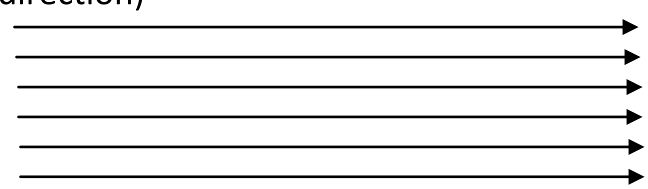
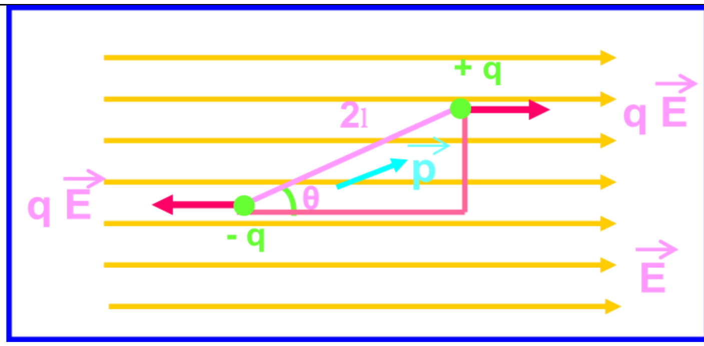
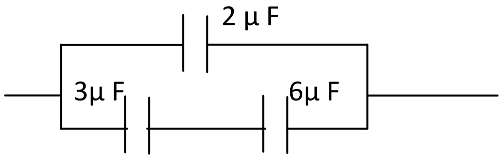
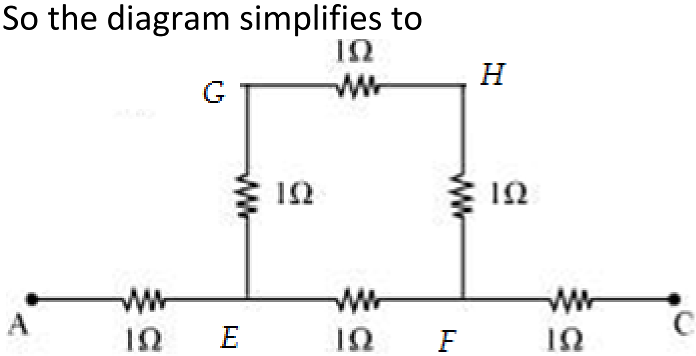
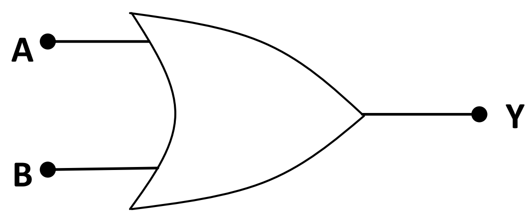
PHYSICS SAMPLE PAPER

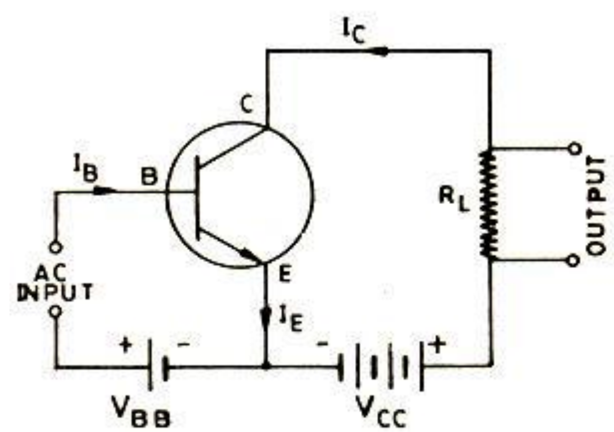
MARKING SCHEME

Ques. No	Value Points	Marks	Total Marks
1.	Electric field Vector	½ ½	**1**
2.	P= VI I=P/V = 60/220=0.27 A	½ ½	**1**
3.	R1= ρ l1/A1 Volume remains constant A1 l1 = A2 l2 l2 = 2l1 ∴ A2 = A1/2 R2 = 4 R1	½ ½	**1**
4.	(Equally spaced parallel lines with all arrows in same direction) 	1	**1**
5.	Lenz's Law (or Fleming's Right Hand Rule) Statement	½ ½	**1**
6.	Concave lens or diverging lens A concave lens gives $m<1$ and $m>0$ for any position of object	½ ½	**1**
7.	Correct definition	1	**1**
8.	Amplifier (AF Amplifier or Power Amplifier)	1	**1**

9.	 The forces due to the field are along different lines of action and constitute a couple. Hence the dipole will rotate and experience torque. Torque = Electric Force x distance τ = q E (2l sin θ) = p E sin θ $\vec{t} = \vec{p} \times \vec{E}$	1 ½ ½	**2**
10.	Correct diagram  The 3 μ F and 6 μ F are connected in series. Their effective capacitance = 2 μ F The 2 μ F capacitor is connected in parallel to this. Now the resultant capacitance of the combination = 2+2 = 4 μ F	1 ½ ½	**2**
11.	The resistors connected to B and D are not included as current need not pass through them to reach C from A. So the diagram simplifies to  The effective resistance of the three 1 Ω resistors along EGHF = 3Ω	½ ½	**2**

	This is in parallel with 1 Ω along EF The effective resistance = 3x1/(3+1) = ¾=0.75 Ω Now the 1 Ω resistance at AE and that at FC are in series with this. Therefore, the effective resistance between A and C = 1 + 0.75 + 1 = 2.75 Ω	½ ½	
12.	(i) $E = E_o \sin \omega t$ where $E_o = NAB\omega$ $I_o = E_o/R = NAB\omega/R = 4.5$ A (ii) $\Phi = NBA \cos\theta$, where θ is the angle between the directions of area vector (**A**) and magnetic field (**B**) Φ is maximum when θ = 0° (That is when the plane of the coil is perpendicular to the magnetic field lines) Φ is 0 when θ = 90° (That is when the plane of the coil is parallel to the magnetic field lines)	½ ½ ½ ½	**2**
13.	$I_1 = I$ and $I_2 = 4I$ The resultant intensity, $I_R = I_1 + I_2 + 2\sqrt{(I_1 I_2)} \cos\phi$ Where ϕ is the phase difference. (i) If $\phi = \pi$ $I_R = I + 4I + 2\sqrt{(I \times 4I)}\,(-1)$ $= 5I - 4I = I$ (ii) If $\phi = \pi/2$ $\cos\phi = 0$ $\therefore I_R = I + 4I = 5I$	1 1	**2**
14.	i. Gamma Rays ii. Microwave iii. Yellow light iv. Radio wave	2	**2**
15.	$$\lambda = \frac{h}{\sqrt{2mE}}$$	1	**2**

<table>
<tr><td></td><td>$$\lambda_e = \lambda_\alpha$$
$$\sqrt{2m_eE_e} = \sqrt{2m_\alpha E_\alpha}$$
$\therefore \frac{E_\alpha}{E_e} = \frac{m_e}{m_\alpha}$</td><td>1</td><td></td></tr>
<tr><td>16.</td><td>Symbol of OR Gate


Truth Table
<table>
<tr><th>A</th><th>B</th><th>Y</th></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>1</td></tr>
<tr><td>1</td><td>1</td><td>1</td></tr>
</table>
OR
Correct diagram
Correct Labeling

</td><td>1
1
1
1</td><td>2</td></tr>
<tr><td>17.</td><td>In first case
$Q = CV = 8 \times 10^{-6} \times 200 = 1.6 \times 10^{-3}$ C

(a) The effective capacitance = 8+4=12μ F
$V = Q/C_{eff} = (1.6 \times 10^{-3}/12 \times 10^{-6}) = 133.3$ V</td><td>1

½
½</td><td>3</td></tr>
</table>

	(b)The total charge remains constant. When connected in parallel, the pd is same for both ∴ $Q_1/C_1 = Q_2/C_2$ ⇨ $Q_1=2Q_2$ ⇨ Q_1+Q_2 = 3 Q2=1.6×10^{-3} C ⇨ $Q_2 = (1.6/3)\times10^{-3}$ C ⇨ $Q_1=2Q_2=(3.2/3)\times10^{-3}$ C	½ ½	
18.	Let the emf of each cell = E First Case When 19 cells are in series, the total emf = 19 E Total internal resisitance = 19x0.1 = 1.9Ω Current = 19 E/(1.9 + R) = 2 19E = 2(1.9 + R) --> (1) Second Case When 15 cells are in series, the total emf = 15 E Total internal resisitance = 15x0.1 = 1.5Ω Current = 15 E/(1.5 + 9.5+R) = 1 15 E =(11+R) --> (2) (1)/(2) => 19/15 = (3.8 +2 R)/(11+R) 15x3.8 +30 R = 19 x 11 + 19 R 30R-19R =209-57 11R = 152 R=152/11 =**13.81 Ω** From eqn (2): E= (11+13.81)/15 =**1.654 V**	½ ½ ½ ½ 1	**3**
19.	The magnetic ,moment of a current loop, μ = iA where A is the area of the orbit $\mu = \frac{ev}{2\pi r} . \pi r^2 = \frac{evr}{2}$ If m is the mass of the electron, $\mu = \frac{e\,(mvr)}{2m}$ Mvr is the angular momentum (*l*)of the electron about the central nucleus.		**3**

	$\mu = \frac{e\,(l)}{2m}$ (i) When the frequency of revolution is doubled the magnetic moment is doubled (ii) When the orbital radius is halved, The magnetic moment is halved		
20.	c=v λ $\lambda = 3 \times 10^{8}/5\times10^{19} = 6 \times 10^{-12}$m The em wave is Gamma ray. These rays are used in i) Industrial diagnostics ii) To study the structure of the nucleus. (Or any two valid uses)	½ 1 ½ ½ ½	**3**
21.	Diagram Correct construction steps on the basis of Huygens theory Derivation	1 1 1	**3**
22.	R.P. of a compound Microscope $= \frac{2\mu \sin\theta}{\lambda} = 2\mu \sin\theta \frac{\nu}{c}$ (i) When frequency ν increases, R.P. increases (ii) R.P. does not change with change in focal length of objective lens. (iii) When aperture increases, θ increases ∴ R.P. increases.	 1 ½ ½ 1	**3**
23.	Derivation for total energy For proving that total energy is negative of K.E. and half of potential energy	2 1	**3**
24.	Curve between mass number and average binding energy per nucleon. Explanation to release of energy during fusion and fission reactions based on the curve.	2 1	**3**

25.	Block Diagram Explanation	2 1	
	OR		**3**
	Explaining: (1) Ground waves (2) Space waves (3) Sky waves	 1 1 1	
26.	The needle need not float towards the northern side	*1*	
	The south pole is also attracted towards the southern side	*1*	
	The net force is on the needle is zero	*1*	***4***
	The torque is responsible for aligning the needle in the north – south direction	*1*	
27.	Labelled diagram	1	
	Principle	1	
	Working of a.c. generator.	1	
	Deduce the expression for emf generated.	1	
	The deflection of galvanometer depends on then direction of current and the needle will not be able to show a value as the direction of current is reversing several times periodically in every second.	1	**5**
	OR		
	principle, construction working of a transformer.	1 1 1	

	Mention any four causes of energy loss in a transformer.	2	
28.	graph Deducing the relation $$n = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$ **OR** Define diffraction. diagram Deduction of expression for fringe width of the central maxima of the diffraction pattern, produced by single slit illuminated with monochromatic light source.	1 4 1 1 3	**5**
29.	Circuit diagram Explanation Output versus input voltage curve Marking the region in which the transistor is used as a (i) switch, (ii) Amplifier. **OR** Forward and reverse characteristic curves of a PN junction diode. Circuit diagram Describing the working of PN junction diode as a full wave rectifier. **2f** in fullwave rectifier	1 1 1 1 1 1+1 1 1 ½ ½	**5**