Practice Question Set For A-Level
Subject : Physics
Paper-3 Topic: Section B (Section 13_ Electronics)

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Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

(a) speed of light in free space independent of motion of source and / or the observer ✓
and of motion of observer

1

(b) laws of physics have the same form in all inertial frames
laws of physics unchanged from one inertial frame to another ✓

1

(c) time taken(= $\frac{\text{distance}}{\text{speed}} = \frac{34\text{ m}}{0.95 \times 3.0 \times 10^8\text{ m s}^{-1}}$)$= 1.2 \times 10^{-7}$ s ✓

1

(d) $t = \frac{18\text{ ns}}{(1 - 0.95^2 c^2 / c^2)^{1/2}}$ ✓

Allow substitution for this mark

1

time taken for π meson to pass from one detector to the other = 58 ns ✓

1

2 half-lives (approximately) in the detectors' frame of reference. ✓

1

two half-lives corresponds to a reduction to 25 % so 75% of the π mesons passing the first detector do not reach the second detector. ✓
OR
Appreciation that in the lab frame of reference the time is about 6 half-lives had passed ✓

1

In 6 half-lives 1 / 64 left so about 90% should have decayed ✓

Clear conclusion made
Either Using special relativity gives agreement with experiment
or Failure to use relativity gives too many decaying (WTTE)

1

[8]

Q2.

(a) 1.43, 1.29

1

(b) Both plotted points to nearest mm ✔

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Best line of fit to points ✔

The line should be a straight line with approximately an equal number of points on either side of the line.

2

(c) (i) Large triangle drawn (at least 8 cm × 8 cm) ✔

Correct values read from graph ✔

Gradient value in range (0.618 to 0.652) × 10^{-6} to 2 or 3 sf ✔

Allow the 2nd mark for incorrect numerical values read ignoring incorrect power of 10.

Incorrect power of 10 is penalised in gradient value.

3

(ii) Same figure quoted for gradient but with correct unit

1

(d) (i) Straight line (through origin) ✔

(directly) proportional ✔

2

(ii) Evidence of substituting data from the table / graph into $w = mD/s + c$ (from $y = mx + c$) ✔

Computation of correct value for c (i.e. value of w when $D/s = 0$) with correct unit.

Should be approximately 0.1 × 10^{-3} m, depending on the exact lobf drawn.

2

(iii) w

1

(e) Any reference to **either** width of slits **OR** single slit diffraction ✔

1

[13]

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