

***Thinking Like an Engineer 5th edition Stephan
Solutions Manual***

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Review 1 – 1 Answer

- a) The practice of using mathematical equations.
(Mathematics is only a part of engineering.)
- b) The application of science.
(Correct: Engineers apply science to solve problems.)
- c) The discovery of technological inventions.
(Discovery is the focus of science, not engineering.)
- d) The supervision of project design.
(This is a better definition of management.)

Review 1 – 2 Answer

- a) I want to understand things.
(Correct: mastery seeks understanding all of the other options are external.)
- b) I want to get excellent grades
(This is an external motivation.)
- c) I want my parents to be proud of me.
(This is an external motivation.)
- d) I want to earn a lot of money.
(This is an external motivation.)

Review 1 – 3 Answer

- a) I want to understand things.
(This is an internal motivation.)
- b) I want to get excellent grades.
(Correct: Grades are 'rewards for hard work' and performance oriented goals seek rewards.)
- c) I want to help people succeed.
(This is an internal motivation.)
- d) I want to solve problems.
(This is an internal motivation.)

Review 1 – 4 Answer

- a) Your family and friends feel it is a good fit.
(Yes, but do you feel it is a good fit?)
- b) You are satisfied and challenged.
(Correct: You are the only one who can know that you've chosen the right career.)
- c) Your boss is happy with your work.
(Yes, but are you happy with your work?)
- d) You are appropriately compensated.
(Money is important, but not the most important part of a career.)

Review 1 – 5 Answer

- a) Discover new uses for fixed nitrogen compounds.
(This could help, but isn't the focus of the challenge.)
- b) Reduce the amount of nitrogen being used in fertilization.
(This would help, but could result in restrictions that reduce crop yield.)
- c) Discover ways to augment natural denitrification.
(Correct: Extensive use of the Haber-Bosch process of fixating nitrogen is causing an imbalance in the nitrogen cycle.)
- d) Reduce the rate of nitrogen uptake in plants.
(This would make matters worse, because more fixated nitrogen would be required.)

Review 1 – 6 Answer

- a) 1%
(Too low)
- b) 10%
(Too low)
- c) 50%
(Correct)
- d) 90%
(Too high)
- e) 99%
(Too high)

Review 1 – 7 Answer

- a) A biosystems engineer.
(Not the best answer, a biosystems engineer would typically know about filtration, but not necessarily how to integrate such a system into the human body)
- b) An electrical engineer.
(Not the best answer, an electrical engineer might design systems to control the artificial kidneys, but not necessarily how to integrate such a system into the human body)
- c) A mechanical engineer.
(Not the best answer, a mechanical engineer would typically know about pumps and filters, but not necessarily how to integrate such a system into the human body)
- d) A biomedical engineer.
(Correct, this will require knowledge of how devices interact with human biological systems.)

Review 1 – 8 Answer

- a) Civil Engineering.
(Correct, of these choices, civil engineering would be concerned with the design, construction, and operation of large-scale facilities. Industrial engineering might also be particularly involved in the planning and operation stages.)
- b) Mechanical Engineering.
(Incorrect, mechanical engineering would be concerned with the design of the equipment in those facilities, but not necessarily the design of the facilities as a whole.)
- c) Bioengineering.
(Incorrect, it doesn't seem like either of these would feature substantial biological processes.)
- d) Chemical engineering.
(Incorrect, chemical engineering would be concerned with the design of certain equipment in those facilities, but not necessarily the design of the facilities as a whole.)

Review 1 – 9 Answer

- a) Computer engineers.
(Not the best answer; in this scenario, computer engineers would design the hardware and the communications protocols.)
- b) Industrial engineers.
(Not the best answer; in this scenario, industrial engineers might design or improve the manufacturing process.)
- c) Electrical engineers.
(Correct, communication and control systems are typically designed by electrical engineers.)
- d) Materials engineers.
(Not the best answer; in this scenario, materials engineers might design a PCB-free circuit board manufacturing process for the microcontroller.)

Review 1 – 10 Answer

- a) A materials engineer.
(Not the best answer; a materials engineer might help improve a part design through the use of a new material, but would not be likely to study the overall manufacturing process.)
- b) An industrial engineer.
(Correct, an industrial engineer would be most likely to improve the manufacturing process.)
- c) A mechanical engineer.
(Not the best answer; a mechanical engineer might help improve the process for manufacturing certain parts, but would not be likely to study the overall manufacturing process.)
- d) A civil engineer.
(Not the best answer; a civil engineer might help redesign the manufacturing facility, but would not be likely to study the overall manufacturing process.)

Review 1 – 11 Answer

- a) An industrial engineer.
(Not the best answer; an industrial engineer would not be likely to have the expertise to design composite materials.)
- b) A mechanical engineer.
(Not the best answer; a mechanical engineer might test the properties of the new plane, but would not be likely to have the expertise to design composite materials.)
- c) A materials engineer.
(Correct, a materials engineer would design the structure and manufacturing of special materials.)
- d) An electrical engineer.
(Not the best answer; an electrical engineer would not be likely to have the expertise to design composite materials.)