PHYSICS

31. (1)

Energy gap, $\Delta E_g = \frac{hc}{\lambda} \Rightarrow \lambda = \frac{hc}{\Delta E_g}$

$\Rightarrow \lambda = \frac{1242}{1.9}\text{nm} = 654 \text{ nm}$ of red colour

32. (3)

Both the diodes are reverse biased, so there is no flow of current through 5 Ω and 20 Ω resistances.

Now, two resistors of 10 Ω and two resistors of 5 Ω are in series.

Hence, current I through the network = 0.3 A

33. (3)

As we know, current density,

$j = \sigma E = nev_d$

$\sigma = ne\frac{v_d}{E} = ne\mu$

$\frac{1}{\sigma} = \rho = \frac{1}{n_e e\mu_e} = \text{Resistivity}$

$= \frac{1}{10^{19} \times 1.6 \times 10^{19} - 19 \times 1.6}$ or $P = 0.4\ \Omega m$

34. (1)

For same value of current higher value of voltage is required for higher frequency hence (1) is correct answer.

35. (1)

Si and Ge are semiconductors but C is an insulator. In Si and Ge room temperature, the energy band gap is low due to which electrons in the covalent bonds gains kinetic energy and break the bond and move to conduction band. As a result, hole is created in valence band. So, the number of free electrons is significant in Si and Ge.

36. (3)

For different values of A and B input, obtain output Z,

A	B	X	Y	Z
1	1	0	0	0
1	0	0	1	0
0	1	1	0	0
0	0	1	1	1

Therefore the given circuit represents NOR gate.

37. (2)

Truth table → The output is of OR-gate

A	B	$\overline{A}$	$\overline{B}$	$\overline{\overline{A} \cdot \overline{B}}$
0	0	1	1	0
0	1	1	0	1
1	0	0	1	1
1	1	0	0	1

38. (4)

The final Boolean expression

A	**B**	**Y**
0	**0**	**0**
0	**1**	**0**
1	**0**	**0**
1	**1**	**1**

$Y = \left(\overline{\overline{A} + \overline{B}}\right) = \overline{\overline{A}} \cdot \overline{\overline{B}} = A \cdot B$

Thus, it is an AND gate for which truth table is

39. (4)

The truth table for the above circuit is

A	B	C
1	1	1
1	0	1
0	1	1
0	0	0

When either A or B conducts, the gate conducts. It means C = A + B which is for OR gate.

40. (2)

Power dissipated = P

$= \frac{V^2}{R} = \frac{(18)^2}{6} = 54\text{ W}$