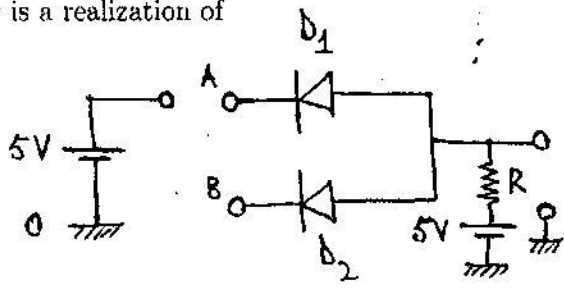15. The zeroeth law of thermodynamics introduces the concept of

(A) pressure

(B) volume

(C) temperature

(D) density

16. A nonmagnetic medium with dielectric function ϵ is dispersive if

(A) ϵ is complex

(B) ϵ is a tensor

(C) ϵ has a spatial dependence

(D) ϵ has a frequency dependence

17. Given that CsCl crystal has a b.c.c. structure and the radii of Cs and Cl ions are r_1, and r_2, respectively, the lattice constant of this structure is given by

(A) $(r_1 + r_2)/\sqrt{2}$

(B) $(r_1 + r_2)/\sqrt{3}$

(C) $2(r_1 + r_2)/\sqrt{3}$

(D) $(r_1 + 2r_2)/\sqrt{3}$

18. The circuit shown below is a realization of

(A) AND gate

(B) OR gate

(C) XOR gate

(D) NAND gate

19. For a CE transistor to function as an amplifier it is necessary to keep

(A) $B - E$ junction forward biased and $C - B$ junction forward biased

(B) $B - E$ junction reverse biased and $C - B$ junction forward biased

(C) $B - E$ junction reverse biased and $C - B$ junction reverse biased

(D) $B - E$ junction forward biased and $C - B$ junction reverse biased

where E, B and C refer to emitter, base, and collector.

20. The width of an excited state (Γ) is related to its life time (τ) by

(A) $\Gamma = \hbar/\tau$

(B) $\Gamma = \tau\hbar$

(C) $\Gamma = 1/\tau$

(D) $\Gamma = C/\tau$