} m to 7×10^{-16} m B1

Any value in the range. Accept value of λ from (4 to 7)x. Accept order 10^{-6} m to 10^{-16} m. If units missing mark, mm. 1 mark awarded.

(c) (i) Laser light is monochromatic (and parallel for a long distance). B1

(ii) Central maximum $x = \frac{1}{2}(5.2 \text{ mm})$

$= 2.6\text{mm} = 2.6\times10^{-3}\text{ m}$ C1

Slit width $a = \frac{D\lambda}{x} = \frac{D\lambda}{x}$ or

$= \frac{80.0\times10^{-2}\times546\times10^{-9}}{2.6\times10^{-3}}$ C1

$= 1.68\times10^{-4}\text{ m}$ A1

Accept $a = \frac{2D\lambda}{x}$ where $x = 5.2\text{mm}$.

4 (a) (i) Rate of doing work

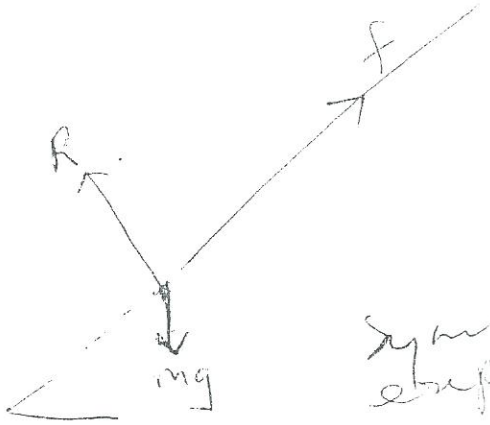
(ii) Power P $= \dfrac{\text{work done}(w)}{\text{time}(t)}$

$= \dfrac{f \times s}{t}$

$\dfrac{s}{t} = v$

$\therefore P = Fv$

(b) (i)



R - reaction
f - friction
mg - weight

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

$1.0 = 0 + \dfrac{1}{2}(a)(2.0)^2$ OR

$a = 0.5\ ms^{-2}$

Using f $= ma = mg \sin\theta - f$

$\therefore f = mg \sin\theta - ma$

$= 5(9.81 \sin 30 - 0.5)$

$= 22.03$ N

(b) (iii) work done by block $= (5.0)(1.0 \sin 30°)$