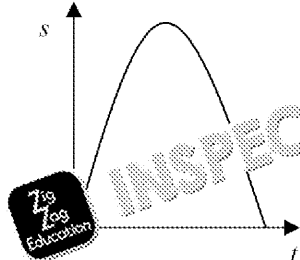# Solutions to Forces and Motion – Test A

1. (a) displacement / s on vertical axis and time / t
        on horizontal   [1]
        starts at zero and increases then decreases   [1]
        accept straight lines for this MP
        symmetrical n-shaped curve   [1]

    (b) velocity / v on vertical axis and time / t on
        horizontal   [1]
        starts with a positive value then decreases through
        zero to an equal magnitude negative value   [1]
        straight line(s) used   [1]
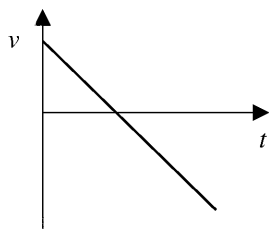
    (c) acceleration / a on vertical axis and time / t on
        horizontal   [1]
        graph is a horizontal line   [1]
        in the negative quadrant   [1]
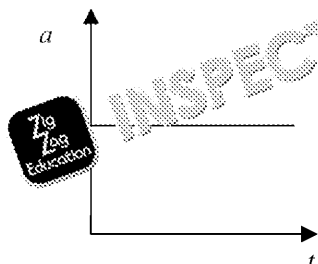
2. zero resultant force / zero acceleration   [1]
    (means) constant velocity in a straight line   [1]
    or at rest   [1]

3. (a) moment = $Fd\cos\theta$ [1]
        $22 \times 0.41 \times \cos 37°$ or $22 \times 0.41 \times 0.80$ [1]
        7.2 Nm   [1]
        must include unit
    (b) moment = Fd or $7.2 = 0.19\,X$ [1]
        = 38 N   or 37.9 N   [1]
    (c) D   [1]

4. (a) $p = h\rho g$ or substitution   [1]
        49 kPa or kNm^{-2} [1]
    (b) $F = pA$ or sub   [1]
        a ... × 10^{-3} [1]
        N   [1]
    (c) cube A (no mark)
        because the difference in density between
        cube A and water is greater   [1]
        cube A has less weight so resultant upward
        force on it is greater   [2]
        (ii) will accelerate upwards   [1]

5. (a) verti...
        = 39...
        use o...
        accep...

        $s = \dfrac{u...}{2...}$

        = 78...
    (b) use o...
        highe...
        = 3.9...
        total...
        horiz...
        = 58...
        use o...
        = 46...

6. (a) calcu...

        using...

        Use ...
        $\dfrac{0.04...}{0...}$
        = 0.8...
        or co...
        plot ...
        draw...
        g is t...
    (b) repea...
    (c) eithe...
        less t...
        becau...
        reduc...
        or
        equal...
        becau...
        ball ...
        Do n...

7. (a) weigh...
        which...
    (b) the to...
        is co...
        mass...
        the tr...
    (c) (i)
        (ii)

        (iii)

8. (a) use of $v^2 = u^2 + 2as$ or $v^2 = 2as$ or substitution **[1]**
        $v^2 = 29.43$ **[1]**
        $v = 5.4$ ms⁻¹ **[1]**

    (b) $p = mv$ or substitution **[1]**
        $= 54$ Ns or kgms⁻¹ **[1]**
        Must include unit

    (c) momentum of the ball becomes zero **[1]**
        but the grains of sand are displaced, so they have ⬚⬚tial momentum as a ⬚

9. in an elastic collision kinetic energy is c⬚⬚rv⬚d **[1]**
    if the collisions were not elastic ⬚⬚ th⬚ ⬚⬚icles would lose speed on each colli⬚
    so the temperature of th⬚ ⬚⬚ wo⬚ ⬚ decrease with time **[1]**

10. (a) $\frac{1}{2}⬚⬚^2$ or substitution **[1]**
        ⬚.75 J **[1]**

    (b) (i) idea that magnitude of momentum of both trolleys is equal **[1]**

            $mv_A = 2mv_B$ or $v_B = \frac{v_A}{2}$ **[1]**

        (ii) total kinetic energy of the system $= 0.75$ J **[1]**
            ratio of kinetic energies A : B $= 2 : 1$ **[1]**
            kinetic energy of A $= 0.50$ J and B $= 0.25$ J **[1]**
            velocity of A $= 1.4$ ms⁻¹ **[1]**
            velocity of B $= 0.71$ ms⁻¹ **[1]**

Preview of Answers Ends Here