$g = 10\ m/s^2$

Ex 1: Can an automobile with a velocity toward the north simultaneously have an acceleration toward the south? Explain.

Yes, it is possible if automobile start decelerating (- ve acceleration) in North direction, resulting acceleration in South direction (+ ve acceleration).

Ex 7: Harry says acceleration is how fast you go. Carol says acceleration is how fast you get fast. They look to you for confirmation. Who's correct?

Carol is correct, how fast you go only denotes velocity and how fast your velocity changes is acceleration.

Ex12: Cite an example of something with a constant speed that also has a varying velocity. Can you cite an example of something with a constant velocity and a varying speed? Defend your answers.

Motion of planet is good natural example. Every planet is moving with constant speed but it velocity changes due to change in direction. Another example, when a ball attached with string is moving in a horizontal circular path with constant speed, then its speed remains the same but direction changes, and velocity is vector quantity, hence velocity changes.

Velocity cannot be constant for varying speed.

Ex 18: (a) Can an object be moving when its acceleration is zero? If, so give an example. (b) Can an object be accelerating when its speed is zero? If so, give an example.

Yes, when there is no acceleration or zero, there is no change in velocity, i.e. if object is moving it will tend to move with constant velocity.

Yes, object can be accelerate at zero speed, throw a ball to sky, when it reaches its highest point its speed becomes zero at that instant but acceleration is not zero it is 10 m/s2.

Ex 21: What is the acceleration of a car that moves at a steady velocity of 100 km/h for 100 seconds? Explain your answer.

When car is moving with constant velocity, Its acceleration is zero, since acceleration is rate of change of velocity and there is no change in velocity.

Ex 25: If you drop an object, its acceleration toward the ground is 10 m/s2. If you throw it down instead, would its acceleration after throwing be greater than 10 m/s2? Why or why not?

No, both objects will experience same gravitational acceleration. However, there initial velocity may differ. After throwing the object since there is no external force and acceleration is always due to some external force.

Ex 32: Consider a vertically-launched projectile when air drag is negligible. When is the acceleration due to gravity greater: when ascending, at the top, or when descending? Defend your answer.

Acceleration due to gravity will always be same; it will depend upon gravitational force. It will always 10m/s2 and direction towards the ground or center of the earth.

Problem 4:
A ball is thrown with enough speed straight up so that it is in the air several seconds. (a) What is the velocity of the ball when it gets to its highest point? (b) What is its velocity 1 s before it reaches its highest point? (c) What is the change in its velocity during this 1–s interval? (d) What is its velocity 1 s after it reaches its highest point? (e) What is the change in velocity during this 1–s interval? (f) What is the change in velocity during the 2–s interval? (Careful!) (g) What is the acceleration of the ball during any of these time intervals and at the moment the ball has zero velocity?

(a) Velocity is zero at highest point.
(b) Using a = (v – u)/ t, here v =0 m/s, t = 1s, a = 10 m/s2 towards ground.
The velocity is 10 m/s upward direction.
(c) The change in velocity is -10 m/s. (final velocity – initial velocity= acceleration* time difference).
(d) Velocity 1 s after it reaches its highest point is 10 m/s downward.
(e) The change in velocity is 10 m/s. (final velocity – initial velocity= acceleration* time difference).
(f) The change in velocity in any interval is always acceleration * time difference. And acceleration is fix 10 m/s2. So change in velocity in 2 second interval is 20 m/s.
(g) Acceleration of the ball will be constant 10 m/s2. Since acceleration is due to gravity. Velocity of the ball may vary but not acceleration.

Problem 5:
What is the instantaneous velocity of a freely-falling object 10 s after it is released from a position of rest? What is its average velocity during this 10–s interval? How far will it fall during this time?

Since object is free falling its initial velocity is zero. So **instantaneous velocity** of object after 10 s is 10 m/s2 * 10 s **= 100 m/s**
(using formula final velocity – initial velocity= acceleration time difference).*
Average velocity during 10 s interval is **50 m/s**.
(Average velocity = (final velocity + initial velocity) / 2)
The **distance traveled** by object in this interval is **500 m**.
*(Distance travel = average velocity * time)*