(1) Given,

Mass of car = 1200 kg, $u = 90\ km/h = 25\ m/s$, $v = 18\ km/h = 5\ m/s$

$t = 4\ s$

$\Delta P = mv - mu$

$\Delta P = 1200 \times 5 - 1200 \times 25 = -24000\ kg\ m/s$

$v = u + at$

$5 = 25 + a \times 4$

$\Rightarrow a = -5\ m/s^2$ (retardation)

$|F| = m|a| = 1200 \times 5 = 6000\ N$

(2) Given,
$m = 100\,kg$
$\Delta t = 10\,s$

(i) Dist. travelled in next 5 sec,
$d = 100\,m$

Thus, velocity acquired $= v = \frac{d}{t} = \frac{100}{5} = 20\,m/s$

(ii) Acceleration produced by the force,
$a = \frac{v}{t} = \frac{20}{10} = 2\,m/s^2$

(iii) Magnitude of force, $F = ma = 100\,kg \times 2\,m/s^2 = 200\,N$

(3) m = mass of object, u = initial velocity, v = final velocity, t = time interval,
F = constant force.

$P_1 = mu$ = Initial momentum of obj.
$P_2 = mv$ = Final momentum of obj.
$\Delta P = P_2 - P_1 = mu - mv = m(v-u)$
The rate of change of $P = \frac{m(v-u)}{t}$
$F \propto \frac{m(v-u)}{t}$
$F = \frac{km(v-u)}{t}$
$F = kma$

The unit of force is chosen so that the value of k becomes 1. So, $F = ma$

(4) Newton's 1st law of motion states that an object in rest will remain in rest until & unless a force acts upon it while, the 2nd law of motion states that the ~~a~~ ~~of~~ acceleration (a) of a body is dependant on mass (m) & the force (F) acting up on that body so we can say that hear the force is the product of mass & acceleration. Ac. to 2nd law; F = ma,

Ac. to the 1st law,

F = 0, if mass is constant

F = a

a = 0, So here we can say that when force is equals

So 0 acceleration is also 0 or when the object is at rest or in motion it will remain in rest & motion respectively until & unless a force acts upon it.

5) (a) Firing of ~~gun~~ bullet, Recoil
(b) Action - Hitting hammer on nail, Reaction - the nail exerts = force on hammer
(c) Book exets force on the table (gravity), the table exerts equal force on the book

(d) The fuel burns & releases large amount of force in opposite direction of the movement of rocket, the burnt fuel exerts equal pressure on the rocket & rocket moves in upward direction.

(e) Action - the person exerts force on the floor.
Reaction - the floor exerts equal force of on the legs of person due to which he move forward.

(f) Action - the train collides to stationary train by applying large amount of Force due to its large P.

Reaction - the stationary train also exerts equal force on the moving train which opposes the motion of the moving train.

(6)(a) A hose which is ejecting large amounts of water at a high velocity, then a reaction force is applied to us in the backward direction. This is because of Newton's 3rd law of motion.

(b) Action & Reaction do not cancel each other or $F_{net} \neq 0$ because the action & reaction are applied two different bodies instead of 1.
$\therefore F_{net} \neq 0$.

7(a) According to Newton's 3rd law, to every action there is an equal & opposite reaction. When we jump on the shore from the boat, we are applying force on the boat in the opposite directing in order to move forward and hence the boat moves in the opposite direction.

(b) As the air released moves in downward direction, the equal opposite reaction of downward going air pushes the ballon upwards & vice-versa.

8(a) According to Newton's 3rd law of motion, the gas expelled applies a opposite force on the rocket's body & hence propelling it.

(b) Yes, in the direction opposite to that of the gas expelled.

(c) Acceleration (a) is 2a — (I)
F = ma
But a = 2a from (I)

Hence F = m × 2a
$a = \frac{F}{2m}$

(d) Mass is twiced (m) = 2m — (I)

a remain same
F = ma
But m = 2m from (I)
F = 2m × a
$a = \frac{F}{2m}$

(e) mass (m) & acceleration (a) are doubled ⇒ m = 2m
& a = 2a
F = ma
F = 2m × 2a
$a = \frac{F}{4m}$

For a exerted on rocket by gas
F = ma
F = 2m × 2a = 4ma — (I)
Force in original situation
F = ma — (II)

Date

From (I) & (II) force exerted in (I) is 4 time more than in (II).