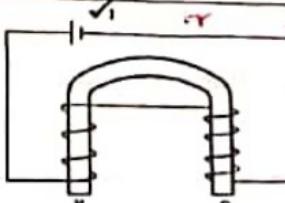


SECTION A (25 marks)

1.	<p>Correct reflection at the two mirrors ✓ (1) Angle of reflection = 70° ✓ (1)</p> <p>Correct reflections at the two mirrors. ✓ Angle of reflection = 70° ✓ <i>If 0° is missed, 1/2 mark.</i></p>	✓ or second ray (2 marks)
2.	<p>An uncharged body will also cause a decrease on the divergence of the leaf. <i>Conductor</i></p> <p>OR</p> <p>Both positively charged body and an uncharged body cause a decrease in divergence. <i>Conductor / do not conduct</i></p>	(1 mark)
3.	<ul style="list-style-type: none"> - Do not cross one another. <i>Parallel</i> repel each other sides - They are complete loops. <i>Under constant state of tension</i> - Direction of field is from North to South. <i>N to S</i> - They are normal to the surface at the poles. <i>Perpendicular</i> <p>Any two ✓</p> <p><i>Closer at the poles and far apart along the central axis of field lines.</i></p>	(2 marks)

4.		If direction contradicts, mark as wrong.	(1 mark)
5.	- Increasing the number of turns in the coil. - Increasing the current (or number of cells).	(2 marks)	
6.	Polarization occurs.	(1 mark)	
7.	$I = \frac{V}{R}$ ✓ = $I = E$ $I = \frac{E}{R+r}$ ✓ - (new) $= \frac{1.5}{2+0.5}$ ✓ $= 0.6A$ ✓	(3 marks)	
8.	- To sterilize medical equipment - To kill cancerous cells and malignant growths in the body.	Radiotherapy Cancer therapy treat Cancer	(2 marks)
9.	During the first half cycle of the input signal, current flows in the first diode, while the second diode does not conduct. During the second half cycle of the input signal, current flows in the second diode, while the first diode does not conduct. When the currents through the two diodes are combined, a rectified wave signal is obtained as the output signal.	branched, 1 reverse branched, 1 (3 marks)	
10.	By increasing the heating current in order to produce more electrons.	Cathode heating increasing temp. of filament current	(1 mark)
11.	- Fuse in the neutral wire instead of the live wire. - Switch to lamp A on the neutral wire instead of live wire. - Connection of lamp B on Live wires only.	2 (specify the error.) Bulb B's short circuit	(2 marks)

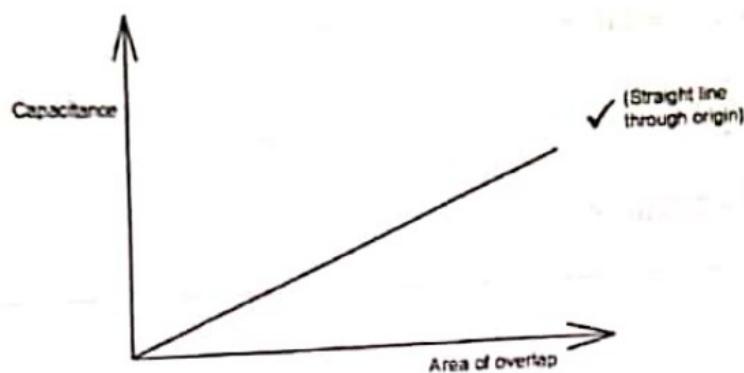
${}_2^4\text{He}$ \times $d-1'$

Helium atom \times
Helium alone \sim decay.

12.	Alpha particle. ✓ / Helium nucleus / Helium ion	(1 mark)
13.	Shows the object as being further than it actually is. ✓ / produces diminished images / focus	→ (1 mark) Swallow
14.	Infrared ✓ / IR	(1 mark)

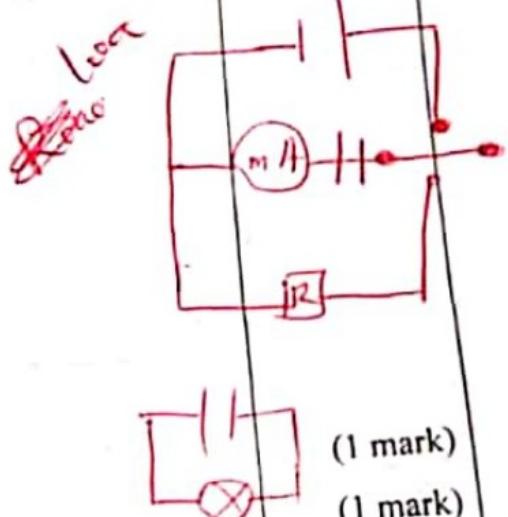
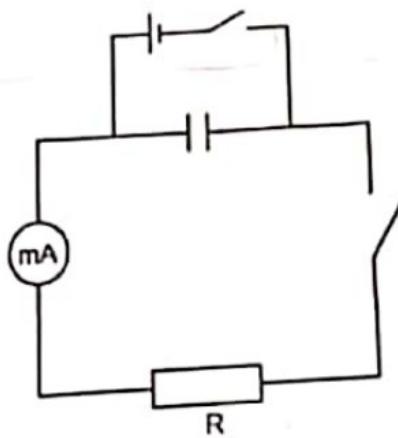
SECTION B (55 Marks)

15. (a)



(1 mark)

(b) (i)

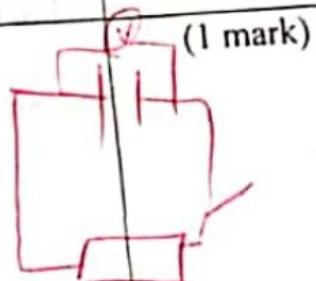
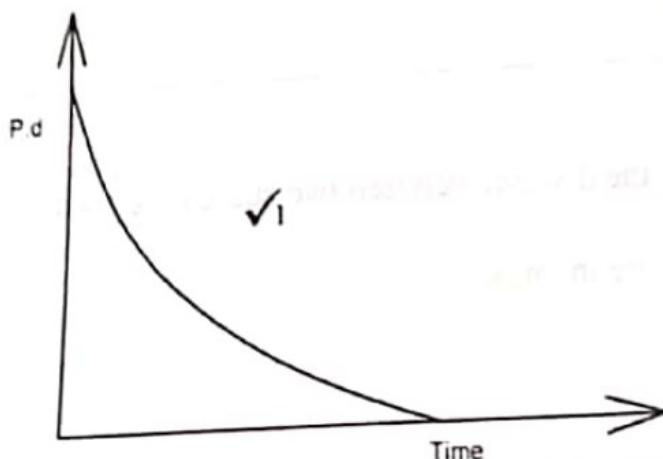


(1 mark)
(1 mark)

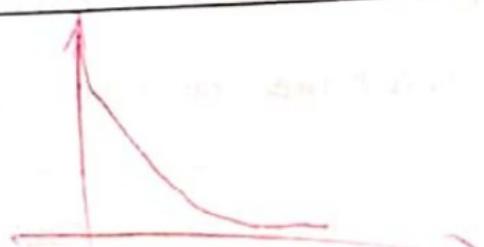
Milliammeter and resistor ✓

Cell and switch ✓

(ii)

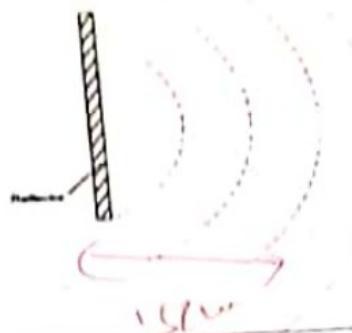


(1 mark)



(c)	<p>(i)</p> $C_{\text{parallel}} = 2 + 3 = 5 \mu\text{F} \quad \checkmark$ $\frac{1}{C_s} = \frac{1}{5} + \frac{1}{4} \quad \checkmark$ $C_T = \frac{20}{9} = 2.22 \mu\text{F} \quad \checkmark$	$\text{or } \frac{5 \times 4}{5+4} = 2.22 \mu\text{F}$ $\text{or } \frac{1}{C} = \frac{1}{5} + \frac{1}{4} \quad \checkmark$	(3 marks)
	<p>(ii)</p> $Q = CV \quad \cancel{\checkmark}$ $= 2.22 \times 10^{-6} \times 6 \quad \checkmark$ $= 1.332 \times 10^{-5} \text{ C} \quad \checkmark$	$\text{Allow for } E^7$	(2 marks)
	<p>(iii)</p> $V = \frac{Q}{C}$ $= \frac{1.33 \times 10^{-5}}{4 \times 10^{-6}} \quad \checkmark$ $= 3.33 \text{ V} \quad \checkmark$	$V_p = \frac{1.332 \times 10^{-5}}{5 \times 10^{-6}} = 2.664$ $6 - 2.664 = 3.336 \text{ V}$	(2 marks)
16. (a)	<p>(i)</p> <p>Amplitude is the maximum displacement of a particle from the mean position.</p>		(1 mark)
	<p>(ii)</p> <p>Wavelength is the distance between two successive points in a wave which are in phase.</p> <p>OR</p> <p>Distance between two successive crests or troughs in a transverse wave/between rarefaction or compressions in a longitudinal wave.</p> <p><i>distance between successive particles in</i></p>		(1 mark)

(b) (i)



Single slit
Please
Answer

(3 marks)

(ii)

$$\text{Wavelength} = \frac{\text{distance}}{\text{number of waves}}$$

$$= \frac{15}{4} \checkmark$$

$$= 3.75\text{cm} \checkmark$$

$$\therefore \frac{15}{3} = 5\text{cm}$$

$$\therefore \frac{40}{5} = 8\text{Hz} \checkmark$$

$$(III) f = \frac{v}{\lambda}$$

$$= \frac{40}{3.75} \checkmark$$

$$= 10.67\text{Hz}$$

$$\lambda = 1.5\text{cm}$$

$$0.67\lambda = 1\text{cm}$$

$$3.67\lambda = 5\text{cm}$$

$$\lambda = \frac{5}{3.67} \checkmark$$

(2 marks)

(c) (i) (I) - due to constructive interference ✓

(II) - due to destructive interference ✓

(ii) The fringes get closer ✓

OR

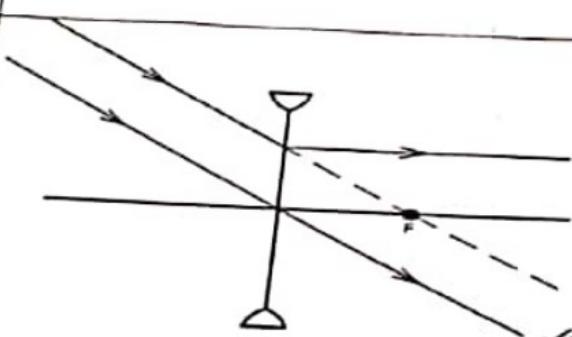
When the frequency is higher the wavelength reduces hence the

fringe separation decreases.

More fringes are formed or

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the path length is an odd multiple of half wavelengths so it is not bright - not white

		48° But allow E.T.	
17. (a)	(i) Critical angle = 42° ✓ since the angle of refraction is 90° . (ii) $\sin c = \frac{1}{n}$ $n = \frac{\sin 90}{\sin 42}$ $= 1.424$ ✓	$n = \frac{\sin 90}{\sin 42}$ $= 1.424$	(1 mark) E.T. fine (2 marks)
(b)	Refractive index = $\frac{\text{real depth}}{\text{apparent depth}}$ ✓ $\therefore \text{apparent depth} = \frac{15}{1.32}$ ✓ $= 11.36\text{cm}$ ✓		(3 marks)
(c)		✓ must have an arrow may or may not have an arrow	(2 marks)
(d)	(i) - Eye has a variable focal length while the focal length of camera lens is fixed. - Camera lens is fixed but eye lens is variable. - Image distance from the lens is almost constant in the eye while in a camera it can be varied. - Eye views multiple images while the camera takes only one photograph at a time. <i>Eye lens is muscular while camera lens is clear plastic</i> <i>(Any two correct @ 1 mark each)</i>	(2 marks)	
	(ii) Ciliary muscles. ✓		(1 mark)

	<p style="text-align: center; color: red;">1. a) Suspend a bar magnet 2. a) Pass an alternating current through a solenoid</p>	
18. (a)	Place the bar magnet inside a solenoid placed in an East, West direction then pass an alternating current through the solenoid ✓ withdraw the magnet slowly from the solenoid while the a is still passing. ✓	(2 marks)
(b)	<ul style="list-style-type: none"> - Suspend each of the bars through its centre of gravity and set it swinging in a horizontal plane about a vertical axis through its centre. ✓ - The magnetized bar will always come to rest in a north-south direction. ✓ 	(2 marks)
(c)	<p>(i) The galvanometer pointer first deflects then moves back ✓ when the switch is closed a current builds up in coil X and due to change in flux linkage an emf is induced ✓ in coil Y making an induced current flow through the galvanometer during the time current in coil X is rising. When current through coil X is steady no induced current flows through the galvanometer since there is no change in flux ✓ linkage. Therefore pointer deflects back. ✓</p> <p>(ii) Pointer deflects in the opposite direction ✓ and back to zero (1 mark) (iii) Magnitude of deflection increases. ✓ (momentarily) (1 mark)</p>	(4 marks)

becomes higher (has a higher deflection) larger deflection
deflection doubles.

Should be expressed

① Off numerical answers (4s/t) (1 mark)
in dip (2 dip atleast) - do not accept fractions for more than one

② do not penalise units or co signs. a candidate goes ahead correctly,

③ include formula but substitute formulae and award.

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232/2 MS

Ignore the wrong capital units of Hz.
④ Don't penalise small letter but full words - start word wrongly - don't penalise.

⑤ Spelling of word wrongly - don't penalise

Mass	19. (a)	Half life is the time taken for half the number of nuclides initially present in a sample to decay.	(1 mark)
	(b)	(i) Expansion cloud chamber radiation (ii) Due to collisions between the radiations from the radiation source and the air molecules. (iii) When the piston is pulled down air expands hence cools ✓ The ions form nuclei for condensation upon cooling on ✓ which the saturated alcohol vapour condenses ✓ for saturation (2)	(1 mark) (1 mark) (3 marks)
	(c)	(i) - The work function of the metal ✓ Type of metal (2 marks) - Energy of incident radiation/frequency/wavelength. (ii) I Energy = $eV = 1.6 \times 10^{-19} \times 2.21$ $= 3.54 \times 10^{-19} J$ ✓ II $E = hf$ $f = \frac{E}{h}$ $= \frac{3.54 \times 10^{-19}}{6.63 \times 10^{-34}}$ ✓ $= 5.33 \times 10^{14} Hz$ ✓	(1 mark) (2 marks)

⑥ Incase of correct answer but expressed with wrong unit (A₀) no unit - award 1 mark.

⑦ Check on error transfer.

⑧ parallel work which is not cancelled, mark the first attempt and ignore the rest.

⑨ Cancelled work in case of parallel is not marked

⑩ Cancelled but as parallel work - mark it

9) Multiple ^{E 2019} The National Examinations Council