NANYANG GIRLS' HIGH SCHOOL
2021 Sec 4 Physics Practical 03

Marking Scheme (10 marks)

Note to teachers: Practical values may be quite different from theoretical values (the relationship where $\mathbf{I = I_1 + I_2}$ may not be obvious). Do **discuss theoretical values and underlying assumptions** (negligible resistance in resistors, ammeter, infinite resistance in voltmeter) in class.

Advice: Students to measure e.m.f. to ensure it is at least 2.70 V at the start of experiment.

Sample and theoretical values (in brackets)

E = 2.90 V *(3.00 V)*

	I	**I_1**	**I_2**
Fig. 1 (b & c)	0.48 A *(0.90A)*	0.16 A *(0.30 A)*	0.30 A *(0.60 A)*
Fig. 2 (e)	0.34 A *(0.60 A)*	0 A *(0 A)*	0.34 A *(0.60 A)*
	smaller than in Fig 1 since one 1 branch left	*path through 10 Ω is broken*	*Same as in Fig 1, since same e.m.f. & R = 5 Ω*
Fig. 3 (f)	0.60 A *(1.20 A)*	0.15 A *(0.30 A)*	0.26 A *(0.60 A)*
	$I = 2I_1 + I_2$	Same as Fig. 1	Same as Fig. 1

b) Precision = 0.01 A & **I** should not be greater than 0.90 A and must be in **2 d.p.** [1]

c) The value of $\mathbf{I_1}$ < 0.30 A (in **2 d.p.**) [1]

The value of $\mathbf{I_2}$ < 0.60 A (in **2 d.p.**) [1]

Relationship: $\mathbf{I = I_1 + I_2}$ [1]

d) The value of **E** > 2.70 V (in **2 d.p.**) **E** = 2.90 V, [1]

The value of $\mathbf{V_{PQ}}$ could be < 2.00 V (in **2 d.p.**) $\mathbf{V_{PQ}}$ = 2.00 V [1]

e) $\mathbf{I} = \mathbf{I_2}$ (< 0.60 A) **&** $\mathbf{I_1}$ = 0 [1]

Comparing Fig 2 with Fig 1, **I** is smaller, $\mathbf{I_1}$ becomes zero, & $\mathbf{I_2}$ is slightly larger (or same). [1]

f) The value of **I** < 1.20 A, $\mathbf{I_1}$ < 0.30 A and $\mathbf{I_1}$ < 0.60 A. [1]
(currents recorded in **2 d.p.**)

Comparing Fig 3 with Fig 1, **I** is larger, $\mathbf{I_1}$ & $\mathbf{I_2}$ remains the about the same. [1]