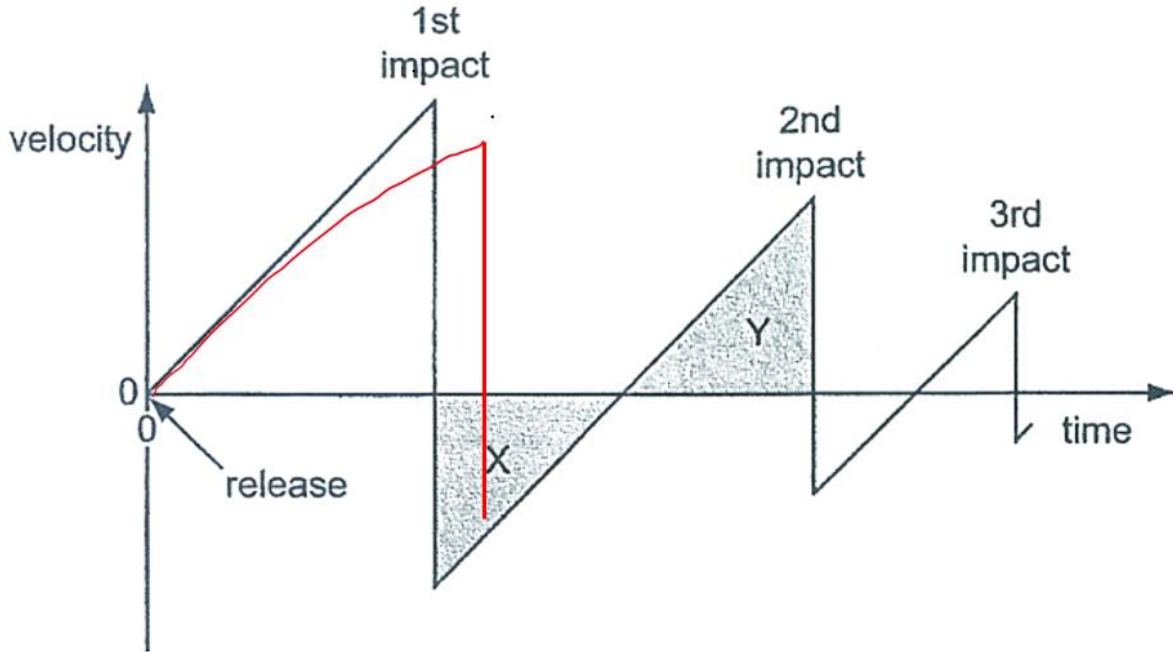


2025 CHS SEC 4 PHYSICS PRELIMINARY EXAMINATION

2025 CHS Physics Prelim Paper 1

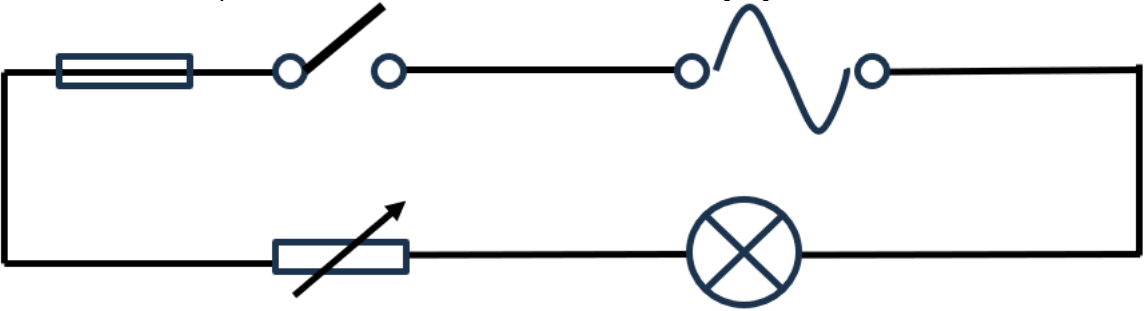
Qn		Qn		Qn		Qn		Qn	
1	B	2	D	3	D	4	B	5	B
6	B	7	D	8	D	9	D	10	C
11	A	12	B	13	C	14	D	15	B
16	B	17	C	18	C	19	C	20	C
21	A	22	B	23	D	24	B	25	A
26	D	27	C	28	A	29	C	30	B
31	B	32	A	33	B	34	B	35	B
36	D	37	C	38	C	39	C	40	C

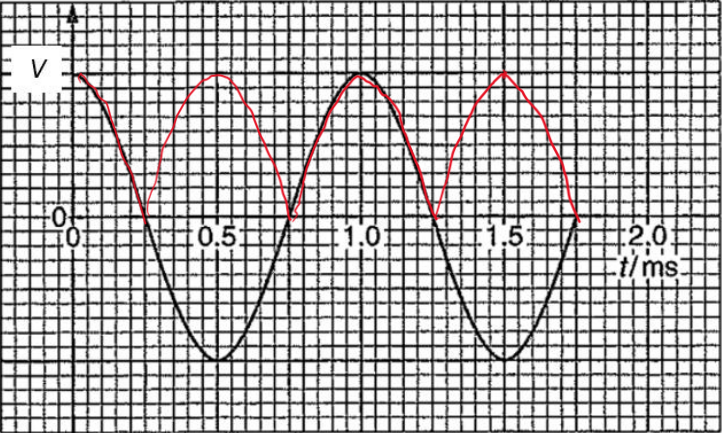
2025 CHS Physics Prelim Paper 2 Section A

S/N	Mark Scheme
1ai	10 m/s² [A1]
1aii	- ball moves (downwards) with speed increasing at a constant rate (or with a constant acceleration) [B1] - moves upwards (or changes direction) with speed decreasing at a constant rate (or with a constant deceleration) until it is instantaneously stationary. [B1]
1aiii	Distance travelled (vertically) upwards (after first impact with ground) is the same as distance travelled (vertically) downwards (before second impact with ground / after reaching maximum height) [A1]
1bi	same gradient at $t = 0$ and decreasing gradient (cannot be zero) and longer time for first impact with ground and smaller maximum velocity before first impact with ground and velocity becomes zero. [A1] 
1bii	- Air resistance increases with speed and is in opposite direction to weight. [M1] - Resultant force decreases, and hence acceleration decreases (or speed increases at a decreasing rate). [A1]

S/N	Mark Scheme
2a	By principle of moments, Taking moments about pivot, [formula] Sum of clockwise moments = sum of anti-clockwise moments [formula] $M = F \times d$ [formula] $F \times 4.0 \cos 50^\circ = 45 \times (7.0 + 4.0 \cos 50^\circ)$ [B1] $F = 168 \text{ N}$ (3 s.f.) [B1]
2b	By Newton's First Law, Sum of downward forces = sum of upward forces Force on pivot + 45 = 168 Force on pivot = 123 N [B1] Direction = downwards [B1]
2c	- At the back, molars apply a force on the food whose line of action has a shorter perpendicular distance to the pivot. [B1] - For the same moment created by F, force by molar teeth on (hard) food is larger. [B1]
2d	- Incisors have a smaller surface area of contact (with the meat) than molars. [B1] (For the same force exerted,) incisors exert a larger pressure to be able to cut meat. [B1]
3ai	- change of <u>internal energy</u> (of a material) per unit mass [B1] - for each unit change in temperature [B1]
3aii	$E = mc\Delta\theta$ [formula] $= 2.0 \times 460 \times (500 - 50)$ [B1] $= 4.14 \times 10^5 \text{ J}$ (3 s.f.) [B1]
3b	- air (above the water) <u>expands</u> on heating [B1] - density of hot air less (than cold air) and hot air rises [B1] - cold air (being denser) falls (and cycle repeats) [B1]
4a	a wave that travels in a direction <u>parallel</u> to the direction of <u>vibration (or oscillation)</u> of <u>particles</u> [B1]
4bi	C in correct position i.e. gap 4, 18 or 32 [B1] R in correct position i.e. gap 11 or 25 [B1]
4bii	6.4 cm [B1]
4biii	$v = f \lambda$ $= 5100 \times 0.064$ (using answer in 4bii converted to m) [B1] $= 326 \text{ m/s}$ [B1]
4c	(Sound travels faster in glass than in air) because glass particles are closer together and collide more easily with one another than air particles. [B1] (Light travels faster in air than glass) because air is optically less dense than glass [B1]

S/N	Mark Scheme
5ai	gamma rays, visible light, infra-red radiation [B1]
5aii	• can travel in space/vacuum or no medium needed • same (high) speed (in air) or travel at speed of light • transverse (stated or explained) • transfer/transmit energy • (oscillating) magnetic and electric fields/waves • reflection/refraction
5bi	microwaves [B1]
5bii	radio waves [B1]
5biii	• cover a large area over the horizon / larger coverage of events around the world • unaffected by tall buildings/hills / no obstructions • higher quality of signal
6a	distance between optical centre and principal focus of lens [B1]
6b	• correct location of real image [B1] • correct incident and refracted rays [B1 for both] • focal length = 2.1 – 2.4 cm [B1]
6ci	• image becomes larger or magnified or further from lens [B1]
6cii	image becomes smaller or closer to object/lens. [B1]
7ai	Geiger-Muller tube/counter/detector [B1]
7aii	• keep distance (away from source) by using tongs [B1] • or use lead-lined box to store radioactive source • or use source for short time • or wear lead-lined clothing and gloves
7bi	Radiation when there is no source that is deliberately introduced [B1] or naturally occurring (radiation) or always present
7bii	• measure count rate with no source [B1] • subtract from (measured) count (rate for same time) [B1]
7ci	• graph is 2 cpm lower for $d = 0$ to 4.0 cm [B1]
7cii	alpha (particles/radiation) [B1] count rate decreases when they travel in air [B1]

S/N	Mark Scheme
8a	- correct symbols for a.c. power supply, variable resistor, lamp, switch and fuse [B1] - variable resistor, lamp, switch and fuse are connected in series [B1] 
8b	$R = V / I$ $= 240 / 12 \text{ [B1 for formula and substitution]}$ $= 20 \, \Omega$
8c	- when current increases, temperature increases (due to decrease in resistance of variable resistor) [B1] - resistance increases [B1]
8d	- possible overheating leading to electrical fire [B1] - short circuit due to negligible resistance (alternative path) of bare copper wire (compared to floodlight and variable resistor), leading to surge in current [B1]
8e	- When light intensity decreases (at night), resistance of LDR increases. [B1] - resistance of floodlight takes up a smaller proportion of total resistance (compared to day) [B1] - potential difference across floodlight decreases (making it less bright). [B1]
9a	- energy transferred electrically / through electric current [B1] - energy (then) transferred mechanically due to work done by motor on (back) wheel [B1]
9bi	V_{max} is directly proportional to the number of revolutions per second of the coil. [B1]
9bii	- as number of revolutions per second increases (or decreases), rate of change of magnetic flux linking the coil (and the magnet) increases (or decreases). [B1] - by Faraday's Law, magnitude of (maximum) induced e.m.f. increases. [B1]
9biii	- magnetic field of induced current interacts with that of (permanent) magnet to produce a force on sides of coil. [B1] - oppositely directed to the force used to rotate the coil, reducing rate of change of magnetic flux (linking the coil) and hence values of maximum current. [B1]
9biv	- split-ring commutator reverses the direction of current in the coil every time it passes the vertical position so that force(s) acting on side(s) of coil ensure that it always turns in the same direction. [B1] - slip rings ensure that coil is not entangled / induced current is transferred to external circuit (or resistor) / induced current is alternating. [B1]

S/N	Mark Scheme	
9bv		[B1 for correct shape]

2025 CHS Physics Prelim Paper 2 Section B

S/N	Mark Scheme
10ai	force (acting) per unit area [B1]
10aai	$p = F / A$ $= mg / A$ [B1 for both formulae] $= (60 \times 10) / 0.0024$ [B1] $= 250 \text{ kPa}$ [B1]
10bi	- rubber molecules (in old tyre) are (constantly and randomly) vibrating about fixed positions [B1] - air molecules (in modern tyre) are moving constantly and randomly (at high speeds) [B1] - strong(er) attractive forces between rubber molecules than in air molecules (or vice versa) [B1]
10bii	(when temperature increases) air molecules move faster and collide more frequently and forcefully with (inner walls of) tyre [B1] - larger force (by air molecules) per unit area on (inner walls of) tyre [B1] - pressure (in tyre) increases [B1]
11ai	- left soft iron: S on left and N on right - right soft iron: S on left and N on right [B1 for all correct]
11aai	- unlike poles attract (or N pole of left soft iron is attracted to S pole of right soft iron). [B1] - both soft irons come into contact / move towards one another. [B1]
11aiii(1)	resistance of thermistor decreases [B1]
11aiii(2)	- current in coil increases, causing magnetic field of coil to be stronger [B1] - reed switch closes (or soft irons come into contact) (causing current to flow through lamp) [B1]
11bi	electron [B1]
11bii(1)	- opposite charge between pipe and petrol can cause a spark (or discharge path) [B1] - spark can ignite petrol (vapour) causing a fire or explosion. [B1]
11bii(2)	grounding or earthing the can / connecting a metal chain from the can to ground [B1]