



# Headquarters Air Cadets Examination

Senior Cadet  
33/3 Propulsion  
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1. Use black or dark blue pen, NOT pencil.
2. Write only on the answer sheet. Add your personal details.

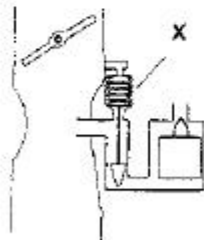
- 1 In the modified 4-stroke cycle, which of these is valve lead?
- a Exhaust valve closing after the piston has passed TDC
  - b Inlet and exhaust valves are open together
  - c Exhaust valve opening before the piston reaches BDC
  - d Inlet valve closing after the piston has passed BDC

- 2 In a 4-stroke piston engine, what is the force which closes the exhaust and inlet valves?

- a Suction
- b A spring
- c Gravity
- d A pushrod

- 3 The arrow X points to a device which is often incorporated into the carburettor of a piston aero engine. What is its function?

- a Supplies extra fuel when needed for acceleration
- b Prevents the fuel/air ratio from becoming richer as the throttle valve is opened
- c Prevents the fuel/air mixture from becoming richer as the aircraft climbs
- d Encourages good atomisation of the fuel



- 4 A jet engine's compressor is driven by:

- a The turbine
- b Air pressure at the air intake
- c Residual pressure in the tailpipe
- d The gearbox

- 5 Which of these is a turbojet engine?

- a Spay
- b Adour
- c Viper
- d Pegasus

- 6 Which of these is a turboshaft engine?

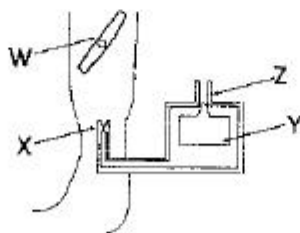
- a The Lynx Helicopter's Gem
- b Boeing 747's RB211
- c Concorde's Olympus
- d Harrier's Pegasus

- 7 What characteristic of the piston engine permits the use of such efficiency-enhancing features as valve lead, valve lag and valve overlap?

- a Its wide tolerance of operating temperatures
- b Its ability to be mounted at any angle
- c Ineffective crank angle at TDC and BDC
- d The ease with which extra cylinders may be added at the design stage

- 8 In this diagram of a simple carburettor, which arrow (W, X, Y or Z) points to the main jet?

- a Y
- b Z
- c W
- d X



- 9 What ratio (by weight) of fuel to air should the carburettor normally supply in a piston engine?

- a 02:01
- b 01:15
- c 01:02
- d 15:01

- 10 Which of these statements, about an exhaust-driven turbocharger, is true?

- a It operates as soon as the throttle is opened
- b It is more effective than an engine-driven supercharger at increasing the power output
- c It operates best at low engine speeds
- d It operates best at high engine speeds

- 11 What is the purpose of the fins which are arranged about the cylinder and cylinder head of an air-cooled engine?

- a To allow heat to dissipate rapidly
- b To direct air through the engine compartment
- c To reduce the weight of the engine
- d To support the engine cowlings

- 12 In this diagram of a piston engine's valve mechanism, the arrow X points to:

- a A scraper
- b A cam
- c A pushrod
- d A tappet



13 In a piston engine, ineffective crank angle occurs in the region of:

- a BDC only
- b 90 degrees after BDC and TDC
- c TDC only
- d Both BDC and TDC

14 What is the primary function of a supercharger on a piston engine?

- a To increase the pressure in the induction manifold
- b To ensure the battery is charged throughout the full range of engine speeds
- c To make use of unburnt fuel in the exhaust gases
- d To speed up the extraction of exhaust gases

15 A variable-pitch propeller is said to be feathered when:

- a The leading edges face forward in the direction of flight
- b It is in fully fine pitch
- c The leading edges are at 90 degrees to the direction of flight
- d It is in fully coarse pitch

16 Which of these is a turboprop engine?

- a Spey
- b Tyne
- c Dart
- d Gem

17 Which of these is a turboprop engine?

- a Spey
- b RB 211
- c Adour
- d Dart

18 After-burning in a jet engine involves burning additional fuel in the:

- a Compression
- b Jet pipe
- c Turbine
- d Combustion chamber

19 In the modified 4-stroke cycle, ignition takes place:

- a Just before TDC on the compression stroke
- b At TDC on the compression stroke
- c At TDC on the power stroke
- d Just before TDC on the power stroke

20 What is the main function of a supercharger when fitted to a piston engine?

- a It delivers a stronger spark to the sparking plugs
- b It increases the amount of air and fuel delivered to the cylinders
- c It ensures that the batteries are always fully charged
- d It increases the amount of lubricating oil delivered to the bearings

21 In a simple 4-stroke piston engine, which of these air-to-fuel ratios (by weight) would be the normal mixture?

- a 06:01
- b 09:01
- c 12:01
- d 15:01

22 In a piston aero engine, the purpose of the distributor is to distribute:

- a The correct mixture of air and fuel to the cylinders
- b Cooling air to all external parts
- c Oil to all parts of the engine
- d High voltage electrical impulses to the cylinders

23 What is the main benefit of using liquid (as opposed to air) to cool an aircraft piston engine?

- a The engine will be lighter
- b The engine will be simpler
- c A steady operating temperature will be more easily maintained
- d The engine will be less costly to produce

24 The blade angle on a propeller is varied from a coarse angle at the root to a fine angle at the tip. This is called:

- a Adjustable pitch
- b Blade translation
- c Blade twist
- d Variable pitch

25 Which of the following statements applies to the process of afterburning, as used in some jet engines? It provides extra thrust without:

- a Increasing the exhaust velocity
- b Increasing the engine's frontal area
- c The use of additional fuel
- d Removing any more oxygen from the exhaust gases