

# PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

## Diodes - CSIR NET Physics PYQs

Electronics . All PYQs (2015-2025) with answer key

**15 questions . Answer key included**

---

[www.physicsbyaaryan.com](http://www.physicsbyaaryan.com) . [www.csirnetphysics.com](http://www.csirnetphysics.com)

Contact: 9501976811

**Q1. [Dec 2015] . 3.5 marks**

Electronics &gt; Diodes

CSIR NET	2015 Dec	3.5 M
----------	----------	-------

If the reverse bias voltage of a silicon varactor is increased by a factor of 2, the corresponding transition capacitance

1. increases by a factor of  $\sqrt{2}$
2. increase by a factor of 2
3. decreases h a factor of  $\sqrt{2}$
4. decreases by a factor of 2

**Q2. [Dec 2016] . 3.5 marks**

Electronics &gt; Diodes

CSIR NET	2016 Dec	3.5M
----------	----------	------

The active medium in a blue LED (light emitting diode) is a  $\text{Ga}_x\text{In}_{1-x}\text{N}$  alloy. The band gaps of GaN and InN are 3.5 eV and 1.5 eV respectively. If the band gap of  $\text{Ga}_x\text{In}_{1-x}\text{N}$  varies approximately linearly with  $x$ , the value of  $x$  required for the emission of blue light of wavelength 400 nm is (take  $hc \approx 1200\text{eV} - \text{nm}$ )

1. 0.95
2. 0.75
3. 0.50
4. 0.33

**Q3. [June 2016] . 3.5 marks**

Electronics &gt; Diodes

CSIR NET	2016 June	3.5M
----------	-----------	------

The intensity distribution of a red LED on an absorbing layer of material is a Gaussian centred at the wavelength  $\lambda_0 = 660 \text{ nm}$  and width  $20 \text{ nm}$ . If the absorption coefficient varies with wavelength as  $\alpha_0 - K(\lambda - \lambda_0)$ , where  $\alpha_0$  and  $K$  are positive constants, the light emerging from the absorber will be

1. blue shifted retaining the Gaussian intensity distribution
2. blue shifted with an asymmetric intensity distribution
3. red shifted retaining the Gaussian intensity distribution
4. red shifted with an asymmetric intensity distribution

**Q4. [Dec 2017] . 3.5 marks**

Electronics &gt; Diodes

CSIR NET	2017 Dec	3.5M
----------	----------	------

A Zener diode with an operating voltage of 10 V at 25°C has a positive temperature coefficient of 0.07% per °C of the operating voltage. The operating voltage of this Zener diode at 125°C is

1. 12.0 V
2. 11.7 V
3. 10.7 V
4. 9.3 V

Q5. [Dec 2017] . 5.0 marks

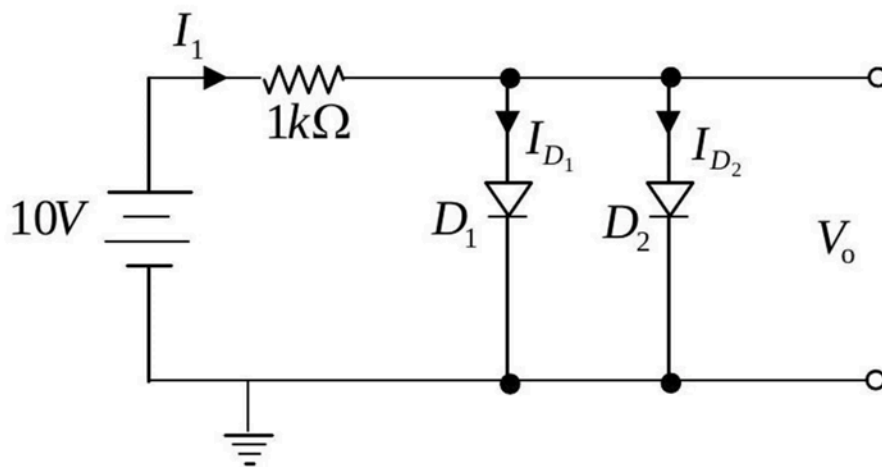
Electronics &gt; Diodes

CSIR NET

2017 Dec

5M

In the circuit below,  $D_1$  and  $D_2$  are two silicon diodes with the same characteristics. If the forward voltage drop of a silicon diode is  $0.7V$  then the value of the current  $I_1 + I_{D_1}$  is



1. 18.6 mA
2. 9.3 mA
3. 13.95 mA
4. 14.65 mA

## Q6. [June 2017] . 5.0 marks

Electronics &gt; Diodes

CSIR NET	2017 June	5M
----------	-----------	----

Let  $I_0$  be the saturation current,  $\eta$  the ideality factor and  $v_F$  and  $v_R$  the forward and reverse potentials respectively, for a diode. The ratio  $R_R/R_F$  of its reverse and forward resistances  $R_R$  and  $R_F$ , respectively, varies as (In the following  $k_B$  is the Boltzmann constant,  $T$  is the absolute temperature and  $q$  is the charge.)

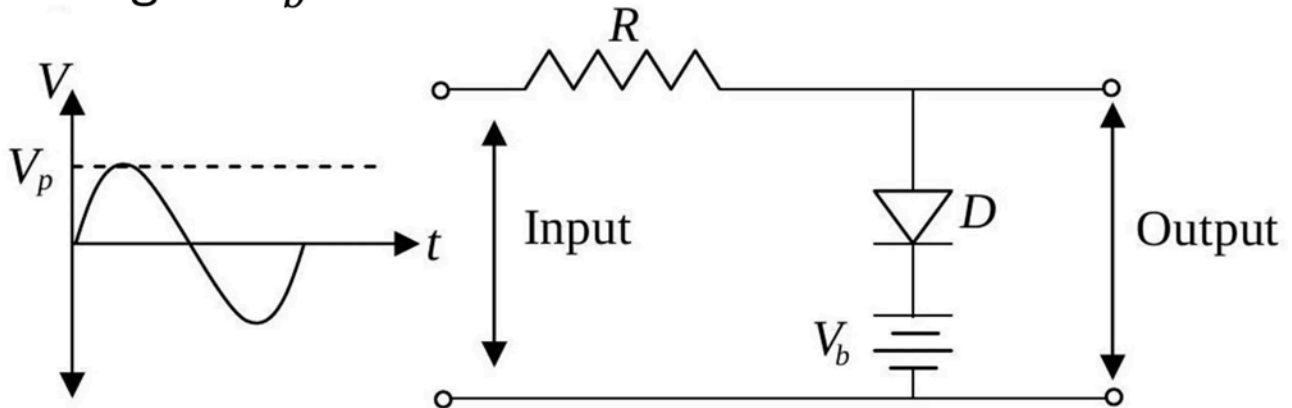
1.  $\frac{v_R}{v_F} \exp\left(\frac{qv_F}{\eta k_B T}\right)$
2.  $\frac{v_F}{v_R} \exp\left(\frac{qv_F}{\eta k_B T}\right)$
3.  $\frac{v_R}{v_F} \exp\left(-\frac{qv_F}{\eta k_B T}\right)$
4.  $\frac{v_F}{v_R} \exp\left(-\frac{qv_F}{\eta k_B T}\right)$

Q7. [Dec 2018] . 3.5 marks

Electronics > Diodes

CSIR NET	2018 Dec	3.5M
----------	----------	------

A sinusoidal voltage having a peak value of  $V_p$  is an input to the following circuit, in which the DC voltage is  $V_b$



Assuming an ideal diode which of the following best describes the output waveform?

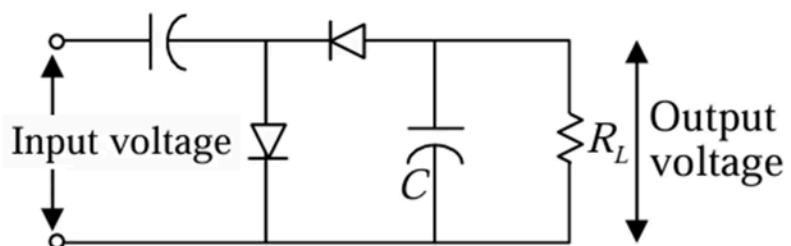
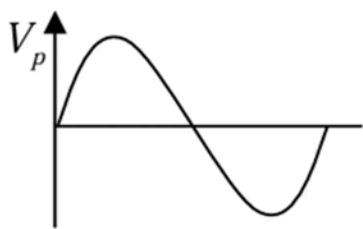
- 1.
- 2.
- 3.
- 4.

Q8. [June 2018] . 3.5 marks

Electronics > Diodes

CSIR NET	2018 June	3.5M
----------	-----------	------

In A sinusoidal signal with a peak voltage  $V_p$  and average value zero, is an input to the following circuit. Assuming ideal diodes, the peak value of the output voltage across the load resistor  $R_L$  is



1.  $V_p$
2.  $\frac{V_p}{2}$
3.  $2V_p$
4.  $\sqrt{2}V_p$

Q9. [Dec 2019] . 3.5 marks

Electronics &gt; Diodes

CSIR NET

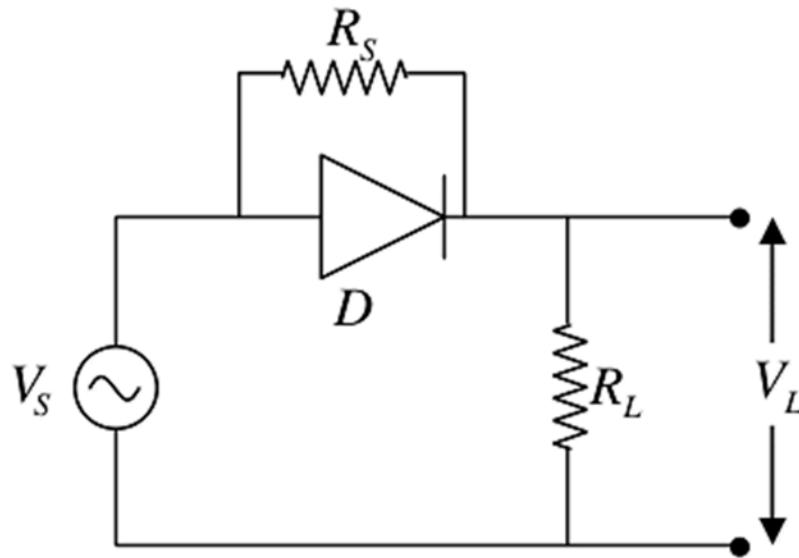
2019 Dec

3.5M

In the circuit below,  $D$  is an ideal diode, the source voltage  $V_S = V_0 \sin \omega t$  is a unit amplitude sine wave and  $R_S = R_L$

The average output voltage,  $V_L$ , across the load resistor  $R_L$  is

1.  $\frac{1}{2\pi} V_0$
2.  $\frac{3}{2\pi} V_0$
3.  $3V_0$
4.  $V_0$



**Q10. [June 2019] . 5.0 marks**

Electronics &gt; Diodes

CSIR NET	2019 June	5M
----------	-----------	----

The forward diode current is given by

$I = kT^\alpha e^{-E_g/k_B T} (\exp(eV/k_B T) - 1)$ , where  $E_g$  is the band gap of the semiconductor,  $V$  is the voltage drop across the diode,  $T$  is the temperature of the diode operating near room temperature and,  $\alpha$  and  $K$  are constants. A diode is used as a thermal sensor in the circuit shown below.

If  $V$  is measured using an ideal voltmeter to estimate  $T$ , the variation of the voltage  $V$  as a function of  $T$  is best approximated by (in the following  $a$  and  $b$  are constants)

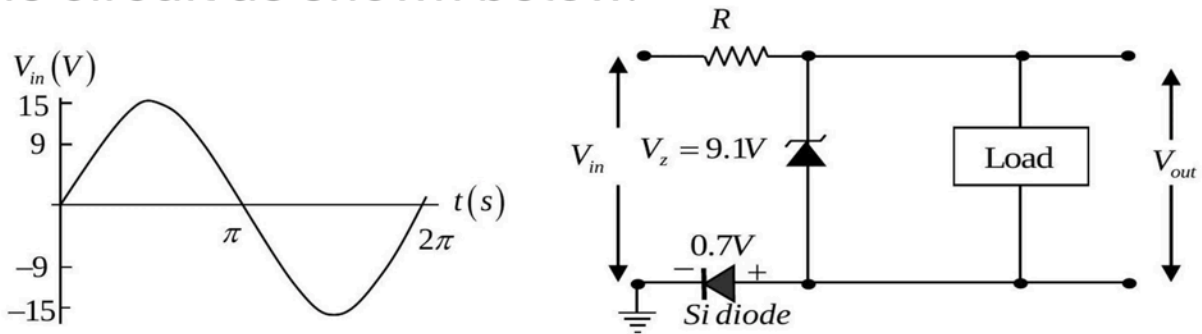
1.  $aT^2 + b$
2.  $aT + b$
3.  $aT^3 + b$
4.  $aT + bT^2$

Q11. [June 2022] . 3.5 marks

Electronics > Diodes

CSIR NET	2022 June	3.5M
----------	-----------	------

A high impedance load (network) is connected in the circuit as shown below.



The forward voltage drop for silicon diode is 0.7 V and the Zener voltage is 9.10 V . If the input voltage ( $V_{in}$ ) is sine wave with an amplitude of 15 V (as shown in the figure above), which of the following waveform qualitatively describes the output voltage ( $V_{out}$ ) across the load?

- 1.
- 2.
- 3.
- 4.

Q12. [Dec 2023] . 3.5 marks

Electronics > Diodes

CSIR NET	2023 Dec	3.5 M
----------	----------	-------

The light incident on a solar cell has a uniform photon flux in the energy range of 1 eV to 2 eV and is zero elsewhere. The active layer of the cell has a bandgap of 1.5 eV and absorbs 80% of the photons with energies above the bandgap. Ignoring non-radiative losses, the power conversion efficiency (ratio of the output power to the input power) is closest to

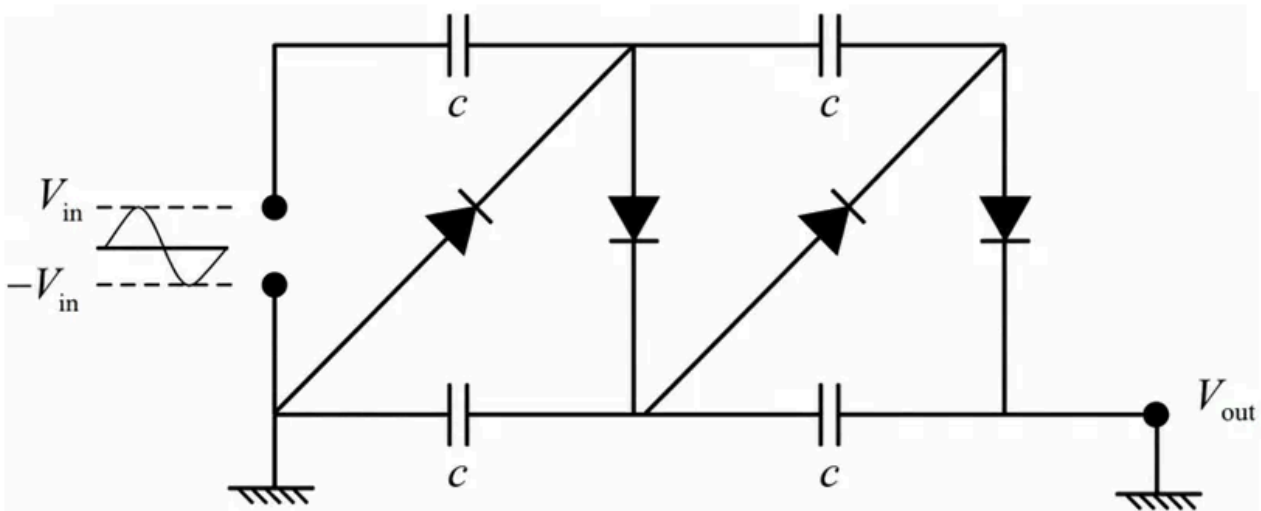
1. 47%
2. 70%
3. 23%
4. 35%

Q13. [June 2023] . 5.0 marks

Electronics &gt; Diodes

CSIR NET	2023 June	5M
----------	-----------	----

In the circuit shown below, four silicon diodes and four capacitors are connected to a sinusoidal voltage source of amplitude  $V_{in} > 0.7 \text{ V}$  and frequency  $1 \text{ kHz}$ .



If the knee voltage for each of the diodes is  $0.7 \text{ V}$  and the resistances of the capacitors are negligible, the DC output voltage  $V_{out}$  after 2 seconds of starting the voltage source is closest to

1.  $1.4 V_{in} - 0.7 \text{ V}$
2.  $4 V_{in} - 2.8 \text{ V}$
3.  $V_{in} - 0.7 \text{ V}$
4.  $V_{in} - 2.8 \text{ V}$

Q14. [Dec 2024] . 5.0 marks

Electronics &gt; Diodes

CSIR NET

2024 Dec

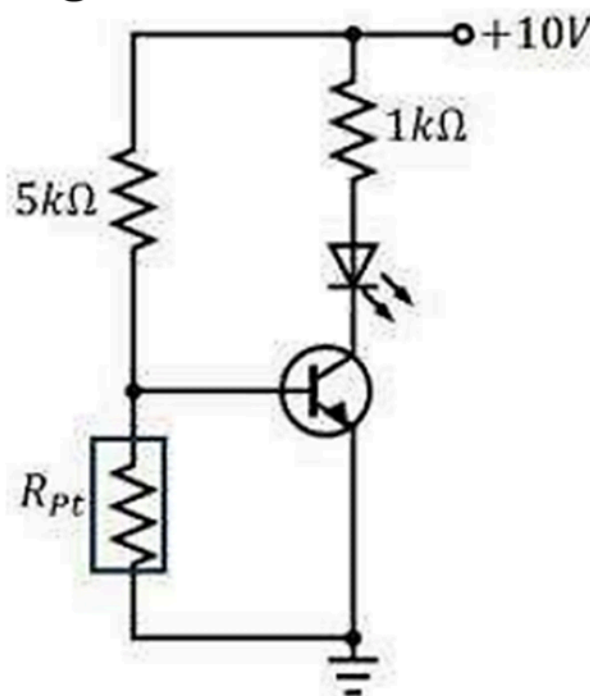
5M

An LED is required to glow brightly when the temperature sensed by a Platinum resistance thermometer exceeds a certain value. In the circuit shown below, the resistance of the Pt thermometer (in ohms) varies as

$$R_{Pt}(T) = 100 + 0.4 T$$

where  $T$  is temperature in degree Celsius. The transistor turns on when  $V_{BE} > 0.7 V$  and it has a very high current gain. The temperature at which the LED would start glowing is closest to

1.  $850^{\circ}\text{C}$
2.  $400^{\circ}\text{C}$
3.  $500^{\circ}\text{C}$
4.  $700^{\circ}\text{C}$

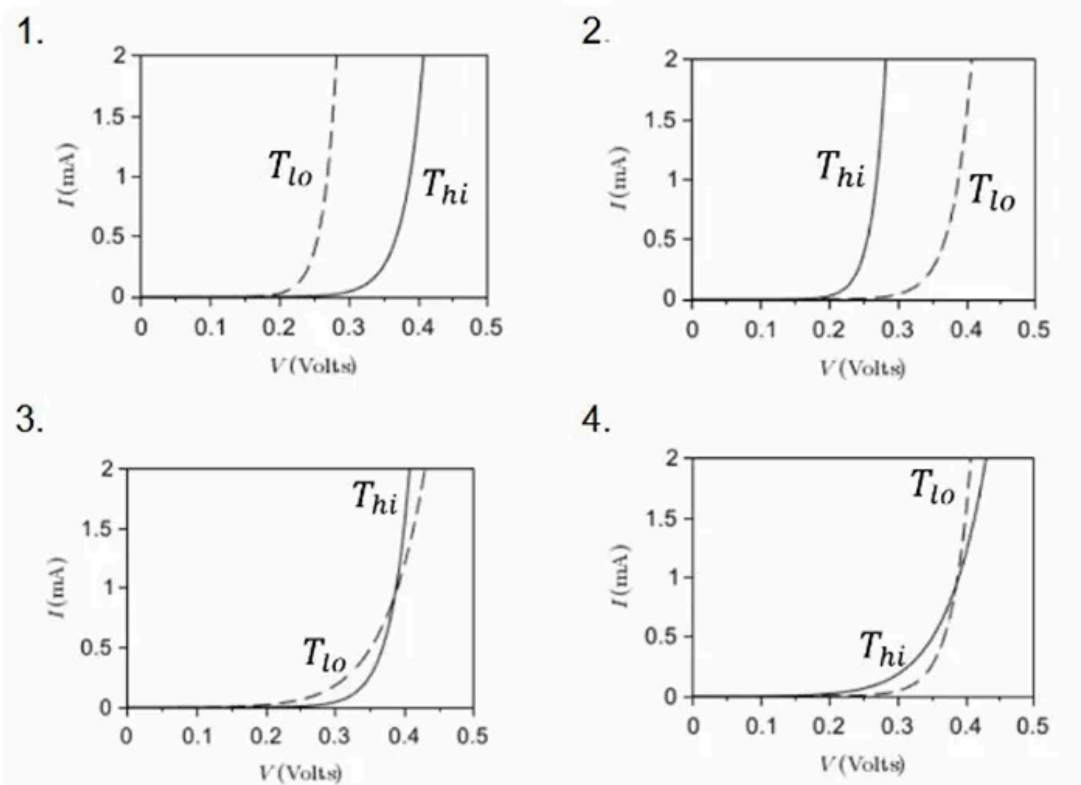


Q15. [June 2025] . 3.5 marks

Electronics > Diodes

CSIR NET	2025 June	3.5M	Electronics
----------	-----------	------	-------------

A Silicon p-n junction diode is operated under forward bias at two temperatures  $T_{hi} \approx 300$  K, (shown by solid line) and  $T_{lo} \approx 200$  K, (shown by dotted line). Which of the following plots best represents the I-V characteristics of the diode?



## Answer Key

15 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Electronics	Diodes	3
Q2	Electronics	Diodes	2
Q3	Electronics	Diodes	4
Q4	Electronics	Diodes	3
Q5	Electronics	Diodes	3
Q6	Electronics	Diodes	1
Q7	Electronics	Diodes	3
Q8	Electronics	Diodes	3
Q9	Electronics	Diodes	2
Q10	Electronics	Diodes	2
Q11	Electronics	Diodes	3
Q12	Electronics	Diodes	1
Q13	Electronics	Diodes	2
Q14	Electronics	Diodes	4
Q15	Electronics	Diodes	2

## Study with PhysicsByAaryan

---

Full CSIR NET / GATE / JEST / BARC Physics live batch by Aaryan Mehra Sir.  
Concept-first teaching, complete PYQ coverage, daily doubt support.

**Use coupon CONSISTENCY for Rs. 500 off**

### Visit

[www.physicsbyaaryan.com](http://www.physicsbyaaryan.com)

[www.csirnetphysics.com](http://www.csirnetphysics.com)

### Contact

9501976811