Assessment Schedule – 2024

Physics, Earth and Space Science: Demonstrate understanding of a physical system using energy concepts (92047)

Evidence

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	Gravitational potential energy → Kinetic energy	• Correct answer.		
(b)	$\Delta E_p = mg\Delta h$ $0.0585 \times 10 \times 14.7 = 8.6$ J	• Correct answer. Need to show formula.		
(c)	$E_k = \frac{1}{2}mv^2$ $8.6 = \frac{1}{2} \times 58.5 \times 10^{-3} \times v^2$ $v^2 = \frac{2 \times 8.6}{58.5 \times 10^{-3}} = 294.0$ $v = 17.1$ m s^{-1} (accept rounded answer of 17 m s^{-1})	• Correct formula used plus numbers added but forgot to take square root of v^2 (294) (or other minor computational errors). OR Correct answer with no working	• Correct answer (Unit not required, but candidates must show some working.)	
(d)	The speed will be less than what was calculated above in part (c). This is because some of the energy would be converted to heat energy due to friction with the air particles hitting the surface of the ball.	• Speed will be less. OR Some energy is lost (due to air resistance).	• Speed will be less. AND Some energy is lost due to air resistance / friction / heat / drag.	• Speed will be less due to some energy lost due to air resistance as the particles of air are hitting the ball.

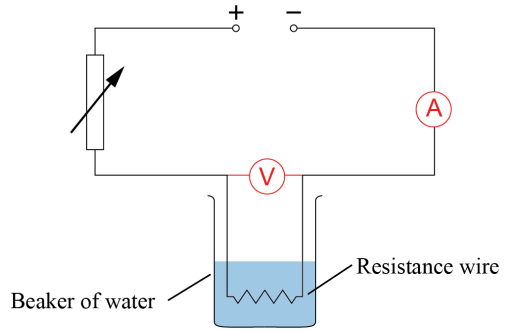
(e)	Power is how quickly work is done or energy is spent or changed. When Maya runs up the stairs her kinetic energy is changed into gravitational potential energy. Assuming all of the kinetic energy is changed into gravitational potential energy (no loss through friction). Gravitational potential energy gained = mgh $E_p = mgh = 48 \times 10 \times 15 = 7200$ J $P = \frac{E}{t} = \frac{7200}{34.2} = 210$ W (accept unrounded answer, i.e. 210.5 W) Accept 211 W rounded.	• Power is how quickly work is done or energy is gained or lost. OR Kinetic energy is changed to gravitational potential energy. OR Correct answer for E_p = 7200 J OR Correct calculation of power using wrong value for E_p. OR Some energy lost to Heat/Thermal energy.	• Power is how quickly work is done or energy is gained or lost. AND • Kinetic energy is changed to gravitational potential energy. Correct answer for E_p = 7200 J AND - P = 210 W (211 W) (Units not required) OR One definition and one calculation.	• Definition for power and connection between kinetic Energy and gravitational energy. Assumption that all kinetic energy is transformed into potential (As Maya runs up the stairs) and both equations correct with units.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence.	1A	2A	3A	4A	2M	3M	1E + 1M	2E

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
TWO (a)	Latent heat of fusion is the amount of energy required to change state from solid to liquid or from liquid to solid without a change in temperature.	• Correct definition. Can refer to either solid to liquid or liquid to solid.	• Correct definition including no change in temperature (not – no change in heat).	
(b)	$E = mL$ $E = 0.750 \times 334000$ $E = 250500$ J (250.5 kJ)	• Correct answer (accept 2 s.f.). (unit not required)		
(c)	The specific heat capacity of water is much less than the latent heat of fusion because the energy required to get particles moving faster is less than the energy required to change state.	• States specific heat is much less than latent heat. OR Less heat energy required to heat something up than change its state.	• Explains why specific heat capacity is lower than latent heat value.	
(d)	• Vacuum to reduce heat loss via conduction / convection. • Reflective coating to reduce heat energy loss via radiation. Mentions electromagnetic radiation. • Stopper to prevent loss via conduction or convection. This stops particles passing on particle motion. • Used glass as this is a poor conductor of heat.	• One feature with descriptions and the correct type of heat transfer for each feature.	• TWO features with descriptions and the correct type of heat transfer for each feature.	• TWO featurer named plus ONE explanation of the nature of the nature of this heat loss.

(e)	The rate of thermal energy gain can be calculated by using the total energy gained divided by the time taken. Use of $E = mc\Delta T$ and $P = \frac{\Delta E}{t}$ ΔT is $12 - 5 = 7\,^\circ$C m is 0.75 kg c is 4200 J kg^{-1} °C^{-1} $E = 0.75\,\text{kg} \times 4200 \times 7$ $E = 22050$ J (accept 22.05×10^{-3} J or 22.050 kJ) $P = \frac{22.05 \times 10^{-3}}{5 \times 60 \times 60}$ $P = 1.2$ W (accept 1.225 W) Should be 22.05 × 10$^{3.}$ (Accept 22.05E3)	• Correct change in temperature. OR Attempts to use formula (letters and numbers).	• Correct value for thermal energy gained. OR Correct power calculation using wrong value of E. (Units not required)	• Correct value for thermal energy gained and correct value Power (both units required).

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence	1A	2A	3A	4A	2M	3M	1E + 1M	2E

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
THREE (a)		• Ammeter in series OR voltmeter in parallel to the wire.	• Ammeter and voltmeter are correct.	
(b)	Gradient of the graph $= \frac{4.0}{0.50} - 8.0\ \Omega$	• Correct answer. (show working plus unit)		
(c)	The wire is submerged in water to keep the temperature constant.	• Keeping temperature constant / keep it cooler.	Keeping temperature of the coil constant / keep resistance constant / keep it cooler.	
(d)	Using $P = VI$ Max value for $V = 5.6$ V Max value for $I = 0.7$ A $P = 5.6 \times 0.7$ $P = 3.92$ W (4.0 W)	• Correct use of formula and started to add some numbers to it.	• Correct answer with incorrect units. OR Used correct formula with incorrect V or I (used 4 and 0.50 from (b) (correct unit for this required).	• Correct answer with correct unit. (W or J s^{-1})
(e)	The variable resistor is used to adjust the total resistance of the circuit and cause the current in the circuit to change. As resistance increases, the current will decrease. The circuit voltage is not changing (as R increases, I decreases in proportion, to keep V the same).	• The variable resistor changes the total resistance. OR As the resistance of the variable resistor increases the current reduces. OR As the resistance of the variable resistor increases the voltage across the coil reduces.	• As the resistance of the variable resistor increases the voltage across the coil decreases and the (total) current reduces. OR Total voltage of circuit stays the same.	• As the resistance of the variable resistor increases the voltage across the coil decreases and the (total) current reduces. Because the total voltage of the circuit remains constant.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence	1A	2A	3A	4A	2M	3M	1E + 1M	2E

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
00 – 06	07 – 12	13 – 17	18 – 24