Physics of the Atmosphere

1.   The ISA

Option A.   assumes a standard day.
Option B.   is taken from the equator.
Option C.   is taken from 45 degrees latitude.

Correct Answer is B.
Explanation.   The properties of a standard day are related to sea level at latitude 45° latitude.

2.   At higher altitudes as altitude increases, pressure

Option A.   decreases at constant rate.
Option B.   decreases exponentially.
Option C.   increases exponentially.

Correct Answer is B.
Explanation.   Pressure decreases – sure! But the rate of decrease reduces with altitude. At 18 000 ft, half the pressure is lost already, and there is still another 40 000 ft or so to go.

3.   When the pressure is half of that at sea level, what is the altitude?

Option A.   12 000 ft.
Option B.   18 000 ft.
Option C.   8 000 ft.

Correct Answer is B.
Explanation.   Just one of those facts you have to learn – but it is quoted in just about every text book on CAA reading list.

4.   If gauge pressure on a standard day at sea level is 25 psi, the absolute pressure is

Option A.   39.7 psi.
Option B.   10.3 psi.
Option C.   43.8 psi.

Correct Answer is A.
Explanation.   Absolute pressure = gauge pressure plus atmospheric pressure. Atmospheric pressure at sea level = 14.7 psi.

5.   Pressure decreases

Option A.   inversely proportional to temperature.
Option B.   proportionally with a decreases in temperature.
Option C.   pressure and temperature are not related.

Correct Answer is B
Explanation.   Temperature and volume are directly proportional – *Charles'* Law.

6.   As air gets colder, the service ceiling of an aircraft

Option A.   reduces.
Option B.   increases.
Option C.   remains the same.

Correct Answer is B.

Explanation.   As air gets colder it gets denser. Lift increases (remember the lift equation has density) and the engines produce more thrust – so it can climb higher.

7.   What is sea level pressure?

Option A.   1012.3 mb.
Option B.   1013.2 mb.
Option C.   1032.2 mb.

Correct Answer is B.
Explanation.   Learn the ISA sea level quantities, in all units.

8.   How does IAS at the point of stall vary with height?

Option A.   It decreases.
Option B.   It is practically constant.
Option C.   It increases.

Correct Answer is B.
Explanation.   The stalling IAS at altitude is practically the same as it is at sea level. That's because IAS is not corrected for density.

9.   What is the lapse rate with regard to temperature?

Option A.   4°C per 1 000 ft.
Option B.   1.98°C per 1 000 ft.
Option C.   1.98°F per 1 000 ft.

Correct Answer is B.
Explanation.   The lapse rate is approximately 2°C per 1 000 feet (in the troposphere).

10.   Standard sea level temperature is

Option A.   20 degrees Celsius.
Option B.   0 degrees Celsius.
Option C.   15 degrees Celsius.

Correct Answer is C.
Explanation.   15°C is standard sea level temperature!

11.   As altitude increases, pressure

Option A.   decreases exponentially.
Option B.   decreases at constant rate.
Option C.   increases exponentially.

Correct Answer is A.
Explanation.   As altitude increases, pressure decreases exponentially. Since pressure is given by density·gravity·height, both density and height decreases (that is, height above the point you measuring) so the decrease in pressure is exponential.

12.   Lapse rate usually refers to

Option A.   Density.
Option B.   Pressure.
Option C.   Temperature.

Correct Answer is C.
Explanation.   Temperature lapse rate is constant up to 36 000 ft (−2 degrees per 1 000 ft).

13. Temperature above 36 000 feet will

Option A.   increase exponentially.
Option B.   decrease exponentially.
Option C.   remain constant.

Correct Answer is C.
Explanation.   Temperature lapse rate up to 36 000 feet (the tropopause) is approximately 2 degrees centigrade
                per 1 000 feet. Above the tropopause it is constant.

14. With increasing altitude pressure decreases and

Option A.   temperature decreases at the same rate as pressure reduces.
Option B.   temperature decreases but at a lower rate than pressure reduces.
Option C.   temperature remains constant to 8 000 ft.

Correct Answer is B.
Explanation.   See a graph of pressure against altitude and temperature against altitude. Pressure decreases
                faster than temperature therefore pressure has a greater effect upon the performance of the
                aircraft.

15. What is the temperature in comparison to ISA conditions at 30 000 ft?

Option A.   −60°C.
Option B.   0°C.
Option C.   −45°C.

Correct Answer is C.
Explanation.   ISA = 15°C temperature lapse rate is 2°C per 1 000 ft. Therefore 30 000 = −60 + 15 = −45.

16. At what altitude is the tropopause?

Option A.   36 000 ft.
Option B.   57 000 ft.
Option C.   63 000 ft.

Correct Answer is A.
Explanation.   The tropopause is 36 000 ft. Above the tropopause is the stratosphere.

17. What approximate percentage of oxygen is in the atmosphere?

Option A.   12%.
Option B.   21%.
Option C.   78%.

Correct Answer is B.
Explanation.   21% oxygen, 78% nitrogen, 1% other gases.

18. Which has the greater density?

Option A.   Air at low altitude.
Option B.   Air at high altitude.
Option C.   It remains constant.

Correct Answer is A.
Explanation.   Air density reduces with altitude.

19. At what altitude does stratosphere commence approximately?

Option A.   Sea level.
Option B.   36 000 ft.
Option C.   63 000 ft.

Correct Answer is B.
Explanation.   The stratosphere is above 36 000 ft.

20. A pressure of one atmosphere is equal to

Option A.   14.7 psi.
Option B.   1 inch Hg.
Option C.   100 millibar.

Correct Answer is A.
Explanation.   One atmosphere is 14.7 psi.

21. The millibar is a unit of

Option A.   atmospheric temperature.
Option B.   pressure altitude.
Option C.   barometric pressure.

Correct Answer is C.
Explanation.   Barometric pressure is measured in millibar.

22. With an increase in altitude under I.S.A. conditions the temperature in the troposphere

Option A.   remains constant.
Option B.   decreases.
Option C.   increases.

Correct Answer is B.
Explanation.   Temperature reduces at a lapse rate of 1.98 degrees celsius per thousand feet from sea level to about 36 000 ft (the tropopause).

23. A barometer indicates

Option A.   pressure.
Option B.   density.
Option C.   temperature.

Correct Answer is A.
Explanation.   A barometer indicates pressure.

24. The amount of water vapour capacity in the air (humidity holding capacity of the air) is

Option A.   greater on a colder day, and lower on a hotter day.
Option B.   doesn't have a significant difference.
Option C.   greater on a hotter day and lower on a colder day.

Correct Answer is C.
Explanation.   The amount of water vapour capacity in the air is greater on a hotter day.

25. Which condition is the actual amount of water vapour in a mixture of air and water?

Option A.   Relative humidity.
Option B.   Absolute humidity.
Option C.   Dew point.

Correct Answer is B.
Explanation.   Absolute humidity is the "actual" amount of water in a mixture of air and water.

26.   Which will weigh the least?

Option A.   98 parts of dry air and 2 parts of water vapour.
Option B.   50 parts of dry air and 50 parts of water vapour.
Option C.   35 parts of dry air and 65 parts of water vapour.

Correct Answer is C.
Explanation.   Water vapour is 62% the weight of dry air.

27.   Which is the ratio of the water vapour actually present in the atmosphere to the amount that
would be present if the air were saturated at the prevailing temperature and pressure?

Option A.   Absolute humidity.
Option B.   Dew point.
Option C.   Relative humidity.

Correct Answer is C.
Explanation.   Relative humidity is the ratio of the water vapour actually present to the water vapour that the
air would hold if it were saturated.

28.   The speed of sound in the atmosphere

Option A.   changes with a change in pressure.
Option B.   varies according to the frequency of the sound.
Option C.   changes with a change in temperature.

Correct Answer is C.
Explanation.   Speed of sound is affected by air temperature only.

29.   What is sea level pressure?

Option A.   1 032.2 mb.
Option B.   1 012.3 mb.
Option C.   1 013.2 mb.

Correct Answer is C.
Explanation.   Sea level pressure is 1 013.2 mb.

30.   Which statement concerning heat and/or temperature is true?

Option A.   Temperature is a measure of the kinetic energy of the molecules of any substance.
Option B.   Temperature is a measure of the potential energy of the molecules of any substance.
Option C.   There is an inverse relationship between temperature and heat.

Correct Answer is A.
Explanation.   Temperature is a measure of the kinetic energy of the molecules of a substance. Heat is a form
of energy exchange.

31.   What is absolute humidity?

Option A.   The temperature to which humid air must be cooled at constant pressure to become
saturated.
Option B.   The actual amount of the water vapour in a mixture of air and water.
Option C.   The ratio of the water vapour actually present in the atmosphere to the amount that
would be present if the air were saturated at the prevailing temperature and pressure.

Correct Answer is C.
Explanation.   Absolute Humidity is the actual amount of water vapor in a liter of gas.

32. The temperature to which humid air must be cooled at constant pressure to become saturated is called

Option A.   relative humidity.
Option B.   dew point.
Option C.   absolute humidity.

Correct Answer is B.
Explanation.   The temperature to which humid air must be cooled to become saturated is called the "due point".

33. Density changes with altitude at a rate

Option A.   of 2 kg/m^3 per 1 000 ft.
Option B.   which changes with altitude.
Option C.   which is constant until 11 km.

Correct Answer is B.
Explanation.   The rate of change of density is not constant − it diminishes with altitude. So no single figure for lapse rate can be quoted.

34. Above 65 800 ft temperature

Option A.   decreases by 1.98°C up to 115 000 ft.
Option B.   remains constant up to 115 000 ft.
Option C.   increases by 0.303°C up to 115 000 ft.

Correct Answer is C.
Explanation.   65 800 ft is the upper stratosphere boundary. Temperature increases with altitude in the stratosphere.

35. At sea level, ISA atmospheric pressure is

Option A.   14.7 kPa.
Option B.   10 bar.
Option C.   14.7 psi.

Correct Answer is C.
Explanation.   An alternative to 1 013.2 mb.

36. On a very hot day with ambient temperature higher than ISA, the pressure altitude is 20 000 ft. How much will the density altitude be?

Option A.   the same.
Option B.   greater than 20 000 ft.
Option C.   less than 20 000 ft.

Correct Answer is B.
Explanation.   "Density Altitude" is pressure altitude corrected for temperature and humidity. Assuming constant humidity (we are told no different) ISA or above temperature will further thin the air for a given pressure altitude thus making the density altitude higher. Note: At ISA temp. density and pressure altitude will be the same and for less than ISA density altitude will be less.

37. The atmospheric zone where the temperature remains fairly constant is called the

Option A.   Stratosphere.
Option B.   Ionosphere.
Option C.   Troposphere.

Correct Answer is A.
Explanation.   The stratosphere starts at 36 000 ft and rises to about 66 000 ft.

38.   In the ISA the height of the tropopause is

Option A.   11 000 feet.
Option B.   11 000 metres.
Option C.   36 000 metres.

Correct Answer is B.
Explanation.   11 000 metres or 36 000 feet approximately.

39.   In the ISA the sea level pressure is taken to be

Option A.   14 psi.
Option B.   1 013.2 mb.
Option C.   1.013 mb.

Correct Answer is B.
Explanation.   1 013.2 millibars.

40.   In the ISA the temperature lapse rate with altitude is taken to be

Option A.   dependent on pressure and density changes.
Option B.   linear.
Option C.   non linear.

Correct Answer is B.

41.   Put in sequence from the ground up

Option A.   tropopause, stratosphere, troposphere.
Option B.   tropopause, troposphere, stratosphere.
Option C.   troposphere, tropopause, stratosphere.

Correct Answer is C.

42.   The International Standard Atmosphere can be described as

Option A.   the atmosphere at 45 degrees north latitude.
Option B.   the atmosphere at the equator with certain conditions.
Option C.   the atmosphere which can be used Worldwide to provide comparable performance
             results.

Correct Answer is C.

43.   The temperature lapse rate below the tropopause is

Option A.   1°C per 1 000 ft.
Option B.   2°C per 1 000 ft.
Option C.   3°C per 1 000 ft.

Correct Answer is B.
Explanation.   1.98°C per 1 000 ft to be exact.

44.   Above the tropopause air pressure

Option A.   decreases at a constant rate.
Option B.   decreases exponentially.
Option C.   increases exponentially.

Correct Answer is B.
Explanation.   Air pressure continues to decrease exponentially in the stratosphere.

45.   Which of the following is correct?

Option A.   Absolute pressure + Atmospheric pressure = Gauge pressure.
Option B.   Absolute pressure = Gauge pressure + Atmospheric pressure.
Option C.   Atmospheric pressure = Absolute pressure + Gauge pressure.

Correct Answer is B.
Explanation.   Absolute pressure = Gauge pressure + Atmospheric pressure.

46.   As the altitude increases what happens of the ratio of Nitrogen to Oxygen?

Option A.   Increases.
Option B.   Decreases.
Option C.   Stays the same.

Correct Answer is C.

47.   What happens to the density of air as altitude is increased?

Option A.   Decreases.
Option B.   Stays the same.
Option C.   Increases.

Correct Answer is A.

Aerodynamics

1.   An aircraft is travelling at a speed of 720 nautical miles per hour. To calculate speed in mph you

Option A.   divide by 0.83.
Option B.   multiply by 0.83.
Option C.   multiply by 1.15.

Correct Answer is C.
Explanation.   1 nmph = 1.15 mph·1 mph = 0.83 nmph.

2.   Lift on a delta wing aircraft

Option A.   increases with an increased angle of incidence (angle of attack).
Option B.   does not change with a change in angle of incidence (angle of attack).
Option C.   decreases with an increase in angle of incidence (angle of attack).

Correct Answer is A.
Explanation.   This question is much easier than it looks at first read. All wing types (straight, swept, delta etc.) increase lift with an increase in angle of attack (up to the stall angle).

3.   The CofP is the point where

Option A.   the lift can be said to act.
Option B.   the three axis of rotation meet.
Option C.   all the forces on an aircraft act.

Correct Answer is A.

4.   When an aircraft experiences induced drag

Option A.   air flows under the wing span wise towards the root and on top of the wing span wise towards the tip.
Option B.   Neither a) or b) since induced drag does not caused by span wise flow.

Option C.	air flows under the wing span wise towards the tip and on top of the wing span wise towards the root.

Correct Answer is C.
Explanation.	The high pressure under the wing flows around the tip to the low pressure on top of the wing. The resulting vortex is what causes induced drag. Since air is viscous it drags the air underneath the wing towards the tip, and pushes the air on top of the wing towards the root.

5.	At stall, the wingtip stagnation point

Option A.	doesn't move.
Option B.	moves toward the lower surface of the wing.
Option C.	moves toward the upper surface of the wing.

Correct Answer is B.
Explanation.	At stall the angle of attack is high (all along the wing) and the stagnation point moves towards the lower surface of the wing.

6.	The rigging angle of incidence of an elevator is

Option A.	the angle between the bottom surface of the elevator and the longitudinal datum.
Option B.	the angle between the bottom surface of the elevator and the horizontal in the rigging position.
Option C.	the angle between the mean chord line and the horizontal in the rigging position.

Correct Answer is C.
Explanation.	The angle of incidence of any surface is measured from the mean chord line.

7.	Which of the following is true?

Option A.	Lift acts at right angles to the relative airflow and weight acts vertically down.
Option B.	Lift acts at right angles to the wing chord line and weight acts vertically down.
Option C.	Lift acts at right angles to the relative air flow and weight acts at right angles to the aircraft centre line.

Correct Answer is A.
Explanation.	Lift acts at right angles to the relative airflow and weight acts vertically down.

8.	The vertical fin of a single engined aircraft is

Option A.	parallel with the longitudinal axis but not the vertical axis.
Option B.	parallel with both the longitudinal axis and vertical axis.
Option C.	parallel with the vertical axis but not the longitudinal axis.

Correct Answer is B.
Explanation.	Single engined aircraft fin is offset to left to counter torque...i.e. chord of fin is at an angle to longitudinal axis.

9.	"What happens to air flowing at the speed of sound when it enters a converging duct?"

Option A.	Velocity increases, pressure and density decreases.
Option B.	Velocity, pressure and density increase.
Option C.	Velocity decreases, pressure and density increase.

Correct Answer is C.
Explanation.	Subsonic air in incompressible, so density does not change. But this is sonic speed, and everything (P and V) change opposite to what they would if it were subsonic air. Density increases, as does pressure, and velocity decreases. See Mechanics of Flight by AC Kermode.

10. As the angle of attack of an airfoil increases the centre of pressure.

Option A.   remains stationary.
Option B.   moves aft.
Option C.   moves forward.

Correct Answer is C.
Explanation.   As the angle of attack of the aerofoil increases, the centre of pressure moves forward.

11. Vapour trails from the wingtips of an aircraft in flight are caused by

Option A.   low pressure above the wing and high pressure below the wing causing vortices.
Option B.   low pressure above the wing and high pressure below the wing causing a temperature rise.
Option C.   high pressure above the wing and low pressure below the wing causing vortices.

Correct Answer is A.
Explanation.   Vapour trails are caused by wing tip vortices which are caused by low pressure above the wing and high pressure below the wing.

12. The chord line of a wing is a line that runs from

Option A.   the centre of the leading edge of the wing to the trailing edge.
Option B.   half way between the upper and lower surface of the wing.
Option C.   one wing tip to the other wing tip.

Correct Answer is A.
Explanation.   The chord line is a STRAIGHT line which goes from the leading edge of the wing to the trailing.

13. The angle of incidence of a wing is an angle formed by lines

Option A.   parallel to the chord line and longitudinal axis.
Option B.   parallel to the chord line and the vertical axis.
Option C.   parallel to the chord line and the lateral axis.

Correct Answer is A.
Explanation.   The angle of incidence is the angle between the chord line and the longitudinal axis.

14. The centre of pressure of an aerofoil is located

Option A.   30 − 40% of the chord line forward of the leading edge.
Option B.   50% of the chord line back from the leading edge.
Option C.   30 − 40% of the chord line back from the leading edge.

Correct Answer is C.
Explanation.   The centre of pressure is positioned roughly 30 − 40 % of the chord line BACK from the leading edge.

15. Compressibility effect is

Option A.   drag associated with the form of an aircraft.
Option B.   the increase in total drag of an aerofoil in transonic flight due to the formation of shock waves.
Option C.   drag associated with the friction of the air over the surface of the aircraft.

Correct Answer is B.
Explanation.   Compressibility effect is associated with an increase in drag during the transonic flight stage.

16. A high aspect ratio wing will give

Option A.   high profile and low induced drag.
Option B.   low profile and high induced drag.
Option C.   low profile and low induced drag.

Correct Answer is A.
Explanation.   A high aspect ratio has a lower induced drag (due to less wing tip effect) and a higher frontal area therefore greater profile drag.

17. Aerofoil efficiency is defined by

Option A.   lift over drag.
Option B.   lift over weight.
Option C.   drag over lift.

Correct Answer is A.
Explanation.   At plus 4° AOA the lift weight ratio is greatest. This is the optimum AOA therefore the wing is at its most efficient when lift is greatest and drag is at a minimum.

18. The relationship between induced drag and airspeed is, induced drag is

Option A.   directly proportional to the square of the speed.
Option B.   directly proportional to speed.
Option C.   inversely proportional to the square of the speed.

Correct Answer is C.
Explanation.   Induced drag decreases proportionally with the square of the speed.

19. What is the definition of Angle of Incidence?

Option A.   The angle the underside of the mainplane or tailplane makes with the horizontal.
Option B.   The angle the underside of the mainplane or tailplane makes with the longitudinal datum line.
Option C.   The angle the chord of the mainplane or tailplane makes with the horizontal.

Correct Answer is C.
Explanation.   Angle of incidence is the "wing setting angle". That is the angle of the chord of the mainplane or tailplane with the horizontal − or aircraft centre line when in the rigging position.

20. What is Boundary Layer?

Option A.   Separated layer of air forming a boundary at the leading edge.
Option B.   Sluggish low energy air that sticks to the wing surface and gradually gets faster until it joins the free stream flow of air.
Option C.   Turbulent air moving from the leading edge to trailing edge.

Correct Answer is B.
Explanation.   The boundary layer is the layer of air immediately in contact with the aircraft skin which is slowed down by the skin friction.

21. "What is the collective term for the fin and rudder and other surfaces aft of the centre of gravity that helps directional stability?"

Option A.   Empennage.
Option B.   Fuselage surfaces.
Option C.   Effective keel surface.

Correct Answer is C.

Explanation.   All the side surfaces aft of the centre of gravity which aid the directional stability are collectively called the EFFECTIVE KEEL SURFACE.

22.   "A decrease in incidence toward the wing tip may be provided to"

Option A.   prevent adverse yaw in a turn.
Option B.   retain lateral control effectiveness at high angles of attack.
Option C.   prevent span wise flow in maneuvers.

Correct Answer is B.

Explanation.   A decrease in incidence towards the wingtip (known as washout) causes the wing root to stall before the wing tip. So, even after the wing roots have stalled, the wing tips are still flying and full aileron control is provided.

23.   For a given aerofoil production lift, where P = pressure and V = velocity

Option A. P_1 is greater than P_2, and V_1 is less than V_2.
Option B. P_1 is greater than P_2, and V_1 is greater than V_2.
Option C. P_1 is less than P_2 and V_1 is greater than V_2.

Correct Answer is A.

Explanation.   *Bernoulli's* principle applies.

24.   Low wing loading

Option A.   increases stalling speed, landing speed and landing run.
Option B.   increases lift, stalling speed and maneuverability.
Option C.   decreases stalling speed, landing speed and landing run.

Correct Answer is C.

Explanation.   Wing loading is aircraft weight divided by wing area, therefore an aircraft with a low wing loading will require less landing speed, less landing run and have a decreased stalling speed.

25.   As a general rule, if the aerodynamic angle of incidence (angle of attack) of an aerofoil is slightly increased, the centre of pressure will

Option A.   move towards the tip.
Option B.   move forward towards the leading edge.
Option C.   never move.

Correct Answer is B.

Explanation.   As the angle of attack increases the centre of pressure moves towards the leading edge.

26.   The 'wing setting angle' is commonly known as

Option A.   angle of dihedral.
Option B.   angle of incidence.
Option C.   angle of attack.

Correct Answer is B.

Explanation.   The wing setting angle is commonly known as the 'angle of incidence'.

27.   When does the angle of incidence change?

Option A.   It never changes.
Option B.   When the aircraft attitude changes.
Option C.   When the aircraft is ascending or descending.

Correct Answer is A.

Explanation.   The angle of incidence is the angle at which the wing is 'set' into the fuselage. It never changes.

28.   As the angle of attack decreases, what happens to the centre of pressure?

Option A.   It moves rearwards.
Option B.   Centre of pressure is not affected by angle of attack decrease.
Option C.   It moves forward.

Correct Answer is A.
Explanation.   The centre of pressure moves FORWARDS with an INCREASE in angle of attack. Therefore it moves REARWARDS with a DECREASE in angle of attack.

29.   A decrease in pressure over the upper surface of a wing or aerofoil is responsible for

Option A.   approximately ⅔ (two thirds) of the lift obtained.
Option B.   approximately ½ (one half) of the lift obtained.
Option C.   approximately ⅓ (one third) of the lift obtained.

Correct Answer is A.
Explanation.   Look at a diagram of the lift distributions on the top and bottom surfaces of a wing. ⅔rds of the lift is provided by the top surface.

30.   Which of the following types of drag increases as the aircraft gains altitude?

Option A.   Interference drag.
Option B.   Parasite drag.
Option C.   Induced drag.

Correct Answer is C.
Explanation.   As density decreases with altitude, the lift must be compensated by increasing angle of attack. Induced drag increases with angle of attack, therefore induced drag increases with altitude.

31.   The layer of air over the surface of an aerofoil which is slower moving, in relation to the rest of the airflow, is known as.

Option A.   none of the above.
Option B.   camber layer.
Option C.   boundary layer.

Correct Answer is C.
Explanation.   The boundary layer is the layer of air in immediate contact with the skin of the aircraft which is slowed down by skin friction.

32.   What is a controlling factor of turbulence and skin friction?

Option A.   Countersunk rivets used on skin exterior.
Option B.   Aspect ratio.
Option C.   Fineness ratio.

Correct Answer is A.
Explanation.   Countersunk rivets increase skin friction and turbulence.

33.   If the C of G is aft of the Centre of Pressure

Option A.   when the aircraft yaws the aerodynamic forces acting forward of the Centre of Pressure.
Option B.   changes in lift produce a pitching moment which acts to increase the change in lift.
Option C.   when the aircraft sideslips, the C of G causes the nose to turn into the sideslip thus applying a restoring moment.

Correct Answer is B.
Explanation.   If the C of G is aft of the centre of pressure (not normal, but possible), an increase in lift will pitch the aircraft nose-up, which will increase the lift even further etc. etc.

34. The upper part of the wing in comparison to the lower

Option A.   develops less lift.
Option B.   develops the same lift.
Option C.   develops more lift.

Correct Answer is C.
Explanation.   Look at the lift distribution diagram of an aerofoil and see how approximately ⅔rds of the lift is derived from the top surface.

35. What effect would a forward CG have on an aircraft on landing?

Option A.   Increase stalling speed.
Option B.   Reduce stalling speed.
Option C.   No effect on landing.

Correct Answer is A.
Explanation.   A forward CG would require the tail of the aircraft to exert more download to keep the nose level. This will increase the wing loading and thus the aircraft would stall at a higher speed.

36. QNH refers to

Option A.   quite near horizon.
Option B.   setting the altimeter to zero.
Option C.   setting the mean sea level atmospheric pressure so an altimeter reads the aerodrome altitude above mean sea level.

Correct Answer is C.
Explanation.   'Q' is the mathematical symbol for pressure. 'NH' stands for Nautical Height. QNH refers to the setting of actual sea level atmospheric pressure so the altimeter indicates the actual altitude above sea level of the non-standard day.

37. QNE refers to

Option A.   setting the mean sea level atmospheric pressure in accordance with ICAO standard atmosphere i.e. 1 013 millibars.
Option B.   setting an altimeter to read aerodrome altitude above sea level.
Option C.   quite new equipment.

Correct Answer is A.
Explanation.   'Q' is the mathematical symbol for pressure. 'NE' stands for Nautical Elevation. QNE refers to the setting of the standard sea level atmospheric pressure (i.e. 1 013 mb) so the altimeter indicates the elevation above mean sea level. (Although it is not the 'true' elevation, if it is not a standard day).

38. An aspect ratio of 8:1 would mean

Option A.   span 64, mean chord 8.
Option B.   mean chord 64, span 8.
Option C.   span squared 64, chord 8.

Correct Answer is A.
Explanation.   Aspect Ratio is the ratio of the span to the chord.

39. QFE is

Option A.   airfield pressure.
Option B.   difference between sea level and airfield pressure.
Option C.   sea level pressure.

Correct Answer is A.

Explanation.   'Q' is the mathematical symbol for pressure. 'FE' stands for Field Elevation. QFE refers to setting airfield pressure so the altimeter indicates zero on the runway.

40.   For any given speed, a decrease in aircraft weight, the induced drag will

Option A.   decrease.
Option B.   remain the same.
Option C.   increase.

Correct Answer is A.

Explanation.   Induced drag is 'lift dependant drag'. Less lift and there will be less induced drag.

41.   The amount of lift generated by a wing is

Option A.   greatest at the tip.
Option B.   constant along the span.
Option C.   greatest at the root.

Correct Answer is C.

Explanation.   See a diagram of the lift distribution of the wing (viewed from the front) and you will see it is parabolic. The wing tip vortices decrease the lift at the tips.

42.   Induced Drag is

Option A.   greatest towards the tip and downwash decreases from tip to root.
Option B.   greatest towards the wing tip and downwash is greatest towards the root.
Option C.   greatest towards the wing root and downwash is greatest at the tip.

Correct Answer is A.

Explanation.   Induced drag is associated with wingtip vortices. The greater the vortices at the tip, the greater is the induced drag.

43.   Induced Drag is

Option A.   never equal to profile drag.
Option B.   equal to profile drag at V_{md}.
Option C.   equal to profile drag at stalling angle.

Correct Answer is B.

Explanation.   Sketch the drag curves (drag against speed). Induced drag decreases exponentially with speed. Profile drag increases exponentially with speed. V_{md} (minimum drag speed) is where they meet.

44.   With an increase in aircraft weight

Option A. V_{md} will be at a higher speed.
Option B. V_{md} will be at the same speed.
Option C. V_{md} will be at a lower speed.

Correct Answer is A.

Explanation.   Sketch the drag curves (drag against speed). Induced drag decreases exponentially with speed. Profile drag increases exponentially with speed. The induced drag is elevated with weight (since it is lift dependant) and so cuts the profile drag further to the right (higher V_{md}).

45.   For a given IAS an increase in altitude will result in

Option A.   an increase in induced drag.
Option B.   no change in the value of induced drag.
Option C.   an increase in profile drag.

Correct Answer is A.

Explanation.   With a decrease in density the aircraft must fly with a greater angle of attack (AOA) to compensate for the loss of lift. Induced drag is dependant upon AOA, therefore induced drag increases with altitude.

46.   As the angle of attack of a wing is increased in level flight

Option A.   the C of G moves aft and the CofP forward.
Option B.   the CofP and transition point move forward.
Option C.   the CofP moves forward and the stagnation point aft over the upper surface.

Correct Answer is B or C?

Explanation.   As AOA increases in level flight, CofP moves forward and the Transition Point (the point at which the laminar flow breaks away and forms into turbulent flow) also moves forward.

47.   Stall inducers may be fitted to a wing

Option A.   at the root to cause the root to stall first.
Option B.   at the tip to cause the root to stall first.
Option C.   at the root to cause the tip to stall first.

Correct Answer is A.

Explanation.   Stall inducers (or stall strips) are placed at the root of the wing to trip up the airflow just before full stall to ensure the wing stalls first at the root (and maintains the aileron authority even with a partially stalled wing).

48.   The optimum angle of attack of an aerofoil is the angle at which.

Option A.   the aerofoil produces maximum lift.
Option B.   the aerofoil produces zero lift.
Option C.   the highest lift/drag ratio is produced.

Correct Answer is C.

Explanation.   The optimum angle of attack is the angle at which the highest lift/drag ratio is produced.

49.   A high aspect ratio wing has a

Option A.   increased induced drag.
Option B.   decreased skin friction drag.
Option C.   decreased induced drag.

Correct Answer is C.

Explanation.   Induced drag decreases with increasing aspect ratio. (However, skin friction drag also reduces with an increased chord length due to thickening of the boundary layer − but this is less significant).

50.   Minimum total drag of an aircraft occurs.

Option A.   when induced drag is least.
Option B.   at the stalling speed.
Option C.   when profile drag equals induced drag.

Correct Answer is C.

Explanation.   Sketch the drag curves (drag against speed). Induced drag decreases exponentially with speed. Profile drag increases exponentially with speed. V_{md} (minimum drag speed) is where they meet.

51.   If the weight of an aircraft is increased, the induced drag at a given speed.

Option A.   will increase.

Option B.   will decrease.
Option C.   will remain the same.

Correct Answer is A.
Explanation.   If weight is increased, for a given speed the aircraft must fly at a greater angle of attack (CL).
                  Induced drag increases with increased AOA.

52.   The transition point on a wing is the point where.

Option A.   the boundary layer flow changes from laminar to turbulent.
Option B.   the flow divides to pass above and below the wing.
Option C.   the flow separates from the wing surface.

Correct Answer is A.
Explanation.   The transition point is a point on the surface of the wing where the boundary layer changes from
                  laminar to turbulent.

53.   The boundary layer of a body in a moving airstream is

Option A.   a layer of air over the surface where the airspeed is changing from free stream speed to
               zero speed.
Option B.   a layer of separated flow where the air is turbulent.
Option C.   a thin layer of air over the surface where the air is stationary.

Correct Answer is C.
Explanation.   The boundary layer is a thin layer of slowed air in contact with the surface of the skin which is
                  slowed by friction. Speed ranging from stationary to free stream speed.

54.   A laminar boundary layer will produce

Option A.   more skin friction drag than a turbulent one.
Option B.   the same skin friction drag as a turbulent one.
Option C.   less skin friction drag than a turbulent one.

Correct Answer is C.
Explanation.   Skin friction drag is greater in a turbulent boundary layer than in a laminar boundary layer.

55.   The boundary layer is

Option A.   thickest at the leading edge.
Option B.   thickest at the trailing edge.
Option C.   constant thickness from leading to trailing edges.

Correct Answer is B.
Explanation.   The boundary layer is thickest at the trailing edge.

56.   The amount of thrust produced by a jet engine or a propeller can be calculated using

Option A.   *Newton's* 3rd law.
Option B.   *Newton's* 2nd law.
Option C.   *Newton's* 1st law.

Correct Answer is B.
Explanation.   *Newton's* second law is Force = Mass × Acceleration.

57.   An engine which produces an efflux of high speed will be

Option A.   less efficient.
Option B.   more efficient.

Option C.   speed of efflux has no affect on the engine efficiency.

Correct Answer is A.
Explanation.   A pure turbojet accelerates a low mass of air at a high rate and is less efficient than a turbo fan or turbo prop. This is because the wasted energy is $\frac{1}{2}mV^2$ of the jet efflux.

58.   Wing loading is calculated by weight

Option A.   divided by lift.
Option B.   divided by gross wing area.
Option C.   multiplied by gross wing area.

Correct Answer is B.
Explanation.   Wing loading is weight divided by wing area and measured in Newtons per square metre.

59.   Induced drag is

Option A.   nothing to do with speed.
Option B.   proportional to speed.
Option C.   inversely proportional to the square of speed.

Correct Answer is C.
Explanation.   Induced drag is inversely proportional to the square of the speed – i.e. it reduces with the square of the speed.

60.   As the angle of attack increases the stagnation point

Option A.   moves towards the upper surface.
Option B.   does not move.
Option C.   moves towards the lower surface.

Correct Answer is C.
Explanation.   The stagnation point is the stationary air at the leading edge of the wing. As the angle of attack increases the stagnation point moves towards the lower surface.

61.   The term pitch-up is due to

Option A.   compressibility effect.
Option B.   ground effect.
Option C.   longitudinal instability.

Correct Answer is C.
Explanation.   Pitch-up' is a longitudinal instability. It is caused by wingtip stall on swept wings, resulting in a drop of the tail.

62.   In a steady climb at a steady IAS, the TAS is.

Option A.   more than IAS.
Option B.   the same.
Option C.   less than IAS.

Correct Answer is A.
Explanation.   IAS = TAS × square root of sigma. Sigma is the ratio of density at altitude to density at sea level. Sigma is always less than 1.

63.   An untapered straight wing will.

Option A.   have no yaw effect in banking.
Option B.   stall at the root first.

Option C.   have no change in induced drag in the bank.

Correct Answer is B.
Explanation.   The straight wing will always stall at the root first. This is the desired stall characteristic.

64.   With the ailerons away from the neutral, induced drag is

Option A.   higher on the lower wing plus profile drag increases.
Option B.   unchanged but profile drag is higher.
Option C.   higher on the upper wing plus profile drag increases.

Correct Answer is C.
Explanation.   Induced drag is 'lift dependant drag'. The upper wing has more lift and hence more induced drag. It also has more profile drag due to the aileron's protrusion into the airflow.

65.   All the lift can be said to act through the.

Option A.   centre of pressure.
Option B.   centre of gravity.
Option C.   normal axis.

Correct Answer is A.
Explanation.   All the lift is said to act through the centre of pressure.

66.   The concept of thrust is explained by

Option A.   *Bernoulli's* theorem.
Option B.   *Newton's* 3rd law.
Option C.   *Newton's* 1st law.

Correct Answer is B.
Explanation.   *Newton's* Third Law states 'Every action has an equal and opposite reaction'.

67.   The camber of an aerofoil section is

Option A.   the angle which the aerofoil makes with the relative airflow.
Option B.   the curvature of the median line of the aerofoil.
Option C.   the angle of incidence towards the tip of a wing.

Correct Answer is B.
Explanation.   Aerofoil camber is the curvature of the median line of the aerofoil.

68.   Induced drag

Option A.   is caused by skin friction.
Option B.   is associated with the lift generated by an aerofoil.
Option C.   results from disturbed airflow in the region of mainplane. OR is associated with the lift generated by an aerofoil.

Correct Answer is C.
Explanation.   Induced drag is often called 'lift dependant drag' because it increases with increasing lift (due to increased AOA).

69.   As air flows over the upper cambered surface of an aerofoil, what happens to velocity and pressure?

Option A.   Velocity increases, pressure increases.
Option B.   Velocity increases, pressure decreases.
Option C.   Velocity decreases, pressure decreases.

Correct Answer is B.

Explanation.   As air flows over the upper cambered surface of an aerofoil, velocity increases and pressure decreases. This is *Bernoulli's* effect.

70.   What is the force that tends to pull an aircraft down towards the earth?

Option A.   Thrust.
Option B.   Weight.
Option C.   Drag.

Correct Answer is B.

Explanation.   Weight tends to pull the aircraft down towards the earth.

71.   The angle at which the chord line of the aerofoil is presented to the airflow is known as

Option A.   angle of attack.
Option B.   resultant.
Option C.   angle of incidence.

Correct Answer is A.

Explanation.   Angle of Attack is the angle at which the chord line of the aerofoil is presented to the airflow.

72.   The imaginary straight line which passes through an aerofoil section from leading edge to trailing edge is called.

Option A.   the chord line.
Option B.   the direction of relative airflow.
Option C.   centre of pressure.

Correct Answer is A.

Explanation.   The Chord Line is the imaginary straight line which passes through the aerofoil from leading edge to trailing edge.

73.   What is the angle between the chord line of the wing, and the longitudinal axis of the aircraft, known as?

Option A.   Angle of dihedral.
Option B.   Angle of attack.
Option C.   Angle of incidence.

Correct Answer is C.

Explanation.   Angle of incidence is the angle between the chord line of the wing and the longitudinal axis of the aircraft.

74.   Wing tip vortices create a type of drag known as

Option A.   form drag.
Option B.   profile drag.
Option C.   induced drag.

Correct Answer is C.

Explanation.   Induced drag is associated with wingtip vortices.

75.   Which of the following describes the 'Empennage'?

Option A.   Tail section of the aircraft, including fin, rudder, tail plane and elevators.
Option B.   Nose section of an aircraft, including the cockpit.
Option C.   The wings, including the ailerons.

Correct Answer is A.

Explanation.   Empannage' is the whole tail of the aircraft including fin, rudder, tailplane and elevator.

76. As the angle of attack is increased (up to the stall point), which of the following is correct?

Option A. Both b) and c) are correct.
Option B. Pressure difference between top and bottom of the wing increases.
Option C. Lift increases.

Correct Answer is A.
Explanation. As the angle of attack is increased the pressure difference between the upper and lower surfaces of the wing is increased. This causes the lift to increase.

77. What type of drag, depends on the smoothness of the body, and surface area over which the air flows?

Option A. Form drag.
Option B. Parasite drag.
Option C. Skin friction drag.

Correct Answer is C.
Explanation. Skin friction drag depends upon the smoothness of the body and the surface area.

78. When airflow velocity over an upper cambered surface of an aerofoil decreases, what takes place?

Option A. Pressure decreases, lift increases.
Option B. Pressure increases, lift decreases.
Option C. Pressure increases, lift increases.

Correct Answer is B.
Explanation. When airflow velocity over the upper cambered surface of an aerofoil DECREASES, the pressure increases and thus the lift decreases.

79. When an aircraft stalls

Option A. lift increases and drag decreases.
Option B. lift and drag increase.
Option C. lift decreases and drag increases.

Correct Answer is C.
Explanation. When an aircraft stalls the drag increases and the lift decreases.

80. Wing loading is

Option A. the maximum all up weight multiplied by the total wing area.
Option B. the maximum all up weight divided by the total wing area.
Option C. the ratio of the all up weight of the aircraft to its basic weight.

Correct Answer is B or C.
Explanation. Wing Loading is weight divided by wing area. Measured in Newtons per Square Metre.

81. An aircraft wing with an aspect ratio of 6:1 is proportional so that

Option A. the wing area is six times the span.
Option B. the mean chord is six times the thickness.
Option C. the wing span is six times the mean chord.

Correct Answer is C.
Explanation. If aspect ratio is 6:1 the wing span is 6 times the mean chord.

82. Upward and outward inclination of a mainplane is termed

Option A.   dihedral.
Option B.   sweep.
Option C.   stagger.

Correct Answer is A.
Explanation.   Upward and outward inclination of a mainplane is termed dihedral.

83. Which of the following forces act on an aircraft in level flight?

Option A.   Lift, drag, thrust.
Option B.   Lift, thrust, and weight.
Option C.   Lift, thrust, weight, and drag.

Correct Answer is C.
Explanation.   Lift, thrust, weight and drag act on an aircraft in level flight.

84. With reference to altimeters, QFE is

Option A.   the manufacturers registered name.
Option B.   quite fine equipment.
Option C.   setting aerodrome atmospheric pressure so that an altimeter reads zero on landing and
              take off.

Correct Answer is C.
Explanation.   Q is the mathematical symbol for pressure. FE stands for Field Elevation. QFE refers to setting
              the altimeter to aerodrome atmospheric pressure so the altimeter reads zero on landing and
              takeoff.

85. Under the ICAO 'Q' code there are which three settings?

Option A.   QEF, QNH, QEN.
Option B.   QE, QN, QQE.
Option C.   QFE, QNH, QNE.

Correct Answer is C.
Explanation.   The ICAO 'Q' codes are QFE. QNE, QNH.

86. Wing loading is

Option A.   WING AREA × WING CHORD.
Option B.   GROSS WEIGHT divided by GROSS WING AREA.
Option C.   the ultimate tensile strength of the wing.

Correct Answer is B.
Explanation.   Wing loading is gross weight divided by wing area measured in Newtons per Square Metre.

87. Weight is equal to

Option A.   mass·acceleration.
Option B.   mass·gravity.
Option C.   volume·gravity.

Correct Answer is B.
Explanation.   Weight = mass·gravity in straight and level flight. In a manoeuvre, additional accelerations are
              present, which are sometimes considered to increase weight. The question can therefore be
              answered in two ways.

88. Induced drag

Option A.   increases with increase in aircraft weight.
Option B.   increases with an increase in speed.
Option C.   reduces with an increase in angle of attack.

Correct Answer is A.
Explanation.   Induced drag increase with aircraft weight because it is 'lift dependant drag'.

89. Airflow over the upper surface of the wing generally

Option A.   flows towards the tip.
Option B.   flows towards the root.
Option C.   flows straight from leading edge to trailing edge.

Correct Answer is B.
Explanation.   Due to wing tip vortices there is a general flow of air from tip to root on the top surface, and root to tip on the lower surface.

90. With an increase in aspect ratio for a given IAS, induced drag will

Option A.   reduce.
Option B.   remain constant.
Option C.   increase.

Correct Answer is A.
Explanation.   A long slender wing (high aspect ratio) has a low induced drag.

91. If the density of the air is increased, the lift will

Option A.   remain the same.
Option B.   increase.
Option C.   decrease.

Correct Answer is B.
Explanation.   See the formula for lift. Lift is directly proportional to air density.

92. All the factors that affect the lift produced by an aerofoil are

Option A.   angle of attack, velocity, wing area, aerofoil shape, air density.
Option B.   angle of attack, air temperature, velocity, wing area.
Option C.   angle of attack, air density, velocity, wing area.

Correct Answer is A.
Explanation.   Lift formula is CL (includes aerofoil shape and angle of attack)·½·air density·velocity squared.

93. A wing section suitable for high speed would be

Option A.   thin with high camber.
Option B.   thick with high camber.
Option C.   thin with little or no camber.

Correct Answer is C.
Explanation.   A high speed wing is thin with little camber.

94. The induced drag of an aircraft

Option A.   increases if aspect ratio is increased.
Option B.   decreases with increasing speed
Option C.   increases with increasing speed.

Correct Answer is B.
Explanation.   Induced drag decreases with increasing speed.

95.   As the speed of an aircraft increases, the profile drag

Option A.   decreases at first then increase.
Option B.   increases.
Option C.   decreases.

Correct Answer is B.
Explanation.   Profile drag increases with increasing speed.

96.   The stagnation point on an aerofoil is the point where

Option A.   the boundary layer changes from laminar to turbulent.
Option B.   the suction pressure reaches a maximum.
Option C.   the airflow is brought completely to rest.

Correct Answer is C.
Explanation.   The stagnation point on the aerofoil is the point where the airflow is brought completely to rest
                 on the leading edge.

97.   The stalling of an aerofoil is affected by the.

Option A.   transition speed.
Option B.   airspeed.
Option C.   angle of attack.

Correct Answer is C.
Explanation.   The stall position of an aerofoil is determined by its angle of attack only.

98.   The most fuel efficient of the following types of engine is the

Option A.   turbo-jet engine.
Option B.   turbo-fan engine.
Option C.   rocket.

Correct Answer is B.
Explanation.   The turbo fan is the most fuel efficient engine.

99.   The quietest of the following types of engine is the

Option A.   turbo-jet engine.
Option B.   rocket.
Option C.   turbo-fan engine.

Correct Answer is C.
Explanation.   The turbo fan is the quietest engine.

100. Forward motion of a glider is provided by

Option A.   the weight.
Option B.   the drag.
Option C.   the engine.

Correct Answer is A.
Explanation.   The weight provides forward motion of a glider.

101. Profile drag consists of what drag types?

Option A.   Form, induced and interference.
Option B.   Form, induced and skin friction.
Option C.   Form, skin friction and interference.

Correct Answer is C.
Explanation.   Profile drag (known as Parasite drag in the USA) consists of Form Drag, Skin Friction Drag and Interference Drag.

102. An aircraft in straight and level flight is subject to

Option A.   a load factor of 1.
Option B.   a load factor of ½.
Option C.   zero load factor.

Correct Answer is A.
Explanation.   An aircraft in straight and level flight is subject to a load factor of 1 (i.e. 1g).

103. Aspect ratio is given by the formula

Option A.   Mean Chord / Span.
Option B. $Span^2$ / Area.
Option C. $Span^2$ / Mean Chord.

Correct Answer is B.
Explanation.   Aspect Ratio is span/mean chord. Multiply top and bottom by span and you get $span^2$/area.

104. An aspect ratio of 8 means

Option A.   the mean chord is 8 times the span.
Option B.   the span is 8 times the mean chord.
Option C.   the area is 8 times the span.

Correct Answer is B.
Explanation.   An Aspect Ratio of 8 means the span is 8 times the chord.

105. A high aspect ratio wing

Option A.   has a higher stall angle than a low aspect ratio wing.
Option B.   is stiffer than a low aspect ratio wing.
Option C.   has less induced drag than a low aspect ratio wing.

Correct Answer is C.
Explanation.   A long slender wing (high aspect ratio) has less induced drag than a short stubby wing.

106. Induced downwash

Option A.   reduces the effective angle of attack of the wing.
Option B.   increases the effective angle of attack of the wing.
Option C.   has no effect on the angle of attack of the wing.

Correct Answer is A.
Explanation.   Induced downwash reduces the effective angle of attack of the wing.

107. A straight rectangular wing, without any twist, will

Option A.   have less angle of attack at the tip.
Option B.   have greater angle of attack at the tip.
Option C.   have the same angle of attack at all points along the span.

Correct Answer is A or C.

Explanation.   Due to wingtip vortices, there is more downwash at the tip, and therefore there is less angle of attack at the tip.

108.   Given 2 wings, the first with a span of 12 m and a chord of 2 m. The second has a span of 6 m and a chord of 1 m. How do their Aspect Ratios compare?

Option A.   The first is higher.
Option B.   They are the same.
Option C.   The second is higher.

Correct Answer is B.

Explanation.   Aspect ratio = Span/Chord.

109. The C of G moves in flight. The most likely cause of this is

Option A.   movement of passengers.
Option B.   consumption of fuel and oils.
Option C.   movement of cargo.

Correct Answer is B.

Explanation.   Consumption of fuel and oil causes the C of G to move in flight.

110. A straight rectangular wing, without any twist, will

Option A.   stall equally along the span of the wing.
Option B.   stall first at the tip.
Option C.   stall first at the root.

Correct Answer is C.

Explanation.   A straight rectangular wing will stall first at the root. This is because the effective angle of attack is reduced at the tips because of the greater downwash at the tips.

111. When an aircraft experiences induced drag

Option A.   air flows under the wing span wise towards the root and on top of the wing span wise towards the tip.
Option B.   air flows under the wing span wise towards the tip and on top of the wing span wise towards the root.
Option C.   Neither a) or b) since induced drag does not cause span wise flow.

Correct Answer is B or C.

Explanation.   Induced drag causes air to flow under the wing span wise towards the tip and on top of the wing span wise towards the root.

112. An aeroplane wing is designed to produce lift resulting from relatively

Option A.   positive air pressure below and above the wing's surface.
Option B.   positive air pressure below the wing's surface an negative air pressure above the wing's surface.
Option C.   negative air pressure below the wing's surface and positive air pressure above the wing's surface. OR negative air pressure below the wing's surface and positive air.

Correct Answer is C.

Explanation.   The wing is designed to produce lift resulting from relatively positive air pressure below the wing surface and negative air pressure above the wing surface.

113. Aspect ratio of a wing is defined as the ratio of the

Option A.   wingspan to the mean chord.
Option B.   wingspan to the wing root.
Option C.   square of the chord to the wingspan.

Correct Answer is A.
Explanation.   Aspect ratio is defined as the ratio of the wing span to mean chord.

114. Which of the following is true?

Option A.   Lift acts at right angles to the relative air flow and weight acts vertically down.
Option B.   Lift acts at right angles to the wing chord line and weight acts vertically down.
Option C.   Lift acts at right angles to the relative air flow and weight acts at right angles to the aircraft centre line.

Correct Answer is A.
Explanation.   Lift acts at right angles to the relative airflow and weight acts vertically down.

115. The airflow over the upper surface of a cambered wing.

Option A.   increases in velocity and reduces in pressure.
Option B.   increases in velocity and pressure.
Option C.   reduces in velocity and increases in pressure.

Correct Answer is A.
Explanation.   Airflow flowing over the upper surface of an aerofoil increases in velocity and decreases in pressure.

116. With increased speed in level flight

Option A.   profile drag increases.
Option B.   induced drag increases.
Option C.   profile drag remains constant.

Correct Answer is A.
Explanation.   With increased speed in level flight, the profile drag increases and the induced drag decreases.

117. An aeroplane wing is designed to produce lift resulting from relatively

Option A.   positive air pressure below the wing's surface and negative air pressure above the wing's surface.
Option B.   negative air pressure below the wing's surface and positive air pressure above the wing's surface.
Option C.   positive air pressure below and above the wing's surface.

Correct Answer is C.
Explanation.   The wing is designed to produce lift resulting from relatively positive air pressure below the wing surface and negative air pressure above the wing surface.

118. The angle of attack of an aerofoil section is the angle between the

Option A.   underside of the wing surface and the mean airflow.
Option B.   chord line and the relative airflow.
Option C.   chord line and the centre line of the fuselage.

Correct Answer is. chord line and the relative airflow.
Explanation.   Angle of attack of an aerofoil is the angle between the chord line and the relative air flow.

119. A swept wing tends to stall first at the

Option A.   centre section.
Option B.   root.
Option C.   tip.

Correct Answer is C.
Explanation.   A swept wing tends to stall first at the tip.

120. The trailing vortex on a pointed wing (taper ratio = 0) is

Option A.   at the tip.
Option B.   equally all along the wing span.
Option C.   at the root.

Correct Answer is C.
Explanation.   The vortex of a pointed wing concentrated at the root of the wing – exactly opposite to straight wings.

121. The lift curve for a delta wing is

Option A.   more steep than that of a high aspect ratio wing.
Option B.   less steep than that of a high aspect ratio wing.
Option C.   the same as that of a high aspect ratio wing.

Correct Answer is B.
Explanation.   A delta wing produces less lift for any given angle of attack than any other type of wing.

122. An increase in the speed at which an aerofoil passes through the air increases lift because.

Option A.   the increased speed of the airflow creates a greater pressure differential between the upper and lower surfaces.
Option B.   the increased speed of the airflow creates a lesser pressure differential between the upper and lower surfaces.
Option C.   the increased velocity of the relative wind increases the angle of attack.

Correct Answer is A or C.
Explanation.   Increasing the speed of an aerofoil increases the pressure differential between the upper and lower surface.

123. A delta wing has.

Option A.   a lower stall angle than a straight wing.
Option B.   a higher stall angle than a straight wing.
Option C.   the same stall angle than a straight wing.

Correct Answer is B.
Explanation.   A delta wing has a much higher stall angle than a normal wing (some as much as 40°).

124. The airflow over the upper surface of a cambered wing

Option A.   reduces in velocity and increases in pressure.
Option B.   increases in velocity and reduces in pressure.
Option C.   increases in velocity and pressure.

Correct Answer is B.
Explanation.   Airflow over the upper surface of a cambered surface of the wing increases in velocity and decreases in pressure.

125. The speed of air over a swept wing which contributes to the lift is

Option A.   less than the aircraft speed.
Option B.   the same as the aircraft speed.
Option C.   more than the aircraft speed.

Correct Answer is A.
Explanation.   If aircraft speed is V, speed of airflow over wing which contributes to lift is V_{cos} (sweepangle). Cos (sweepangle) < 1.

126. For a given angle of attack, induced drag is

Option A.   greater on a high aspect ratio wing.
Option B.   greater towards the wing root.
Option C.   greater on a low aspect ratio wing.

Correct Answer is C.
Explanation.   A low aspect ratio wing (short-stubby wing) has a greater induced drag.

127. In straight and level flight, the angle of attack of a swept wing is

Option A.   less than the aircraft angle to the horizontal.
Option B.   more than the aircraft angle to the horizontal.
Option C.   the same as the aircraft angle to the horizontal.

Correct Answer is A.
Explanation.   Since the 'effective' velocity vector over a swept wing is not parallel with the forward direction of the aircraft, a change in pitch of the aircraft has lesser effect upon the AOA of the wing.

128. Induced drag

Option A.   is equal to the profile drag at V_{md}.
Option B.   is equal to the profile drag at the stalling speed.
Option C.   is never equal to the profile drag.

Correct Answer is A.
Explanation.   Induced drag is equal to profile drag at V_{md}.

129. A delta wing aircraft flying at the same speed (subsonic) and angle of attack as a swept wing aircraft of similar wing area will produce

Option A.   more lift.
Option B.   less lift.
Option C.   the same lift.

Correct Answer is B.
Explanation.   A delta wing aircraft at any given angle of attack and speed will produce less lift than any other type of wing.

130. The stagnation point is

Option A.   static pressure minus dynamic pressure.
Option B.   dynamic pressure only.
Option C.   static pressure plus dynamic pressure.

Correct Answer is C.
Explanation.   At stagnation, the pressure is total (static plus dynamic).

131. On a swept wing aircraft, due to the adverse pressure gradient, the boundary layer on the upper surface of the wing tends to flow

Option A.   towards the root.
Option B.   towards the tip.
Option C.   directly from leading edge to trailing edge.

Correct Answer is B.
Explanation.   Due to adverse pressure gradient on a swept wing, the boundary layer slides towards the tip and thickens at the tip. This is why swept wings stall first at the tips.

132. With increased speed in level flight

Option A.   induced drag increases.
Option B.   profile drag increases.
Option C.   profile drag remains constant.

Correct Answer is B.
Explanation.   Profile drag increases with speed, induced drag decreases with speed.

133. If a swept wing stalls at the tips first, the aircraft will

Option A.   pitch nose up.
Option B.   roll.
Option C.   pitch nose down.

Correct Answer is A.
Explanation.   Since the tips are behind the Centre of Gravity, losing the lift at the tips will cause the nose to rise.

134. The thickness/chord ratio of the wing is also known as

Option A.   fineness ratio.
Option B.   mean chord ratio.
Option C.   aspect ratio.

Correct Answer is A.
Explanation.   The thickness/chord ratio of the wing is also known as the fineness ratio. (Technically, thickness/chord ratio = 1/fineness ratio).

135. Flexure of a rearward swept wing will

Option A.   increase the lift and hence increase the flexure.
Option B.   increase the lift and hence decrease the flexure.
Option C.   decrease the lift and hence decrease the flexure.

Correct Answer is C.
Explanation.   Flexure of a rearward swept wing will decrease the lift (since the wing presents its upper surface to the airflow and the angle of attack reduces) and so the wing flexes back.

136. A High Aspect Ratio wing is a wing with

Option A.   short span, long chord.
Option B.   long span, long chord.
Option C.   long span, short chord.

Correct Answer is C.
Explanation.   Aspect ratio is the ratio of span to chord.

137. Stall commencing at the root is preferred because

Option A.   it provides the pilot with a warning of complete loss of lift.
Option B.   the ailerons become ineffective.
Option C.   it will cause the aircraft to pitch nose up.

Correct Answer is A.
Explanation.   Stall commencing at the root causes turbulent air to hit the tailplane. The resulting 'buffet' warns the pilot just before complete stall.

138. An aircraft flying in 'ground effect' will produce

Option A.   the same lift as a similar aircraft outside of ground effect.
Option B.   less lift than a similar aircraft outside of ground effect.
Option C.   more lift than a similar aircraft outside of ground effect.

Correct Answer is C.
Explanation.   An aircraft flying in ground effect will have more lift than an aircraft not flying in ground effect (which is why seagulls glide close to the water surface).

139. If the angle of attack of a wing is increased in flight, the

Option A.   CofP will move aft.
Option B.   CofP will move forward.
Option C.   C of G will move aft.

Correct Answer is B.
Explanation.   Increasing the AOA moves the CofP forward.

140. The Rams Horn Vortex on a forward swept wing will be

Option A.   more than a rearward swept wing.
Option B.   less than a rearward swept wing.
Option C.   the same as a rearward swept wing.

Correct Answer is B.
Explanation.   A forward swept wing does not suffer from the Rams Horn Vortex.

141. For a cambered wing section the zero lift angle of attack will be

Option A.   4 degrees.
Option B.   zero.
Option C.   negative.

Correct Answer is C.
Explanation.   A non symmetrical wing will produce some lift at zero degrees. Therefore it must have a negative angle of attack to produce zero lift.

142. Airflow at subsonic speed is taken to be

Option A.   compressible.
Option B.   either a or b depending on altitude.
Option C.   incompressible.

Correct Answer is C.
Explanation.   Subsonic airflow is always considered to be incompressible.

143. *Bernoulli's* equation shows that

Option A.   at constant velocity the kinetic energy of the air changes with a change of height.

Option B.   with a change in velocity at constant height the static pressure will change.
Option C.   with a change in speed at constant height both kinetic and potential energies change.

Correct Answer is B.
Explanation.   *Bernoulli's* theorem states that if velocity increases, the static pressure decreases, and vice versa.

144. If fluid flow through a venturi is said to be incompressible, the speed of the flow increases at the throat to

Option A.   allow for a reduction in static pressure.
Option B.   maintain a constant volume flow rate.
Option C.   allow for an increase in static pressure.

Correct Answer is B.
Explanation.   Volume flow rate is constant at all parts of the flow (if fluid in incompressible) regardless of cross sectional area.

145. To produce lift, an aerofoil must be

Option A.   asymmetrical.
Option B.   symmetrical.
Option C.   either symmetrical or asymmetrical.

Correct Answer is C.
Explanation.   To produce lift, the aerofoil can be either symmetrical or asymmetrical.

146. Lift is dependent on

Option A.   the net area of the wing ,the density of the fluid medium and the velocity.
Option B.   the area of the wing, the density of the fluid medium, and the square of the velocity.
Option C.   the frontal area of the wing, the density of the fluid medium and the velocity.

Correct Answer is B.
Explanation.   See the formula for lift.

147. A wing develops 10 000 N of lift at 100 knots. Assuming the wing remains at the same angle of attack and remains at the same altitude, how much lift will it develop at 300 knots?

Option A.   30 000 N.
Option B.   900 000 N.
Option C.   90 000 N.

Correct Answer is C.
Explanation.   See the formula for lift. Velocity is squared, so if you triple the velocity, the lift is 9 times.

148. The angle of attack is

Option A.   related to angle of incidence.
Option B.   always kept below 15 degrees.
Option C.   not related to the angle of incidence.

Correct Answer is C.
Explanation.   See definitions of angle of attack and angle of incidence.

149. The difference between the mean camber line and the chord line of an aerofoil is

Option A.   neither are straight.
Option B.   they both may be curved.

Option C. one is always straight and the other may be straight.

Correct Answer is C.
Explanation. See the definitions of mean camber and chord line.

150. If the C of G is calculated after loading as within limits for take off

Option A. a further calculation is required prior to landing to allow for fuel and oil consumption.
Option B. a further calculation is required prior to landing to allow for flap deployment.
Option C. no further calculation is required.

Correct Answer is A.
Explanation. If the CG of the fuel is not directly on the empty aircraft CG, the loaded aircraft CG must be calculated twice (with and without fuel).

151. Helicopter rotor blades create lift by

Option A. pushing the air down.
Option B. working like a screw.
Option C. creating low pressure above the blades.

Correct Answer is C.
Explanation. A pure aerodynamicist would say all three are correct. But probably a) is technically most correct.

152. The span wise component of the airflow is

Option A. greater at higher speeds
Option B. unaffected by speed.
Option C. less at higher speeds.

Correct Answer is C.
Explanation. The tip vortices are less at high speed (due to lower AOA at high speed). The tip vortices cause the span wise flow.

153. A wing fence

Option A. acts as a lift dumping device.
Option B. reduces span wise flow on a swept wing thus reducing induced drag.
Option C. increases lateral control.

Correct Answer is B.
Explanation. A wing fence reduces span wise flow. Refer: Barnard and Phillpott Page 78.

154. With all conditions remaining the same, if the aircraft speed is halved, by what factor is the lift reduced?

Option A. Half.
Option B. By a factor of 4.
Option C. Remains the same.

Correct Answer is B.
Explanation. Lift is proportional to the square of aircraft speed.

155. The boundary layer over an aerofoil is

Option A. a layer of air close to the aerofoil which is moving at a velocity less than free stream air.
Option B. a layer of turbulent air close to the aerofoil which is moving at a velocity less than free stream air.
Option C. a layer of air close to the aerofoil that is stationary.

Correct Answer is B.

Explanation.   Boundary layer air consists of turbulent and laminar airflow.

156. On a swept wing aircraft, the fineness ratio of an aerofoil is

Option A.   highest at the root.
Option B.   equal throughout the span.
Option C.   highest at the tip.

Correct Answer is C.

Explanation.   Fineness ratio (chord/thickness) is greatest at the tip. Fineness ratio is the inverse of thickness/chord ratio. Some textbooks differ on the definition of 'fineness ratio' but most state FR = chord/thickness. Quote A&P Mechanics Airframe Handbook Page 32 "If a wing has a high fineness ratio, it is a very thin wing. A thick wing has low fineness ratio".

157. Streamlining will reduce

Option A.   induced drag.
Option B.   skin friction drag.
Option C.   form drag.

Correct Answer is C.

Explanation.   Form drag is a function of shape.

158. If an aircraft has a gross weight of 3 000 kg and is then subjected to a total weight of 6 000 kg the load factor will be

Option A.   2G.
Option B.   9G.
Option C.   3G.

Correct Answer is A.

Explanation.   Load factor is a measure of how many times heavier the aircraft 'feels' compared to how heavy it actually is.

159. Ice formed on the leading edge will cause the aircraft to

Option A.   stall at a higher speed.
Option B.   stall at a lower speed.
Option C.   stall at the same stall speed and AOA.

Correct Answer is A.

Explanation.   Ice change the wing section shape and hence lift (CL) is less and stall speed is greater.

160. Under what conditions will an aircraft create best lift?

Option A.   Hot damp day at 1 200 ft.
Option B.   Cold dry day at 200 ft.
Option C.   Cold wet day at 1 200 ft.

Correct Answer is B.

Explanation.   Cold dry air at low altitude provides maximum air density hence best lift.

161. As Mach number increases, what is the effect on boundary layer?

Option A.   Becomes more turbulent.
Option B.   Decreases in thickness.
Option C.   Becomes less turbulent.

Correct Answer is A.

Explanation.   As speed increases (speed here is measured in Mach) the transition point moves forward, hence turbulent boundary layer increases.

162. During a glide the following forces act on an aircraft

Option A.   lift and weight only.
Option B.   lift, drag, weight.
Option C.   lift, weight, thrust.

Correct Answer is B.
Explanation.   No thrust in a glide. The weight provides the forward motion.

163. If an aileron is moved downward

Option A.   the stalling angle of that wing is increased.
Option B.   the stalling angle is not affected but the stalling speed is decreased.
Option C.   the stalling angle of that wing is decreased.

Correct Answer is C.
Explanation.   The aileron increases the 'local' AOA and provides a greater camber. Both will cause the stalling angle of the wing to decrease.

164. If the wing loading of an aircraft were reduced the stalling speed would

Option A.   increase.
Option B.   not be affected.
Option C.   decrease.

Correct Answer is C.
Explanation.   An increase in wing loading increases the stall speed. And vice versa.

165. The lift on a wing is increased with

Option A.   an increase in temperature.
Option B.   an increase in pressure.
Option C.   an increase in humidity.

Correct Answer is B.
Explanation.   Lift depends on density. Increases in humidity and temperature reduce density. Increase in pressure increases density.

166. The airflow behind a normal shockwave will

Option A.   always be subsonic and in the same direction as the original airflow.
Option B.   always be supersonic and in the same direction as the original airflow.
Option C.   always be subsonic and deflected from the direction of the original airflow.

Correct Answer is A.
Explanation.   The airflow behind a normal shock is subsonic, and in the same direction. It is supersonic behind an oblique shock (and slightly deflected).

167. Induced drag can be reduced by the use of

Option A.   streamlining.
Option B.   high aspect ratio wings.
Option C.   fairings at junctions between fuselage and wings.

Correct Answer is B.
Explanation.   High aspect ratio wings have low induced drag (IE a glider wing).

168. Interference drag can be reduced by the use of

Option A.   fairings at junctions between fuselage and wings.
Option B.   high aspect ratio wings.
Option C.   streamlining.

Correct Answer is A.
Explanation.   Interference drag occurs as a result of turbulence at wing body joints.

169. Gliding angle is the angle between

Option A.   ground and the glide path.
Option B.   aircraft and flight path.
Option C.   aircraft and airflow.

Correct Answer is A.
Explanation.   The greater the L/D angle the less the glide angle is – therefore you can glide further.

170. Propeller Solidity can be increased by

Option A.   increasing the number of blades.
Option B.   decreasing the length of the blades.
Option C.   increasing the blade angle.

Correct Answer is A.
Explanation.   A C Kermode Mechanics of Flight CH 4 Page 138 shows methods of increasing solidity.

171. Lift is generated by a wing

Option A.   mostly on the bottom surface.
Option B.   mostly on the top surface.
Option C.   equally on the top and bottom surfaces.

Correct Answer is B.
Explanation.   ⅔ of lift is produced by the top surface.

172. Lift is dependent on

Option A.   the area of the wing, the density of the fluid medium and the square of the velocity.
Option B.   the net area of the wing, the density of the fluid medium and the velocity.
Option C.   the frontal area of the wing, the density of the fluid medium and the velocity.

Correct Answer is A.
Explanation.   Lift = Lift Coefficient × ½ × density × velocity^2 × wing area (Lift formula).

173. To produce lift, an aerofoil must be

Option A.   symmetrical.
Option B.   asymmetrical.
Option C.   either (a) or (b).

Correct Answer is C.
Explanation.   A symmetrical wing will produce lift if presented at a suitable positive angle of attack.

174. If fluid flow through a venturi is said to be incompressible, the speed of the flow increases at the throat to

Option A.   allow for a reduction in static pressure.
Option B.   allow for an increase in static pressure.
Option C.   maintain a constant volume flow rate.

Correct Answer is C.
Explanation.   Continuity of flow principle.

175. *Bernoulli's* equation shows that

Option A.   at constant velocity the total energy of the air changes with a change in height.
Option B.   with a change in speed at constant height both kinetic and potential energies change.
Option C.   with a change in velocity at constant height the static pressure will change.

Correct Answer is A.
Explanation.   *Bernoulli's* theorem states that if velocity increases, the static pressure decreases, and vice versa.

176. Airflow at sub-sonic speed is taken to be

Option A.   incompressible.
Option B.   compressible.
Option C.   either (a) or (b) depending on altitude.

Correct Answer is A.

177. The total drag of an aircraft

Option A.   changes with speed.
Option B.   increases with speed.
Option C.   increases with the square of speed.

Correct Answer is A.
Explanation.   The graph of TOTAL drag against airspeed is 'U' shaped. c can be the only correct answer.

178. _____ angle of attack is known as optimum angle of attack.

Option A.   5 to 7 degrees.
Option B.   3 to 4 degrees.
Option C.   10 to 12 degrees.

Correct Answer is B.

179. Induced drag is _____ at root.

Option A.   lowest.
Option B.   greatest.
Option C.   neutral.

Correct Answer is A.

180. Profile drag is _____ to speed.

Option A.   neutral.
Option B.   inversely proportional.
Option C.   proportional.

Correct Answer is C.

181. A shock stall occurs at

Option A.   large angles of attack.
Option B.   small angles of attack.
Option C.   equally both large and small angles of attack.

Correct Answer is B.

Explanation. An arguable point. Shock stall is due to shock induced separation which can occur at any angle of attack, but it would be difficult to achieve the high speed necessary with a high angle of attack.

182. What happens to the wingtip stagnation point as the AOA increases?

Option A. It moves down and under the leading edge.
Option B. It moves up and over the leading edge.
Option C. It remains unchanged.

Correct Answer is A.
Explanation. It moves down and under the leading edge.

183. What does the term 'wing washout' mean?

Option A. The design of the wing that gives the wing tip a lower angle of incidence.
Option B. The design of the wing that gives the wing tip a much greater angle of incidence.
Option C. The airflow moves toward the end of the wing.

Correct Answer is A.
Explanation. Wing is twisted such that incidence is lower at the tip.

184. The point at which airflow ceases to be laminar and becomes turbulent is the

Option A. boundary point.
Option B. transition point.
Option C. separation point.

Correct Answer is B.
Explanation. transition point.

185. Which of the following is true about Profile Drag?

Option A. Profile Drag = Skin Drag + Form Drag.
Option B. Profile Drag = Skin Drag + Induced Drag.
Option C. Profile Drag = Induced Drag + Form Drag.

Correct Answer is A.
Explanation. Profile Drag = Skin Drag + Form Drag.

186. Which statement is true?

Option A. Both Induced drag and profile drag increase with the square of the airspeed.
Option B. Profile drag increases with the square of the airspeed.
Option C. Induced drag increases with the square of the airspeed.

Correct Answer is C.
Explanation. Profile drag increases with the square of the airspeed but induced drag decreases with the square of the airspeed.

187. Which statement is true?

Option A. Rectangular wings stall at the root first.
Option B. Both tapered and rectangular wings will stall at the tip first.
Option C. Tapered wings stall at the root first.

Correct Answer is A.
Explanation. Rectangular wings stall at the root first.

188. During inverted level flight an aircraft accelerometer shows

Option A.   −2g.
Option B.   −1g.
Option C.   0g.

Correct Answer is B.
Explanation.   Inverted (level) flight is −1g.

189. During straight and level flight an aircraft accelerometer shows

Option A.   4g.
Option B.   1g.
Option C.   2g.

Correct Answer is B.
Explanation.   Straight and level flight is 1g.

190. Which of the following is incorrect about induced drag?

Option A.   It will increase inversely to the square of the airspeed.
Option B.   It will decrease in proportion to the square of the airspeed.
Option C.   It will increase when the angle of attack is reduced.

Correct Answer is C.

191. What produces the most lift at low speeds?

Option A.   High camber.
Option B.   Low aspect ratio.
Option C.   High aspect ratio.

Correct Answer is C.

192. If the angle of attack is zero, but lift is produced, the.

Option A.   wing is symmetrical.
Option B.   wing is cambered.
Option C.   wing has positive angle of incidence.

Correct Answer is B.

193. When is the angle of incidence the same as the angle of attack?

Option A.   Never.
Option B.   In descent.
Option C.   When relative airflow is parallel to longitudinal axis.

Correct Answer is C.

Theory of Flight

1.   Flaps at landing position

Option A.   decrease landing speed.
Option B.   decrease take off and landing speeds.
Option C.   decrease take off speed.

Correct Answer is A.
Explanation. Although an aircraft will take-off with flaps at landing position, this is not normal.

2.   As a subsonic aircraft speeds-up, its Centre of Pressure

Option A.   moves aft.
Option B.   moves forward.
Option C.   is unaffected.

Correct Answer is A.
Explanation.   Assuming that the aircraft is to remain at constant altitude, it must reduce its angle of attack as it speeds-up. This alone will move the CofP rearwards, in accordance with the sub-sonic angle of attack change theory.

3.   Lowering of the flaps

Option A.   increases drag.
Option B.   increases lift.
Option C.   increases drag and lift.

Correct Answer is A.
Explanation.   Jeppesen A+P Technician General Textbook. Page 1-17.

4.   Wing spoilers, when used asymmetrically, are associated with

Option A.   rudder.
Option B.   elevators.
Option C.   ailerons.

Correct Answer is C.
Explanation.   Pallett Automatic Flight Control 4th Edition Page 51. Jeppesen A&P Technician Airframe Textbook Page 1-12.

5.   What do ruddervators do?

Option A.   Control yaw and roll.
Option B.   Control pitch and yaw.
Option C.   Control pitch and roll.

Correct Answer is B.
Explanation.   Jeppesen A+P Technician General Textbook. Page 1-16 fig 1-36.

6.   What controls pitch and roll on a delta wing aircraft?

Option A.   Ailerons.
Option B.   Elevons.
Option C.   Elevators.

Correct Answer is B.
Explanation.   Jeppesen A+P Technician General Textbook. Page 1-17.

7.   What does a trim tab do?

Option A.   Allows the C of G to be outside the normal limit.
Option B.   Provides finer control movements by the pilot.
Option C.   Eases control loading for pilot.

Correct Answer is C.
Explanation.   A&P General Textbook Pg 2-35.

8.   How does a balance tab move?

Option A.   In the same direction a small amount.
Option B.   In the opposite direction proportional to the control surface it is attached to.
Option C.   In the same direction proportional to the control surface it is attached to.

Correct Answer is B.
Explanation.   A&P General Textbook Pg 2-36.

9.   If an aircraft is yawing to the left, where would you position the trim tab on the rudder?

Option A.   To the centre.
Option B.   To the left.
Option C.   To the right.

Correct Answer is B.
Explanation.   Automatic flight control, Pallett, 4th Edition Page 43.

10.   If an aircraft is flying with a left wing low, where would you move the left aileron trim tab?

Option A.   Down.
Option B.   Up.
Option C.   Moving the aileron trim tab will not correct the situation.

Correct Answer is B.
Explanation.   Automatic flight control, Pallett, 4th Edition Page 43.

11.   When a leading edge flap is fully extended, what is the slot in the wing for?

Option A.   To re-energise the boundary layer.
Option B.   To increase the lift.
Option C.   To allow the flap to retract into it when it retracts.

Correct Answer is A.
Explanation.   Pallett Automatic Flight Control 2nd Edition Page 50. Jeppesen A&P Technician Airframe Textbook Page 1-32.

12.   With respect to differential aileron control, which of the following is true?

Option A.   The up going and down going ailerons both deflect to the same angle.
Option B.   The up going Aileron moves through a smaller angle than the down going aileron.
Option C.   The down going aileron moves through a smaller angle than the up going aileron.

Correct Answer is C.
Explanation.   Mechanics of Flight, Kermode, Page 301. The down going aileron moves less, to reduce the induced drag which causes adverse aileron yaw.

13.   The aeroplane fin is of symmetrical aerofoil section and will therefore provide a side-load

Option A.   only when the rudder is moved.
Option B.   if a suitable angle of attack develops due either yaw or rudder movement.
Option C.   only if a suitable angle of attack develops due to yaw.

Correct Answer is B.
Explanation.   Rudder deflection or yaw.

14.   An aircraft left wing is flying low. The aileron trimmer control to the left aileron trim tab in the cockpit would be

Option A.   moved up causing the left aileron to move up.

Option B.	moved up causing the left aileron to move down.
Option C.	moved down causing the left aileron to move down.

Correct Answer is B.
Explanation.	Down aileron required – which requires up trim.

15.	An elevator tab moves down

Option A.	to make the nose go down.
Option B.	to counteract for the aircraft flying nose heavy.
Option C.	to counteract for the aircraft flying tail heavy.

Correct Answer is B.
Explanation.	Elevator tab DOWN, elevator UP, aircraft nose UP.

16.	The stall margin is controlled by

Option A.	speed bug cursor.
Option B.	EPR limits.
Option C.	angle of attack and flap position.

Correct Answer is C.
Explanation.	Flight Instruments and Automatic Flight Control Page 143/4.

17.	Other than spoilers, where are speed brakes located?

Option A.	Under the Fuselage.
Option B.	Either side of the Fuselage.
Option C.	On the wing.

Correct Answer is B.
Explanation.	Reference BAe 146 etc.

18.	With a trailing edge flap being lowered, due to rising gusts, what will happen to the angle of attack?

Option A.	Tend to decrease.
Option B.	Stay the same.
Option C.	Tend to increase.

Correct Answer is C.
Explanation.	Assuming that 'rising gust' means it has a vertical component.

19.	A device used do dump lift from an aircraft is

Option A.	leading edge flaps.
Option B.	trailing edge flaps.
Option C.	spoiler.

Correct Answer is C.
Explanation.	Spoilers are sometimes called 'lift dumps'.

20.	The purpose of a slot in a wing is to

Option A.	provide housing for the slat.
Option B.	speed up the airflow and increase lift.
Option C.	act as venturi, accelerate the air and re-energise boundary layer.

Correct Answer is C.
Explanation.	A slot is to act as venturi, accelerate the air and re-energise boundary layer.

21. Large flap deployment

Option A.   causes increased span wise flow towards tips on wing upper surface.
Option B.   causes increased span wise flow towards tips on wing lower surface.
Option C.   has no effect on span wise flow.

Correct Answer is B.
Explanation.   Flaps increase the pressure differential between top and bottom surfaces, increase tip vortices and span wise flow.

22. Which part of the wing of a swept-wing aircraft stalls first?

Option A.   Tip stalls first.
Option B.   Both stall together.
Option C.   Root stalls first.

Correct Answer is A.
Explanation.   The tip of a swept wing stalls first.

23. During flight, an aircraft is yawing to the right. The aircraft would have a tendency to fly

Option A.   right wing low.
Option B.   left wing low.
Option C.   nose up.

Correct Answer is A.
Explanation.   The leading wing (left wing) has increased lift, causing it to rise.

24. In the reversed camber horizontal stabilizer

Option A.   there is an increased tail plane up-force.
Option B.   the elevator causes tail down movement i.e. increased tail plane down force.
Option C.   there is an increased tail plane down-force.

Correct Answer is C.
Explanation.   The lower cambered surface produces a down-force on the tail.

25. When the trailing edge flap is extended

Option A.   CP moves rearward.
Option B.   the CP moves forward but the CG does not change.
Option C.   the CP moves forward and the pitching moment changes to nose up.

Correct Answer is A.
Explanation.   CP moves rearwards when the flap is extended.

26. With a drop in ambient temperature, an aircraft service ceiling will

Option A.   rise.
Option B.   not be affected.
Option C.   lower.

Correct Answer is A.
Explanation.   As ambient temperature drops, density increases and aircraft performance increases.

27. What type of flap is this?

Option A.   Split flap.
Option B.   Plain flap.
Option C.   Fowler flap.

Correct Answer is A.
Explanation.   Split flap.

28.   Servo tabs

Option A.   enable the pilot to bring the control surface back to neutral.
Option B.   move in such a way as to help move the control surface.
Option C.   provide artificial feel.

Correct Answer is B.
Explanation.   A&P Technician Airframe Textbook Pg.1-29.

29.   Spring Tabs

Option A.   provide artificial feel.
Option B.   enable the pilot to bring the control surface back to neutral.
Option C.   move in such a way as to help move the control surface.

Correct Answer is C.
Explanation.   A&P Technician Airframe Textbook Pg.1-29.

30.   Extending a leading edge slat will have what effect on the angle of attack of a wing?

Option A.   Increase the angle of attack.
Option B.   Decrease the angle of attack.
Option C.   No effect on angle of attack.

Correct Answer is B.

31.   To ensure that a wing stalls at the root first, stall wedges are

Option A.   installed on the wing leading edge at the wing root.
Option B.   installed on the wing leading edge at the wing tip.
Option C.   installed at the wing trailing edge at the wing root.

Correct Answer is A.

32.   *Krueger* flaps make up part of the

Option A.   wing lower surface leading edge.
Option B.   wing lower surface trailing edge.
Option C.   wing upper surface leading edge.

Correct Answer is A.
Explanation.   Jeppesen A&P Technician Airframe Textbook 1-37. Automatic Flight Control Pallett Page 53
                fig 1.37 (Note: lower surface when retracted, upper surface when extended.)

33.   In a turn, wing spoilers may be deployed

Option A.   to assist the up going aileron.
Option B.   in unison with both the up going and down going ailerons.
Option C.   to act as an airbrake, interacting with the ailerons.

Correct Answer is A.

34.   Dutch role is movement in

Option A.   yaw and pitch.
Option B.   yaw and roll.
Option C.   pitch and roll.

Correct Answer is B.
Explanation.   Avionic Fundamentals Jeppesen page 291.

35.   What is the main purpose of a frise aileron?

Option A.   Increase drag on the up going wing.
Option B.   Decrease drag on the up going wing.
Option C.   Help pilot overcome aerodynamic loads.

Correct Answer is B.
Explanation.   The Frise aileron increases drag on the up-going aileron, which is on the downgoing wing. And
               Vise versa on the other aileron.

36.   Flap asymmetry causes the aircraft to

Option A.   nose down.
Option B.   go one wing down.
Option C.   nose up.

Correct Answer is B.

37.   If an aircraft moves in yaw, what axis is it moving about?

Option A.   Longitudinal.
Option B.   Lateral.
Option C.   Normal.

Correct Answer is C.

38.   If an aircraft is aerodynamically stable

Option A.   aircraft returns to trimmed attitude.
Option B.   CofP moves back.
Option C.   aircraft becomes too sensitive.

Correct Answer is A.

39.   What are ground spoilers used for?

Option A.   To assist the aircraft coming to a stop.
Option B.   To slow the aircraft.
Option C.   To dump lift.

Correct Answer is C.

40.   Mass balance weights are used to

Option A.   balance the trailing edge of flying control surfaces.
Option B.   counteract flutter on control surfaces.
Option C.   balance the tabs.

Correct Answer is .

41.   What is a slot used for?

Option A.   Increased angle of attack during approach.
Option B.   Increase the speed of the airflow.
Option C.   To reinforce the boundary layer.

Correct Answer is C.
Explanation.   Automatic Flight Control Pallett Page 53.

42.   Angle of Attack is the angle between cord line and

Option A.   horizontal axis.
Option B.   relative air flow.
Option C.   tip path plane.

Correct Answer is B.
Explanation.   Automatic Flight Control Pallett Page 3.

43.   A high lift device is used for

Option A.   take-off only.
Option B.   take-off and landing.
Option C.   landing only.

Correct Answer is B.
Explanation.   Automatic Flight Control Pallett Page 50.

44.   How is a spoiler interconnected to other flight control systems?

Option A.   Spoiler to elevator.
Option B.   Spoiler to aileron.
Option C.   Spoiler to flap.

Correct Answer is B.
Explanation.   Automatic Flight Control Pallett Page 54.

45.   What is aileron droop?

Option A.   The droop of ailerons with no hydraulics on.
Option B.   The leading edge of both ailerons presented to the airflow.
Option C.   One aileron lowered.

Correct Answer is A.

46.   Earth's atmosphere is

Option A.   3/5 oxygen, 2/5 nitrogen.
Option B.   4/5 oxygen, 1/5 nitrogen.
Option C.   1/5 oxygen, 4/5 nitrogen.

Correct Answer is C.

47.   An anti-balance tab is used

Option A.   to relieve stick loads.
Option B.   for trimming the aircraft.
Option C.   to give more feel to the controls.

Correct Answer is C.
Explanation.   Jeppesen A&P Technician Airframe Textbook 1-29.

48.   The fin helps to give

Option A.   directional stability about the normal axis.
Option B.   directional stability about the longitudinal axis.
Option C.   longitudinal stability about the normal axis.

Correct Answer is A.

Explanation.   Jeppesen A&P Technician Airframe Textbook 1-22.

49.   If an aircraft moves in roll, it is moving about the

Option A.   longitudinal axis.
Option B.   normal axis.
Option C.   lateral axis.

Correct Answer is A.

Explanation.   Mechanics of flight by A.C. Kermode page 241.

50.   What effect does lowering the flaps for take-off have?

Option A.   Increases lift & reduces drag.
Option B.   Increases lift and drag.
Option C.   Increase lift only.

Correct Answer is B.

Explanation.   Avionics Fundamentals. Jeppesen Page 244.

51.   What effect does lowering flaps for takeoff have?

Option A.   Reduces takeoff speeds only.
Option B.   Reduces landing speeds only.
Option C.   Reduces takeoff and landing speeds.

Correct Answer is A.

Explanation.   Avionics Fundamentals. Jeppesen Page 244.

52.   When the flaps are lowered

Option A.   the lift vector moves rearward.
Option B.   there is no effect on the lift vector.
Option C.   the lift vector moves forward.

Correct Answer is A.

Explanation.   Automatic Flight Control, Pallett Page 51.

53.   At take-off, if the flaps are lowered there is a

Option A.   large increase in lift and drag.
Option B.   large increase in lift and small increase in drag.
Option C.   small increase in lift and drag.

Correct Answer is A.

Explanation.   Avionics Fundamentals. Jeppesen Page 244.

54.   Wing spoilers be used

Option A.   to assist the respective down going aileron in a turn.
Option B.   as ground spoilers on landing.
Option C.   to assist the elevators.

Correct Answer is B.

Explanation.   Automatic Flight Control. Pallett page 55. A&P Techn. Airframe Textbook by Jeppesen.

55.   Differential aileron control will

Option A.   cause a nose down moment.

Option B.   prevent yawing in conjunction with rudder input.
Option C.   cause a nose up moment.

Correct Answer is B.

56.   Dutch Roll affects.

Option A.   pitch and yaw simultaneously.
Option B.   yaw and roll simultaneously.
Option C.   pitch and roll simultaneously.

Correct Answer is B.
Explanation.   Automatic Flight Control. Pallett page 26.

57.   Which of the following are primary control surfaces?

Option A.   Elevators, ailerons, rudder.
Option B.   Roll spoilers, elevators, tabs.
Option C.   Elevators, roll spoilers, tabs.

Correct Answer is A.

58.   A split flap

Option A.   forms part of the trailing edge's lower surface when retracted.
Option B.   forms part of the leading edge's lower surface when retracted.
Option C.   forms part of the trailing edge's upper surface when retracted.

Correct Answer is A.
Explanation.   Jeppesen A&P Airframe Technician Textbook Page1-30 /31.

59.   An anti-servo tab

Option A.   assists the pilot to move the controls back to neutral.
Option B.   moves in the opposite direction to the control surface to assist the pilot.
Option C.   moves in the same direction as the control surface to assist the pilot.

Correct Answer is A.

60.   Slats

Option A.   keep the boundary layer from separating for longer.
Option B.   increase the overall surface area and lift effect of wing.
Option C.   act as an air brake.

Correct Answer is A.
Explanation.   Jeppesen A & P technician airframe textbook page 1-32.

61.   Due to the change of lift forces resulting from the extension of flaps in flight

Option A.   nose should be lowered, reducing AOA.
Option B.   nose should be raised, increasing AOA.
Option C.   nose should remain in the same position, maintaining same AOA.

Correct Answer is A.
Explanation.   The main purpose of flaps is to increase lift so that the pilot can lower the nose, increase decent angle and get a better view of the runway.

62.   Flight spoilers

Option A.   can be deployed on the down going wing in a turn to increase lift on that wing.
Option B.   can be used to decrease lift to allow controlled decent without reduction of airspeed.
Option C.   can be used with differential ailerons to reduce adverse yaw in a turn.

Correct Answer is B.

63.   If the aircraft is flying nose heavy, which direction would you move the elevator trim tab?

Option A.   Up to move elevator down.
Option B.   Up to move elevator up.
Option C.   Down to move elevator up.

Correct Answer is C.

64.   Wing tip vortices are strongest when

Option A.   flying high speed straight and level flight.
Option B.   flying into a headwind.
Option C.   flying slowly at high angles of attack.

Correct Answer is C.

65.   Aerodynamic balance

Option A.   will reduce aerodynamic loading.
Option B.   will cause CP to move forward of hinge and cause overbalance.
Option C.   will cause CP to move towards the trailing edge and cause instability.

Correct Answer is A.

66.   A balance tab

Option A.   effectively increases the area of the control surface.
Option B.   assists the pilot to move the controls.
Option C.   is used to trim the appropriate axis of the aircraft.

Correct Answer is B.
Explanation.   Jeppesen A & P Technician Textbook pg 1-29.

67.   Elevons combine the functions of both

Option A.   rudder and elevator.
Option B.   elevator and aileron.
Option C.   rudder and aileron.

Correct Answer is B.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 1-16 Fig 1-36.

68.   Flutter can be reduced by using

Option A.   a horn balance.
Option B.   mass balancing.
Option C.   servo tabs.

Correct Answer is B.

69. An elevator provides control about the

Option A.   longitudinal axis.
Option B.   lateral axis.
Option C.   horizontal stabilizer.

Correct Answer is B.

70. The outboard ailerons on some large aircraft

Option A.   are isolated at high speeds.
Option B.   are isolated to improve sensitivity.
Option C.   are isolated at low speeds.

Correct Answer is A.

71. Which wing increases drag when the ailerons are moved?

Option A.   Both wings increase drag but the wing with the up-going aileron increases more.
Option B.   Both wings have an equal increase in drag.
Option C.   Both wings increase drag but the wing with the down-going aileron increases more.

Correct Answer is C.
Explanation.   Jeppesen A & P Technician Airframe Textbook page 1-26.

72. Which flap will increase wing area and camber?

Option A.   Slot.
Option B.   Split.
Option C.   Fowler.

Correct Answer is C.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 20.

73. Wing loading of an aircraft

Option A.   varies with dynamic loading due to air currents.
Option B.   is independent of altitude.
Option C.   decreases with density.

Correct Answer is B.
Explanation.   Wing loading = aircraft weight/wing area.

74. An automatic slat will lift by itself when the angle of attack is

Option A.   high.
Option B.   high or low.
Option C.   low.

Correct Answer is A.

75. On aircraft fitted with spoilers for lateral control, roll to the right is caused by

Option A.   left spoilers extending, right spoilers remaining retracted.
Option B.   right spoilers extending, left spoilers remaining retracted.
Option C.   left and right spoilers extending.

Correct Answer is B.

76. A split flap increases lift by increasing

Option A.   the angle of attachment of the lower hinged portion.
Option B.   the surface area.
Option C.   the camber of the top surface.

Correct Answer is A.
Explanation.   Jeppesen A & P Technician Airframe Textbook page 1-30.

77. When the trailing edge flaps are lowered, the aircraft will

Option A.   pitch nose up.
Option B.   pitch nose down.
Option C.   sink.

Correct Answer is B.
Explanation.   Due to the centre of pressure moving.

78. In aileron control

Option A.   the up going aileron moves further than down going aileron.
Option B.   the down going aileron moves further than up going aileron.
Option C.   it is assisted by the rudder.

Correct Answer is A.

79. The aircraft is controlled about the lateral axis by the

Option A.   ailerons.
Option B.   elevator.
Option C.   rudder.

Correct Answer is B.

80. The aircraft is controlled about the normal axis by the

Option A.   ailerons.
Option B.   elevator.
Option C.   rudder.

Correct Answer is C.

81. Dutch roll is

Option A.   a combined yawing and rolling motion.
Option B.   primarily a pitching instability.
Option C.   a type of slow roll.

Correct Answer is A.

82. The aircraft is controlled about the longitudinal axis by the

Option A.   ailerons.
Option B.   elevator.
Option C.   rudder.

Correct Answer is A.

83. Ruddervators when moved, will move

Option A.   opposite to each other only.
Option B.   together only.
Option C.   either opposite each other or together, depending on the selection.

Correct Answer is C.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 16.

84. As a consequence of the C of G being close to its aft limit

Option A.   the stick forces will be high in fore and aft pitch, due to the high longitudinal stability.
Option B.   the stick forces to manoeuvre longitudinally will be low due to the low stability.
Option C.   the stick forces when pitching the nose down will be very high.

Correct Answer is C.

85. What is the term used for the amount of water in the atmosphere?

Option A.   Relative humidity.
Option B.   Absolute humidity.
Option C.   Dew point.

Correct Answer is B.

86. An anti-balance tab is moved

Option A.   via a fixed linkage
Option B.   hydraulically
Option C.   when the C.G. changes

Correct Answer is A.

87. A servo tab is operated.

Option A.   directly by the pilot to produce forces which in turn move the main control surfaces.
Option B.   automatically, and moves in the same direction as the main control surfaces.
Option C.   by a trim wheel and moves in the opposite direction to the main control surfaces when moved.

Correct Answer is A.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 23.

88. On an aircraft with an all-moving tailplane, pitch up is caused by

Option A.   decreasing tailplane incidence.
Option B.   up movement of the elevator trim tab.
Option C.   increasing tailplane incidence.

Correct Answer is A.

89. When checking full range of control surface movement, they must be positioned by

Option A.   moving them by hand directly until against the primary stops.
Option B.   moving them by hand directly until against the secondary stops.
Option C.   operating the control cabin controls until the system is against the primary stops.

Correct Answer is C.

90. An excess of aerodynamic balance would move the control surface centre of pressure

Option A. rearwards, resulting in too much assistance.
Option B. rearwards, resulting in loss of assistance.
Option C. forwards, resulting in an unstable overbalance.

Correct Answer is C.

91. A flying control mass balance weight

Option A. keeps the control surface C of G as close to the trailing edge as possible.
Option B. tends to move the control surface C of G close to the hinge line.
Option C. ensures that the C of G always acts to aid the pilot thus relieving control column load.

Correct Answer is B.

92. The type of flap which extends rearwards when lowered is called a

Option A. Plain flap.
Option B. Split flap.
Option C. Fowler flap.

Correct Answer is C.

93. Which of the following trailing edge flaps give an increase in wing area?

Option A. Split flap.
Option B. Fowler flap.
Option C. Slotted flap.

Correct Answer is B.

94. Which of the following is not a primary flying control?

Option A. Elevator.
Option B. Tailplane.
Option C. Rudder.

Correct Answer is B.

95. A leading edge slat is a device for

Option A. increasing the stalling angle of the wing.
Option B. decreasing the stalling angle of the wing.
Option C. decreasing wing drag.

Correct Answer is A.

96. A Krueger flap is

Option A. a flap which extends rearwards but does not lower.
Option B. a leading edge flap which hinges forward.
Option C. a leading edge slat which extends forward.

Correct Answer is B.

97. A tab which assists the pilot to move a flying control by moving automatically in the opposite direction to the control surface is called a

Option A. servo tab.

Option B. geared balance tab.
Option C. trim tab.

Correct Answer is B.

98. What is attached to the rear of the vertical stabilizer?

Option A. elevator.
Option B. aileron.
Option C. rudder.

Correct Answer is C.

99. What is fitted on the aircraft to enable the pilot to reduce his speed rapidly in event of severe turbulence, or speed tending to rise above the Never Exceed Limit?

Option A. Lift dumpers.
Option B. Air brakes.
Option C. Wheel brakes.

Correct Answer is B.

100. When spoilers are used asymmetrically, they combine with

Option A. ailerons.
Option B. rudder.
Option C. elevators.

Correct Answer is A.

101. "What is used to correct any tendency of the aircraft to move towards an undesirable flight attitude?"

Option A. Trim tabs.
Option B. Spring tabs.
Option C. Balance tabs.

Correct Answer is A.

102. The layer of air over the surface of an aerofoil which is slower moving, in relation to the rest of the airflow, is known as

Option A. none of the above are correct.
Option B. camber layer.
Option C. boundary layer.

Correct Answer is C.

103. A control surface which forms a slot when deployed is called a

Option A. slat.
Option B. slot.
Option C. flap.

Correct Answer is A.

104. Asymmetric flaps will cause

Option A. the aircraft to descend.
Option B. the aircraft to ascend.

Option C. one wing to rise.

Correct Answer is C.

105. When airflow velocity over an upper cambered surface of an aerofoil decreases, what takes place?

Option A. Pressure decreases, lift increases.
Option B. Pressure increases, lift decreases.
Option C. Pressure increases, lift increases.

Correct Answer is B.

106. What is a controlling factor of turbulence and skin friction?

Option A. Countersunk rivets used on skin exterior.
Option B. Aspect ratio.
Option C. Fineness ratio.

Correct Answer is A.

107. Changes in aircraft weight

Option A. cause corresponding changes in total drag due to the associated lift change.
Option B. will not affect total drag since it is dependent only upon speed.
Option C. will only affect total drag if the lift is kept constant.

Correct Answer is A.

108. When an aircraft stalls

Option A. lift increases and drag decreases.
Option B. lift and drag increase.
Option C. lift decreases and drag increases.

Correct Answer is C.

109. Spoiler panels are positioned so that when deployed

Option A. roll will not occur.
Option B. pitch trim is not affected.
Option C. no yaw takes place.

Correct Answer is B.

110. The aircraft stalling speed will

Option A. only change if the MTWA were changed.
Option B. be unaffected by aircraft weight changes since it is dependant upon the angle of attack.
Option C. increase with an increase in weight.

Correct Answer is C.

111. In a bank and turn

Option A. extra lift is not required if thrust is increased.
Option B. extra lift is not required.
Option C. extra lift is required.

Correct Answer is C.

112. The method employed to mass balance control surfaces is to

Option A.   fit bias strips to the trailing edge of the surfaces.
Option B.   attach weights forward of the hinge line.
Option C.   allow the leading edge of the surface to project into the airflow.

Correct Answer is B.

113. Control surface flutter may be caused by

Option A.   excessive play in trim tab attachments.
Option B.   high static friction in trim tab control tabs.
Option C.   incorrect angular movement of trim tabs.

Correct Answer is A.

114. A differential aileron control system results in

Option A.   aileron drag being reduced on the inner wing in a turn.
Option B.   aileron drag being reduced on the outer wing in a turn.
Option C.   aileron drag being compensated by small rudder movements.

Correct Answer is B.

115. The primary function of a flap is

Option A.   to trim the aircraft longitudinally.
Option B.   to alter the position of the centre of gravity.
Option C.   to alter the lift of an aerofoil.

Correct Answer is C.
Explanation.   Jeppesen A & P Technician Airframe Textbook page 1-30.

116. The angle of attack at which stall occurs

Option A.   can be varied by using flaps and slats.
Option B.   depends on the weight of the aircraft.
Option C.   cannot be varied, it is always constant.

Correct Answer is A.

117. The stalling speed of an aircraft

Option A.   is increased when it is heavier.
Option B.   does not change.
Option C.   is increased when it is lighter.

Correct Answer is A.

118. A wing flap which has dropped or partially extended on one wing in flight will lead to

Option A.   a fixed banked attitude which would be corrected by use of the rudder.
Option B.   a pitching moment which would be corrected by used of the elevators
Option C.   a steady rolling tendency which would be corrected by use of the ailerons.

Correct Answer is C.

119. With an increase in the amount of flap deployment, the stalling angle of a wing

Option A.   remains the same.

Option B.   increases.
Option C.   decreases.

Correct Answer is C.

120. Aerodynamic balance of a control surface may be achieved

Option A.   by a horn at the extremity of the surface forward of the hinge line.
Option B.   by weights added to the control surface aft of the hinge line.
Option C.   by a trimming strip at the trailing edge of the surface.

Correct Answer is A.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 24 Para 7.

121. A control surface is provided with aerodynamic balancing to

Option A.   assist the pilot in moving the control.
Option B.   increase stability.
Option C.   decrease the drag when the control is deflected.

Correct Answer is A.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 24 Para 7.

122. Downward displacement of an aileron

Option A.   increases the angle at which its wing stalls.
Option B.   decreases the angle at which its wing will stall.
Option C.   has no effect on its wing stalling angle, it only affects the stalling speed on that wing.

Correct Answer is B.

123. Due to the tailplane angle of attack change, the flap-induced downwash on the tailplane.

Option A.   will tend to cause an aircraft nose-up pitch.
Option B.   "may cause a nose-down or nose-up pitch depending upon the initial tailplane load."
Option C.   will tend to cause an aircraft nose down pitch.

Correct Answer is A.

124. Due to the change in lift coefficient accompanying extension of the flaps, to maintain the lift
      constant it would be necessary to

Option A.   raise the nose.
Option B.   lower the nose.
Option C.   keep the pitch attitude constant.

Correct Answer is B.

125. The extension to the rudder (shaded portion shown on the diagram), is provided to

Option A.   make the pilot aware of the aerodynamic forces encountered when moving the control.
Option B.   provide aerodynamic assistance for the pilot when moving the rudder.
Option C.   prevent control surface flutter.

Correct Answer is B.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 25 Para 7.

126. A differential aileron control is one which gives

Option A.   the down-going aileron more travel than the up-going one.

Option B.   equal aileron travel in each direction, but variable for stick movement.
Option C.   a larger aileron up travel than down.

Correct Answer is C.

127. Which leading edge device improves the laminar flow over the wing?

Option A.   Flap and slat.
Option B.   Slat.
Option C.   Flap.

Correct Answer is B.

128. The balance tab is an auxiliary surface fitted to a main control surface

Option A.   operating automatically to assist the pilot in moving the controls.
Option B.   operated independently at which point in the length of cable the tensiometer is applied.
Option C.   operating automatically to provide feel to the controls.

Correct Answer is A.

129. Aerodynamic balancing of flight controls is achieved by

Option A.   placing a weight ahead of the hinge point.
Option B.   placing a weight in the leading edge of the control surface.
Option C.   providing a portion of the control surface ahead of the hinge point.

Correct Answer is C.
Explanation.   AL/3-24 para 4.2.

130. Aerodynamic balance is used to

Option A.   reduce the control load to zero.
Option B.   make the flying controls easier to move.
Option C.   prevent flutter of the flying controls.

Correct Answer is B.

131. A horn balance is

Option A.   a rod projecting forward from the control surface with a weight on the end.
Option B.   a rod projecting upward from the main control surface to which the control cables are attached.
Option C.   a projection of the outer edge of the control surface forward of the hinge line.

Correct Answer is C.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 16.

132. A control surface is mass balanced by

Option A.   the attachment of weights acting on the hinge line.
Option B.   fitting a balance tab.
Option C.   the attachment of weights acting forward of the hinge line.

Correct Answer is C.

133. The purpose of anti-balance tabs is to

Option A.   relieve stick loads.
Option B.   trim the aircraft.

Option C.   give more feel to the control column.

Correct Answer is C.

134. You have adjusted the elevator trim tab to correct for nose heavy. What was the direction of travel of the trim tab?

Option A.   The elevator trim tab has moved down.
Option B.   The elevator trim tab has moved up.
Option C.   The port elevator tab has moved up and starboard moved down.

Correct Answer is A.

135. The tropopause exists at about

Option A.   18 000 ft.
Option B.   30 000 ft.
Option C.   36 000 ft.

Correct Answer is C.

136. Induced drag curve characteristics of a slender delta wing are such that there is

Option A.   an increase in gradient with wing speed.
Option B.   no change in gradient with wing speed.
Option C.   decrease in gradient with wing speed.

Correct Answer is C.

137. If an aircraft is yawing left, the trim tab on the rudder would be positioned

Option A.   to the right, moving the rudder left.
Option B.   to the centre.
Option C.   to the left, moving the rudder right.

Correct Answer is C.

138. Instability giving roll and yaw

Option A.   is dutch roll.
Option B.   is longitudinal stability.
Option C.   is lateral stability.

Correct Answer is A.

139. Vortex generators are fitted to

Option A.   move transition point rearwards.
Option B.   move transition point forwards.
Option C.   advance the onset of flow separation.

Correct Answer is B.

140. Leading edge flaps

Option A.   increase stalling angle of the wing.
Option B.   decrease stalling angle of the wing.
Option C.   do not change the stalling angle.

Correct Answer is A.

141. Krueger flaps are on

Option A.   the leading edge.
Option B.   either the leading or training edge.
Option C.   the trailing edge.

Correct Answer is A.

142. Sweepback will

Option A.   decrease lateral stability.
Option B.   not affect lateral stability.
Option C.   increase lateral stability.

Correct Answer is C.

143. A plain flap

Option A.   does not increase the wing area on deployment.
Option B.   is attached to the leading edge of the wing.
Option C.   forms part of lower trailing edge.

Correct Answer is A.

144. A split flap, when deployed

Option A.   is used only on high speed aircraft.
Option B.   increases lift without a corresponding increase in drag.
Option C.   increases drag with little lift coefficient increase, from intermediate to fully down.

Correct Answer is C.

145. A flying control mass balance weight

Option A.   keeps the control surface C of G as close to the trailing edge as possible.
Option B.   tends to move the control surface C of G close to the hinge line.
Option C.   tends to move the control surface C of G forward of the hinge line.

Correct Answer is B.

146. An elevator controls the aircraft motion in

Option A.   yaw.
Option B.   roll.
Option C.   pitch.

Correct Answer is C.

147. Air above Mach 0.7 is

Option A.   compressible only when above the speed of sound.
Option B.   incompressible.
Option C.   compressible.

Correct Answer is C.
Explanation.   Aircraft Flight Barnard and Philpot, Second Edition Page123. Mechanics of Flight AC Kermode
               10th Edition Page 385.

148. Supersonic air passing through a divergent duct causes the

Option A.   pressure to increase, velocity to increase.

Option B.   pressure to increase, velocity to decrease.
Option C.   pressure to decrease, velocity to increase.

Correct Answer is C.
Explanation.   Mechanics of Flight AC Kermode 10th Edition Page 340.

149. An aircraft flying below the tropopause descends at a constant True Airspeed. Its Mach. No. will

Option A.   not change.
Option B.   decrease.
Option C.   increase

Correct Answer is B.
Explanation.   Speed of sound INCREASES with DECREASING altitude, so Mach number will decrease.

150. A nose down change of trim (tuck-under) occurs due to shock induced

Option A.   tip stall on a delta wing aircraft.
Option B.   root stall on a delta wing aircraft.
Option C.   tip stall on a straight wing aircraft.

Correct Answer is B.
Explanation.   Pallett Automatic Flight Control 2nd Edition Page 45.

151. A symmetrical aerofoil is accelerating through Mach 1 with an angle of attack of 0°. A shock wave will form

Option A.   on the upper and lower surface and will move aft until the point of maximum camber.
Option B.   on the upper and lower surface and will move aft.
Option C.   on the upper surface only and move aft.

Correct Answer is B.
Explanation.   Shockwaves form on upper and lower surfaces BEGINNING at point of max curvature, gradually moving back.

152. Shock stall

Option A.   occurs at high speeds.
Option B.   is a flap down stall and occurs at high speeds.
Option C.   occurs at low speeds.

Correct Answer is A.
Explanation.   Shock stall (or shock induced stall) is caused by the formation of shock waves in the transonic speed range.

153. As you approach supersonic speed

Option A.   thrust is reduced.
Option B.   total drag is increased.
Option C.   lift is reduced.

Correct Answer is B.
Explanation.   An additional drag − wave drag − is added to the total drag.

154. Mach trim in some aircraft assists

Option A.   lateral stability.
Option B.   vertical stability.
Option C.   longitudinal stability.

Correct Answer is C.
Explanation.   Mach trim is used to correct the longitudinal trim upset during the transonic speed range.

155. Before an aircraft reaches critical Mach

Option A.   the nose pitches up because the CP moves forward.
Option B.   the aircraft buffets because the CP moves to the shock wave.
Option C.   the nose pitches down because the CP moves rear.

Correct Answer is C.
Explanation.   Mechanics of Flight 10th edition Barnard and Philpott pp. 341.

156. On a standard day, at which altitude will the speed of sound be the greatest?

Option A.   20 000 ft.
Option B.   10 000 ft.
Option C.   Sea level.

Correct Answer is C.

157. Which of the following will increase the Critical Mach Number of an aerofoil?

Option A.   Using a thin airfoil and sweeping the wings back.
Option B.   Decreasing the fineness ratio of the wings.
Option C.   Increasing the aspect ratio of the wings.

Correct Answer is A.

158. As an aircraft accelerates through the transonic region, the centre of pressure tends to

Option A.   turn into a shock wave.
Option B.   move rearward.
Option C.   move forward.

Correct Answer is B.

159. Supersonic air going through an incipient shock wave will decrease its speed and

Option A.   decrease temperature and increase density.
Option B.   increase temperature and decrease density.
Option C.   increase temperature and increase density.

Correct Answer is C.
Explanation.   Mechanics of Flight AC Kermode 10th Edition Page 326 fig 11.4.

160. An increase in Mach number will cause the

Option A.   CofP to move rearwards giving more downwash on the tail plane.
Option B.   CofP to move forwards giving less downwash on the tail plane.
Option C.   CofP to move rearwards giving less downwash on the tail plane.

Correct Answer is C.
Explanation.   Automatic Flight Control, Pallett. Page 50.

161. At speeds above Mach 1, shockwaves will form above and below the wing

Option A.   at the trailing edge.
Option B.   at both the leading edge and the trailing edge.
Option C.   at the leading edge.

Correct Answer is B.

162. Above the critical Mach number, the drag coefficient

Option A.   increases.
Option B.   remains the same.
Option C.   decreases.

Correct Answer is A.

163. Mach trim counters

Option A.   longitudinal instability.
Option B.   vertical instability.
Option C.   lateral instability.

Correct Answer is A.
Explanation.   Automatic Flight Control Pallett page 231 and 50.

164. At high Mach Numbers above Mach 2.2, some aircraft metals

Option A.   such as aluminum, become brittle.
Option B.   lose their strength due to the kinetic heating effect.
Option C.   will shrink due to the extreme pressures involved.

Correct Answer is B.

165. Mach trim operates

Option A.   along the longitudinal axis.
Option B.   along the lateral axis.
Option C.   to reduce Dutch roll.

Correct Answer is A.

166. To increase critical Mach number

Option A.   the wings are swept.
Option B.   elevons are fitted.
Option C.   tailerons are fitted.

Correct Answer is A.

167. When approaching the speed of sound the

Option A.   pressure above the wing exceeds the pressure below the wing in places.
Option B.   pressure above the wing can never exceed the pressure below the wing.
Option C.   pressure above the wing equals the pressure below the wing.

Correct Answer is A.

168. Airspeeds above the speed of sound, but not exceeding 4 times the speed of sound are

Option A.   supersonic.
Option B.   hypersonic.
Option C.   hyposonic.

Correct Answer is A.

169. An aircraft experiences a large loss of lift and a big increase in drag in straight and level flight, what would be the most probable cause?

Option A.   Atmospheric conditions.
Option B.   Aircraft reached its critical Mach number.
Option C.   Severe head winds.

Correct Answer is B.

170. A Mach Trimmer is a device which

Option A.   prevents the aircraft from exceeding its critical Mach No.
Option B.   automatically compensates for trim changes in the transonic region
Option C.   switches out trim control to prevent damage in the transonic speed range.

Correct Answer is B.

171. Mach trim usually operates between

Option A.   0.9 Mach and 0.99 Mach.
Option B.   0.7 and 0.8 Mach.
Option C.   0.6 Mach 0.7 Mach.

Correct Answer is B.

172. Mach trimming is initiated by an input signal from the

Option A.   IRS.
Option B.   vertical gyro.
Option C.   CADC.

Correct Answer is B.

173. Mach trim prevents

Option A.   the nose dropping in a low speed turn.
Option B.   the nose dropping at high speed.
Option C.   the nose lifting at high speed.

Correct Answer is B.

174. Critical Mach No. may be increased by

Option A.   using a higher thickness/chord ratio wing.
Option B.   sweeping back the wing.
Option C.   using more powerful engines.

Correct Answer is B.

175. Airflow either side of a normal shock wave is

Option A.   sonic upstream and downstream.
Option B.   sonic upstream, subsonic downstream.
Option C.   subsonic upstream, sonic downstream.

Correct Answer is B.

176. Mach Number is defined as

Option A.   speed of sound at sea level divided by local speed of sound.
Option B.   IAS divided by the local speed of sound.

Option C.   TAS divided by local speed of sound.

Correct Answer is C.
Explanation.   Jeppesen A&P Technician Airframe Textbook Page 66.

177. The reason for sharp leading edged wings on high speed aircraft is to

Option A.   enable the shockwave to be accurately positioned.
Option B.   decrease wave drag.
Option C.   decrease boundary layer.

Correct Answer is A.

178. Critical Mach Number is defined as

Option A.   that number at which the airflow becomes supersonic.
Option B.   that free-stream Mach Number at which some part of the airflow over the aircraft
                 becomes sonic.
Option C.   the minimum Mach number at which the aircraft can go supersonic.

Correct Answer is B.

179. The transonic region is a region of

Option A.   all subsonic.
Option B.   all supersonic.
Option C.   mixed airflow.

Correct Answer is C.

180. Immediately downstream of an oblique shockwave is always

Option A.   supersonic.
Option B.   the same as upstream.
Option C.   subsonic.

Correct Answer is A.

181. Wave drag

Option A.   increases in the supersonic region.
Option B.   increases at the low speed stall.
Option C.   increases in the transonic region.

Correct Answer is C.

182. For increased M_{crit}

Option A.   decrease thickness/chord ratio.
Option B.   decrease sweepback.
Option C.   decrease true airspeed.

Correct Answer is A.

183. Symptoms of shock stall are

Option A.   decrease in speed, buffet and movement of the centre of pressure.
Option B.   buffet, loss of control, and instability.
Option C.   compressibility effects, buffet and loss of control.

Correct Answer is B.

184. Sweepback increases M_{crit} by

Option A.   decreasing the amount of airflow over the lowest point on the aerofoil section.
Option B.   decreasing the amount of airflow over the highest point on the aerofoil section.
Option C.   increasing the amount of airflow over the highest point on the aerofoil section.

Correct Answer is B.

185. Mach number is

Option A.   the ratio of the aircrafts TAS to the speed of sound at the same atmospheric conditions.
Option B.   the ratio of the aircrafts IAS to the speed of sound at the same atmospheric conditions.
Option C.   the ratio of the aircrafts TAS to the speed of sound at sea level.

Correct Answer is A.
Explanation.   Flight Instruments and Automatic Flight Control, David Harris Page 19.

186. The critical Mach number is

Option A.   the Mach No. when a shock wave forms at the leading edge.
Option B.   the Mach No. when the aircraft reaches the speed of sound.
Option C.   the aircraft Mach. No. when the airflow reaches the speed of sound at some point on the aircraft.

Correct Answer is C.

187. Above the Critical Mach No. the drag coefficient will

Option A.   remain the same.
Option B.   start to increase.
Option C.   start to decrease.

Correct Answer is B.

188. A wing of low thickness/chord ratio, the Critical Mach No. will be

Option A.   lower than a wing of high thickness/chord ratio.
Option B.   higher than a wing of high thickness/chord ratio.
Option C.   the same as a wing of high thickness/chord ratio.

Correct Answer is B.

189. An aeroplane flying above the Critical Mach No. will usually experience

Option A.   a nose up pitch.
Option B.   an oscillation in pitch.
Option C.   a nose down pitch

Correct Answer is C.

190. Tuck-under can be counteracted by

Option A.   Mach trim.
Option B.   aileron reversal.
Option C.   trim tabs.

Correct Answer is A.

191. What causes tuck under?

Option A.   Flap back effect.
Option B.   Shock stall.
Option C.   Aileron reversal.

Correct Answer is B.

192. When does a shock stall occur?

Option A.   When the aircraft forward speed is above Mach One.
Option B.   At the critical Mach number of the aeroplane.
Option C.   When the aircraft reaches speed of sound in a dive.

Correct Answer is B.

193. With an increase in altitude under I.S.A. conditions, the temperature in the troposphere

Option A.   increases.
Option B.   remains constant.
Option C.   decreases.

Correct Answer is C.

194. Air either side of an oblique shockwave is generally

Option A.   sonic.
Option B.   supersonic.
Option C.   subsonic.

Correct Answer is B.

195. Downstream of a normal shock wave

Option A.   pressure decreases temperature increases.
Option B.   pressure and temperature increase.
Option C.   pressure and temperature decrease.

Correct Answer is B.

196. Speed of sound varies with

Option A.   altitude.
Option B.   temperature.
Option C.   pressure.

Correct Answer is B.

197. Immediately downstream of a normal shockwave, air is always

Option A.   subsonic.
Option B.   supersonic.
Option C.   the same as upstream.

Correct Answer is A.

198. Increased sweepback

Option A.   improves tip stall characteristics.
Option B.   raises M_{crit}.

Option C.   decreases stability.

Correct Answer is B.

199. Aerodynamic heating

Option A.   increases as a function of airspeed.
Option B.   increases with skin friction.
Option C.   decreases with altitude.

Correct Answer is A.

200. To overcome ineffective control surface problems in the transonic region

Option A.   an all moving tailplane may be used.
Option B.   hydraulic powered elevators may be used.
Option C.   Frise ailerons may be used.

Correct Answer is A.

201. An aircraft flying below the tropopause descends at a constant True Airspeed, its Mach. No. will

Option A.   remain the same.
Option B.   increase.
Option C.   decrease.

Correct Answer is C.

202. To counter the effect of a shift of centre of pressure as an aircraft flies through the transonic region, fuel is pumped

Option A.   forwards.
Option B.   backwards.
Option C.   sideways.

Correct Answer is B.

203. An aircraft flying above the tropopause descends at a constant True Airspeed, its Mach. No. will

Option A.   remain the same.
Option B.   decrease.
Option C.   increase.

Correct Answer is A.

204. The velocity of sound with an increase in altitude will

Option A.   remain constant.
Option B.   increase.
Option C.   decrease.

Correct Answer is C.
Explanation.   Flight Instruments and Automatic Flight Control Systems, David Harris Page 19.

205. Mach number equals the ratio of

Option A.   altitude to airspeed.
Option B.   sonic speed to indicated airspeed.
Option C.   true airspeed to local sonic speed.

Correct Answer is C.
Explanation.   Flight Instruments and Automatic Flight Control Systems, David Harris Page 19.

206. Tuck-under is caused by

Option A.   tip stall on a straight wing aircraft.
Option B.   tip stall on a swept wing aircraft.
Option C.   root stall on a swept wing aircraft.

Correct Answer is C.

207. The purpose of sweepback on an aerofoil is to

Option A.   decrease drag.
Option B.   decrease M_{crit}.
Option C.   increase M_{crit}.

Correct Answer is C.

208. As the airspeed over a cambered wing is increased, a shock wave will appear initially

Option A.   at the leading edge.
Option B.   at the trailing edge.
Option C.   near the point of maximum curvature.

Correct Answer is C.

209. In the transonic speed range

Option A.   the position of the wing centre of pressure remains constant.
Option B.   the centre of pressure movement may become oscillatory.
Option C.   the centre of pressure initially moves forward, then back.

Correct Answer is B or C.

210. The angle of attack of a blade is the

Option A.   angle between the spin axis and relative air flow.
Option B.   angle between the chord line and plane of rotation.
Option C.   angle between the chord line and relative airflow.

Correct Answer is C.

211. On a helicopter, what is blade dragging?

Option A.   Movement of each blade vertically about their lateral hinges.
Option B.   Contact of the blade tips on the ground.
Option C.   Movement of each blade horizontally about their vertical hinge.

Correct Answer is C.
Explanation.   A&P General Textbook Pg 2-58.

212. Lift generated by a blade is proportional to the

Option A.   relative airflow and the pitch.
Option B.   aircraft airspeed and angle of attack.
Option C.   relative airflow and the angle of attack.

Correct Answer is B.

213. What effect does the ground have on a helicopter?

Option A.   No effect.
Option B.   Increases lift.
Option C.   Increases thrust.

Correct Answer is B.
Explanation.   A&P Airframe Technician Textbook Pg 1-58.

214. What damps vibrations on a helicopter?

Option A.   Swashplate.
Option B.   Scissor levers.
Option C.   Bifilar damper.

Correct Answer is C.

215. What design factors govern RPM of a helicopter rotor?

Option A.   Weight of blade.
Option B.   Fineness ratio.
Option C.   Engine and gearbox.

Correct Answer is A.
Explanation.   A&P Airframe Technician Textbook Pg 1-54.   http://www.tpub.com/content/hseries/TM-1-
                1520-265-23/css/TM-1-1520-265-23_104.htm

216. Relative velocity of a helicopter rotor

Option A.   increases at forward travelling blade.
Option B.   is equal for all blades.
Option C.   increases at retreating blade.

Correct Answer is A.
Explanation.   A&P Airframe Technician Textbook Pg 1-59.

217. When OAT increases, what happens to an helicopter operating ceiling?

Option A.   Decrease.
Option B.   Increase.
Option C.   No effect.

Correct Answer is A.
Explanation.   As temperature increases, density decreases and aircraft performance decreases.

218. With the helicopter in forward flight, parasitic drag will cause the helicopter to

Option A.   pitch nose down with an increase in forward airspeed.
Option B.   pitch nose down with a decrease in forward airspeed.
Option C.   pitch nose up with an increase in forward in airspeed.

Correct Answer is A.

219. When a blade moves about the flapping hinge

Option A.   the pitch angle of the blade always reduces.
Option B.   the drag forces on the blade change.
Option C.   the drag forces on the blade change and the angle of attack (AOA) changes.

Correct Answer is C.

220. To maintain the position of the helicopter with a decrease in air density, the pilot must increase

Option A.   main rotor RPM.
Option B.   cyclic pitch.
Option C.   collective pitch.

Correct Answer is C.

221. The forces which govern the coning angle are

Option A.   lift and centrifugal force.
Option B.   thrust and centrifugal force.
Option C.   lift and thrust.

Correct Answer is A.

222. As a helicopter accelerates in level forward flight above approximately 15 knots, it will be necessary to:

Option A.   reduce power because of the additional lift due to translational flight.
Option B.   increase power because rotor RPM is increasing.
Option C.   reduce power because rotor profile drag is reduced.

Correct Answer is A.

223. Assuming the phase lag of a rotor blade is 90° and the control advance angle is 15°, then the pitch operating arm must be at the highest point of the swash plate

Option A.   90° ahead of the highest flapping position.
Option B.   75° ahead of the highest flapping position.
Option C.   105° ahead of the highest flapping position.

Correct Answer is B.

224. A helicopter is hovering and the pilot applies right pedal. Assuming the main rotor rotates anti clockwise viewed from above, the helicopter will

Option A.   descend, unless the pilot inches the throttle open.
Option B.   ascend, unless the pilot decreases rotor RPM.
Option C.   descend, unless the pilot applies more collective pitch.

Correct Answer is C.

225. A helicopter has a main rotor which rotates anti-clockwise viewed from above, and is fitted with an anti-torque tail rotor. It will tend to drift sideways to

Option A.   port, if the tail rotor is mounted on the left side of the aircraft.
Option B.   starboard, whichever way the tail rotor is fitted.
Option C.   port, if the tail rotor is mounted on the right side of the aircraft.

Correct Answer is B.

226. As the rotor head is tilted to travel forward, what happens to the rearward travelling blade's pitch angle?

Option A.   Increases.
Option B.   Decreases.
Option C.   No change.

Correct Answer is A.
Explanation.   A&P Technician Airframe Textbook Pg.1-59.

227. The tail rotor

Option A.   produces a force opposing torque reaction.
Option B.   produces a force in the same direction as torque reaction.
Option C.   is not subject to dissymmetry of lift.

Correct Answer is A.

228. With the tail rotor pedals in neutral, the tail rotor blade pitch will be

Option A.   positive.
Option B.   negative.
Option C.   neutral.

Correct Answer is A.

229. The main rotor drive shaft is tilted laterally on some helicopters to correct tail rotor

Option A.   drift.
Option B.   torque.
Option C.   roll.

Correct Answer is A.

230. Certain helicopters tend to tilt laterally when landing. This problem can be overcome by placing the tail rotor thrust

Option A.   below the line of the main rotor hub.
Option B.   above the line of the main rotor hub.
Option C.   in line with the main rotor hub.

Correct Answer is C.

231. Ground cushion effect is produced by

Option A.   recirculating air giving additional lift.
Option B.   increased pressure under the main rotor disc.
Option C.   increase in density above the fuselage.

Correct Answer is B.

232. A helicopter hovering near a tall building will

Option A.   drift away from it.
Option B.   be unaffected by it.
Option C.   drift towards it.

Correct Answer is C.

233. Drooping of helicopter blades is compensated by

Option A.   flapping.
Option B.   dragging.
Option C.   centrifugal force.

Correct Answer is C.
Explanation.   Centrifugal force counteracts the drop of helicopter blades at low RPM.

234. During decent with power-on, on a helicopter

Option A.   lift, weight and thrust are acting on the helicopter.
Option B.   lift, drag and thrust are acting on the helicopter.
Option C.   lift, drag, thrust and weight are acting on the helicopter.

Correct Answer is C.
Explanation.   All four forces act on the helicopter.

235. A helicopter hovering 2 m above the ground subject to a strong cross wind will

Option A.   lose lift due to the removal of the ground cushion effect.
Option B.   increase lift due to ground cushion effect.
Option C.   lose lift due to recirculation.

Correct Answer is C.

236. With a drop in ambient temperature, an aircraft service ceiling will

Option A.   lower.
Option B.   rise.
Option C.   not be affected.

Correct Answer is B.
Explanation.   As ambient temperature drops, density increases and aircraft performance increases.

237. During an autorotative descent, rotor RPM will be

Option A.   higher than in powered flight.
Option B.   lower than in powered flight.
Option C.   substantially the same as in powered flight.

Correct Answer is A.

238. Helicopter blades are

Option A.   symmetrical.
Option B.   highly cambered.
Option C.   reverse cambered.

Correct Answer is A.
Explanation.   Helicopter blades are usually symmetrical section.

239. Autorotative force is the

Option A.   component of the total reaction which acts forward in the plane of rotation in opposition
             to drag.
Option B.   force required to turn in a hover.
Option C.   force the pilot must apply to the collective lever to obtain a controlled descent.

Correct Answer is A.

240. Autorotation

Option A.   leaves the aircraft with no directional control.
Option B.   results in a loss of power.
Option C.   is the production of lift from freely rotating rotor blades.

Correct Answer is C.

241. If the main rotor of a helicopter rotates in an anti-clockwise direction when viewed from above, and a hovering left turn is required, the following movements of the controls are selected:

Option A.   Rudder pedal to the left, and decrease throttle.
Option B.   Rudder pedal to the left, and increase throttle.
Option C.   Rudder pedal to the right, and increase throttle.

Correct Answer is A.

242. Helicopter derives its lift from

Option A.   air is pushed downward.
Option B.   rotor acts as a airscrew.
Option C.   the blade of the helicopter creates a low pressure above it.

Correct Answer is C.
Explanation.   All three are correct, but an aerodynamicist would choose a 'creates a low pressure above it'.

243. A two bladed helicopter rotor on a central gimbal is called

Option A.   semi rigid rotor
Option B.   fully articulated rotor.
Option C.   rigid rotor.

Correct Answer is A.
Explanation.   A&P Technician Airframe Textbook Pg.1-53.

244. If a helicopter rotor disc is rotating anticlockwise, viewed from above where, would a pitch input be fed into the disc to move the helicopter backwards, (90 degrees to what)?

Option A.   In front of the lateral axis.
Option B.   Left of the longitudinal axis.
Option C.   Right of the longitudinal axis.

Correct Answer is C.
Explanation.   Due to precession of the rotor disc, the input to tilt the disc backwards must be placed 90 degrees before, in direction of motion of the disc.

245. On a helicopter, what is vortex ring state?

Option A.   Tip vortex build-up during hover.
Option B.   Tip vortex interference at high forward speed.
Option C.   Ground vortex interference when hovering close to the ground.

Correct Answer is A.
Explanation.   During hover, the tip vortex of one blade adds to the tip vortices of the preceding blades, producing a large vortex ring and a very inefficient helicopter.

246. Climbs with forward speed require less power than vertical climbs, because of

Option A.   translational lift.
Option B.   increased inertia.
Option C.   forward momentum.

Correct Answer is A.

247. Translational flight is

Option A.   achieved by raising or lowering the collective lever.
Option B.   when the helicopter changes from one steady flight condition to another.

Option C.	achieved by tilting the rotor disc in the direction of flight.

Correct Answer is C.

248.	The best design of a rotor blade is where the CofP

Option A.	moves freely along the length of the blade.
Option B.	does not move.
Option C.	is insignificant.

Correct Answer is B.

249.	When the cyclic stick is eased forward in the hover position

Option A.	altitude is increased.
Option B.	forward thrust is decreased.
Option C.	vertical lift is reduced.

Correct Answer is C.

250.	The rotor cone is formed by

Option A.	blade alignment.
Option B.	centrifugal force and lift.
Option C.	centrifugal force only.

Correct Answer is B.

251.	Tracking is carried out to_____the main rotor blade tip path.

Option A.	restore.
Option B.	align.
Option C.	balance.

Correct Answer is B.

252.	The advancing blade of a helicopter is the one moving

Option A.	one moving forward into relative airflow.
Option B.	highest blade.
Option C.	one moving in direction of relative air flow.

Correct Answer is A.

253.	Lift is generated by

Option A.	down-wash below the blade.
Option B.	high pressure above the blade.
Option C.	low pressure above the blade.

Correct Answer is C.

254.	Static stability of a helicopter is

Option A.	the stability of the helicopter when hovering.
Option B.	the tendency move back toward neutral after disturbance.
Option C.	the tendency to oscillate until the neutral is achieved.

Correct Answer is B.

255. Forward velocity causes the advancing blade to

Option A.   flap down to increase lift.
Option B.   give increased lift due to blade flapping.
Option C.   flap up to reduce lift.

Correct Answer is C.

256. When moving from the hover to forward flight it is necessary to

Option A.   increase the engine power.
Option B.   decrease the engine power.
Option C.   maintain constant engine power.

Correct Answer is A.

257. After a change in collective pitch the Rotor RPM will rise and fall. This is called

Option A.   static droop.
Option B.   transient droop.
Option C.   under swing.

Correct Answer is B.
Explanation.   The Helicopter and How it Flies by John Fay Page 20/21. The initial total fall in rotor RPM is
                 called transient droop. The change in stabilized RPM is referred to as static droop. The RPM
                 difference between transient droop and static droop is called the under swing.

258. After a change in pitch of a rotor blade, the blade will be at maximum flap at

Option A.   90°.
Option B.   0°.
Option C.   180°.

Correct Answer is A.

259. The rotor disc is

Option A.   the ground cushion.
Option B.   the distance between tip to tip.
Option C.   the rotor head hub.

Correct Answer is B.
Explanation.   Automatic Flight Control. Pallett. Page 59/60 fig 1.42.

260. The maximum forward speed of a helicopter is limited by

Option A.   retreating blade stall and the forward speed of the advancing blade.
Option B.   engine power.
Option C.   the shape of the fuselage.

Correct Answer is A.

261. What principle does the delta 3 hinge use?

Option A.   Triangular pitch change lever.
Option B.   Flapping actuators.
Option C.   Offset hinges.

Correct Answer is C.

262. As the angle of attack of a rotor blade increases, it affects the

Option A.   flapping forces.
Option B.   dragging and the flapping forces.
Option C.   dragging forces.

Correct Answer is B.

263. With an increase in its angle of attack, the drag acting on a rotor blade

Option A.   decreases.
Option B.   increases.
Option C.   remains constant.

Correct Answer is B.

264. Forces on a helicopter, in a power-on descent are

Option A.   lift, drag, thrust, weight.
Option B.   lift, drag, thrust.
Option C.   weight, drag, lift.

Correct Answer is A.

265. The bell stability augmentation system is based on

Option A.   flapping hinges.
Option B.   offset hinges.
Option C.   gyroscopic forces.

Correct Answer is C.

266. During forward flight the advancing blade will

Option A.   flap down.
Option B.   flap up.
Option C.   lag.

Correct Answer is B.

267. What is the advancing blade on a helicopter doing?

Option A.   Going to the highest point.
Option B.   Increasing in lift.
Option C.   Increasing in drag.

Correct Answer is B.

268. What is the swash plate on a helicopter used for?

Option A.   Control of the pitch of the rotor blades.
Option B.   Control of the speed of the rotor blades.
Option C.   Control of the flap of the rotor blades.

Correct Answer is A.
Explanation.   Automatic Flight Control Pallett Page 61.

269. Upwash on a helicopter would result in

Option A.   decrease in lift.

Option B.   increase in lift without an increase in power.
Option C.   decrease in speed.

Correct Answer is B.
Explanation.   Upwash increases angle of attack.

270. After a roll to the left of a statically unstable helicopter, the helicopter would

Option A.   continue to roll further.
Option B.   remain at the position that it had rolled to.
Option C.   roll back to the horizontal.

Correct Answer is A.
Explanation. Automatic Flight Control Pallett Page 65.

271. The difference between transient droop and static droop is

Option A.   overswing.
Option B.   underswing.
Option C.   a hole in one.

Correct Answer is B.
Explanation.   The Helicopter history, piloting and how it flies John Fay ISBN81-70002-030-1 Page No 21.

272. What happens to a helicopter in autorotative flight?

Option A.   The rotor goes in the normal direction of rotation.
Option B.   The rotor goes the opposite direction to the normal direction of rotation.
Option C.   The cabin goes in the direction of rotation.

Correct Answer is A.

273. The RPM of the rotor blades is constant, within small limits to

Option A.   prevent blades over-speeding.
Option B.   prevent blades folding up during flight.
Option C.   reduce torque loading.

Correct Answer is B.

274. To maintain the position of the helicopter, when hovering with a decrease in air density, the pilot must

Option A.   increase the collective pitch.
Option B.   increase rotor RPM.
Option C.   increase the cyclic pitch.

Correct Answer is A.

275. Relative airflow over a helicopter blade

Option A.   increases at the tip.
Option B.   is unaffected by blade position.
Option C.   increases at the root.

Correct Answer is A.

276. An helicopter fin helps to give

Option A.   longitudinal stability about the normal axis.

Option B. directional stability about the normal axis.
Option C. directional stability about the longitudinal axis.

Correct Answer is B.

277. After a roll to the left of a statically stable helicopter, the helicopter would

Option A. continue to roll.
Option B. come back to level flight.
Option C. increases roll.

Correct Answer is B.

278. Solidity of the rotor is the ratio of the

Option A. blade area to disc area.
Option B. all up weight to blade area.
Option C. all up weight to disc area.

Correct Answer is A.

279. Which direction is the air flowing through the main rotor during autorotation?

Option A. Upwards.
Option B. Parallel to the rotor chord line.
Option C. Downwards.

Correct Answer is A.

280. The purpose of an off-set vertical stabilizer is to

Option A. provide stability during vertical flight.
Option B. relieve some of the load on the tail rotor during forward flight.
Option C. provide lift during forward flight.

Correct Answer is B.

281. The purpose of the horizontal stabilizer is to

Option A. maintain the aircraft in as near a horizontal attitude as possible, during forward flight.
Option B. to reduce rotor head loads during translational flight.
Option C. to stabilize the aircraft in the hover.

Correct Answer is A.

282. During autorotation, the rudder pedals

Option A. would need to be backed off due to the loss of torque.
Option B. would have no effect on directional control.
Option C. would need to be advanced to counteract the increased torque.

Correct Answer is A.

283. In forward flight, the advancing blade would be expected to

Option A. lag.
Option B. increase pitch.
Option C. flap up.

Correct Answer is C.

284. When the helicopter moves from the hover to translational flight, the lift vector will

Option A.   remain vertical.
Option B.   move forward.
Option C.   move aft.

Correct Answer is B.

285. If the blade angle of attack increases

Option A.   lift increases only.
Option B.   lift and drag increases.
Option C.   drag increases only.

Correct Answer is B.

286. When a blade is flapping up

Option A.   pitch will increase.
Option B.   pitch will decrease.
Option C.   lift and drag both increase.

Correct Answer is B.

287. Vortex ring start requires

Option A.   retreating blade stall.
Option B.   advancing blade stall.
Option C.   power on descent.

Correct Answer is C.
Explanation.   The helicopter and how it flies Page 117 by John Fay.

288. Rotor tip vortices are strongest when

Option A.   hovering with high weight.
Option B.   flying high speed in straight and level flight.
Option C.   flying into a headwind.

Correct Answer is A.

289. Tail rotor effects the helicopter in

Option A.   pitch and roll.
Option B.   vertical axis.
Option C.   horizontal axis.

Correct Answer is B.

290. A blade of a Helicopter Main Rotor is

Option A.   highly cambered.
Option B.   reverse cambered.
Option C.   symmetrically cambered.

Correct Answer is C.

291. Helicopter rotor blades produce lift by

Option A.   moving a small mass of air downwards slowly.

Option B.   moving a large mass of air downwards quickly.
Option C.   creating a lower pressure above the blade than below.

Correct Answer is C.

292. With an increase in forward velocity of a helicopter, the increase in parasitic drag will cause the fuselage attitude to

Option A.   pitch down.
Option B.   remain level.
Option C.   pitch up.

Correct Answer is A.
Explanation.   The amount of parasitic drag increases with increasing airspeed, so that the thrust/parasite drag (nose down) couple becomes stronger.

293. On a helicopter, rotor disc lift happens

Option A.   180° later.
Option B.   90° later.
Option C.   immediately.

Correct Answer is C.

294. During an autorotative decent, rotor RPM will be

Option A.   higher than in powered flight.
Option B.   approximately the same as in powered flight.
Option C.   lower than in powered flight.

Correct Answer is A.

295. Lift in a helicopter is a result of

Option A.   pitch·square root of speed.
Option B.   angle of attack·velocity squared.
Option C.   angle of attack·velocity squared and forward speed.

Correct Answer is B.

296. After a change in pitch of a rotor blade the blade will be at maximum flap at

Option A.   180°.
Option B.   90°.
Option C.   0°.

Correct Answer is B.

297. When the rotor blade increases its angle of attack, the centre of pressure

Option A.   does not move.
Option B.   moves rearwards.
Option C.   moves forward.

Correct Answer is A.

298. Autorotative force attempts to pull the rotor blade

Option A.   in the direction of normal rotation.
Option B.   both in and against the direction of normal rotation.

Option C.   against the direction of normal rotation.

Correct Answer is A.

299. The ground effect is effective up to a height equaling

Option A.   twice the diameter of the rotor disc.
Option B.   the length of the fuselage.
Option C.   the diameter of the rotor disc.

Correct Answer is C.

300. Movement of the collective control will

Option A.   increase the pitch of the main rotor blades.
Option B.   increase the pitch of the tail rotor.
Option C.   tilt the disc and increase engine power.

Correct Answer is A.

301. Rotor blade sailing is a problem at

Option A.   low rotor RPM at engine shut down.
Option B.   normal rotor RPM in gusty conditions.
Option C.   high rotor RPM at engine start up.

Correct Answer is A.

302. The layer of air over the surface of an aerofoil which is slower moving, in relation to the rest of the airflow, is known as

Option A.   camber layer.
Option B.   boundary layer.
Option C.   none of the above are correct.

Correct Answer is B.

303. During helicopter forward flight the retreating blade will tend to

Option A.   flap down.
Option B.   no change.
Option C.   flap up.

Correct Answer is A.

304. When airflow velocity over an upper cambered surface of an aerofoil decreases, what takes place?

Option A.   Pressure increases, lift decreases.
Option B.   Pressure decreases, lift increases.
Option C.   Pressure increases, lift increases.

Correct Answer is A.

305. What is a controlling factor of turbulence and skin friction?

Option A.   Countersunk rivets used on skin exterior.
Option B.   Fineness ratio.
Option C.   Aspect ratio.

Correct Answer is A.

306. Changes in aircraft weight

Option A.   will only affect total drag if the lift is kept constant.
Option B.   will not affect total drag since it is dependant only upon speed.
Option C.   cause corresponding changes in total drag due to the associated lift change.

Correct Answer is C.

307. When an aerofoil stalls

Option A.   lift and drag increase.
Option B.   lift decreases and drag increases.
Option C.   lift increases and drag decreases.

Correct Answer is B.

308. When a helicopter rotor disc is tilted forward, what happens to the pitch of the retreating blade?

Option A.   Increases.
Option B.   Remains constant.
Option C.   Decreases.

Correct Answer is A.

309. Airflow through the main rotor disc in autorotation is

Option A.   always down through the rotor disc.
Option B.   always up through the rotor disc.
Option C.   may be either up or down.

Correct Answer is B.

310. The blade stalling speed will

Option A.   only change if the MTWA were changed.
Option B.   increase with an increase in helicopter weight.
Option C.   be unaffected by helicopter weight changes since it is dependant upon the angle of attack.

Correct Answer is B.

311. Ground effect will be most apparent when

Option A.   taxiing in the hover.
Option B.   hovering close to the ground.
Option C.   taxiing on the ground.

Correct Answer is B.

312. When entering into a stable autorotative state, the main rotor RPM will initially

Option A.   increase.
Option B.   decrease.
Option C.   be unaffected.

Correct Answer is B.

313. The stalling speed of an helicopter blade

Option A.   is increased when the helicopter is heavier.

Option B.   is increased when the helicopter is lighter.
Option C.   does not change.

Correct Answer is A.

314. Helicopters in forward flight are usually

Option A.   directionally stable.
Option B.   laterally stable.
Option C.   longitudinally stable.

Correct Answer is A.

315. Stability of a helicopter is its

Option A.   ability to hover at a fixed point above the ground.
Option B.   ability to move in all 3 axis where and when required.
Option C.   ability to return to original attitude after displacement.

Correct Answer is C.

316. In forward flight the relative air velocity at each blade

Option A.   is greatest for the retreating blade.
Option B.   is equal at all blades due to compensation.
Option C.   is greatest for the advancing blade.

Correct Answer is C.

317. What forces are acting on the helicopter during descent?

Option A.   Lift only.
Option B.   Lift and weight.
Option C.   Weight only.

Correct Answer is B.

318. The ground cushion effect is apparent

Option A.   in the hover only.
Option B.   in the hover and at low translational flight close to the ground.
Option C.   on the ground only.

Correct Answer is B.

319. If the angle of attack is increased on a main rotor blade

Option A.   there is no change in drag.
Option B.   there is an increase in drag.
Option C.   there is a reduction in drag.

Correct Answer is B.

320. A helicopter main rotor blade may be tapered from root to tip to

Option A.   equalise lift along the blade.
Option B.   reduce induced drag.
Option C.   reduce the blade weight.

Correct Answer is A.

321. A helicopter main rotor blade is twisted from root to tip to

Option A.   permit the blade to straighten under aerodynamic load.
Option B.   equalise lift along the blade.
Option C.   give the blade additional strength.

Correct Answer is B.

322. Translational drift is

Option A.   the tendency for the aircraft to drift laterally.
Option B.   the tendency for the aircraft to turn to port.
Option C.   the tendency for the aircraft to pitch nose up.

Correct Answer is A.

323. The choice of aerofoil section for a rotor blade is such that.

Option A.   it has a stable centre of pressure.
Option B.   the CofP moves very slowly.
Option C.   the CofP moves rapidly in response to pitch changes.

Correct Answer is A.

324. When the rotor blade is flapping up, the angle of attack

Option A.   remains the same as the pitch angle.
Option B.   is less than the pitch angle.
Option C.   is greater than the pitch angle.

Correct Answer is B.

325. When the rotor blade is flapping down, the pitch angle

Option A.   is less than the angle of attack.
Option B.   remains the same.
Option C.   is greater than the angle of attack.

Correct Answer is A.

326. The tropopause exists at about

Option A.   18 000 ft.
Option B.   30 000 ft.
Option C.   36 000 ft.

Correct Answer is C.

327. The rotor blades operate at the best Lift/Drag ratio when their

Option A.   angle of attack is 0 degrees.
Option B.   pitch angles closely approach the stall angle.
Option C.   angle of attack is about +3 degrees.

Correct Answer is C.

328. The centre of pressure of an aerofoil is that point on the cord line.

Option A.   which moves most, with changes in angle of attack, if the section is symmetrical.
Option B.   at which the highest pressure is said to act.

Option C.   at which the lift forces resultant is said to act.

Correct Answer is C.

329. The main rotor assembly of a helicopter provides

Option A.   both lift and horizontal thrust.
Option B.   lift, a component of which is horizontal so thrust is obtained.
Option C.   lift, but an unbalanced component in the direction of flight moves the aircraft forward.

Correct Answer is B.

330. An advantage of the symmetrical section blades used on helicopters is that

Option A.   the movement of the centre of pressure with changes of the angle of attack is greater than that of a fixed wing.
Option B.   the centre of pressure moves forward with changes in angle of attack.
Option C.   the position of the feather axis and the centre of pressure and centre of gravity coincide, providing stability.

Correct Answer is C.

331. Which part of the rotor disc produces the most lift during forward flight?

Option A.   The mid-span portion.
Option B.   The front portion.
Option C.   The rear portion.

Correct Answer is B.

332. The aerofoil shape of a main rotor blade is symmetrical in order to make the blade have.

Option A.   the highest possible lift co-efficient when hovering.
Option B.   the best possible autorotative characteristics.
Option C.   a relatively stable centre of pressure position with changes in angle of attack.

Correct Answer is C.

333. Aspect ratio is the ratio of the

Option A.   disc diameter to the chord.
Option B.   blade chord to the disc area.
Option C.   blade span to the chord.

Correct Answer is C.

334. Disc loading is defined as the

Option A.   ratio of gross weight to disc area.
Option B.   ratio of blade area to disc area.
Option C.   ratio of gross weight to total blade area.

Correct Answer is A.

335. A helicopter has a main rotor which rotates anticlockwise viewed from above. What happens if a loss of anti-torque device at cruise speed in flight?

Option A.   Nose pitches up slightly + yaw to right.
Option B.   Nose pitches up slightly + yaw to left.
Option C.   No appreciable change.

Correct Answer is A.

336. Over pitch causes

Option A.   an increase in RPM.
Option B.   a reduction in RPM.
Option C.   blades to cone up.

Correct Answer is C.

337. A shrouded tail rotor

Option A.   reduces need for cyclic feathering.
Option B.   gives control in pitch and yaw.
Option C.   has increased airflow so yaw can be controlled by the rudder.

Correct Answer is A.

338. In a helicopter with its main rotor turning anti-clockwise, which way does the aircraft tend to drift?

Option A.   Port if tail rotor is mounted on the right.
Option B.   Starboard, irrespective of which side the tail rotor is mounted on.
Option C.   Port if tail rotor is mounted on the left.

Correct Answer is B.

Flight Stability and Dynamics

1.   Dihedral wings combat instability in

Option A.   yaw.
Option B.   side-slip.
Option C.   pitch.

Correct Answer is B.
Explanation.   As the aircraft side-slips, there is a greater angle of attack on the lower wing which increases lift, straightens the aircraft and stops the side-slip.

2.   An aircraft, which is longitudinally stable, will tend to return to level flight after a movement in which axis?

Option A.   Pitch.
Option B.   Yaw.
Option C.   Roll.

Correct Answer is A.
Explanation.   Longitudinal stability is stability about the pitch axis.

3.   The normal axis of an aircraft passes through

Option A.   the centre of gravity.
Option B.   a point at the centre of the wings.
Option C.   at the centre of pressure.

Correct Answer is A.
Explanation.   All the axis of the aircraft (normal, longitudinal and lateral) pass through the centre of gravity.

4.   Due to the change in downwash on an untapered wing (i.e. one of constant chord length) it will

Option A.   not provide any damping effect when rolling.

Option B.   not suffer adverse yaw effects when turning.
Option C.   tend to stall first at the root.

Correct Answer is C.
Explanation.   The change in downwash is caused by the wingtip vortices, which has a lesser affect inboard than it does at the tip. The downwash reduces the effective angle of attack (more so at the tip). This causes the root of the wing to stall before the tip.

5.   Correcting for a disturbance which has caused a rolling motion about the longitudinal axis would re-establish which of the following?

Option A.   Lateral stability.
Option B.   Longitudinal stability.
Option C.   Directional stability.

Correct Answer is A.
Explanation.   The aircraft's response to rolling is lateral stability.

6.   Porpoising is an oscillatory motion in the

Option A.   yaw plane.
Option B.   roll plane.
Option C.   pitch plane.

Correct Answer is C.
Explanation.   Porpoising is an oscillatory motion in pitch, about the lateral axis.

7.   Directional stability is maintained

Option A.   by the tailplane, and controlled by the elevators.
Option B.   by the keel surface and fin, and controlled by the rudder.
Option C.   by the mainplanes, and controlled by the ailerons.

Correct Answer is B.
Explanation.   Directional stability is maintained by the keel surface and the fin and controlled by the rudder.

8.   Longitudinal stability is given by

Option A.   the fin.
Option B.   the wing dihedral.
Option C.   the horizontal tailplane.

Correct Answer is C.
Explanation.   The horizontal stabilizer (tailplane) provides longitudinal stability.

9.   Lateral stability is given by

Option A.   the horizontal tailplane.
Option B.   the ailerons.
Option C.   the wing dihedral.

Correct Answer is C.
Explanation.   The wing dihedral provides lateral stability.

10.   Stability about the lateral axis is given by

Option A.   the ailerons.
Option B.   the horizontal tailplane.
Option C.   wing dihedral.

Correct Answer is B.
Explanation. Stability about the lateral axis is longitudinal stability. The horizontal stabilizer (tailplane) provides longitudinal stability.

11. Sweepback of the wings will

Option A. decrease lateral stability.
Option B. not affect the lateral stability.
Option C. increase lateral stability.

Correct Answer is C.
Explanation. When an aircraft rolls, it sideslips. A sideslipping aircraft with sweepback has a higher AR on the leading wing than it has on the trailing wing. The lift is greater on a higher AR wing, so it corrects the roll (10° of sweepback has the same effect as 1° of dihedral).

12. Dutch Roll is

Option A. primarily a pitching instability.
Option B. a combined rolling and yawing motion.
Option C. a type of slow roll.

Correct Answer is B.
Explanation. Dutch role is a combination of role and yaw.

13. A high wing position gives

Option A. more lateral stability than a low wing.
Option B. less lateral stability than a low wing.
Option C. the same lateral stability as a low wing.

Correct Answer is A.
Explanation. The pendulum effect produced by the fuselage of a high wing aircraft provides more lateral stability.

14. Directional stability may be increased with

Option A. pitch dampers.
Option B. horn balance.
Option C. yaw dampers.

Correct Answer is C.
Explanation. Yaw dampers increase directional stability.

15. Lateral stability may be increased with

Option A. increased lateral dihedral.
Option B. increased lateral anhedral.
Option C. increased longitudinal dihedral.

Correct Answers is A.
Explanation. Lateral dihedral increases lateral stability. (BTW: Longitudinal dihedral is the difference between mainplane and tailplane angles of incidence).

16. Longitudinal stability is increased if the

Option A. CG is forward of the CP.
Option B. Thrust acts on a line below the total drag.
Option C. CP moves forward of the CG.

Correct Answer is A.

Explanation.   If the CG is forward of the CP it will have a nose-down tendency which makes the aircraft less likely to stall and therefore it will have more longitudinal stability.

17.   Directional stability is about the

Option A.   lateral axis.
Option B.   longitudinal axis.
Option C.   normal axis.

Correct Answer is C.
Explanation.   Directional stability is stability about the normal axis.

18.   Lateral stability is about the

Option A.   longitudinal axis.
Option B.   normal axis.
Option C.   vertical axis.

Correct Answer is A.
Explanation.   Lateral stability is stability about the longitudinal axis.

19.   Longitudinal stability is provided by the

Option A.   horizontal stabilizer.
Option B.   vertical stabilizer.
Option C.   mainplane.

Correct Answer is A.
Explanation.   Longitudinal stability is provided by the horizontal stabiliser (tailplane).

20.   If the aircraft turns and side-slips

Option A.   the sweepback of the wing will correct the sideslip.
Option B.   the keel surface will correct the sideslip.
Option C.   the dihedral of the wing will correct the sideslip.

Correct Answer is C.
Explanation.   http://www.allstar.fiu.edu/aero/axes33.htm

21.   An aircraft disturbed from its normal flight path, and automatically returns to that normal flight path, without any action on the part of the pilot is known as

Option A.   aircraft stall.
Option B.   aircraft instability.
Option C.   aircraft stability.

Correct Answer is C.
Explanation.   Stability is the aircraft's ability for the aircraft to return to its normal flightpath after being disturbed.

22.   The fin gives stability about which axis?

Option A.   Longitudinal axis.
Option B.   Lateral axis.
Option C.   Normal axis.

Correct Answer is C.
Explanation.   The fin gives stability about the normal axis.

23. If the nose of the aircraft is rotated about its lateral axis, what is its directional movement?

Option A. Rolling or banking to the left or right.
Option B. Turning to the left or right.
Option C. Climbing or diving.

Correct Answer is C.
Explanation. For an aircraft to climb or dive it must be rotated about ts lateral axis.

24. The function of an aircraft fin

Option A. is to provide directional control.
Option B. is to provide straight airflow across the rudder.
Option C. is to provide stability about the normal axis.

Correct Answer is C.
Explanation. The function of the aircraft fin is to provide stability about the normal axis.

25. Movement of an aircraft about its normal axis

Option A. is rolling.
Option B. is yawing.
Option C. is pitching.

Correct Answer is B.
Explanation. yawing' is movement of the aircraft about its normal axis.

26. If, after a disturbance, an aeroplane initially returns to its equilibrium state

Option A. it has neutral stability.
Option B. it has static stability and may be dynamically stable.
Option C. it is neutrally unstable.

Correct Answer is B.
Explanation. Static stability is when an aircraft returns to its equilibrium (trimmed) state. Dynamic stability is the ability of the aircraft to oppose the disturbance.

27. Stability of an aircraft is

Option A. the tendency of the aircraft to return to its original trimmed position after having been displaced.
Option B. the tendency of the aircraft to stall at low airspeed.
Option C. the ability of the aircraft to rotate about an axis.

Correct Answer is A.
Explanation. Stability is the tendency for the aircraft to return to its original position after being displaced.

28. The three axes concerned with stability of an aircraft have

Option A. normal axis through C of G. Lateral axis – wing tip to wing tip. Longitudinal axis – nose to tail but not through C of G.
Option B. longitudinal, lateral and normal axis all passing through aircraft centre of gravity.
Option C. longitudinal axis nose to tail, lateral axis at furthest span point, normal axis through centre of pressure.

Correct Answer is B.
Explanation. The longitudinal, lateral and normal axis all pass through the aircraft's centre of gravity.

29.   If an aircraft returns to a position of equilibrium it is said to be

Option A.   positively stable.
Option B.   neutrally stable.
Option C.   negatively stable.

Correct Answer is A.
Explanation.   If an aircraft is positively stable it will return to its trimmed position.

30.   The pendulum effect on a high wing aircraft

Option A.   has no effect on lateral stability.
Option B.   increases lateral stability.
Option C.   decreases lateral stability.

Correct Answer is B.
Explanation.   Pendulum effect on a high wing aircraft increases lateral stability.

31.   After a disturbance in pitch, an aircraft continues to oscillate at constant amplitude. It is

Option A.   longitudinally unstable.
Option B.   longitudinally neutrally stable.
Option C.   laterally unstable.

Correct Answer is B.
Explanation.   If an aircraft oscillates in pitch without the oscillations increasing or decreasing it is longitudinally neutrally stable.

32.   On an aircraft with an all-moving tailplane nose up pitch is caused by

Option A.   decreasing tailplane incidence.
Option B.   increasing tailplane incidence.
Option C.   up movement of the trim tab.

Correct Answer is A.
Explanation.   To make the nose pitch-up, the tailplane down load must be increased. This is done by decreasing its incidence (or increasing its negative incidence).

33.   What gives the aircraft directional stability?

Option A.   Vertical stabiliser.
Option B.   Elevators.
Option C.   Horizontal stabiliser.

Correct Answer is A.
Explanation.   The vertical stabiliser gives the aircraft directional stability.

34.   In flight if the aircraft nose gets an upward gust of wind, what characteristic will have the greatest effect to counteract it?

Option A.   Wing Sweep.
Option B.   Horizontal stabiliser and fuselage length.
Option C.   Position of the centre of pressure relative to the centre of gravity.

Correct Answer is B.
Explanation.   Longitudinal stability is effected mainly by the stabiliser and length of fuselage behind the C of G.

35.   To correct dutch roll you must damp oscillation around:

Option A.   the longitudinal axis.
Option B.   the lateral axis.
Option C.   the vertical axis.

Correct Answer is C.
Explanation.   Dutch Roll is a figure of eight oscillation around the vertical axis.

36.   An elevator trim tab is used to

Option A.   counteract propeller torque.
Option B.   prevent the control surface from stalling the airflow.
Option C.   reduce control column forces on the pilot.

Correct Answer is C.
Explanation.   See AC Kermode Chapter 9.

37.   A high wing aircraft will be more

Option A.   laterally stable than a low wing aircraft.
Option B.   longitudinally stable than a low wing aircraft.
Option C.   directionally stable than a low wing aircraft.

Correct Answer is A.
Explanation.   Due to pendulum effect of the fuselage, a high wing aircraft will be more laterally stable than a
                 low wing aircraft.

38.   After an aircraft has been disturbed from its straight and level flight, it returns to its original
      attitude with a small amount of decreasing oscillation. The aircraft is

Option A.   statically stable but dynamically unstable.
Option B.   statically unstable but dynamically stable.
Option C.   statically stable and dynamically stable.

Correct Answer is C.
Explanation.   Static stability is the ability of the aircraft to return to its untrimmed position. Dynamic stability
                 is the ability of the aircraft to not oscillate about the trimmed position.

39.   If there is an increase of density, what effect would there be in aerodynamic dampening?

Option A.   Decreased.
Option B.   Increased.
Option C.   None.

Correct Answer is B.
Explanation.   Flight forces (and hence aerodynamic dampening) are all increased with increasing density.

40.   Yawing is a rotation around

Option A.   the lateral axis obtained by the rudder.
Option B.   the normal axis obtained by the rudder.
Option C.   the normal axis obtained by the elevator.

Correct Answer is B.
Explanation.   Yawing is rotation around the normal axis obtained by the rudder.

41.   Lateral stability is reduced by increasing

Option A.   dihedral.

Option B.   sweepback.
Option C.   anhedral.

Correct Answer is C.
Explanation.   Anhedral is a downward and outward inclination of the wing. It is opposite to dihedral.

42.   Azimuth stability is dependent on

Option A.   dihedral.
Option B.   keel and fin.
Option C.   tailplane.

Correct Answer is B.
Explanation.   Azimuth is a fancy word for 'direction'.

43.   Sweepback of the wings will

Option A.   increase lateral stability at high speeds only.
Option B.   not affect lateral stability.
Option C.   increase lateral stability at all speeds.

Correct Answer is C.
Explanation.   10° of sweepback provides the same effect as 1° of dihedral.

44.   If you have an aircraft that is more laterally stable then directionally stable it will tend to:

Option A.   bank.
Option B.   slip.
Option C.   skid.

Correct Answer is C.
Explanation.   Skidding out of turns is symptomatic of dutch roll, extra vertical stabilisers are often added to correct this (Nimrod MR2).

45.   A centre of gravity position close to its aft limit will cause the aircraft to

Option A.   pitch nose down and increase its longitudinal stability.
Option B.   pitch nose up and decrease its longitudinal stability.
Option C.   pitch nose up and increase its longitudinal stability.

Correct Answer is B.
Explanation.   AC Kermode page 145 states that a pitch up will increase AOA and further destabilise the aircraft.

46.   A sharply swept wing will promote

Option A.   excessive lateral instability.
Option B.   excessive longitudinal stability.
Option C.   excessive lateral stability.

Correct Answer is C.
Explanation.   Swept wing fighter aircraft often have anhedral to promote greater roll rate, which is needed due to excessive stability.

47.   Which control surfaces provide lateral control, also longitudinal control and stability?

Option A.   Ruddervators.
Option B.   Tailerons.
Option C.   Flapperons.

Correct Answer is B.

48. If, after a disturbance, an aeroplane initially returns to its equilibrium state

Option A.   it has neutral stability.
Option B.   it has static stability and may be dynamically stable.
Option C.   it is neutrally unstable.

Correct Answer is B.
Explanation.   Question says nothing about overshooting and oscillating, so it could be dynamically unstable, even though it is statically stable.

49. Yaw dampers are designed to

Option A.   prevent dutch roll.
Option B.   assist the pilot to move the rudder.
Option C.   reduce the effect of crabbing due to cross winds.

Correct Answer is A.

50. Tuck under occurs when

Option A.   a shock stall occurs on the outboard portion of swept wing.
Option B.   a shock stall warning occurs on the inboard position of a straight wing.
Option C.   the aircraft reaches M_{crit}.

Correct Answer is C.

51. The lateral axis is

Option A.   a straight line through the CG at right angles to the longitudinal and lateral axis.
Option B.   a straight line through the CG from nose to tail.
Option C.   a straight line through the CG parallel to a line joining the wingtips.

Correct Answer is C.
Explanation.   A straight line through the CG parallel to a line joining the wingtip.

52. The main factors which affect longitudinal stability are

Option A.   design of the fuselage and position of the CG.
Option B.   design of the mainplane and position of the CG.
Option C.   design of the tailplane and position of the CG.

Correct Answer is C.

53. A yawing motion provides what kind of Stability?

Option A.   Directional.
Option B.   Lateral.
Option C.   Longitudinal.

Correct Answer is A.
Explanation.   Yawing is directional stability.

54. Where would you find the normal axis?

Option A.   Through C of G at right angles to longitudinal and lateral axis.
Option B.   Vertically through CofP.
Option C.   In line with the wing tips through C of G.

Correct Answer is A.

55. When a aircraft is in a slideslip and is yawing the

Option A.   the fin will correct the yawing motion.
Option B.   the effective keel area will make the ac yaw further into the direction of the sideslip.
Option C.   the dihedral will prevent the yaw motion.

Correct Answer is B.
Explanation.   Page 290 Mechanics of Flight Kermode.

56. As a consequence of the C of G being close to its aft limit

Option A.   the stick forces to manoeuvre longitudinally will be low due to low stability.
Option B.   the stick forces will be high in fore and aft pitch, due to the high longitudinal stability.
Option C.   the stick forces when pitching the nose down will be very high.

Correct Answer is C.

57. With the C of G on its forward limit

Option A.   the change in control loading is dependant on the position of the CofP.
Option B.   control loading decreases.
Option C.   control loading increases.

Correct Answer is C.

Other

1. A 'slug' is a unit of

Option A.   mass.
Option B.   density.
Option C.   volume.

Correct Answer is A.

2. An undercarriage leg in flight produces 3 lbs of drag at 100 kts. If speed is increased to 200 kts the drag would be

Option A.   12 lbs.
Option B.   9 lbs.
Option C.   6 lbs.

Correct Answer is A.
Explanation.   Profile drag rises with V squared.

3. A stall warning device must be set to operate

Option A.   at a speed just above stalling speed.
Option B.   at a speed just below stalling speed.
Option C.   at the stalling speed.

Correct Answer is A.

4. In cruise the weight of an aeroplane is decreasing as fuel is used. A stall would occur

Option A.   at a lower speed.
Option B.   at the same speed.
Option C.   at a higher speed.

Correct Answer is A.
Explanation.   Stall speed increases with increasing weight.

5.   The purpose of 'streamlining' is to reduce.

Option A.   profile drag.
Option B.   skin friction drag.
Option C.   induced drag.

Correct Answer is A.

6.   As height increases, with angle of attack and speed constant

Option A.   lift will remain constant.
Option B.   lift increases.
Option C.   lift decreases.

Correct Answer is C.
Explanation.   That is why a greater angle of attack is required at higher altitude.