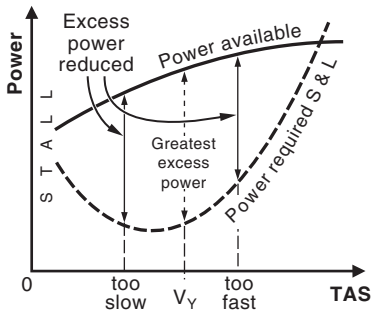
**22.** *Answer a.* To achieve maximum endurance (greatest time in the air) fuel flow must be as low as possible. For a piston engine this occurs at the speed for minimum power. The aircraft should also be flown as low as possible because the denser air at low altitude allows the engine and propeller to work more efficiently.

**23.** *Answer c.* Rate of climb depends on excess power. Rate of climb will reduce when the power available reduces, or the power required for straight and level increases. Climbing faster or slower than the TAS for maximum rate of climb (point $V_Y$ in figure App. 4-1) will increase the power required for straight and level flight. This will reduce the excess power available for climbing and therefore reduce the rate of climb. Answer a is incorrect because if weight is reduced in straight and level flight, lift and drag would also reduce. Power required for steady straight and level flight would then need to be decreased because of the reduced drag allowing the rate of climb to increase. Answer b is incorrect because wind acts horizontally affecting angle of climb but not rate of climb. Answer d could easily be misread as a reduction in density altitude means decreasing height and therefore a density increase. This will result in the power required for straight and level flight reducing, excess power increasing and therefore an increase in rate of climb.




**App. 4-1** Question 23.

**24.** *Answer b.* When an aeroplane turns, lift, load factor and stalling speed increase. The amount by which the stalling speed increases can either be learnt for certain angles of bank, or calculated. In this case we multiply the speed by 1.19, giving $50 \times 1.19 = 59.5$.

**25.** *Answer c.* As speed reduces from maximum to the stall, parasite drag will continuously reduce and induced drag continuously increase. Total drag will therefore decrease and then increase as speed is reduced.

**26.** *Answer c.* If the aeroplane is gliding at its best glide speed, the lift/drag ratio must be maximum and its still air range maximum. If the airspeed was increased, the angle of attack would need to be reduced and therefore the L/D ratio and still air glide range would reduce. If the airspeed was decreased the angle of attack would need to be increased, again reducing the L/D ratio and still air glide range. Answers b and d are therefore incorrect as increasing or decreasing the glide speed will result in the glide range reducing not increasing. When an aeroplane is gliding at its maximum lift/drag ratio the only way range can be increased is if there is a tailwind. In this case the glidepath relative to the ground is shallower and the angle of descent is less. Wind, however, acts horizontally and has no effect on rate of descent so the time that the aeroplane is gliding (endurance) does not change; answer a is incorrect because the endurance will remain the same and not increase. This leaves answer c as the correct answer. A headwind will reduce range but, as explained above, has no effect on endurance.

**27.** *Answer a.* During a level steep turn, lift must be increased so that the vertical component of lift equals weight enabling the aeroplane to remain at the same altitude, and the horizontal component of lift provides the centripetal force required for the aeroplane to turn. This increase in lift is achieved by increasing the angle of attack which also increases induced drag. This is because the increased angle of attack results in the pressure difference about the wing increasing and therefore the size of the wingtip vortices increasing. More power is therefore required to overcome the extra induced drag. If power is not increased entering a steep turn, speed will reduce.

**28.** *Answer d.* Point X is the angle of attack for the maximum lift/drag ratio. At this angle of attack total drag will be minimum. In steady straight and level flight thrust equals drag and therefore the aeroplane will be flying at the angle of attack and speed for minimum thrust. A propeller driven aeroplane flying at the speed for minimum thrust is flying at the speed for maximum still air range. To glide for maximum still air range (i.e. shallowest glidepath) the aeroplane