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1. Which of these events does NOT occur during a four-stroke reciprocating engine cycle? (7.A.1)
2. A fuel and air mixture is sucked into the cylinder through the intake valve.
3. A fuel and air mixture is ejected through the exhaust valve.
4. A fuel and air mixture is compressed.
5. A fuel and air mixture is ignited.
6. What is the purpose of combustion in an internal combustion engine? (7.A.1)
7. To suck air into the engine
8. To generate fuel for the engine
9. To push exhaust out of the engine
10. To apply downward force on the pistons in the engine
11. What would occur if the engine on a single-engine aircraft stops? (7.A.2)
12. The propeller blades would feather to reduce wind resistance.
13. The propeller blades would feather so the propeller can still deliver power.
14. The propeller blades would revert to a flat pitch to reduce wind resistance.
15. The propeller blades would revert to a flat pitch so the propeller can still deliver power.
16. What happens when the pilot decreases propeller RPM? (7.A.2)
17. Mixture becomes richer
18. Mixture becomes leaner
19. Propeller pitch decreases
20. Propeller pitch increases

1. Why would a pilot look at the tachometer when operating an aircraft with fixed-pitch propellers? Select all that apply. (7.A.2)
2. To determine engine power
3. To determine propeller RPM
4. To determine engine RPM
5. To determine airspeed
6. To determine altitude
7. What is the difference between carburetor and fuel injection systems? (7.A.3)
8. A carburetor delivers fuel and air directly to the cylinder, while a fuel injection system mixes fuel and air before sending it to the cylinder.
9. A carburetor mixes fuel and air before sending it to the intake manifold, while a fuel injection system delivers fuel and air directly to the cylinder.
10. A carburetor can compress fuel and air to high pressures before sending it to the cylinder, while a fuel injection system does not compress fuel-air mixtures.
11. A carburetor does not compress fuel-air mixtures, while a fuel injection system compresses fuel and air to high pressures before sending it to the cylinder.
12. What is the purpose of the venturi in a carburetor? (7.A.3)
13. To let air into the carburetor
14. To heat the air and prevent carburetor ice
15. To create an area of low pressure
16. To adjust the flow of fuel to the engine
17. A pilot notices that the carburetor air temperature gauge on his airplane reads –12°. How should the pilot respond? (7.A.3)
18. Increase carburetor heat
19. Decrease carburetor heat
20. Increase carburetor humidity
21. Decrease air flow to the engine
22. What safety precautions should a pilot perform before starting the engine on an airplane? Select all that apply. (7.A.4)
23. Yell “Clear!”
24. Release parking brakes.
25. Turn on the rotating beacons.
26. Check the area for other people.
27. Taxi slowly to prevent blowing debris around.
28. What can cause pre-ignition in an engine? Select all that apply. (7.A.4)
29. Spark plug tips are too hot.
30. The airspeed is too slow.
31. The mixture is too rich.
32. Spark plug insulators are cracked.
33. Carbon deposits have built up on the spark plugs.
34. How would an insufficient supply of oil be indicated on the oil temperature and pressure gauges? (7.A.4)
35. The oil temperature gauge would be too hot and the oil pressure gauge would be too high.
36. The oil temperature gauge would be too hot and the oil pressure gauge would be too low.
37. The oil temperature gauge would be too cold and the oil pressure gauge would be too high.
38. The oil temperature gauge would be too cold and the oil pressure gauge would be too high.
39. A damaged exhaust system can cause which of these dangers? Select all that apply. (7.A.4)
40. Carbon monoxide can enter the cabin.
41. Engine performance can decrease.
42. The engine can grow too cold.
43. Hot air can enter the cabin.
44. Engines can catch on fire.
45. Why do engines with forced induction systems have higher service ceilings than other engines? (7.A.5)
46. Air density is increased at higher altitudes, and forced induction increases the amount of oxygen available to the engine.
47. Air density is increased at higher altitudes, and forced induction decreases the amount of oxygen available to the engine.
48. Air density is reduced at higher altitudes, and forced induction increases the amount of oxygen available to the engine.
49. Air density is reduced at higher altitudes, and forced induction decreases the amount of oxygen available to the engine.
50. Generally speaking, the use of carburetor heat tends to \_\_\_\_\_\_\_\_\_\_. (7.A.3)
51. decrease engine performance
52. increase engine performance
53. have no effect on engine performance
54. increase the amount of fuel going to the engine
55. Which of these accurately describes how turbochargers are different from superchargers? (7.A.5)

1. Turbochargers are less efficient than superchargers.
2. Turbochargers require pilot monitoring, while superchargers do not.
3. Turbochargers capture energy from exhaust, while superchargers use engine power to operate.
4. Turbochargers provide an instant throttle response, while superchargers have a lag in throttle response.
5. What does the EPR gauge indicate? (7.B.1)
6. difference in turbine discharge pressure and engine inlet pressure
7. the rotational speed of the low pressure compressor
8. the torque being applied to the propeller shaft
9. temperature of exhaust gas
10. What occurs during the compression stage of a jet engine? (7.B.1)
11. pressure of intake air is increased
12. pressure of intake fuel is increased
13. pressure of exhaust air is increased
14. pressure of exhaust fuel is increased
15. Which instrument(s) should a pilot monitor to set the thrust on a turboprop airplane? (7.B.1)
16. EGT
17. EPR
18. N1 and N2
19. Torquemeter
20. Where are the permanent and electromagnets placed on a brushless motor? (7.C.1)
21. The permanent and electromagnets are both on the stator.
22. The permanent and electromagnets are both on the rotor.
23. The permanent magnets are on the rotor while the electromagnets are on the stator.
24. The permanent magnets are on the stator while the electromagnets are on the rotor.
25. Why are liquid fuels generally not used in small UAS? (7.C.1)
26. Liquid fuels are expensive to purchase.
27. Liquid fuels are heavy and take up space.
28. Liquid fuels require special training to use.
29. Liquid fuels are flammable and can explode.

1. How is spark ignition different from compression ignition? (7.A.1)

In engines using spark ignition, an electrical current is sent through a spark plug, which ignites the fuel-air mixture. Spark ignition systems are widely used due to their lightweight components.

In compression ignition, air inside the cylinder is compressed until its temperature rises high enough to ignite the fuel. Compression ignition systems are less complex in design as they do not need an electrical system to provide ignition; however, they are generally heavier, as tougher materials are needed to withstand such high temperatures and pressures.

1. For an aircraft with a constant-speed propeller, describe the steps to increase power to the propellers. Explain why the steps are performed in this order. (7.A.2)

To increase power, the pilot should first push in the propeller control. This will increase the RPMs of the engine and the propeller. Then, the pilot should push in the throttle. This will increase manifold pressure. By performing the steps in this order, the pilot would avoid having high manifold pressure and low RPM, which can overstress the engine.

1. Describe air-cooled and liquid-cooled engine systems. State at least one benefit and drawback of each. (7.A.4)

Air-cooled systems circulate outside air over the engine compartment. This design is lightweight, simple, and cheap. However, it is not as effective as liquid cooling.

Liquid-cooled systems use water or other coolant to transfer heat from the engine before dissipating it to the air. This design is more effective than air cooling. However, it is more complex, requires more maintenance, and is heavier.

1. The acceleration of a jet engine is slower than a reciprocating engine. Describe a phase of flight during which pilots must be particularly aware of this operating difference. (7.B.1)

The slow acceleration of a jet engine must be considered when an airplane is slow or close to the ground, as on approach or during a go-around or balked landing. In such situations, the quick power response of a piston engine is a benefit jet pilots don’t have**.**

1. Suppose you are designing a UAS that will record aerial footage of football games. The UAS needs to stay in the air for long periods of time so as to not miss any action. Would a nickel or lithium battery be more appropriate for this system? Explain your answer. (7.C.1)

A lithium-based battery would be more appropriate. A lithium-based battery has a higher power-to-weight ratio. This means that, for the same size system, it can stay in the air longer between charges. It can also run for longer stretches of time, allowing the UAS to stay aloft to record the entire game.