3IB Physics HL only. Training 28-11-2008 TM – *Answers*

1. M05 H1 TZ1: 33 - D

2. M05 H1 TZ2: 27 – D

3. M05 H1 TZ2: 29 – C

4. M05 H1 TZ2: 31 – A

5. M05 H1 TZ2: 30 – A

6. M05 H2 TZ1: B2p2

(a) force exerted per unit mass;
on a small / point mass;

(b) from the law of gravitation, the field strength $\frac{F}{m} = G\frac{M}{R^2}$;

$= g_0$ to give $GM = g_0 R^2$;

N.B. *To achieve full marks, candidates need to state that* $\frac{F}{m} = g_0$.

(c) downwards; *(accept 90° to B field or down the wire)*

(d) $F = Bev\cos\theta$;

(e) work done in moving an electron the length of the wire is
$W = FL = BevL\cos\theta$;
e.m.f. = work done per unit charge;
therefore, $E = BLv\cos\theta$;
or
electric field $= \frac{F}{e} = Bv\cos\theta$;
e.m.f. $E =$ electric field $\times L$;
to give $E = BLv\cos\theta$;
*Award **[2 max]** if flux linkage argument is used.*

(f) $F = G\frac{Mm}{r^2} = \frac{mv^2}{r}$;

such that $v^2 = \frac{GM}{r} = \frac{g_0R^2}{r}$;

$v^2 = \frac{10\times(6.4)^2\times10^{12}}{6.7\times10^6}$ to give $v = 7.8\times10^3\ \text{m s}^{-1}$;

(g) $L = \frac{E}{Bv\cos\theta}$;

$= \frac{10^3}{6.3\times10^{-6}\times7.8\times10^3\times0.93} = 2.2\times10^4\ \text{m}$;