2019 Sec 4 Physics MYE Answers

Paper 1

1------5	6-----10	11----15	16----20	21----25	26---30
BACCA	BDCBD.	CCBBD.	ABABA.	ACACD.	BCDBD

Paper 2

1(a) Equal spacing between successive dots. [1]

(b) Constant speed in region AB=7.8/(2x0.2) = 19.5 cm/s [1]
Average speed in region C-D = 3.2/(4x0.2) = 4.0 cm/s [1]
Average acceleration in D-B = (19.5 - 4.0)/(5 x 0.2) = 15.5 cm/s^2 [1]

2(a) i = 46°, r = 23° (±1° for both is allowed) [1]

(b) n=sin i/sin r = sin 46°/sin 22° [1]
= 1.92 (2 or 3 s.f.) [1]

Also possible to use lens formula
1/f = 1/20.0 + 1/30.0
f = 12.0 cm

3 (a) Correct position of image shown on diagram with some attempt at construction indicated. Clear label **I**. [1]

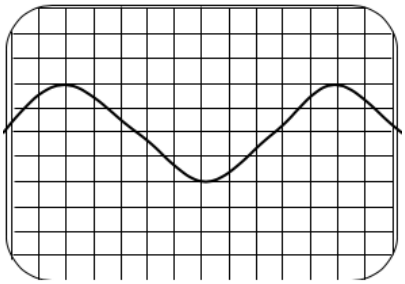
(b) Appropriate construction ray shown on the diagram. [1]

Focal length = 2.4 cm x 5.0 = 12.0 cm (±0.5 cm) [1]

(c) Inverted, enlarged and Real [1]

4(a) T=5 x 20ms = 100ms =0.10 s [1]

f = 1/T =1/0.10 =10 Hz [1]



(b) 10 division horizontally for one wave. [1]

4 divisions vertically (peak to peak) [1]

5(a) Positively charged. [1]

Since the nozzle is connected to a positive terminal the insecticide droplet passes through it will lose electrons / become positively charged. [1]

(b)
- The charged insecticide droplets will be attracted to the neutral plant by induction. / When the positively charged insecticide droplets moved towards the neutral plant it induces a negative charge on the plant surface. [1]
- Since unlike charges attract, the insecticide droplets are attracted to the plant. [1]

(c) The insecticide droplets being likely charged will repel one another, spreading out uniformly onto a plant. [1]
Attraction due to unlike charge will allow droplets to move against gravity to reach the underside of leaves and other plant parts.

6(a) Resistance is defined as the ratio of the potential difference across the wire to the current flowing through it. [1]

(b) $R = \frac{\rho l}{A} = \frac{1.2\ \Omega\ m \times 0.024\ m}{5.0 \times 10^{-6}\ m^2}$ [1]

= 5760Ω ~ 5800 Ω [1]

(c) $R_P : R_Q = \frac{\rho l}{\pi(\frac{d}{2})^2} : \frac{\rho \times 2l}{\pi(\frac{d}{4})^2}$ [1]

$= \frac{1}{(\frac{1}{2})^2} : \frac{2}{\pi(\frac{1}{4})^2}$

$= 4 : 32$

$= 1 : 8$ [1] OR =1/8 OR =0.125 ~ 0.13

7(a) At high temperature, resistance of thermistor decreases. [1]
PD across thermistor decreases OR Total resistance decreases.
PD across bell increases OR Total current increases.
Current flowing through bell increases and activate bell. [1]

(b) Set the variable resistance to a higher value. [1]
PD across bell greater than PD across thermistor. [1]

8(a) With S_1 and S_3 open and S_2 closed, the circuit is effectively a series connection of R_1 and R_3:
$R_1 + R_3 = 9.0\ \Omega$
With S_1 closed, S_2 and S_3 open, the circuit is effectively a series connection of R_2 and R_3:
$R_2 + R_3 = 8.0\ \Omega$
With S_1 and S_3 closed and S_2 open, the circuit is effectively just R_2:
$R_2 = 3.0\ \Omega$
Hence $R_3 = 5.0\ \Omega$ and $R_1 = 4.0\ \Omega$

(i) $R_1 = 4.0\ \Omega$ [1]
(ii) $R_2 = 3.0\ \Omega$ [1]
(iii) $R_3 = 5.0\ \Omega$ [1]

(b) With S_1 and S_2 are now closed and S_3 is now open, the effective resistance between Y and Z is effectively:
$R_{eff} = (1/4.0 + 1/3.0)^{-1} + 5.0$ [1]
= 6.7 Ω (2 s.f.) [1]

9(a) Wire X is the 'Live' wire.
Switches are <u>always placed in the live wire</u> OR so that the <u>lamp would not be live</u> when the switch is open. [1]

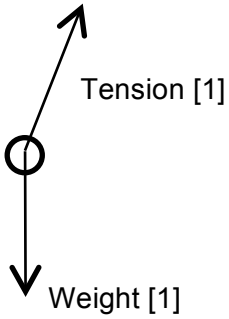
(b) $I_A = 50/240 = 0.2083 = 0.208$ A [1]
$I_B = 100/240 = 0.416 = 0.416$ A [1]
$I_X = I_A + I_B = 0.625$ A or 0.63 A (2 s.f.)
$I_Y = 0.63$ A (2 s.f.) [1] – (ecf from I_A & I_B with $I_X = I_Y$)

Only if both correct

(c) It would not be affected [1]
As the lamps are <u>connected in parallel</u>, the voltage of lamp **B** is constant. [1]

Section B

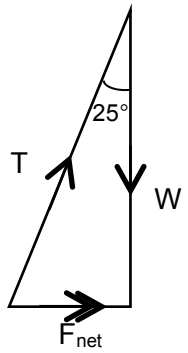
10 (a)



/gravitational force

/ force due to gravity

(b)



Scale: 1.0 cm : 0.5 N [1]

F_{net} / W = tan 25°

F_{net} = mg tan 25° = 0.60 x 10 tan 25° [1]

= 2.798 ≈ <u>2.8 N</u> [1]

(c) $F_{net} = ma$ ➔ $a = F_{net} / m = 2.798 / 0.60$ [1]

= 4.663 ≈ <u>4.7 m s^{-2}</u> [1]

(d) the <u>angle would remain the same</u> as the tension / forces are independent of length of the string.[1]

(e) the car is moving at constant velocity [1] or is at rest [1] (both are expected as shows understanding of Newton's First Law)