

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

- Laser Amplifiers
- Er-Doped Fiber Amplifier
- Week 4 Feedback Form

Quiz : Assignment 4

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Assignment 4

The due date for submitting this assignment has passed.

Due on 2021-02-17, 23:59 IST.

As per our records you have not submitted this assignment.

Instructions:

1. Answer all questions; all questions carry equal mark.
2. All symbols have their usual meanings.
3. Only one of the options is correct.
4. Take care of the units in numerical problems, to match with the units given in the options (of MCQs), and the units in which answers have to be entered (in fill in the blank type of questions).
5. In the fill in the blank type of questions, only the numerical values have to be entered.

NOTE: You can see the correct answers after the last date of submission. Marks obtained in this quiz will be counted towards your final score. You can take the quiz and submit it any number of times, and the latest submitted answers will be taken as your final submission.

- 1) Which one of the following statements regarding doped amplifiers is incorrect? **1 point**
- Nd:YAG amplifier is a 4-level system.
 - Yb:SiO₂ amplifier is a quasi-3 level system.
 - Nd:Glass amplifier is used in high-energy pulse applications
 - Er:SiO₂ amplifier is used in visible light communication.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Er:SiO₂ amplifier is used in visible light communication.

- 2) State whether the following statement is TRUE or FALSE: **1 point**

Larger the uncertainty (spread) of the energy of an atomic energy level, higher will be the lifetime of that level.

- TRUE
- FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
FALSE

- 3) Which one of the following set of quantum numbers corresponds to the energy level ⁴F_{3/2} in the Nd:YAG atomic system? **1 point**

- S = 1/2; L = 3; J = 1/2
- S = 1/2; L = 4; J = 3/2
- S = 3/2; L = 3; J = 3/2
- S = 3/2; L = 4; J = 1/2

No, the answer is incorrect.
Score: 0
Accepted Answers:
S = 3/2; L = 3; J = 3/2

- 4) Which one of the following statements regarding the metastable state of a laser amplifier is incorrect? **1 point**

- It has a larger lifetime relative to that of other excited states.
- More atoms accumulate in the metastable state as the pump power is increased.
- Transitions from the metastable state to lower energy states are forbidden by quantum selection rules.
- Metastable state is not involved in the lasing transition.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Metastable state is not involved in the lasing transition.

- 5) In the Nd:YAG atomic system, the transition from ⁴F_{3/2} to ⁴I_{9/2} is **1 point**

- Forbidden
- Allowed

No, the answer is incorrect.
Score: 0
Accepted Answers:
Forbidden

- 6) Which one of the following light wavelengths cannot be amplified by an Nd:YAG laser amplifier by suitably pumping the amplifier? **1 point**

- 1319 nm
- 1064 nm
- 980 nm
- 808 nm

No, the answer is incorrect.
Score: 0
Accepted Answers:
808 nm

- 7) Which one of the following statements regarding Er-doped fiber amplifier is incorrect? **1 point**

- The large gain-bandwidth is due to the large spread in the energy levels of Er⁺³ atoms.
- The amplified output beam has a circular cross-section.
- The long length of amplifier medium is feasible because the input light propagates as a guided-mode
- The cladding of the optical fiber is doped with Er⁺³ ions.

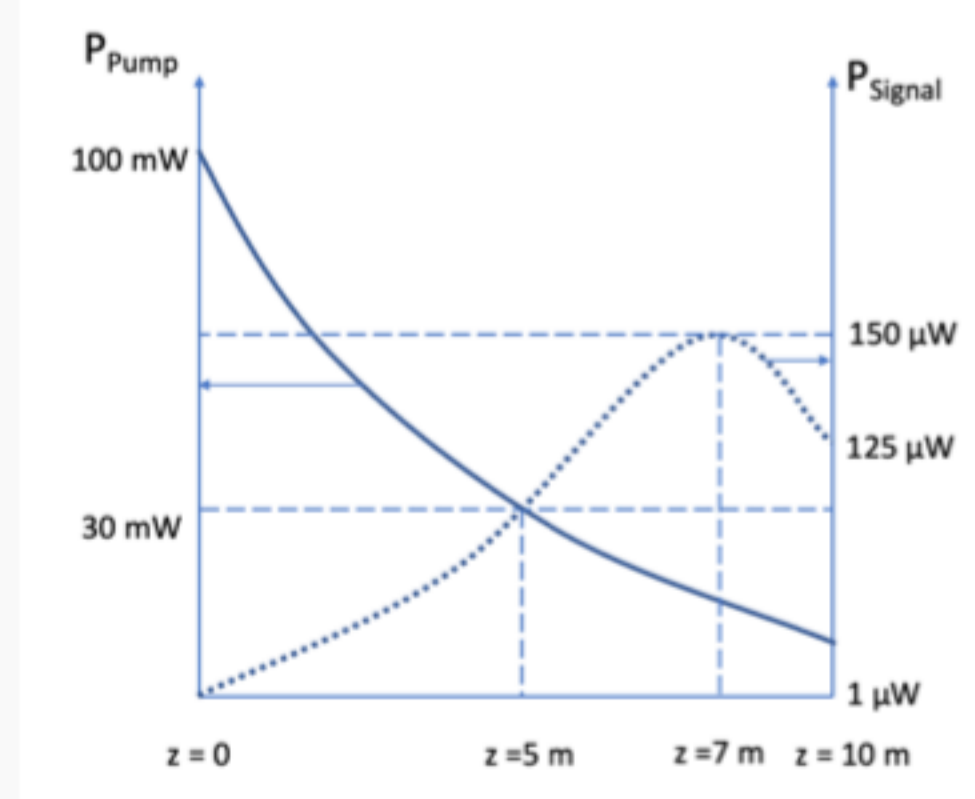
No, the answer is incorrect.
Score: 0
Accepted Answers:
The cladding of the optical fiber is doped with Er⁺³ ions.

- 8) Which one of the following is a necessary condition for gain in an amplifier with a degenerate atomic system as the active medium? (N₁ and N₂ are the atomic population densities in the lower energy state and the excited state, respectively, corresponding to the laser transition; σ_e and σ_a are the emission and the absorption cross-sections, respectively) **1 point**

- σ_e > σ_a
- N₂ > N₁
- σ_eN₁ > σ_aN₂
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of the above

- 9) The variation of pump power and signal power with the length (z-axis) for an EDFA of fiber length 10 m is shown below.



The gain of the EDFA is ____ dB.

(Enter the correct answer up to two decimal place)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 20.8,21.1

- 10) In Q. no. 9 above, if the EDFA is to be operated at the maximum gain, then the fiber length must be reduced by ____ m.

(Enter the answer as an integer)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 3

1 point