Questions

1. a) Describe the production cycle of lambs.

   Sheep naturally come into season later than farmers desire. However, being able to lamb early allows farmers to produce lamb for Easter and also larger lambs by Christmas; farmers aim to maximise production for when demand is most popular.

   b) What methods could farmers use to bring their ewes into season earlier?

2. What specialisations allow animals to run fast?

Hints

Question 1

1) What causes sheep to come into season?

Question 2

1) Which animals run fast and efficiently?
2) What characteristics do fast animals share?

Suggested answers

Question 1

a)

- 2 weeks before tupping, the ewes are moved onto higher quality pasture (flushing) in order to improve their body condition and, consequently, their fertility.
    - In most lowland commercial herds, tupping usually occurs in September or October such that the 147-day gestation period causes:
        - Lambing in February.
        - Weaning in May when the lambs are about 3 months old.

- Most farms scan their ewes when they are 70-100 days pregnant so that they can be sorted into groups depending on the number of lambs they are expecting. They are then fed accordingly.

b)

- Sheep naturally come into season as day length starts to decrease.
    - Therefore, implanting a melatonin chip, since melatonin is produced when it gets dark, and using artificial lighting can trigger ewes to start cycling.
    - The presence of teaser rams (vasectomised rams which still produce testosterone and pheromones) and intravaginal progesterone sponges can also advance cycling.
        - The sponges also allow synchronisation of ovulation, thus narrowing the lambing period.

Question 2

- The three main qualities which facilitate running quickly are:
    - Increased efficiency.
        - There is less effort required for each stride.
    - Increased stride length.
        - Each stride covers more distance.
    - Increased stride frequency.
        - The quicker the limb cycle, the greater the distance travelled in a given time.

- Animals increase their efficiency by having an erect rather than a sprawling stance.
    - Plantigrades (animals which walk on their metacarpals and phalanges – such as humans) are generally less efficient than digitigrades (walk on their phalanges only – such as dogs) which, in turn, are inferior to unguligrades (walk on the tip of one phalanx – such as horses).
        - Unguligrades are more efficient because:
            - They simply have less to lift off the ground in each stride: they only have their 'toe' rather than their heel, sole and toes as a plantigrade has.
            - Their limb is also lengthened thus increasing the length of each stride.

- Stride length is also increased by the scapulae being free from the trunk and so only linked by muscles rather than bone (the collar bone in humans).
    - This allows them to act as limb bones, thus lengthening the limb.
    - It also restricts limb movement to the sagittal plane, such that effort does not have to be exerted in preventing abduction and adduction.
    - Increased mobility of the spine permits sagittal plane spinal flexion, which also increases reach.

- Increasing stride frequency is more difficult than increasing stride length because it is inefficient to increase movements above natural resonant frequency.
    - However, losing distal bones and digits (a quality which defines unguligrades), bunching muscles proximally in the limb and having the ability to flex all joints reduce distal mass, thereby reducing the moment of inertia.