केवल मूल्यांकनकर्ता के उपयोग हेतु!

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल 32 पृष्ठीय

केवल परीक्षक द्वारा भरा जावे। प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्टी करे।

प्रश्न क्रमांक	पृष्ठ क्रमांक		प्रश्न क्रमांक	पृष्ठ क्रमांक	
1			17		
2			18		
3			19		
4			20		
5			21		
6			22		
7			23		
8			24		
9			25		
10			26		
11			27		
12			28		
13					
14					
15					
16					

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

→ परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे

प्रमाणित किया जाता है कि अन्दर के पृष्ठों के अनुरूप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अंकों का योग सही है।

निर्धारित मुद्रा : नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदांकित संस्था के नाम की मुद्रा लगाएं।

परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा

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हस्ताक्षर एवं निर्धारित मुद्रा

योग पूर्व पृष्ठ + पृष्ठ 2 के अंक कुल अंक

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Question (1) A Choose the correct (Answers) :-

(a) Ans :- (ii) Polarisation

(b) Ans :- (i) Material of wire.

(c) Ans :- (iv) Oersted

(d) Ans :- (i) $R = 2f$

(e) Ans :- (iii) Isobar

(f) Ans :- (iv) Immobile ions

Question (2) Fill in the blanks (Answers) :-

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(a) Ans. :- decreases.

(b) Ans. :- diamagnetic.

(c) Ans. :- displacement

(d) Ans. :- objective piece.

(e) Ans. :- conduction band.

(f) Ans. :- holes

Question (3) True or False (Answers) :-

(a) Ans. :- True.

(b) Ans. :- False

(c) Ans. :- True

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(d) Ans :- False

(e) Ans :- False

Question (4) Match the column :-

Column 'A'		Column 'B' (Answers)
(a) Electrostatic force	-	Coulomb
(b) Direction of induced current	-	Lenz law
(c) Electromagnetic wave	-	Maxwell
(d) Double-slit experiment of interference	-	Young
(e) Dual nature of matter	-	De-Broglie
(f) Mass-energy equivalence relation	-	Einstein

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Question (5) One word :- (Answers)

(a) Ans. :- $1/\varepsilon_0$

(b) Ans. :- Ammeter

(c) Ans. :- 1

(d) Ans. :- At angle of minimum deviation when $i_1 = i_2$ and $r_1 = r_2$.

(e) Ans. :- P-type semiconductor.

Question (6) Answer :-

Charaterustics of electric field lines are :-

(i) They originate from positive charge and terminate on negative, that is the reason they never form closed loops.

(ii) Electric field lines never intersect each other.

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(iii) Tangent at any point on electric field gives the direction of electric field at that point.

Question (7) OR Answer :-

Step-up transformer	Step down transformer
(i) It increases the value of voltage.	(i) It decreases the value of voltage.
(ii) It decreases the value of current. In a ca	(ii) It increases the value of current.
(iii) The no. number of turns in secondary coil is more than number of coil turns in primary coil.	(iii) The number of turns in secondary coil is less than number of turns in primary coil.

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Question (8) Answer :-

Ampere's circuital law :- This law states that the line integral of magnetic field B in a closed curve is μ_0 times the current (i) enclosed by the closed curve.

Mathematical form :- $\oint B.\vec{dl} = \mu_0 i$.

Here μ_0 stands for permeability of free space.

Question (9) OR Answer :-

The highest frequency electromagnetic wave is Gamma rays. Their frequency ranges from 10^{18} to 10^{22} Hz. They have high penetrating power.

Uses of gamma rays are :-

(i) In destroying unwanted cells
(ii) In treatment of cancer.

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Question (10) OR Answer :-

If a When a ray of light enters from an optically rarer medium to an optically denser medium, :-

(i) The effect on velocity will be :- Velocity will decrease as velocity is less in optically denser medium.

(ii) The effect on frequency of light ray :- Frequency will not change As during refraction frequency remains unchanged

Question (11) OR Answer :-

Two features of nuclear force are :-

(i) It is a short range force i.e it is effective in a very short distance (10^{-15} m)

(ii) It is a strong attractive force.

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Question (12) Answer :-

Labelled diagram of forward bias of p-n junction diode :-

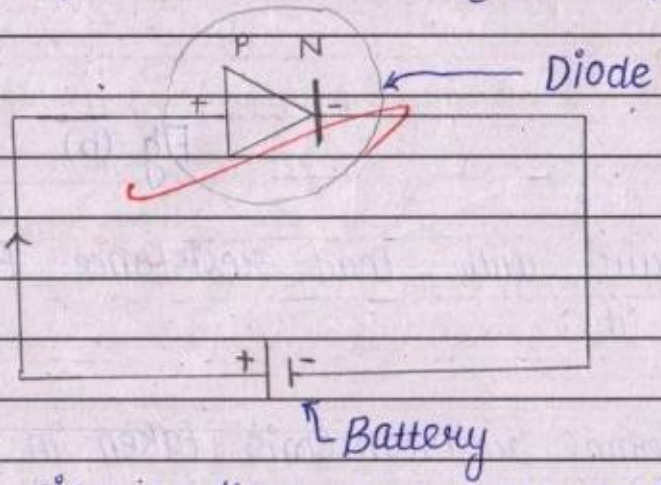

Fig :- Circuit diagram of forward bias

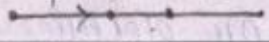

Fig :- diode behave as a wire

In forward bias positive terminal of battery is connected to P side and negative terminal is connected to the N side. The current is allowed to flow and diode behaves as a conducting wire.

Question (13) Answer :-

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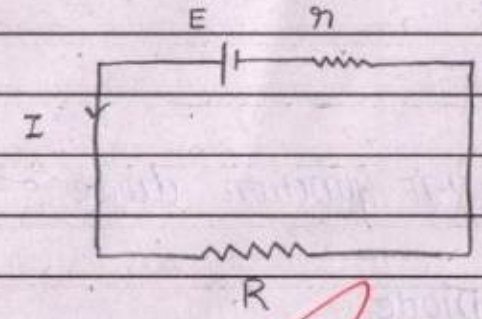

Fig. (a)

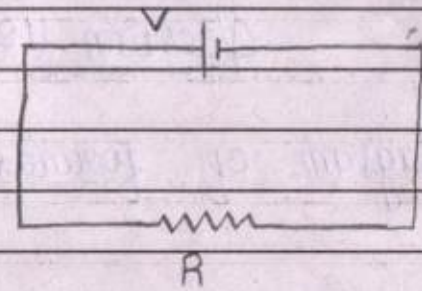

Fig. (b)

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Let an electric circuit with load resistance R and current I flows through it.

Now, in fig. (a) internal resistance is taken in account, so we have to take e.m.f. of cell.

According to ohm's law,

$$E = I(R+r)$$

$$\therefore I = \frac{E}{R+r} \quad \text{— (i)}$$

Now, in fig. (b) only load resistance is taken in account, so we have to take terminal voltage.

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According to Ohm's law,

$$V = IR$$

$$I = \frac{V}{R} \quad \text{--- (ii)}$$

Equating eq. (i) and (ii) we get,

$$\frac{E}{(R+r)} = \frac{V}{R}$$

$$\frac{E}{V} = \frac{(R+r)}{R}$$

$$\frac{ER}{V} = R + r$$

$$\frac{ER}{V} - R = r$$

$$\boxed{r = R\left(\frac{E}{V} - 1\right)}$$

Now, from eq. (i),

$$I = \frac{E}{(R+r)}$$

$$E = IR + Ir$$

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$E = V + Ir$ (from eq. (ii))

$\therefore \boxed{V = E - Ir}$

Here, E = EMF
r = internal resistance.

This is the required expression.

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Question (14) Answer :-

Given,

Length of solenoid (l) = 2 m.
Number of turns (N) = 100 turns
Current (i) = 10 A.

We know that magnetic field inside solenoid is given as :-

$\because B = \mu_0 n i$ (n is number of turns per unit length)

$B = \frac{\mu_0 N i}{l}$ ($\because n = \frac{N}{l}$)

Putting the given values :-

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$$B = 4\pi \times 10^{-7} \times \frac{100}{2} \times 10$$

$$B = 2\pi \times 10^{-7} \times 10^{3}$$

$$B = 2 \times 3.14 \times 10^{-4}$$

$$B = 6.28 \times 10^{-4} \text{ N/A-m. or Tesla}$$

Thus, magnitude of magnetic field inside solenoid is 6.28×10^{-4} Tesla

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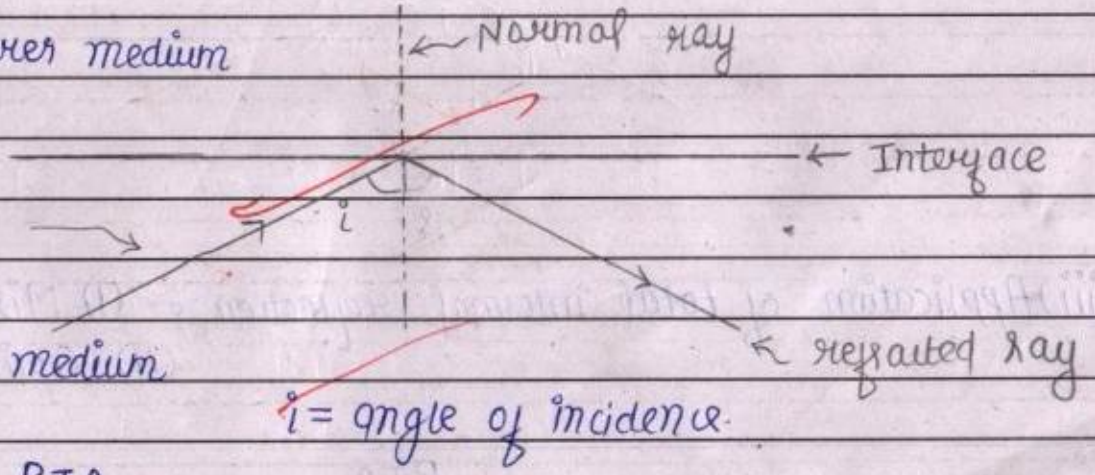
Question (15) Answer :-

Total internal reflection of light :-

(i) Ray diagram :-



i = angle of incidence

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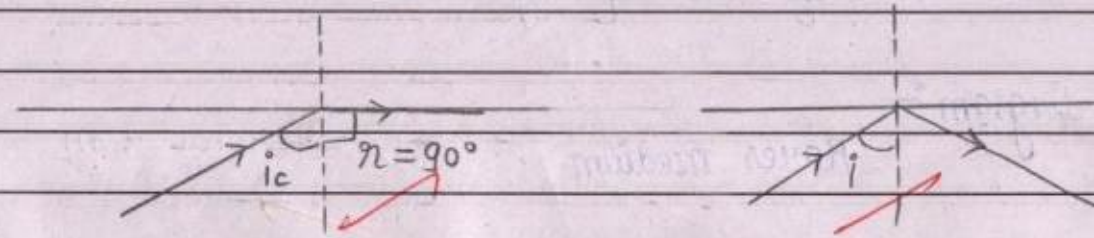
(ii) Definition :- When ray of light travels from denser to rarer medium, it gets reflected back in the same medium on some special condition, this phenomenon is called total internal reflection.

Condition for total internal reflection :-
(i) Ray of light must travel from denser to rarer medium.
(ii) The incident angle must be greater than critical angle.

Critical angle :- That angle of incident on which ray of light becomes perpendicular to the normal.



$i = i_c$ $i > i_c$

(iii) Application of total internal reflection :- (I) Mirage formation
(II) Optical fibres.

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Question (16) Answer :-

Photoelectric effect was described by Einstein.

Three experimental observations of photoelectric effect :-

(1) The electrons are emitted from the surface of metal only when light of suitable frequency (threshold frequency) is incident on metal.

(2) The number of electrons ejected is directly proportional to the intensity of light.

(3) The maximum Kinetic energy of electrons depends on frequency of light

(4) There is no time lag between incident light and ejection of electron

Einstein's equation of photoelectric effect :- $KE_{max} = h\nu - h\nu_0$

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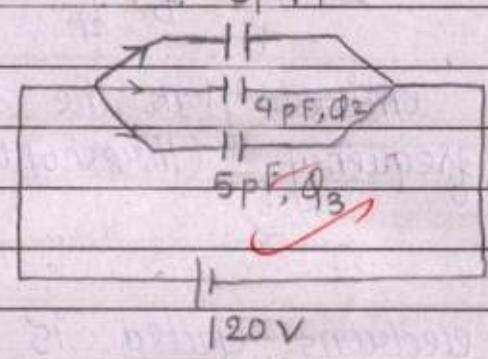
Question (17) OR Answer :-

Given, three capacitors of capacitance 3pF, 4pF and 5pF are connected in parallel to a 120 V battery.

Circuit diagram :-



Now, charge across each capacitor

$$q_1 = C_1V \quad -(i)$$
$$q_2 = C_2V \quad -(ii)$$
$$q_3 = C_3V \quad -(iii)$$

Let the total charge be q.

$$q = q_1 + q_2 + q_3$$
$$C_{eq}V = C_1V + C_2V + C_3V$$
$$V\,C_{eq} = V(C_1 + C_2 + C_3)$$
$$C_{eq} = C_1 + C_2 + C_3$$

(potential is same in parallel combination)

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$\therefore C_{eq} = 3pF + 4pF + 5pF$

$C_{eq} = 12\,pF$ or $12 \times 10^{-12}\,F$.

Total capacitance of combination is 12 pF.

Now,

Charge on each capacitor,

from eq. (i), $Q_1 = CV_1$

$Q_1 = 3 \times 120$

$Q_1 = 360\,pC$ or $360 \times$

from eq. (ii), $Q_2 = C_2V$

$Q_2 = 4 \times 120$

$Q_2 = 480\,pC$ or $480 \times$

$Q_3 =$

from eq. (iii)

$Q_3 = C_3V$

$Q_3 = 5 \times 120$

$Q_3 = 600\,pC$ or $600 \times$

Hence, charge on capacitor 3pF is 360 pC, 4pF is 480 pC and 5pF is 600 pC.

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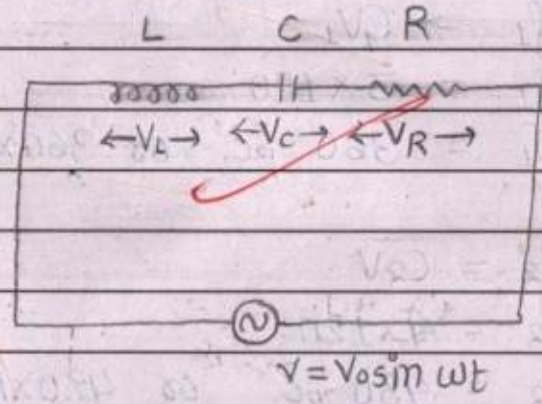
Question (18) OR Answer :-

Series LCR circuit :-

Let an inductor, a capacitance and a resistance connected in series in a circuit

Circuit diagram :-



Let the voltage in the circuit at any instant t is $V_0 \sin \omega t$ and current I is flowing in the circuit.

Now, potential difference across inductor, capacitor and resistance will be,

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By ohm's law, $V_L = IX_L$ — (i)

$V_C = IX_C$ — (ii)

$V_R = IR$ — (iii)

Now, we know that the potential difference in inductor and capacitance have a phase difference of 90° with the current, the in inductor potential leads current and in capacitance potential lags and current leads. And in resistance there is no phase difference between current and voltage.

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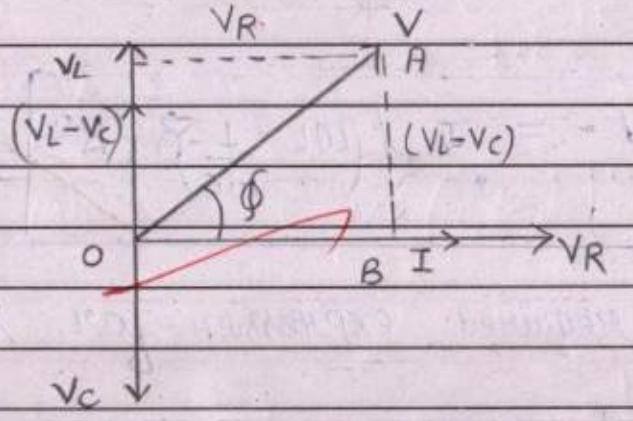
Phasor diagram :-



(Let V be the resultant voltage)

Now in $\triangle AOB$, by pythagoras theorem,

$V = \sqrt{\quad}$

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$$(AO)^2 = (AB)^2 + (OB)^2$$

$$V^2 = (V_L - V_C)^2 + V_R^2$$

$$V = \sqrt{(V_L - V_C)^2 + V_R^2}$$

$$V = \sqrt{(IX_L - IX_C)^2 + (IR)^2}$$

$$V = \sqrt{I^2(X_L - X_C)^2 + I^2R^2}$$

$$V = I\sqrt{(X_L - X_C)^2 + R^2}$$

$$\left(\because X_L = \omega L \quad X_C = \frac{1}{\omega C}\right)$$

$$\boxed{V = I\sqrt{\left(\omega L - \frac{1}{\omega C}\right)^2 + R^2}} \quad \text{(iv)}$$

This is the required expression for resultant voltage in LCR circuit

Impedance :- The resultant resistance provided in the path of current when more than one component (L, C, R) is present in a circuit is called impedence. Its unit is Ω. It is denoted by Z.

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From ohm's law, $\frac{V}{I} = Z$.

from eq. (iv)

$$\frac{V}{I} = \sqrt{\left(\omega L - \frac{1}{\omega C}\right)^2 + R^2}$$

$$\boxed{Z = \sqrt{\left(\omega L - \frac{1}{\omega C}\right)^2 + R^2}}$$

B S E

Phase difference :- The angle between resultant voltage and current in a circuit is called phase difference.

In ΔAOB,

$$\tan\phi = \frac{P}{B} = \frac{|V_L - V_C|}{V_R}$$

$$\tan\phi = \frac{IX_L - IX_C}{IR} \quad \left(\because V_L = IX_L,\ V_C = IX_C,\ V_R = IR\right)$$

$$\tan\phi = \frac{I}{I}\left(\frac{X_L - X_C}{R}\right)$$

$$\boxed{\phi = \tan^{-1}\left(\frac{X_L - X_C}{R}\right)}$$

Incomplete

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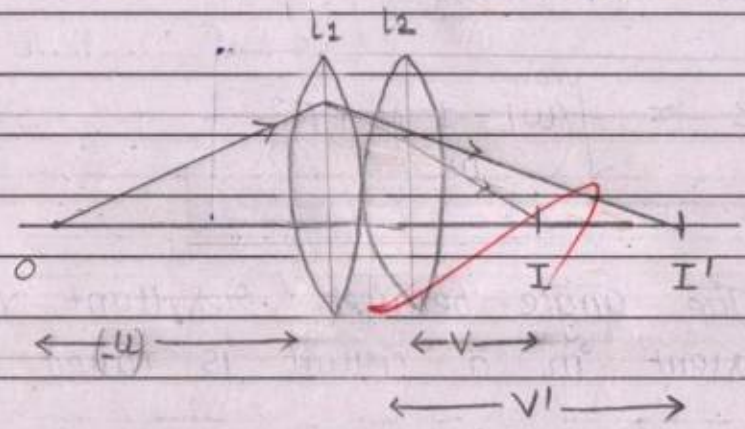
Question (19) Answer :-

Let two lenses L_1 and L_2 kept in contact. L_1 having focal length f_1 and L_2 having focal length f_2.



Suppose the object is kept at distance u from the lens (1) and image I' is formed at a distance V' from optical centre.

Now, by lens formula for L_1, $\frac{1}{f} = \frac{1}{v} \frac{-1}{u}$

$$\frac{1}{f_1} = \frac{1}{V'} - \frac{1}{u} \quad \text{— (i)}$$

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Now, by lens formula for L_2, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$.

For L_2, I' acts as an object and image I is formed at distance v.

$$\therefore \frac{1}{f_2} = \frac{1}{v} - \frac{1}{v'} \quad \text{—(ii)}$$

Adding eq. (i) and (ii) we get,

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v'} - \frac{1}{u} + \frac{1}{v} - \frac{1}{v'}$$

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{f} \qquad \left(\because \frac{1}{v} - \frac{1}{u} = \frac{1}{f}\right)$$

$$\therefore \boxed{\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}} \quad \text{—(iii)}$$

Now, let the power of L_1 be P_1 and L_2 be P_2,

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from eq.(iii)

$$\boxed{P_1 + P_2 = P} \qquad \left(\because \frac{1}{f} = P\right)$$

Therefore, the net power of combination of two thin lens kept in contact is $P_1 + P_2$.

B S E

Question (20) OR Answer :-

Nuclear fusion :- The process in which two lighter nuclei combine to form a single nuclei under high pressure and temperature with release of high amount of energy is called Nuclear fusion. It requires very high temp. of order 10^8 K.

Example :- $${}_1^2H + {}_1^2H \longrightarrow {}_1^3H + {}_1^1H + 4\ \text{Mev.}$$

$${}_1^3H + {}_1^2H \longrightarrow {}_2^4He + {}_0^1n + 17.6\ \text{MeV.}$$

Therefore, fusion of deuterium isotopes releases 21.6 Mev energy.

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Nuclear fission :- The process in which slow neutrons are bombarded on a heavy nucleus and it breaks into two smaller nuclei is called nuclear fission. Tremendous amount of energy is released in this process.

Example :- When a slow neutron is bombarded on a Uranium $^{235}_{92}U$ nuclei it absorbs the neutron and is converted into a highly unstable nuclei $^{236}_{92}U$ which then breaks into two lighter nuclei $^{142}_{56}Ba$ and $^{89}_{36}Kr$ with release of an α particle and energy 190 Mev.

$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{236}_{92}U \longrightarrow {}^{142}_{56}Ba + {}^{89}_{36}Kr + {}^{4}_{2}He + 190\ Mev$$

(Unstable)

END