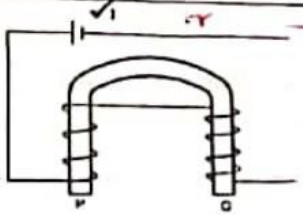


SECTION A (25 marks)

<p>1.</p>	<p>Correct reflection at the two mirrors ✓ (1)</p> <p>Angle of reflection = 70° ✓ (1)</p> <p>Correct reflections at the two mirrors. ✓</p> <p>Angle of reflection = 70° ✓</p>	<p>✓</p> <p>Secondary ray ✓</p> <p>(2 marks)</p>
<p>2.</p>	<p>An uncharged <u>body</u> 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/object) Conductor</i></p>	<p>(1 mark)</p>
<p>3.</p>	<ul style="list-style-type: none"> <li>- Do not cross one another. <i>not touch / they repel each other side</i></li> <li>- They are complete loops. <i>under constant state of constant</i></li> <li>- Direction of field is from North to South. <i>N to S.</i></li> <li>- They are normal to the surface at the poles. <i>perpendicular</i></li> </ul> <p>Any two ✓</p> <p><i>- They are closer at the poles and further apart away from the poles of field lines.</i></p>	<p>(2 marks)</p>

4.		(1 mark) if direction of current is wrong.
(b)	<ul style="list-style-type: none"> <li>- Increasing the number of turns in the coil. ✓</li> <li>- Increasing the current (or number of cells). ✓</li> </ul>	(2 marks)
5.	Increasing speed increases the frequency of the sound ✓ causing an increase in the pitch (higher pitch). ✓	(2 marks)
6.	Polarization occurs. ✓	(1 mark)
7.	$I = \frac{V}{R} = \frac{1.5}{2 + 0.5} = 0.6A$	(3 marks)
8.	<ul style="list-style-type: none"> <li>- To sterilize medical equipment ✓</li> <li>- To kill cancerous cells and malignant growths in the body. ✓</li> </ul>	(2 marks)
9.	<p>During the first half cycle of the input signal, current flows in the first diode, ✓ while the second diode does not.</p> <p>During the second half cycle of the input signal, current flows in the second diode, ✓ while the first diode is reversed.</p> <p>When the currents through the two diodes are combined a fully rectified wave signal is obtained as the output signal. ✓</p>	(3 marks)
10.	By increasing the heating current in order to produce more electrons. ✓	(1 mark)
11.	<ul style="list-style-type: none"> <li>- Fuse in the neutral wire ✓ instead of the live wire.</li> <li>- Switch to lamp on the neutral ✓ wire instead of live wire.</li> <li>- Connection of lamp B on Live wires only.</li> </ul>	(2 marks)

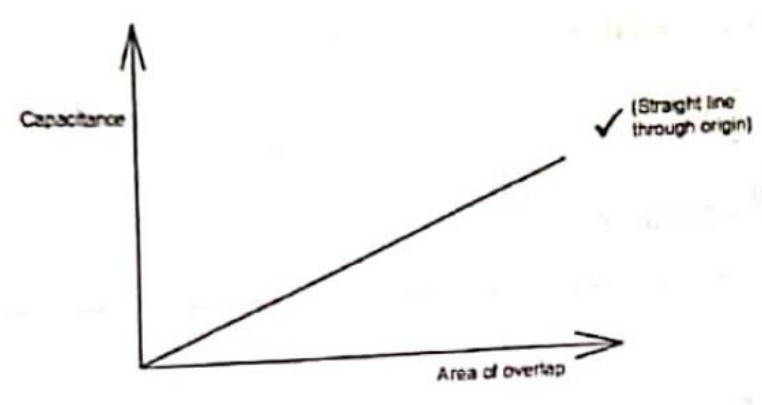
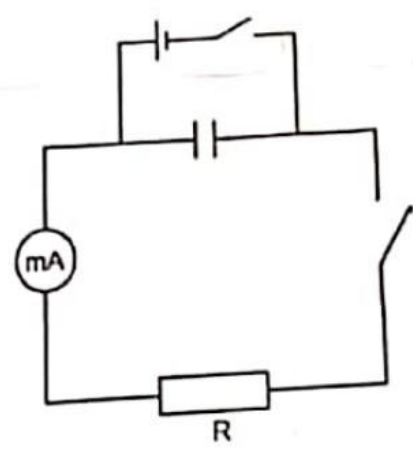
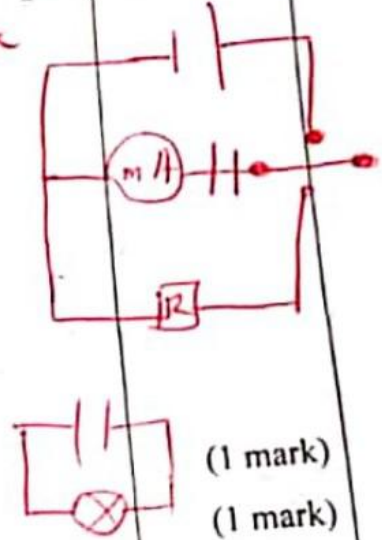
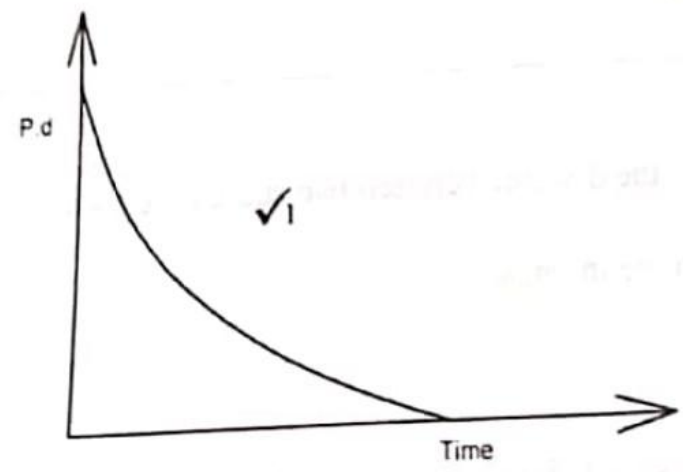
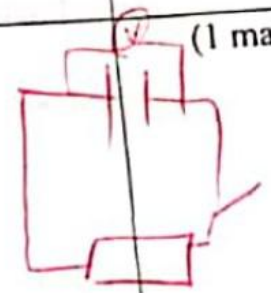
${}^4_2\text{He} \times \text{dang.}$

Helium atom  $\times$   
Helium above  $\text{--- dang.}$

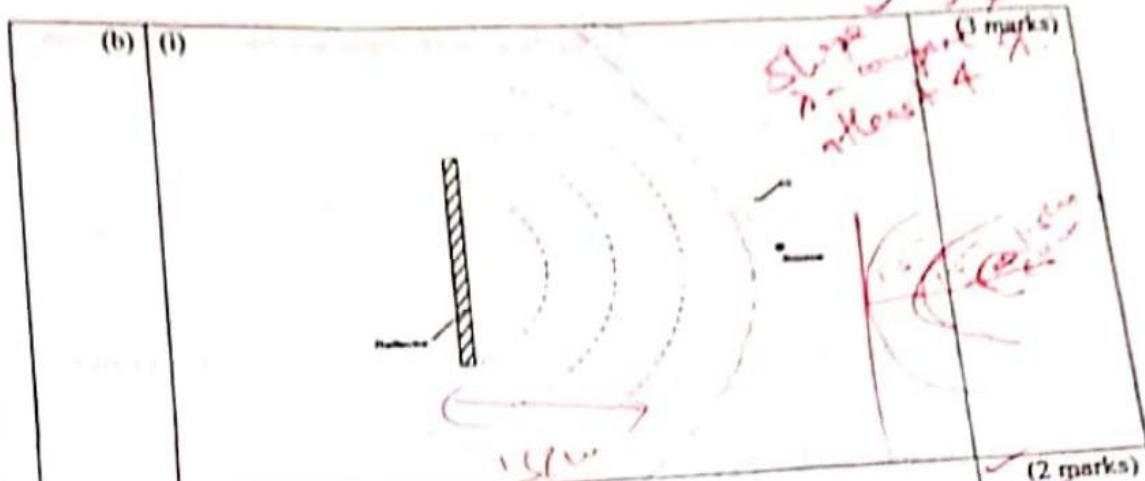
12.	Alpha particle. $\checkmark$ / Helium nucleus / Helium ion	(1 mark)
13.	Shows the object as being further than it actually is. $\checkmark$ / produces diminished images / forms $\rightarrow$ $\text{---}$	(1 mark)
14.	Infrared $\checkmark$ / IR	(1 mark)



SECTION B (55 Marks)

<p>15. (a)</p>		<p>(1 mark)</p>
<p>(b)</p>	<p>(i)</p>  <p>Milliammeter and resistor ✓ Cell and switch ✓</p>	 <p>(1 mark) (1 mark)</p>
<p>(ii)</p>		 <p>(1 mark)</p>

(c)	(i) $C_{\text{parallel}} = 2 + 3 = 5\mu\text{F} \checkmark$ $\frac{1}{C_s} = \frac{1}{5} + \frac{1}{4} \checkmark$ $C_T = \frac{20}{9} = 2.22\mu\text{F} \checkmark$	$\frac{5 \times 4}{5 + 4} = 2.22\mu\text{F} \checkmark \checkmark$ $\frac{1}{C} = \frac{1}{5} + \frac{1}{4} \checkmark$	(3 marks)
	(ii) $Q = CV \checkmark$ $= 2.22 \times 10^{-6} \times 6 \checkmark$ $= 1.332 \times 10^{-5} \text{C} \checkmark$	Allow for $E^{-1}$	(2 marks)
	(iii) $V = \frac{Q}{C}$ $= \frac{1.33 \times 10^{-5}}{4 \times 10^{-6}} \checkmark$ $= 3.33 \text{V} \checkmark$	$V_p = \frac{1.332 \times 10^{-5}}{4 \times 10^{-6}} = 3.33 \text{V}$ $6 - 2.67 = 3.33 \text{V}$	(2 marks)
16. (a)	(i) Amplitude is the maximum displacement of a particle from the mean position.		(1 mark)
	(ii) Wavelength is the distance between two successive points in a wave which are in phase.  OR Distance between two successive crests or troughs in a transverse wave/between rarefaction or compressions in a longitudinal wave. <i>distance between successive particles in</i>		(1 mark)



(ii) (2 marks)

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

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

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

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

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

$$= 10.67 \text{ Hz}$$

Handwritten calculations on the right:  
 $\frac{15}{3} = 5 \text{ cm}$   
 $\frac{40}{5} = 8 \text{ Hz}$   
 $1\lambda = 1.5 \text{ cm}$   
 $0.67\lambda = 1 \text{ cm}$   
 $3.67\lambda = 15 \text{ cm}$   
 $1\lambda = \frac{15}{3.67}$

(c) (i) (I) - due to constructive interference ✓ (2 marks)  
 (II) - due to destructive interference ✓ (1 mark)

(ii) The fringes get closer ✓

OR

When the frequency is higher the wavelength reduces hence the fringe separation decreases.

Handwritten notes at the bottom:  
 dark and bright fringes are formed or  
 since is an odd number of half wavelengths  
 bright - not white  
 dark and bright



48% but allow E.T.

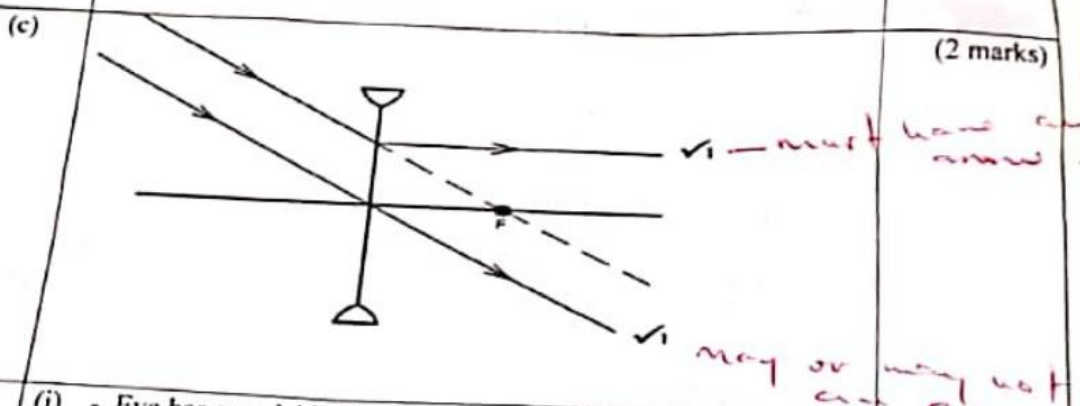
17. (a) (i) Critical angle =  $42^\circ$  ✓ since the angle of refraction is  $90^\circ$ . (1 mark)  
 (ii)  $\sin c = \frac{1}{n}$   
 $n = \frac{1}{\sin 42^\circ}$  ✓  
 $= 1.495$  ✓

$n = \frac{\sin 90}{\sin 42}$   
 $= 1.494$

E.T. from

(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)



(d) (i) - Eye has a variable focal length while the focal length of camera lens is fixed. ✓  
 - 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. (2 marks)

Camera lens can be zoomed but eye lens can't

Eye lens is muscular while camera glass / clear plastic

(Any two correct @ 1 mark each)

(ii) Ciliary muscles. ✓ (1 mark)

The solenoid is placed in an East-West direction then pass an alternating current through the solenoid while the magnet is slowly removed from the solenoid while the current is still passing.

18. (a)	Place the bar magnet inside a solenoid placed in an East, West direction then pass an alternating current through the solenoid while the magnet slowly from the solenoid while the current is still passing.	(2 marks)
(b)	<ul style="list-style-type: none"> <li>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.</li> <li>The magnetized bar will always come to rest in a north-south direction.</li> </ul>	(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>	(4 marks)
	<p>(ii) Pointer deflects in the opposite direction</p> <p>(iii) Magnitude of deflection increases.</p>	(1 mark) (1 mark)

Solenoid is placed in an East-West direction then pass an alternating current through the solenoid while the magnet is slowly removed from the solenoid while the current is still passing.

Separate freely repeat poles. It is repeated.

galvanometer kicks momentarily deflect

kick in the opposite direction

becomes higher / has a higher deflection / larger deflection / deflection doubles.

1. All numerical answers should be expressed in dip (2 dip at least) (4.5.1)
2. do not accept fractions for mixture of equal parts.
3. In case a candidate uses a formula but substitutes incorrectly, award marks for the formula used.

4. Don't penalise capital letters of Hz.
5. Spelling of word wrongly - don't penalise.



Mass  $\downarrow$  Value  $\times$  down  $\downarrow$  / Mass / Size  
 Activity  $\downarrow$  Value  $\downarrow$  / Activity  $\downarrow$  decrease by half

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

⊖ Increase of correct answer but expressed with wrong units ( $A_0$ )  
 no unit - award  $\frac{1}{2}$  mark.

⊕ Check on error transfer.

⊕ Parallel work which is not cancelled, mark the first attempt and ignore the rest.

⊖ Cancelled work increase of parallel is not marked  
 ⊖ Cancelled but no parallel work - mark it

7) Multiple responses © 2019 The Kenya National Examinations Council