1. Potentiometer because it has infinite resistance. ie, it does not draw any current from the cell at null point

2. As \( r = \frac{mv}{qB} = \frac{p}{qB} \)

\( r \propto p \) (as \( q \) and \( B \) are have same values for both the particles) 

Thus \( r_e : r_p = 1:1 \)

3. Short wave band means higher frequency of transmission. Higher the frequency longer is the distance

4. No influence

5. No 

Energy depends on amplitude and frequency and not on speed

6. (a) Since \( Q = CV \), It doubles

(b) Since \( U_E = \frac{1}{2} CV^2 \), it quadruples

7. Correct diagram

8. (a) Which draw \( I_{rms} = 10A \), costs more to operate as it consumes more power. Since \( I_{rms} \) for 12A is \( \frac{12}{\sqrt{2}} = 8.5 \) A.

9. \( K.E = h \gamma - h \gamma_0 \)

(i) Correct definition

(ii) Correct definition

10. Refer NCERT text book Vol – II Page No.322 fig b & c

11. Definition

Energy stored in the Inductor \( u = \frac{1}{2} L i^2 \)

12. Let \( x \) be the capacitance of each capacitors.

In series \( \frac{1}{c} = \frac{1}{x} + \frac{1}{x} + \ldots \ldots \ldots + n \) (terms)

\( \frac{1}{c} = n \cdot \frac{1}{x} \Rightarrow x = nc \)

In parallel \( y = ne + nc + \ldots \ldots \ldots + n \) (terms)

\( = n^2 c \)
13. Power due to the force \( p = \vec{F} \cdot \vec{V} \)  
\[ p = F \cdot V \cdot \cos 90^0 = 0 \]  
(or)

\[ \lambda = \frac{h}{\sqrt{2m_{\text{ev}}} (\text{with proper substitution of values})} \]  
\[ \frac{\lambda_1}{\lambda_2} = \sqrt{\frac{4m_p V^2}{m_p V_1}} = \sqrt{8} = \frac{2\sqrt{2}}{1} \]  

14. \[ r^1 = \left( \frac{E-V}{V} \right) R = \left( \frac{1.5-1.4}{1.4} \right) 8.5 \]  
\[ r^1 = 0.61 \Omega \]  
\[ r = 2 \times 0.61 = 1.22 \Omega \]

15. 

16. Current gain \( \beta = 25 \)  
Voltage gain \( A_v = \beta \frac{R_l}{R_i} \)  
\[ R_L = 6k \Omega \]

17. 
Binding energy per nucleon of \( ^1\text{H}^2 = 1.1 \text{ MeV} \)  
Total B.E of two \( ^1\text{H}^2 = 2.2 \text{ MeV} \)  
Total B.E of two deutron nuclei = \( 2 \times 2.2 = 4.4 \text{ MeV} \)  
B.E per nucleon of \( ^2\text{He}^4 = 7\text{MeV} \)  
Total B.E. of helium \( ^2\text{He}^4 = 4 \times 7 = 28 \text{ MeV} \)  
Energy released in fission = \( 28 - 4.4 = 23.6 \text{ MeV} \)
18. For the objective

\[ \frac{1}{f_0} = \frac{1}{v_0} - \frac{1}{u_0} \]  
\[ v_0 = 7.2 \text{ cm} \]  

For the eyepiece

\[ \frac{1}{f_e} = \frac{1}{v_e} - \frac{1}{u_e} \]  
\[ u_e = 2.27 \text{ cm} \]  

Separation between objective and the eyepiece = \( V_0 + (u_e) = 9.47 \text{ cm} \)

\[ \text{M.P} = \frac{v_0}{u_0} \left[ 1 + \frac{D}{f_e} \right] = 88 \] (1)

19. For correct definition

For correct unit

Mass number of D, \( A = 180 \)

Atomic number of D, \( Z = 72 \) (1 ½)

20. For Correct Definition

\[ \mu = \frac{A_m}{A_c} \] (1)

\[ \mu = \frac{a-b}{a+b} \] (1)

OR

For correct Definition of Space wave propagation

Used in TV, RADAR, Microwave communication

The range is maximum when the two antenna have a height \( h/2 \) each (1)

21. For correct Principle

For Correct diagram

\[ \frac{E_1}{E_2} = \frac{l_1}{l_2} \] (1)
22. For correct Principle
   For Correct diagram
   Working

23. The rays will emerge out of the face ac for which \( i < C \) where C is the critical angle

\[
\frac{\mu g}{\sin c} = \frac{1}{\sin c} \\
\text{here } i = 45^0 \quad \frac{\mu g}{\sin c} = \sqrt{2} = 1.41
\]

Thus the condition is \( \frac{\mu g}{\sin c} < 1.41 \)

only Red Ray will emerge out.

24. (a) Magnetic field \( \vec{B} \) must oscillate along
   \( \vec{R} \) ie \( (Z - \text{axis}) \) because \( \hat{i} = (\vec{J} \times \vec{k}) \)

(b) \( \frac{E_0}{B_0} = c \) (speed of light in vacuum)

25. Biot – savart’s law

26. (a) Electromagnetic Induction
   (b) No. Because refrigerator is a heat liberating agent

(i) Creating awareness, presence of mind coverage
27. Circuit Diagram

Phasor diagram
For derivation of Impedance

Resonance in the circuit

(or)

For correct labelled diagram
Principle
Construction
Workings

28. Assumptions

Sign conventions
Diagram
Correct derivation and lens maker’s formula

(or)

Correct answers of wave front and ray
(i) Correct diagram
(ii) Correct diagram
Principle
Diagram
For proving
29. (a) Correct circuit diagram
   Input wave form
   Output wave form
   \[ \beta = \frac{\Delta I_c}{\Delta I_B}, \quad I_E = I_B + I_C \]
   \[ I_C = \beta I_B \]
   \[ I_B = \frac{IE}{1 + \beta} = 0.1 \text{ mA} \] (1)
   \[ I_C = 59 \times 0.1 = 5.9 \text{ mA} \] (1)

   (or)

   (a) Correct diagram
   Metals (1)
   Insulators (1)
   Semiconductors (1)

   (b) Correct answer
   No it cannot detect (1)
   \([h \gamma \text{ has to be greater than } E_g]\)