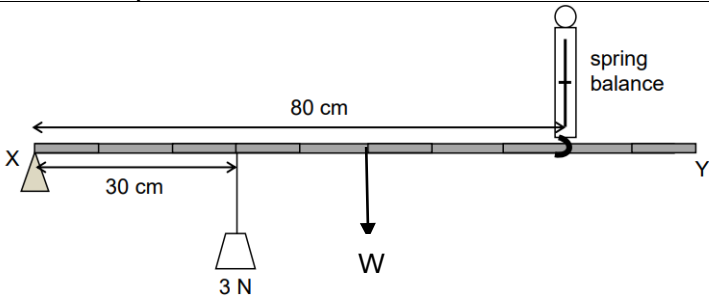
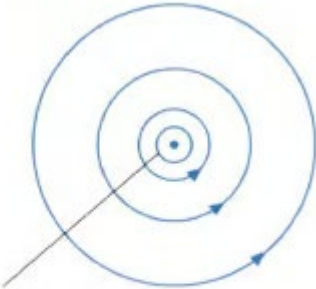


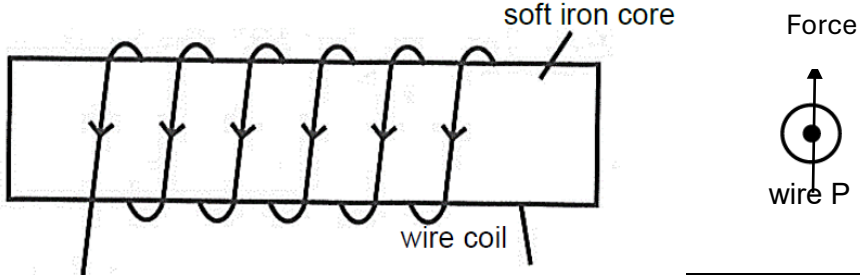
Prelim 2024 Science Physics 4E Answers

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

Q1(a)	$t = 0\text{s}$ to $t = 15\text{s}$, Car is moving at a constant speed of 20 m/s. [1] $t = 15\text{s}$ to $t = 25\text{s}$, car is slowing down at a constant rate, or negative acceleration or constant deceleration. [1]	
(b)	Deceleration = $(20 - 0)/10 = 2\text{ m/s}^2$	
(c)	$F = ma = 2500\text{ kg} \times 2\text{ m/s}^2 = 5000\text{ N}$	
(d)	A constant resistive force is acting on the car and is greater than the forward force[1] , resulting in overall resultant force in opposite direction from the direction of the engine thrust. [1]	
Q2(a)	Loss in GPE = $mgh = 0.6\text{kg} \times 10\text{ N/kg} \times 1.2\text{ m} = 7.2\text{J}$	
(b)	$KE = \frac{1}{2}mv^2 = 7.2\text{ J}$ $\frac{1}{2}(0.6)(V^2) = 7.2$ $V = 4.90\text{ m/s}$	
(c)	Work done = Friction x distance moved $7.2 = 3 \times \text{distance moved}$ distance moved = 2.4 m	
Q3(a)	For an object to be in equilibrium, the sum of clockwise moment about a pivot is equal to the sum of anticlockwise moment about the same pivot.	
(b)(i)	 The diagram shows a horizontal beam XY pivoted at the right end. A 3 N weight hangs 30 cm from the left end X. A downward force W acts 80 cm from the pivot. A spring balance is attached to the pivot.	
(ii)	Moment = $10\text{ N} \times 50\text{ cm} = 500\text{ Ncm}$	
(c)	$80 \times F = (3 \times 30) + 500$ $F = 7.38\text{ N}$	
Q4(a)	$W = mg$	

	3.5 = m(10) m = 0.35 kg			
(b)	Volume = 25.0 cm ³			
(c)	D = mass/volume = 350/25 = 14 g/cm ³			
Q5(a)	Boiling point is the constant temperature at which liquid changes to gas			
(b)(i)	There is an increase rate of heat transfer from the hot water to the surrounding as temperature increases.			
(ii)	Energy is absorbed by the molecules to overcome the intermolecular forces of attraction between the liquid molecules. [1] There is no change in the average Kinetic energy of the particles and increase in PE [1]			
6(a)	Refractive index = sin I / sin r = sin 60/ sin 40 = 1.35			
(b)	Speed of light in air / speed of light in glass = 1.35 (3 x 10 ⁸)/ speed of light in glass = 1.35 speed of light in glass = 2.22 x 10 ⁸ m/s			
Q7(a)	1) Time taken for echo to travel 2) Distance from generator to building			
(b)(i)	Decrease			
(ii)	Same			
(c)	V = fλ 330 = 3700λ λ = 0.0891m			
Q8	Electrons from the dry cloth is transferred to the plastic rod [1] by friction [1]			
Q9(a)		C-12	C-14	
	Number of electrons	6	6	
	Number of protons	6	6	
	Number of neutrons	6	8	
(b)	Half-life = 5500 years			

Q10(a)(i)	$P = IV$ $I = P/V = 60/240 = 0.25 \text{ A}$	
(ii)	1A	
(iii)	$0.06\text{kw} \times 12 \text{ hrs} \times 7 \text{ days} \times \$0.28 = \$1.41$	
(b)	A: live wire B: neutral wire C: Earth wire	
(c)	Appliance become "live" [1], current will flow from "live" wire to the metal casing [1] to the ground, person will not get an electrical shock as the current will flow to the earth wire.[1]	
Q11(a)	$R = V/I$ $= 1\text{V} / 0.01 \text{ A} = 100\Omega$	
(b)	Resistance increases, as voltage increases from 0V. [1] For every unit increase in voltage, current increases more. [1]	
(c)(i)	$w.d = E \times Q = E \times I \times t = 11\text{V} \times 0.04\text{A} \times 300\text{s} = 132\text{J}$	
(ii)	Heating lamp emits infra-red radiation, which is absorbed by the food. [1]. The food particles gains energy and vibrate faster [1], resulting in higher average kinetic energy. [1]	
Q12(a)	A region where a magnetic material experiences a magnetic force.	
(b)(i)	 current out of plane of paper	
(ii)	Magnetic field will change its direction to clockwise. [1]	
(c)(i),(ii)		
(iii)	Increase the amount of current flowing through the wires. OR Increase the number of coils of wire per unit length	
(d)(i)	There will be a magnetic field produce by a current carry	

	conductor. Which will interact with the magnetic field of the magnet to produce a force.	
(ii)	 The diagram shows a rectangular solenoid with a horizontal 'soft iron core'. A 'wire coil' is wound around the core, with arrows indicating the current flows downwards through each loop. To the right of the solenoid, a vertical wire labeled 'wire P' is shown. A dot in the center of wire P indicates the current is directed out of the page. An upward-pointing arrow labeled 'Force' is positioned next to wire P, indicating the direction of the magnetic force exerted on it.	
(iii)	There will be no change in the direction of the force exerted on wire P.	