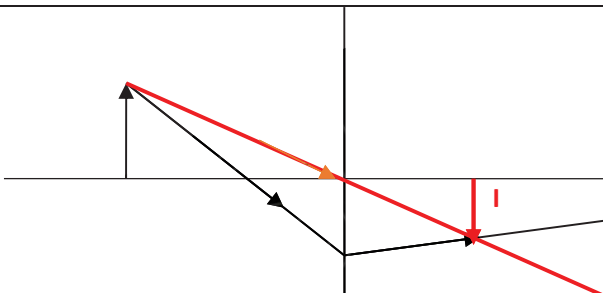
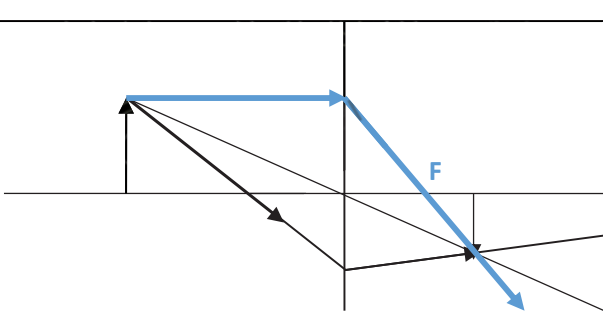
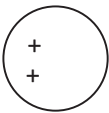
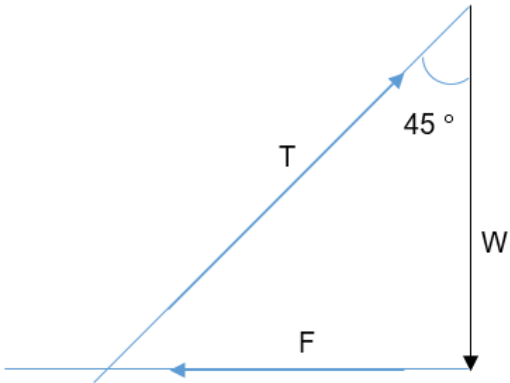


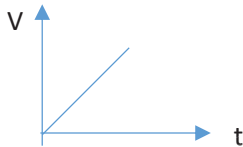
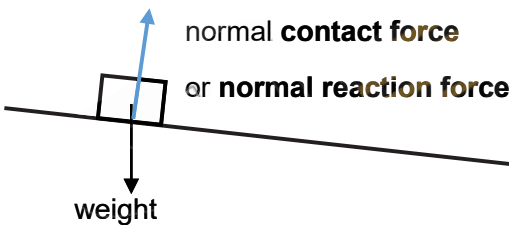
CWSS Prelim 2020
Physics P2 Answer

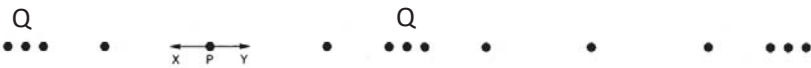
1	(a)	0 s to 10 s: constant velocity or displacement increases at a constant rate	1
		10 s to 20 s: at rest or velocity = 0	1
		20 s to 32 s: moving in opposite direction at constant velocity or velocity is constant and negative	1
	(b)	Anyone: • Infra-red radiation • Radio wave	1
total			4
2	(a)	The skateboarder's foot pushes the skateboard to the left/backwards , this causes the skateboard to move backwards/ to the left.	1
		By Newton's 3 rd law, the skateboard exerts a forward force/ force towards the right acts on the skateboard making him moves forwards/ to the right.	1
	(b)	Chemical potential energy to kinetic energy	1
	(c)	(i) $ke = \frac{1}{2}mv^2$ $= \frac{1}{2} \times 42 \times 0.30^2$ $= 1.89 = 1.9 \text{ J (2 s.f.)}$	1 – working 1 – ans + unit + s.f.
		(ii) The skateboarder exerts a force on the air with his body as he moves forwards and move the air through a distance.	1
		(iii) ~~Converted to~~ thermal energy of the air.	1
total			7
3	(a)	The line of action of the weight of the bus is on the left side of the wheel on the right.	1
		This creates an anticlockwise moment about the wheel on the right wheel. Hence it will not topple.	1
	(b)	The c.g of the bus will be raised if there are more passengers in the upper deck than lower deck. This will cause the bus to be less stable. Or The c.g of the bus will be shifted more to one side of the bus if there are more passengers seated on one side of the bus than the other side.	1

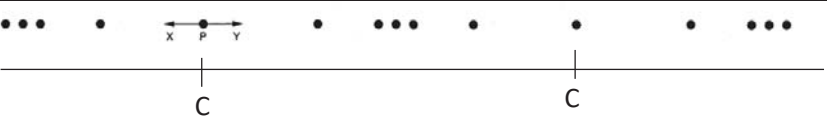
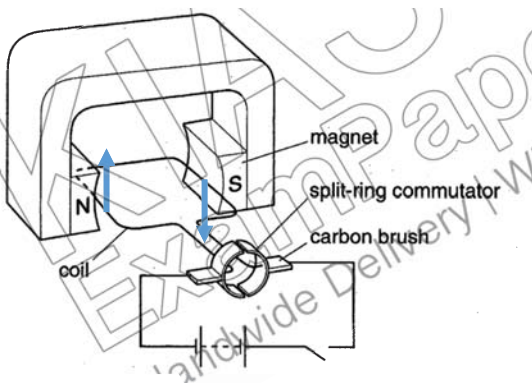
		This will cause the bus to be less stable when the bus turn on the side with more passengers.	
	(c)	(i) Liquid is incompressible .	1
		(ii) $360/0.0012 = F/0.28$ $F = 84\,000\text{ N}$ (2 s.f.)	1 - working 1 - ans + unit + s.f.
total			6
4	(a)	(i) $n = 3.0 \times 10^8 / \text{speed of light in prism}$ speed of light in prism = $3.0 \times 10^8 / 1.6$ = $1.9 \times 10^8 \text{ m/s}$ (2 s.f.)	1 - ans + unit + s.f.
		(ii) $n = 1 / \sin c$ $c = \sin^{-1} (1/1.6)$ = 39° (2 s.f.)	1 working 1 ans and unit + s.f.
	(b)	(i) 	1
		(ii)  F must be marked clearly	1
		(iii) Image will be dimmer	1
		(iv) Move the lens further away from the object	1
total			7

5	(a)	Friction causes electrons/negative charges to move from the roller to the belt . Excess negative charges on the belt caused it to be negatively charged	1 1
	(b)	The electrons/negative charges in metal ball is repelled by the negative charges on the dome through the conducting rod to the Earth . because like charges repel .	1 1
	(c)	 One or more positive charges drawn on the left side of the sphere.	1
	(d) (i)	Region in which an electric charge experiences a force .	1
	(ii)	$I = Q/t = 0.0016 \times 10^{-3} / 0.0012$ $= 0.0013 \text{ A}$ or $1.3 \times 10^{-3} \text{ A}$ (2 s.f.)	1 – working 1 – ans + unit
total			8
6	(a)	9.6 J of work is done to drive 1 coulomb of charge/ a unit charge through the resistor.	1 1
	(b)	Current thru the bulb = current through resistor = V/R $= 9.6 / 40$ $= 0.24 \text{ A}$	1 – working 1 – ans + unit + s.f.
	(c)	$P = I^2 R = 0.24^2 \times 10$ $= 0.58 \text{ W}$ (2.f.)	1 – working 1 – ans + unit + s.f.
	(d)	R lowers the effective resistance in the circuit and increases the current through the bulb . Since $P = I^2 R$, bulb becomes brighter . Or R lowers the effective resistance across both the resistors in parallel and lowers the p.d. difference across the resistors and increases the p.d. across the bulb . Since $P = V^2/R$, bulb becomes brighter . Or R lowers the effective resistance in the circuit and increases the current through the bulb . This increases the p.d. across the bulb . Since $P = IV$, bulb becomes brighter .	1 1 1 1 1 1
total			8

7	(a)	Any one: - to provide a complete circuit (with live) so that current can flow - to pass current back to mains - provide a return path for the current	
	(b)	when live touches metal case, current flow to earth / earth wire / ground or a short circuit is formed between the case and the earth. A large current flows, this causes fuse to melt / blow and disconnects circuit / cuts live / stops current	1 1
	(c)	doubly insulated or case / body made of plastic / insulator / not made of metal so user cannot touch the parts at high potential	1
total			4
8	(a)	The iron ball is magnetically induced / becomes an induced magnet with unlike pole facing the magnet . Since unlike poles attract , the ball is attracted to the magnet.	1 1
	(b) (i)	$W = mg = 0.100 \times 10$ $= 1.0 \text{ N}$ (1, 2 or 3 s.f.)	1 ans+unit
	(ii)	Weight drawn in correct direction to correct scale. Scale MUST be convenient and sufficiently large. Minimum Scale : 1 cm represents 0.2 N Magnetic force and Tension drawn at correct angle & direction with respect to weight. Clearly labelled. Final answer Force = $1.0 \text{ N} \pm (0.1 \times \text{scale})$	1 1 1
			

				total	6
9	(a)	(i)	Anyone: - The acceleration is constant - The speed of the carriage increases throughout the motion - The speed of the carriage increases at a slower rate initially compared to data 1.		1
		(ii)	distance = $\frac{1}{2} \times 2.00 \times 2.50$ = 2.50 m (3 s.f.) 		1 working 1 ans+unit + s.f.
		(iii)	Draw: straight line with arrow in the correct direction from the track and 90° to the track. Label : normal contact force or force on carriage by the track 		1
		(iv)	No difference the gravitational potential energy of the carriage at the top of the track is the same as kinetic energy at the bottom of the track . $mgh = \frac{1}{2} mv^2$ $v = \sqrt{2gh}$ or v is independent of the mass of the carriage		1
	(b)	(i)	$a = (v-u)/t$ = $(0.90-0)/0.20$ or $(1.8-0)/0.40$ or $(2.7-0)/0.60$ = 4.5 m/s^2 (2 s.f.)		1 working 1 ans+unit + s.f.
		(ii)	From $t = 0.60 \text{ s}$ to $t = 1.20 \text{ s}$, acceleration is zero/ the speed is constant . when the carriage is on the horizontal/flat part of the track. This shows that the resultant force is zero . Hence track is frictionless .		1
				total	10
10	(a)	(i)	Air molecules lose internal kinetic energy to the coolant as it passes through. thermal energy is absorbed by the coolant to weaken the forces of attraction between particles of the coolant for the coolant to change from liquid to gaseous state_/ evaporate.		1

		(ii)	The coils increase the surface area exposed to the air. This increases the rate of heat exchange / heat absorption / rate of evaporation between the air and the coolant.	1 1
	(b)	$Q = mc\Delta\theta$ $1200 \times 1 = 94 (35-T)$ $T = 22\text{ }^{\circ}\text{C} (2 \text{ s.f.})$		1 working 1 ans+unit + 2 s.f.
	(c)	Y is more suitable Y has higher specific latent heat of vaporization, this allows it to draw the more energy from the air to evaporate/ change state and higher specific heat capacity, this allows it to absorb more heat for each 1 °C increase/ unit change in temperature.		1 – no mark if wrong liquid is selected 1 - no mark if wrong liquid is selected
	(d)	Black-painted copper Copper is a good conductor of heat . This enables heat to be conducted quickly from air to coolant. Black is good absorber of radiation . This enables heat to be absorbed quickly from air to coolant.		1 – no mark if material is identify wrongly 1 – no mark if material is identify wrongly
total				10
11 Either				
(a)	(i)	Current in the coil makes it an electromagnet . This causes the coil to either attract/ repel the permanent magnet . or Current in the coil creates a magnetic field This interacts with magnetic field of the magnet that results in an unbalance magnetic field to produce a force acting on the coil.		1 1 1 1
	(ii)	Coil moves left and right/ into and out of magnet/ backwards and forwards. because current flow in one direction and then reverses hence reversing the force acting on the cone.		1 1
(b)	(i)	Distance between adjacent particles varies from 0 to 3.0 mm / increases and decreases/ decreases and increases		1 Ignore s.f.
	(ii)	 Accept answer between centre of two compressions/ rarefactions or distance between any 2 points moving in phase.		1

	(iii)	$f = 1/T = 1/2.0$ $= 0.50 \text{ Hz}$	1 - ans + unit + s.f.
	(iv)	$V = f\lambda = 0.5 \times 0.4$ $= 0.2 \text{ m/s or } 20 \text{ cm/s (1 or 2 s.f.)}$	1 – working 1- ans + unit + s.f.
	(vi)		1
total			10
Or			
(a)	(i)	Current in the coil creates a magnetic field This interacts with magnetic field of the cylindrical magnet and resulted an unbalance magnetic field to produce a force acting on the wire.	1 1
	(ii)	Correct direction, must touch coil 	1
	(iii)	The split ring commutator reverses the direction of the current in the coil after it passes through its vertical position. This reverses the direction of force on each side of the coil allowing it to continue turning in same direction./ The force on the coil next to the respective magnetic poles remain the same.	1 1
(b)	(i)	Resultant moment $= 2 \times 4 \times 0.05$ $= 0.4 \text{ Nm or } 40 \text{ Ncm (1 or 2 s.f.)}$	1 – working 1- ans + unit + s.f.

	(ii)	The resultant moment decreases as coil rotates towards vertical position At the vertical position, its moment = 0 As it rotates past the vertical position, the moment increases as it rotates towards horizontal position At horizontal position, its moment = maximum or 0.40 Nm again. Cycle repeats	1
	(c)	Coil rotates faster.	1
total			10

