



# Headquarters Air Cadets Examination

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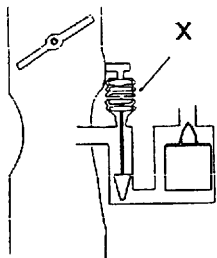
1. Use black or dark blue pen, NOT pencil.
2. Write only on the answer sheet. Add your personal details.

1 In the modified 4-stroke cycle, which of these is valve lead?

- a Inlet and exhaust valves are open together
- b Exhaust valve opening before the piston reaches BDC
- c Inlet valve closing after the piston has passed BDC
- d Exhaust valve closing after the piston has passed TDC

2 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 Encourages good atomisation of the fuel
- d Prevents the fuel/air mixture from becoming richer as the aircraft climbs



3 In a magneto, one purpose of the capacitor (condenser) is to:

- a Make the primary current flow evenly
- b Reduce erosion at the sparking plug gaps
- c Reduce pitting of the contact breaker points
- d Make the secondary current flow evenly

4 A jet engine's compressor is driven by:

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

5 The function of the turbine in a turbojet engine is to:

- a Vaporise the fuel as much as possible
- b Energise the gas stream
- c Drive the compressor
- d Drive the gas stream into the atmosphere

6 For which of these applications is the turboshaft engine most suited?

- a High-speed combat aircraft
- b High-altitude reconnaissance aircraft
- c Low-speed fixed-wing aircraft
- d Helicopters

7 Which of these is a turboshaft engine?

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

8 Which of the following statements applies to the ramjet engine?

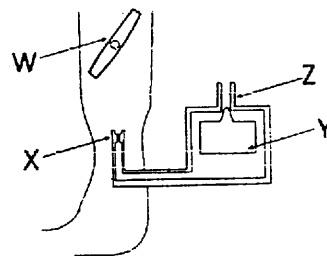
- a It is most efficient at subsonic speeds
- b It has only one compressor
- c It has only one turbine
- d It has no moving parts

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

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

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

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



11 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

12 What is the purpose of the accelerator pump fitted to the carburettor of a piston engine? When the engine is accelerating it:

- a Increases the air pressure in the choke tube
- b Prevents the mixture from becoming too rich
- c Decreases the air pressure in the choke tube
- d Prevents the mixture from becoming too weak

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

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

14 When the airflow over the propeller blades of a failed engine keeps the propeller turning, this is known as:

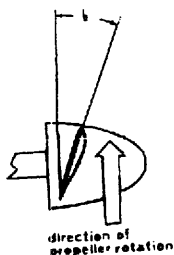
- a Windmilling
- b Reverse thrust
- c Propeller braking
- d Contra rotating

15 Which application or type of operation best suits the turbojet engine?

- a In helicopters
- b In high speed aircraft where low frontal area is an advantage
- c In low speed aircraft operating at low altitudes
- d In static engines in industrial use

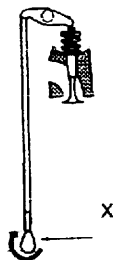
16 In this diagram of a propeller, what is angle 'b'?

- a Pitch angle
- b Prop angle
- c Blade angle
- d Fine angle



17 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



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

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

19 Which of the following describes a magneto as used in an aircraft's piston engine?

- a A mechanical pump for circulating fuel
- b A dynamo to produce the spark for the spark plugs
- c A secondary compass system
- d An instrument for metering the fuel flow

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

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

21 In the turbofan engine, some of the air is not compressed fully. This air is made to bypass the combustion chamber and the overall jet velocity is thereby reduced. An important consequence is that:

- a All the residual thrust is removed
- b The residual thrust is higher
- c The propulsive efficiency at lower aircraft speeds is improved
- d The propulsive efficiency at higher aircraft speed is improved

22 Which of these statements refers to turbo-chargers? They are:

- a Driven by exhaust gases
- b Driven by gears from the engine
- c Fitted to turbojet engines only
- d Fitted to turbo-fans only

23 Blade twist in a propeller helps to:

- a Make the blade stronger and lighter
- b Even out the thrust along the length of the blade
- c Reduce noise levels
- d Make feathering possible

24 Who first patented, in 1930, the design of a reaction motor suitable for aircraft propulsion (that is, a jet engine)?

- a Henry Ford
- b Henry Royce
- c Charles Rolls
- d Frank Whittle

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