Geylang Methodist School (Sec)
Prelim 2020
Sec 4E5N Science (Physics)

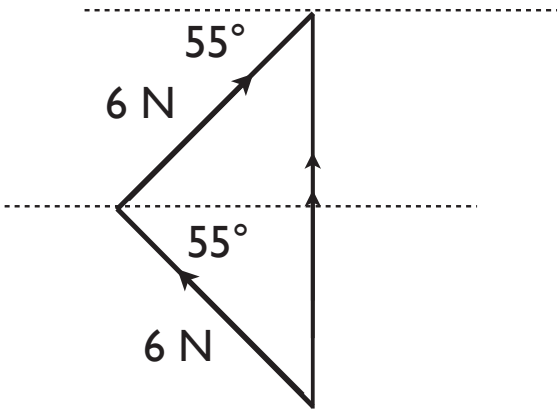
Paper 1: MCQs

1	2	3	4	5	6	7	8	9	10
A	**D**	**D**	**C**	**A**	**B**	**B**	**D**	**B**	**A**

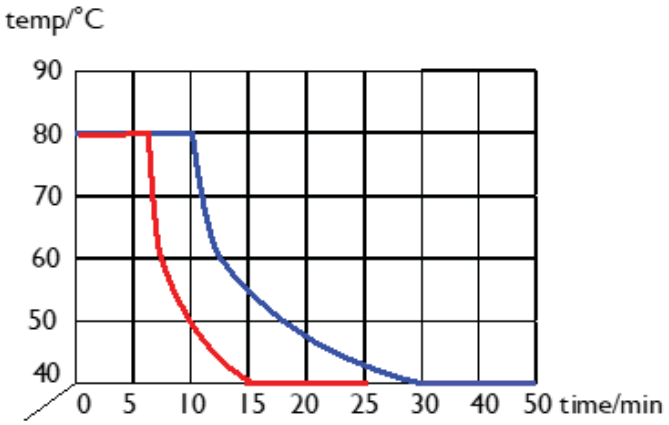
11	12	13	14	15	16	17	18	19	20
D	**D**	**B**	**B**	**C**	**D**	**C**	**A**	**A**	**C**

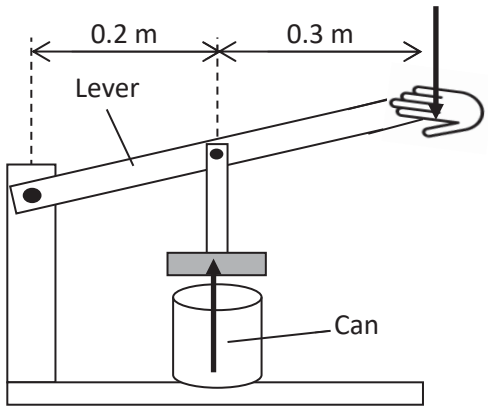
Paper 2

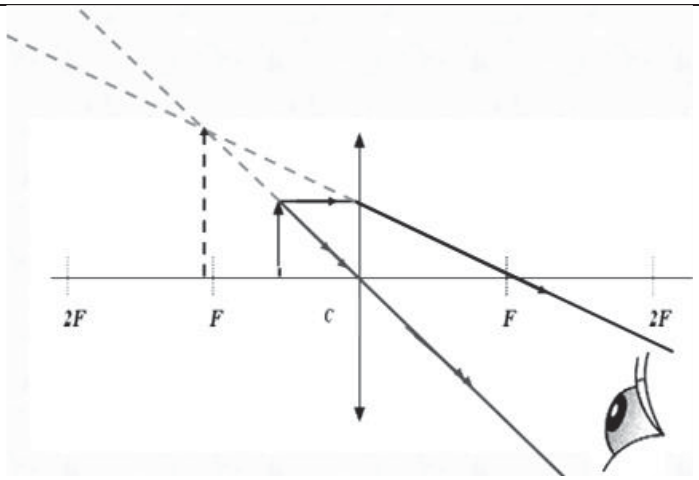
Question	**Answers**	**Marks**
SECTION A		
1(a)	106000m/3600s = 29.4 m/s (accept 29 m/s)	1
1(b)	0.00456 m^2	1
1(c)	1200 kg/m^3	1
2(a)(i)	Velocity is rate of change of displacement / the displacement per unit time / speed in a given direction / distance travelled per unit time in a given direction	1
(ii)	Negative velocity: travelling in opposite direction / U-turn.	1
(iii)	a = $\frac{v-u}{t} = \frac{14-0}{1.4}$ = 10 m/s^2	1 1
(iv)	The acceleration is constant as the man is falling freely / graph has a constant gradient	1
(v)	4 s	1
(vi)	The tension T in the cord is greater than the weight of the man. So there is a resultant upwards force acting on the man and he will accelerate upwards at D, by F=ma.	1 1

Question	Answers	Marks
(b)	C: kinetic energy = 5000 J , elastic potential energy = 0 J D: kinetic energy = 0 J , elastic potential energy = 20 000 J	1 1
3(a)(i)	 F_R = 9.8 N [accept 9.4 to 10.2 N] Correct tip-to-tail diagram, [accept parallelogram method, but with dotted lines, no arrows on dotted lines] Correct direction with double arrows Inappropriate scale (other than 1cm:1N)	 1 1 1 [-1]
(ii)	Weight = 9.8 N (allows ecf)	1
4(a)(i)	Mass of water = 125 - 25 = 100 g Vol of water = 100 cm^3	 1
4(a)(ii)	Vol of Liquid = Vol of water D of liquid = 80/100 = 0.80 g/cm^3	 1
4(b)	Vol = Vol (water) + Vol (Liq) = 100 + 100/0.8 = 225 cm^3 D of mixture = 200/(225) = 0.889 g/cm^3 [award 1 mark for collect Vol. of liquid as 125 cm^3]	1 1
5(i)	KE = ½ m$(4)^2$ = 8.0 J	1 1

Question	Answers	Marks
5(ii)	KE **lost** = GPE **gained** ½ m(4)^2 - ½ mv^2 = mg(0.2) ½ v^2 = 8 - 2 v = 3.46 m/s	1 1
5(iii)	Gain in GPE = Loss in KE mgh = ½ mv^2 (10)(h) = ½ (4)^2 h = 0.80 m	 1 1
6(a)	• Black **and** rough [accept black and dull]. • Good/better absorber of IR [accept heat] [good absorber and good emitter -1/2m]	1 1
6(b)	To increase surface area for heat transfer through conduction.	1
6(c)	• Foam / Styrofoam / Felt • Either reduce heat conduction from the solar panel, OR traps pockets of air which are poor conductor of heat/ good insulator or heat	1 1
6(d)	Reflect IR radiation (or Heat) from inside of solar panel back.	1
7(a)	• During Freezing / solidification, heat energy is released as intermolecular forces (of attraction) are formed/strengthened between the molecules,	1
7(b)	80 °C (same as freezing point)	1
7(c)	Lesser heat lost due to smaller temp. difference (with surroundings) as time passes.	1
7(d)	Reached room temperature / thermal equilibrium with surroundings. [do not accept thermal equilibrium is reached]	1

Question	Answers	Marks
7(e)(i)	 Horizontal line shorter **and** curve steeper • Dark grey is better emitter of IR / heat • shorter time to lose heat for solidification **and** cool down (to room temperature)	 1 1 1
8(a)	3 000,000 waves (or oscillations) produced in 1 sec.	1
8(b)	$v = f\lambda$ $1500 = 3x10^6 \times \lambda$ $\lambda = 5.0 \times 10^{-4}$ m (0.00050 m)	 1 1
8(c)	$v = 2d/t$ $1500 = 2d/0.00025$ $d = 0.188$ m	 1 1

Question	Answers	Marks
SECTION B		
9(a)(i)	 Forces as shown in the diagram [1 m each]	2
9(a)(ii)	50 x 0.5 = F X 0.2 F = 125 N	1 1
9(a)(iii)	P = 125 / (3.14 x 0.03^2) = 442 32 Pa = 442 00 Pa (3sf) (allows ecf)	1 1 1
9(b)(i)	Adv 1: This lowers the centre of gravity + luggage more stable Adv 2: Smaller (clockwise) moment due to the weight of the luggage + due to smaller perpendicular distance (OR, hence smaller upward force needed.)	1 1
9(a)(ii)	The perpendicular distance from the hand to the pivot (wheels) increases. hence lesser upward force needed for balancing.	1 1
10(a)(i)	i = 40°	1
10(a)(ii)	n = sin 65° / sin 40° = 1.41 [award 1m for r = 65°] (allows ecf)	1 1
10(a)(iii)	c. v = c / n = 3.0 X 10^8 / 1.41 = 2.13 X 10^8 m/s (allows ecf)	 1 1
10(a)(iv)	c = $\sin^{-1}$ (1/1.41) = 45.2° (allows ecf)	1

Question	Answers	Marks
10(b)(i)	 **note:** • Correct position (& height) of object & two Fs • correct rays with arrows • upright, virtual and magnified image	 1 1 1
10(b)(ii)	image becomes **more** magnified / (even) bigger [do not accept 'image is magnified'.]	1
11(a)(i)	1/R = ½ + 1/6 R = 1.5 Ω	 1
11(a)(ii)	1.5 + 4.5 = 6.0 Ω	1
11(a)(iii)	V = IR = 2(4.5) = 9.0 V A_1 = V/R = 12/6 = 2.0 A A_2 = ¾ (2) = 1.5 A OR A_2 = V/R = 3/2 = 1.5 A	1 1 1
11(a)(iv)	A_2 = 0 (short-circuit) A_1 = V/R = 12/4.5 = 2.67 A	1 1
11(b)(i)	Neutral (4A) & earth (0A)	1
11(b)(ii)	Live wire touches metal casing (due to damaged insulation)	1
11(b)(iii)	Provides a low-resistance path and direct excess current to the ground, OR prevent electrical shock/electrocution to the user.	1