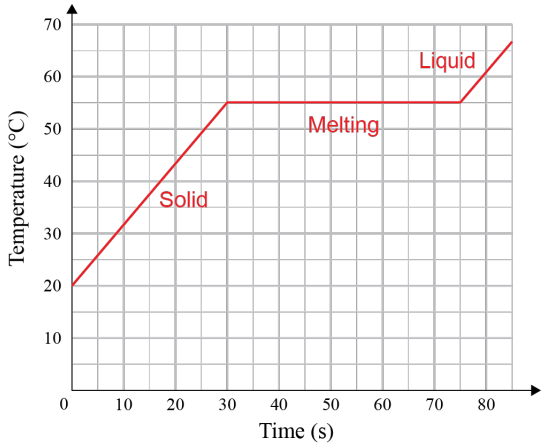
Assessment Schedule – 2022

Physics: Demonstrate understanding of aspects of heat (90939)

Evidence

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Conduction	• Correct answer.		
(b)	Lower the specific heat, the better the conductor, and the faster it will melt the wax. Order: copper – brass – iron – aluminium	• Correct order the wax will melt.	• Correct order. AND Link between the lower the specific heat and the better conductor / will heat up the fastest which will make the wax melt faster.	
(c)	$Q = Pt$ $Q = (20\text{ W})(30\text{ s})$ $Q = 600\text{ J}$ $\Delta t = 55\text{ °C} - 20\text{ °C}$ $= 35\text{ °C}$ $Q = cm\Delta t$ $m = \frac{Q}{c\Delta t} = \frac{600}{2130 \times 35}$ $m = 0.008\text{ kg}$ $m = 8\text{ g}$	• Correct Q calculated. Q = 600 [J] OR Correct Δt. OR Correct rearranging of equation.	• Correct method but with error.	• Correct answer.

(d)		• Correct drawing of graph. OR Graph labelled correctly.	• Complete answer.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	Very little evidence at the Achievement level. Most evidence is at the Not Achieved level.	Some evidence at the Achievement level; partial explanations.	Most evidence provided is at the Achievement level, while some is at the Not Achieved level.	Nearly all evidence provided is at the Achievement level.	Some evidence is at the Merit level with some at the Achievement level.	Most evidence is at the Merit level, with some at the Achievement level.	Evidence is provided for most tasks, with evidence at the Excellence level weak or with minor errors / omissions.	Evidence provided for all tasks. Evidence at the Excellence level accurate and full.
0	1A	2A	3A	4A	1A + 2M 2M	2A + 2M	1A + 1M + 1E	2M + 1E

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	Latent heat is the heat required to change the state of a substance without changing temperature.	• Correct answer.		
(b)	Water absorbs more Sun (radiant) energy and thus heats up the ice below by conduction, whereas ice reflects more of the Sun's energy, and thus there is less conduction than water, and so does not melt as fast. Answer needs to name the type of heat transfer – **conduction.**	• Idea that ice reflects the Sun's energy and water absorbs more of it. OR Idea that conduction happens more in water than ice.	• Complete answer.	
(c)	Solid is rigid, fixed volume and fixed shape. Particles have little energy and only vibrate. Liquid can take the shape of the container, has fixed volume, and has a little more energy that allows particles to slide over each other Similarities: • fixed volume • limited compressibility • particles close together / touching • strong(ish) (intermolecular) forces / bonds between particles.	• Correctly labelled diagram AND one difference between solid and liquid. OR Correctly labelled diagram AND one similarity between solid and liquid. OR One similarity and one difference but diagram incorrect.	• Correct labelling of diagram AND at least one similarity and one difference.	

(d)	$Q = mL$ $= 2.5 \times 10^8 \times 330\,000$ $= 8.25 \times 10^{13}$ J Amount of energy absorbed = 100% – 65% = 35% P = 35% of 1.3×10^9 $= 0.35 \times 1.3 \times 10^9$ $= 4.55 \times x10^8$ $Q = Pt$ $Q = Pt$ $t = \frac{Q}{P}$ $= \frac{8.25 \times 10^{13}}{4.55 \times 10^8}$ $= 1.8131 \times 10^5$ s Convert to days: $t = \frac{1.8131 \times 10^5}{3600}$ $= \frac{50.4 \text{ hours}}{24}$ = 2 days	• Calculates Q correctly. OR Calculates the power but uses wrong percentage. OR Attempts to use $Q = Pt$ to find time.	• Calculates Q and P correctly. OR Uses the correct method to find time, but uses wrong percentage.	• Correct answer.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	Very little evidence at the Achievement level. Most evidence is at the Not Achieved level.	Some evidence at the Achievement level; partial explanations.	Most evidence provided is at the Achievement level, while some is at the Not Achieved level.	Nearly all evidence provided is at the Achievement level.	Some evidence is at the Merit level with some at the Achievement level.	Most evidence is at the Merit level, with some at the Achievement level.	Evidence is provided for most tasks, with evidence at the Excellence level weak or with minor errors / omissions.	Evidence provided for all tasks. Evidence at the Excellence level accurate and full.
0	1A	2A	3A	4A	1A + 2M 2M	2A + 2M	1A + 1M + 1E	2M + 1E

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	$Q = mL$ $Q = 5.0\ \text{g} \times 879\ \text{J g}^{-1}$ $Q = 4395\ \text{J}$	• Correct answer.		
(b)	As the alcohol concentration increases, there will be less water in the solution. Water's latent heat is higher than alcohol. Thus the more alcohol in the solution, the lower the latent heat.	• ONE idea.	• Links concentration of alcohol OR $L_{water} > L_{alc}$ with lower latent heat.	
(c)	When you compare alcohol with water, both the specific heat and latent heat are lower for alcohol than for water. Alcohol has a lower latent heat so it can change state with less heat required, thus evaporation rate increases. Alcohol has lower specific heat capacity, which means it heats up faster from the hand, and helps to increase evaporation rate. Because the evaporation rate increases, it takes the energy away from your hands, and will make your hands feel colder	• Indicates that alcohol has a lower latent heat and specific heat than water. (accept v.v.) OR States latent heat of alcohol is amount of energy required to evaporate alcohol / change state OR States specific heat capacity of alcohol is amount of energy required to heat alcohol up OR Links loss of energy from hands which makes Tim's hands feel cold.	• Explains <u>lower</u> latent heat of alcohol with respect to requiring less E to evaporate / change state OR Explains <u>lower</u> specific heat capacity of alcohol with less E required to heat up AND Links E required to evaporate / heat up alcohol to making Tim's hands feel cold	• Explains latent heat and specific heat with respect to evaporation rate. AND Links evaporation rate to loss of energy from hands which makes Tim's hands feel cold. (Evaporation for E7, rate of evaporation for E8.)
(d)	The hand sanitiser was heated via radiation and conduction from the sun and the contact of the car. The container heated up heating the hand sanitiser inside via conduction. The heating of the liquid gave the particles more energy. This energy created thermal expansion. Thus, when opening the bottle, the liquid will gush out. (Do not accept pressure differences.)	• States thermal expansion / expanded due to heat. OR Heated by conduction. OR Hand sanitiser is heated by conduction. OR Particles have more energy / E_k / move faster / particles further apart.	• Links heating of hand sanitiser via conduction to thermal expansion, which causes it to gush out. • Increase in E – particles moving faster / further apart – increase in vol – look for quality explanation.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	Very little evidence at the Achievement level. Most evidence is at the Not Achieved level.	Some evidence at the Achievement level; partial explanations.	Most evidence provided is at the Achievement level, while some is at the Not Achieved level.	Nearly all evidence provided is at the Achievement level.	Some evidence is at the Merit level with some at the Achievement level.	Most evidence is at the Merit level, with some at the Achievement level.	Evidence is provided for most tasks, with evidence at the Excellence level weak or with minor errors / omissions.	Evidence provided for all tasks. Evidence at the Excellence level accurate and full.
0	1A	2A	3A	4A	1A + 2M 2M	2A + 2M	1A + 1M + 1E	2M + 1E

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24