Practice Question Set For A-Level
Subject : Physics
Paper-3 Topic: Section A(Practical Skills Set-3)

Name of the Student:____
Max. Marks : 16 Marks **Time : 16 Minutes**

Mark Schemes

Q1.

(a) boundary where the escape velocity = c ✔

1

(b) (i) use of $R_s = 2GM/c^2$

to give $R_s = 2 \times 6.67 \times 10^{-11} \times 60 \times 10^6 \times 1.99 \times 10^{30}/(3 \times 10^8)^2$ ✔

$= 1.8 \times 10^{11}$ m ✔

2

(ii) use of D = M/V

to give $D = 60 \times 10^6 \times 2 \times 10^{30}/(4/3\pi\ (1.78 \times 10^{11})^3)$ ✔

$= 5.1 \times 10^3$ kg m^{-3} ✔

2

[5]

Q2.

(a) λ [the gradient] = (−) 0.015 $\left[(-)\frac{0.3}{2.0} \text{ or similar}\right]$ ✔

$N_{½}$ from (−) $\frac{ln}{\lambda}\left[(-)\frac{ln2}{0.015}\right]$ ✔

46.2(1) slides (accept 46 but do not penalise '47 slides needed to halve V')✔

[λ = 0.015 or use of ratio $\frac{0.3}{20}$ ✔

determination of V_0 = 424(.1) mV; ln(V_0/2) = 5.36 [5.357] ✔

$\frac{6.05-5.36}{0.015}$ = 46(.0) slides (accept 46.2, '47 slides needed to halve V' etc ✔]

3

(b) (i) (student must measure or calculate) thickness of slide, t; half-value thickness = $N_{½} \times t$ [= result from (a) × t] ✔

1

(ii) procedure: measure the thickness of multiple slides (either singly or in a stack) and calculate average thickness [divide by number of slides]✔ (reject bland 'repeat and average')

[measure the thickness at **different points** on the slide, and **average** by number of readings or measure the thickness of different slides and average]

1

(iii) procedure: **close** jaws and check reading (= zero) ['check for **zero error**'] ✔

(reject idea of measuring 'known' dimension and checking reading or that 1 micrometer is 'zeroed'/'set to zero'/'zero calibrated' before use')

1

(c) t from $\frac{(R_2 - R_0)}{12}$ = 1.19 **mm** (3 sf only) ✔

1

(d) $n = \frac{14.28}{9.71}$ = 1.47, no unit (3 sf preferred but tolerate 4 sf, do not penalise here and in part a for sf) ✔

1

(e) (i)/(ii) $\Delta(R_2 - R_0) = \Delta(R_2 - R_1)$ = 0.08 **mm** ✔

1

(iii) P_{2-0} = % uncertainty in $(R_2 - R_0) = 100 \times \frac{0.08}{14.28}$ = 0.56(0)% [0.6%] and

P_{2-1} = % uncertainty in $(R_2 - R_1) = 100 \times \frac{0.08}{9.71}$ = 0.82(4)% [0.8%] ✔

working must be shown; allow ecf from i/ii but only if working is correct

P_n = % uncertainty in $n = (P_{2-0}) + (P_{2-1})$ = 1.38(4)% (accept 1.4 %) ✔

for ecf from i/ii working in iii must be valid; for AE in iii allow ecf in final calculation

[max and min values calculated, eg $n_{min} = \frac{14.28 - 0.08}{9.71 + 0.08}$, $n_{max} = \frac{14.28 + 0.08}{9.71 - 0.08}$;

difference = ½ range (✔) convert to % = 1.38 (± 0.02)% (✔)]

2

[11]