Physicsaholics

DPP – 4 (EMI)

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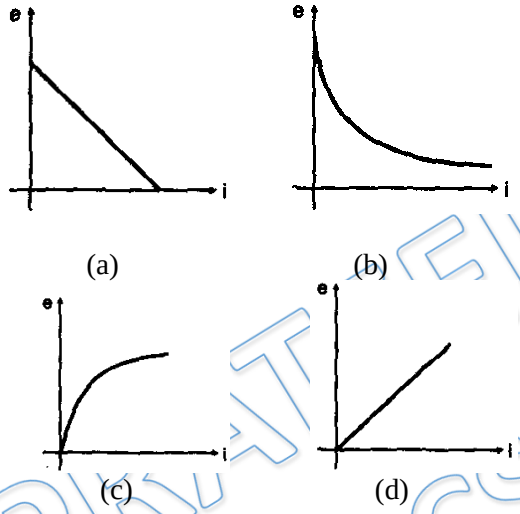
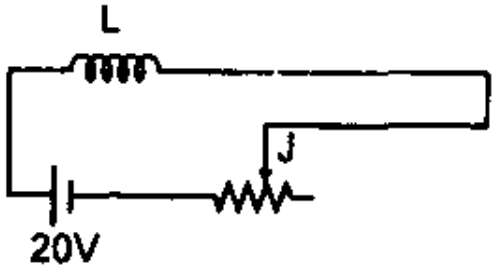
Q 1. In an L-R circuit connected to a battery of constant emf E switch s is closed at time t = 0. If e denotes the induced emf across inductor and i the current in the circuit at any time t. Then which of the following graphs shows the variation of e with i?

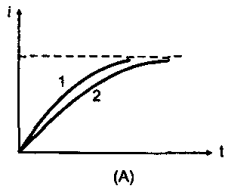


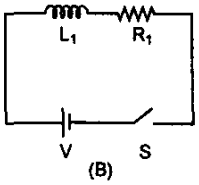
Q 2. In the circuit shown in figure the jockey J is being pulled towards right so that the resistance in the circuit is increasing. Its value at some instant is 5 Ω. The current in the circuit at this instant will be:

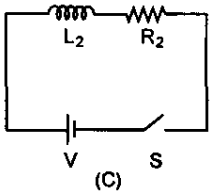


(a) 4 A
(b) less than 4 A
(c) more than 4 A
(d) may be less than or more than 4 A depending on the value of L

Q 3. Current growth in two L-R circuits (B) and (C) is as shown in figure (A). Let L_1, L_2, R_1 and R_2 be the corresponding values in two circuits. Then:

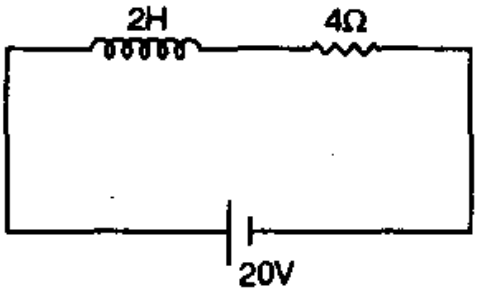






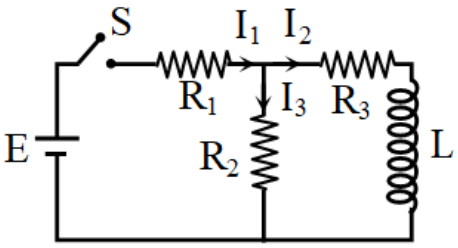
(a) $R_1 > R_2$ (b) $R_1 = R_2$ (c) $L_1 > L_2$ (d) $L_1 < L_2$

Q 4. In the L-R circuit shown in figure, potential difference across the resistance at some instant is 4 V. Then:



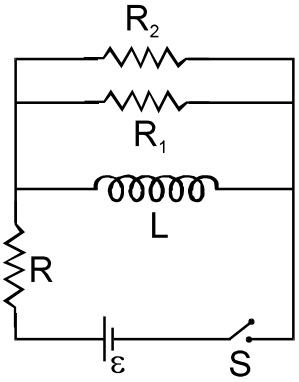
(a) current is increasing at a rate of 8 A/s at this instant
(b) power supplied by the battery at this instant is 20 W
(c) power stored in the magnetic field at this instant is 16 W
(d) current in the circuit at this instant is 1 A

Q 5. In the figure circuit, if E = 10V, R_1 = 2 ohm, R_2 = 3 ohm, R_3 = 6 ohm and L = 5 henry. The current I_1 just after pressing the switch S is



(a) (10/4) ampere
(b) (10/5) ampere
(c) (10/12) ampere
(d) (10/6) ampere

Q 6. Switch S is closed for a long time . at t = 0 It is opened, then:



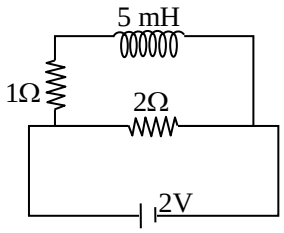
(a) total heat produced in resistor R after opening the switch is $\frac{1}{2}\frac{L\varepsilon^2}{R^2}$

(b) total heat produced in resistor R_2 after opening the switch is $\frac{1}{2}\frac{L\varepsilon^2}{R^2}\left(\frac{R_1}{R_1+R_2}\right)$

(c) heat produced in resistor R_1 after opening the switch is $\frac{1}{2}\frac{R_2 L\varepsilon^2}{(R_1+R_2)R^2}$

(d) Current through R_1 just after opening the switch is $\frac{\varepsilon}{R}.\left(\frac{R_1}{R_1+R_2}\right)$

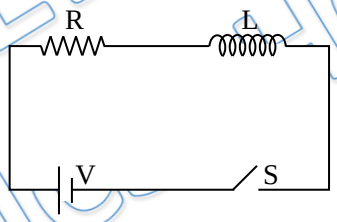
Q 7. When induced emf in inductor coil is 50% of its maximum value then stored energy in inductor coil in the given circuit will be-



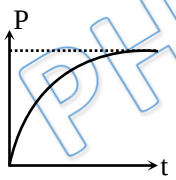
(a) 2.5 mJ (b) 5 mJ
(c) 15 mJ (d) 20 mJ

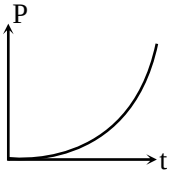
Passage (Q.8 to Q.10)

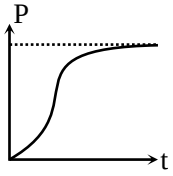
A resistor and inductor are connected in series through a battery. The switch S is closed at time t = 0.

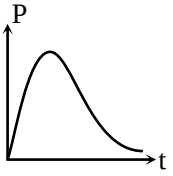


Q 8. The rate of Joule heating (P) in resistor varies with the time 't' is best represented by the graph.

(A) 

(B) 

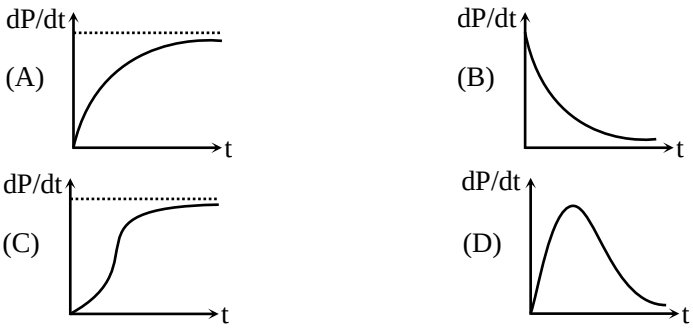
(C) 

(D) 

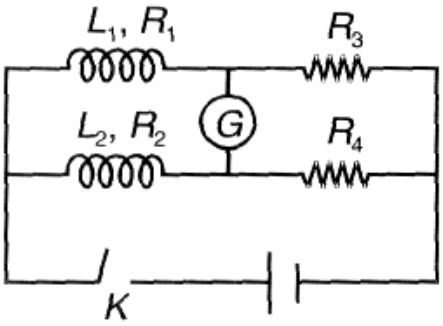
Q 9. What is the magnitude of current flowing when the rate of increase of magnetic energy in the inductor is maximum –

(a) I = V/R (b) I = V/2R
(c) I = V/4R (d) I = (V/R) ln2

Q 10. Which of the following graph best represent rate of change of power dissipated in resistor as a function of time -



Q 11. After the key k is closed, galvanometer in the shown arrangement shows zero deflection at all the times if (R_1, and R_2 are resistances of inductors L_1 and L_2)



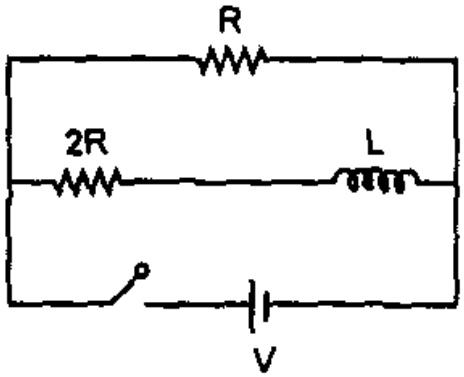
(a) $\frac{R_1}{R_2} = \frac{R_3}{R_4} = \frac{L_1}{L_2}$

(b) $\frac{R_2}{R_1} = \frac{R_3}{R_4} = \frac{L_1}{L_2}$

(c) $\frac{L_1}{L_2} = \frac{R_1}{R_2}$

(d) $\frac{L_1}{L_2} = \frac{R_3}{R_4}$

Q 12. The ratio of time constants during current growth and current decay of the circuit shown in figure is:



(a) 1 : 1 (b) 3 : 2 (c) 2 : 3 (d) 1 : 3

Answer Key

Q.1 a	Q.2 c	Q.3 b, d	Q.4 a, b, c, d	Q.5 b
Q.6 b, c	Q.7 a	Q.8 c	Q.9 b	Q.10 d
Q.11 a	Q.12 b			