Suggested Solutions for Physics Practical Trial 2026

Question 1

Some observations:

- Students should displace the mass slightly. Avoid hitting the bench.
- Some students displaced the spring-mass system in the horizontal direction instead.

a) Correct d.p. and units. Accept within 8.0 cm to 9.0 cm
L_A = 8.0 cm

b) L_B = 17.0 cm

c) Correct d.p. and units:
e = 9.0 cm (accept within 10%)

d) Correct d.p. and units:
t_1 = 10.9 s, t_2 = 11.0 s

e) Correct s.f. and units:
Period = (10.9 + 11.0) / (2 × 15) = 0.73 s

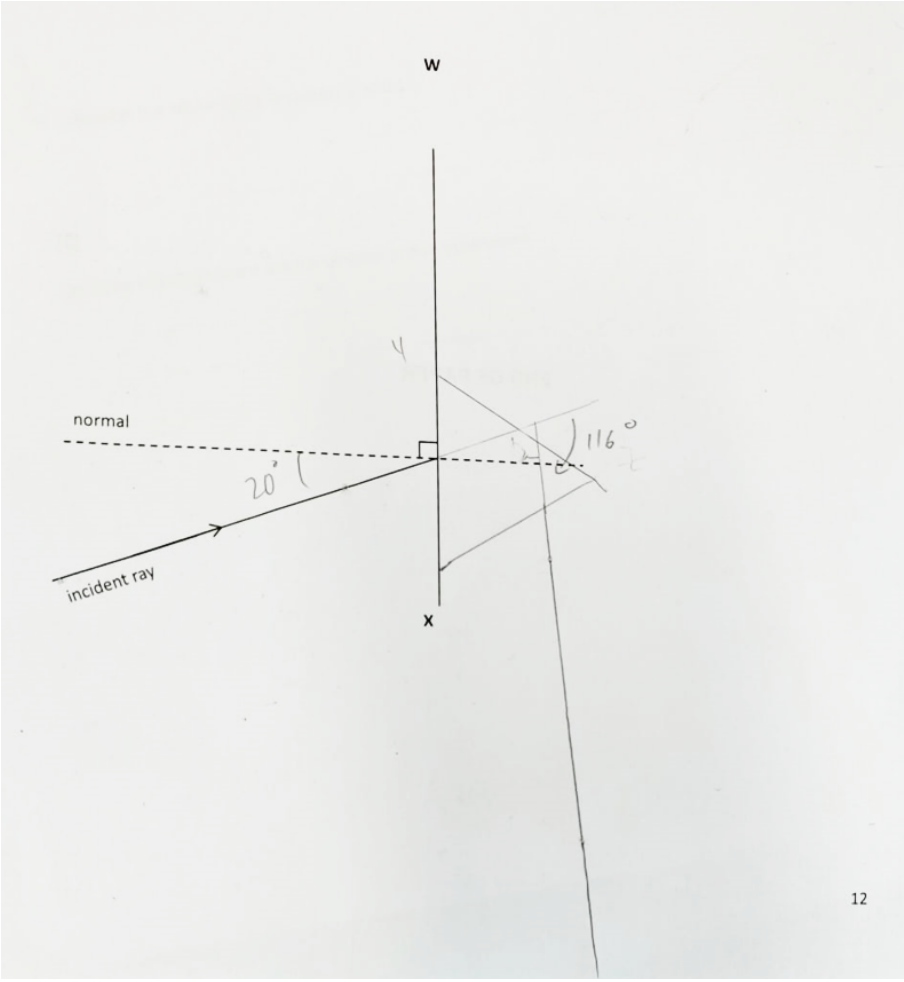
f)

Correct variables: At least one constant: - unstretched length of spring - stiffness of spring or spring constant - accept initial displacement of the mass and correct independent variable: - extension of the spring (accept mass)	1
Procedure: Vary e by adding more slotted masses each time for 9 more values of mass. repeat steps (b) and (c) to obtain extension Measure and record the time taken, t_1 and t_2, for N oscillations, making sure that the value of t is more than 10 s each time. Determine the period T of the oscillations. Also accept: Repeat steps (d) and (e) and calculate T^2.	1
Table headers displayed with units: Students to note: varied quantity and measured data must always be presented (m, L_B) T must be presented in all oscillations experiments. N should be included if the procedure suggests varying number of oscillations m / g, L_B / cm, e / cm, t_1 / s, t_2 / s, N, T / s, T^2 / s^2 For second and third mark, penalise once for *repeated* error (e.g. not repeating t, not calculating T, or not calculating T^2. If different errors are made, penalise twice)	1
Plot a graph of T^2 against e	1
Straight line graph with axes labelled. y-intercept labelled as b	1
States that a is obtained from the gradient and b is the vertical intercept (allow BOD from graph)	1

Question 2

a) Correct d.p. and units. Accept within 19° and 21°.
i = 20°

g) Check below



g) Correct d.p. and units. Accept within 106° and 126°.

Angle of deviation = 116°

h) Total reflection occurs on side YZ, light will not escape from side YZ.

i) Using optical pins

- Use a protractor or set-square to ensure that the pins are placed vertically upright so that the alignment of the pin(s) and image(s) would be accurate.
- The two pins that are used to locate the path of a light ray are placed more than 5.0 cm apart to minimise errors in the location of rays.

j)

- Human judgement error in aligning the positions of the images and pins accurately and thus affecting the measurements of angle of deviation.

- The holes made by the pins provided are rather large, thus affecting the accurate constructions of the paths the emergent rays.
- The prism, with the bevelled edges, makes it hard to replace it on the exact position each time. Thus the values of i and angle of deviation obtained may be inconsistent.

k) Plastic prism has a lower refractive index to air, total reflection may be less likely to occur on side YZ.

Question 3

a) [2 d.p. (to 0.05 V with unit)]

range of 2.50 V to 3.20 V

E = 2.90 V

b)(iii)

L: range of 45.0 cm to 55.0 cm [to 1 d.p. (to 0.1 cm with unit)]

V: At least 1.00 V [2 d.p. (to 0.05 V with unit)]

b)(iv) (1 d.p. to 0.01 A with unit)

At least 0.16 A

b) (v) R: calculated correctly

- apply least s.f. of the V and I values substituted, with unit.

R = 2.90 / 0.16 = 18.1 Ω

c)

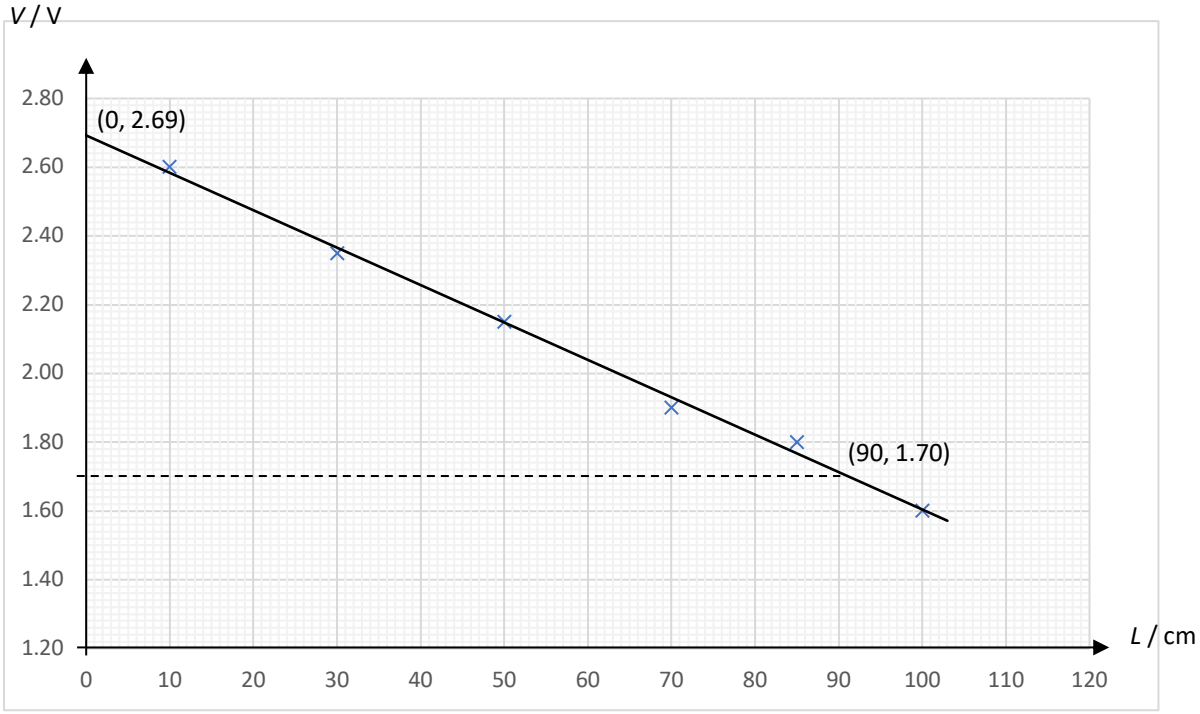
- at least 6 sets of data including (biii) (L, V, I) with correct trend, V decreases as L increases
- Range of L of at least 60.0 cm
- Table headers with correct units
- All values of V to 0.05 V, I to 0.01 A and L to the nearest mm (0.1 cm)
- I remains approximately constant (allow (b)(iv) ± 0.01 A)

L / cm	*I* / A	*V* / V
10.0	0.14	2.60
30.0	0.14	2.35
50.0	0.14	2.15
70.0	0.14	1.90
85.0	0.14	1.80
100.0	0.14	1.60

d)

- Axes labelled with units and correct orientation
- (V on y-axis and L on x-axis)
- (allow ecf from wrong unit in table but not no units)
- Intersection correctly labelled
- Suitable scale with plotted points occupying ≥ half the graph grid in both directions
- All points plotted correctly (≤ ½ small square from the correct position)
- Best fit line

Graph of V against L



e)(i)

- Use of a triangle that uses more than half the drawn line
- Gradient triangle and coordinates clearly labelled on graph

Correct calculation of gradient (units ignored) (accept 2 or 3 s.f.)

G = (2.69 – 1.70) / (0 – 90) = −0.011 (V cm^{-1})

e)(ii) C read correctly from graph (to the nearest half a smallest square), or calculated correctly.

C = 2.69

f) V decreases linearly as L increases.

g)

- The resistance wire had kinks (bends) along its length, hence the length measured is not accurate
- The internal resistance of the ammeter / dry cells / connecting wires is not negligible (any one object) Hence, the total resistance of the circuit was affected.
- The internal resistance of the voltmeter was not infinite. A small current could flow through the voltmeter. Hence the current measured by the ammeter was not the actual current flowing through the rheostat.

h)(i) d = 0.32 mm

Evidence of repeated readings, correct d.p. and units

h)(ii) Correct substitution of G and d into the formula (-1 for power of ten error)

Resistivity calculated correctly with the correct unit (e.g. Ω m, Ω cm)

d = 0.32 mm = 0.032 cm

$\rho = 0.011\ \pi\ (0.032)2 / (4 \times 0.20) = 4.4 \times 10^{-5}\ \Omega$ cm