

Mark Scheme Summer 2007

GCE

GCE Salters Horners Physics (6756/01)

6756 Unit Test PSA6

1. (a) Current = charge/time (any arrangement/accept symbols (d) (□) ✓
 Q, I and t) [E= VIt is also valid] ✓
- (b) Use of speed = distance/time [accept any arrangement and ✓
 symbols] / Statement that the distance travelled by light in 1 ✓
 second is 3×10^8 ✓
 So 1 m is the distance travelled by light in $1/3 \times 10^8$ (3.3×10^{-9}) s
- (c)(i) Use of $E = hf$ ✓
 To $E = 4.97 / 5.0 \times 10^{-19}$ (J) ✓
- (ii) Use of $E = mc^2$ ✓
 To $E = 9 \times 10^{16}$ (J) ✓
 Number of photons required = 1.8×10^{35} ✓
- (d) Analogue - continuous(ly) varying/changing ✓
 Digital - two states / values / 0 + 1 ✓
- (e) Arrow pointing south west ✓✓
 Arrow pointing north east ✓
- (f) Force horizontal to left/to centre of circle ✓
 Force always at right angles to direction of motion ✓
 Causes acceleration at right angles/in this direction ✓
- (g) Energy level lines ✓
 Arrow going up [must start and finish at a line] ✓
- (h)(i) Recall $v = f\lambda$ ✓
 $f = 3 \times 10^8 / 282$ ($\times 10^{-9}$) ✓
 1.06×10^{15} (Hz (s^{-1})) ✓
- (ii) $1 / 1.06 \times 10^{15}$ (ecf) ✓
 Accuracy is (\pm) $9(.43) \times 10^{-16}$ s ✓

Total
22

2. (a) Time 10 oscillations then divide by 10 / keep eye in the same position each time [do not accept light gates etc] ✓
- (b) Nearest 0.01 m / 1 cm ✓
 Either suitable because a 1 m length is sensibly measured to nearest 1 cm ✓
 Or could measure to nearest mm with a metre rule ✓ **2 max**
- (c)(i) Column headed $T^2 / l^{0.5}$ / loglog or lnln ✓
 Units $s^2 / m^{0.5}$ / no units ✓
 Correct values [T^2 check last fig 5.02 / $l^{0.5}$ 0.60 row = 0.78 ✓
 Log 0.6 row : -0.22 0.210] ✓
 Scales: points occupy more than half page ✓
 Points ✓
 Best fit straight line [not thro origin] ✓
 [T v l graph marks 4 and 5 only 2 max]
- (ii) Line does not go through origin ✓
 Therefore T^2 not proportional to l / T not proportional to $l^{1/2}$ ✓
 [LogLog : Need to find gradient ✓
 Round off = 0.5] ✓
- (d) Line does not go thro origin / When T = 0 there appears to be a value of length ✓
 Intercept is about .. cm this shows an error in l ✓
 The actual length of pendulum is longer than measured ✓
 The intercept is long enough to be a possible (systematic) error ✓ **3 max**
 [No marks for log log graphs]
- (e) Gradient from large triangle ✓
 = 3.9 – 4.1 for T^2 / l = 1.9 – 2.05 for root l ✓
 Equate with either $4\pi^2/g$ / 2π / root g ✓
 value 9.6 – 10.5 ms^{-2} ✓
 [log log intercept ✓
 = log (2π / root g) ✓✓
 value 9.6 – 10.5 ms^{-2}] ✓

Total
18

3. (a)(i) $\times 9.81 = 1.04 \times 10^7 \text{ N}$ ✓
- (ii) $F \cos 25 = 1.04 \times 10^7 + T \cos 45$ ✓
 $F \cos 65 = T \cos 45$ ✓
 Attempt to eliminate F ✓
 Combine to get $T = 1.3 / 1.28 \times 10^7 \text{ N}$ ✓
- (b) $\text{Area} = \pi \cdot 0.095^2 = 0.0284$ ✓
 Use of either stress = F/A or strain = e/l ✓
 Calculation of length by trig = 95.5 m ✓
 Extension = .27 m ✓
 Energy = $\frac{1}{2} FX = 1.28 \times 10^7 \cdot 0.27/2 = 1730 \text{ kJ} / 1.7 \times 10^6 \text{ J}$ ✓
 [if 10^7 N used answer = $1 \times 10^6 \text{ J}$]
- (c) Resonance ✓
 When forcing/driving frequency = natural frequency ✓
 Wind causes oscillations/vibrations ✓

Total
13

4. Tension relates to speed of wave on string/ $v = (T/\mu)^{1/2}$ ✓
- So frequency (related to speed) is related to tension/ as
- $v = f\lambda / f = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$ ✓
- Higher tension - higher frequency ✓
- Warming current: electrical energy converted to heat ✓
 $I^2 R$ ✓
- Expands string reducing frequency ✓
- AC current in first coil produces alternating magnetic field ✓
- Magnetic field plus current in string leads to force/ $F=BIL$ ✓
- Standing wave on string ✓
- String generates its own magnetic field as current in it ✓
- Moving/ oscillating/ changing magnetic field / cutting flux induces current in second coil ✓
- Frequency of induced current = freq of string ✓

(max 7)

Total
7

Total for Paper = 60

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