

## Answers to selected questions

### Chapter 20

**Q6.** No. The speed of the plane relative to the ground will be larger than that of the plane relative to the air. The velocity vector of the wind adds as a vector to that of the plane relative to the air. Since these two vectors are at right angles, the vector sum is the hypotenuse of the vector-addition triangle. (See figure 20.5.) This vector sum is the velocity of the plane relative to the ground and is longer than the other two vectors.

**Q12.** Yes. The second of Einstein's two postulates contradicts classical assumptions on the addition of velocities. Einstein assumed that the velocity of light is not affected by the motion of the frame of reference.

**Q18.** Yes. If the father takes a space journey at very high velocities, he could return to earth to find that his child has aged more than he has even though he may have been 20 years or so older initially.

**Q24.** No. Although we often see this conversion expressed in this way, it is misleading. According to Einstein's principle of mass-energy equivalence, mass is energy, so we are converting rest-mass energy to kinetic energy (or other forms of energy) in a nuclear reaction.

**Q30.** No. According to general relativity, a clock located in a strong gravitational field runs more slowly than a clock far removed from gravitational effects.