Northland Secondary School
Secondary 4 Normal Academic
Science Physics Preliminary Examination 2022
Marking Scheme

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Paper 1

1	2	3	4	5	6	7	8	9	10
D	C	B	D	C	A	B	A	C	C
11	12	13	14	15	16	17	18	19	20
B	B	B	A	A	A	C	B	B	C

Paper 2 [Section A]

1	**(a)**	Gravitational potential energy = mgh = 7 x 10 x 10 = 700 J *[1 mark for answer]*	1
	(b)	By COE, loss in GPE = gain in KE Gain in KE = 700 J 700 J = $\frac{1}{2}mv^2$ 700 J = $\frac{1}{2}(7)v^2$ *[1 mark for correct application of equation]* v^2 = 200 v = 14.1 m/s (3s.f) *[1 mark for answer]*	1 1
	(c)	The speed of the object would still be the same as the answer in (b), since the loss in GPE is still at 700 J as the height remains at 10 m. *Note: Student has to give the correct explanation in order for the mark to be awarded; as long as student is able to state that the height remains the same.*	1
2	**(a)**	100 m represents 3 wavelengths. Thus, 1 wavelength = 100 ÷ 3 = 33.3 m *[1 mark for answer]*	1
	(b)	It takes 49 seconds to complete 7 waves (from A to B). Thus, the period of a single wave = 49 ÷ 7 = 7 s *[1 mark for answer]*	1
	(c)	$v = \frac{\lambda}{T}$ $= \frac{33.3}{7}$ *[1 mark for correct application of equation]* = 4.76 m/s (3s.f) *[1 mark for answer]*	1 1

3

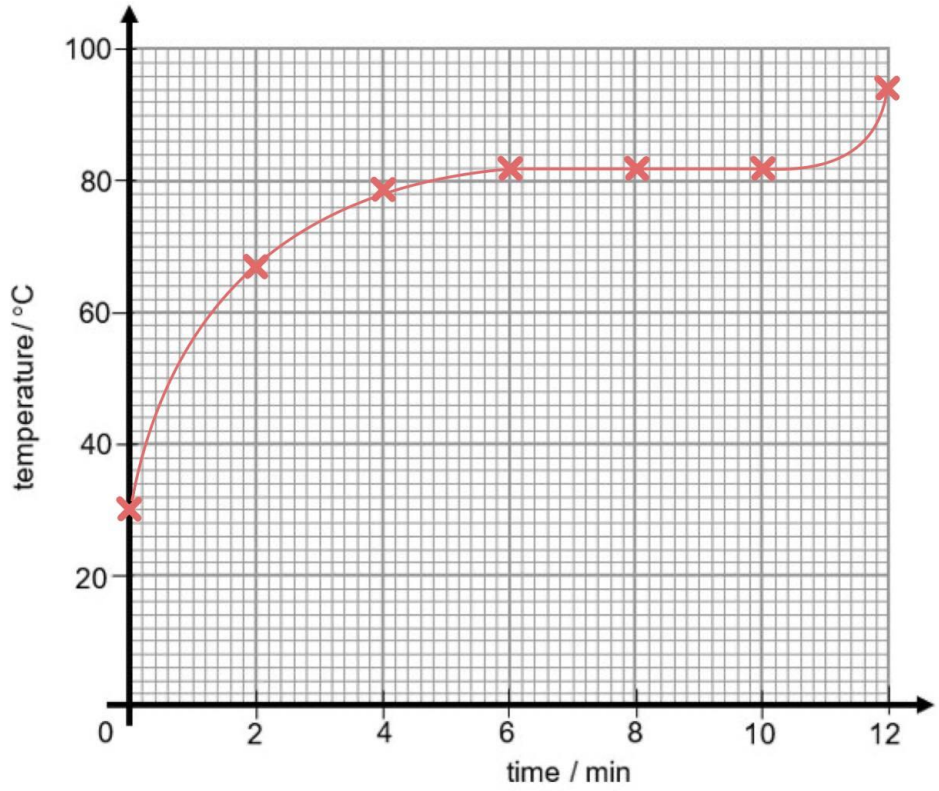
	arrangement	movement
solid	*packed closely in an orderly arrangement*	vibrates about in its fixed positions
liquid	*packed closely in a disorderly arrangement*	slides over/across one another
gas	packed far apart in a random arrangement	*moves rapidly and randomly in all directions*

Note: For full credit, student needs to get all 3 blanks correct. 1 mark would be awarded for students who get 1 or 2 blanks correct.

2

4

(a)



All points are located correctly. 1
All crosses are drawn appropriately. 1

(b) Curve is drawn correctly and passes through all points. 1

(c) 82 °C 1

Paper 2 [Section B]

5	**(a)**		Work is done on the barbell as the barbell moves in the direction of the force applied by the F1 driver. *Note: Student has to give the correct explanation (sound and logical) in order for the mark to be awarded.*	1
	(b)		W = mg = (50 + 75) x 10 = <u>1250 N</u> *[1 mark for answer]*	1
	(c)		$P = \frac{F}{A}$ $= \frac{1250}{2 \times 0.2}$ *[1 mark for correct application of equation]* = <u>3125 N/m^2</u> *[1 mark for answer]*	1 1
	(d)		Design A is preferred, as Design A adopts a broader base. *[1 mark for correct choice and reasoning]* This makes the car <u>more stable</u>. *[1 mark for correct conclusion]*	1 1
	(e)	**(i)**	$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$ $= \frac{5063}{105}$ = <u>48.2 m/s</u> (3s.f) *[1 mark for answer]*	1
		(ii)	$\text{average acceleration} = \frac{v-u}{t}$ $= \frac{75-0}{10}$ = <u>7.5 m/s^2</u> *[1 mark for answer]*	1
6	**(a)**		material chosen: dull white canvas sheet reason 1: white is a poor absorber of heat, thus it is less likely to cause the makeshift shelter from being too warm. reason 2: canvas sheet is a poor conductor of heat as compared to the aluminium plate; thus it is less likely to take in heat via conduction as compared to the aluminium plate. *Note: Marks are awarded for each individual component; if student does choose aluminium plate as the material chosen, at max 2 marks may be awarded.*	1 1 1
	(b)	**(i)**	Conduction	1
		(ii)	Convection	1
	(c)		As the water near the base of the pot gets heated, it <u>expands in volume, becomes less dense</u> than the surrounding water and rises. <u>Cooler and denser water</u> near the top sinks to replace it; the cooler water then gets heated up and rises. This repeats and results in a <u>continuous convection current</u>.	1 1
	(d)		internal potential energy: increase internal kinetic energy: no change *Note: Student has to get both parts correct to get full credit for this question.*	1

7	**(a)**	**(i)**	$R = \frac{V}{I}$ $= \frac{8}{2}$ = 4 Ω *[1 mark for answer]*	1
		(ii)	Potential difference = 12 V – 8 V = 4 V *[1 mark for answer]*	1
		(iii)	Potential difference across 3 Ω resistor = Potential difference across 6 Ω resistor = 4 V *[1 mark for answer]*	1
		(iv)	$I = \frac{V}{R}$ $= \frac{4}{6}$ = 0.667 A (3s.f) *[1 mark for answer]*	1
	(b)	**(i)**	Total energy = 1.5kW x 1.5h x 14 = 31.5 kWh *[1 mark for correct calculation of energy]* Total cost = 30 cents x 31.5 kWh = 945 cents = $9.45 *[1 mark for answer]*	1 1
		(ii)	The earth wire has to be connected to the metallic casing of the electric iron. *[1 mark for correct part identified]* When there is a fault where the live wire comes into contact with the metal casing, the metal casing becomes live. The earth wire prevents the user from being electrocuted by drawing away the excess current into the earth. *[1 mark for correct explanation of safety aspect]*	1 1