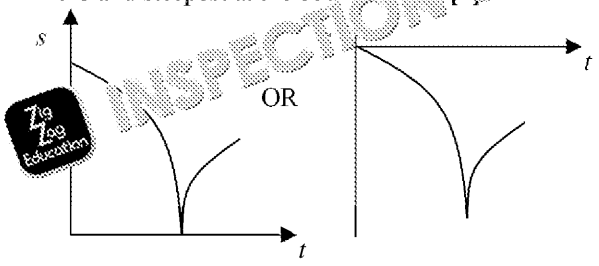
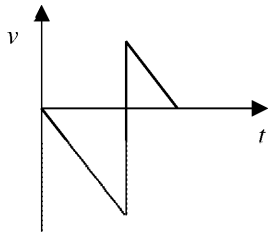
Solutions to Forces and Motion – Test B

1. *In graphs (a) and (b) ignore presence or absence of a difference between starting and finishing values*

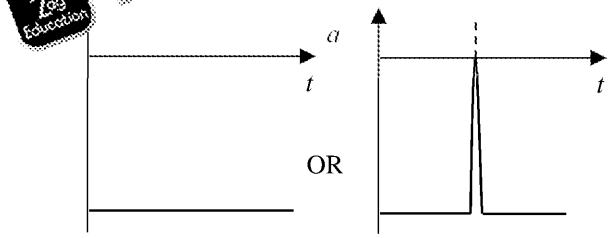
   (a) displacement / s on vertical axis and time / t on horizontal **[1]**
   graph decreases then increases again **[1]**
   accept straight lines for this MP
   curves in the negative quadrant, starting from zero and steepest at the bounce **[1]**



   (b) velocity / v on vertical axis and time / t on horizontal **[1]**
   starts at zero then decreases and increases again **[1]**
   straight line(s) used **[1]**



   (c) acceleration / a on vertical axis and time / t on horizontal **[1]**
   graph is a horizontal line
   Accept an unlabelled line at the bounce time
   in the 4th quadrant **[1]**



2. both have zero resultant force acting **[1]**
   both are in equilibrium **[1]**
   ref to N1L **[1]**

3. (a) moment = $Fd\cos\theta$ **[1]**
   $1.6 \times 0.72 \times \cos 15°$ or $1.6 \times 0.72 \times 0.97$ **[1]**
   1.1 Nm **[1]**
   must include unit

   (b) moment = Fd = 0.5 × **[1]**
   = 2.0 N
   max 1 mark if answer given as 2 N then 1 mark
   ecf from (a) for (b)

   (c) **[1]**

4. (a) $p = h$
   69 Pa

   (b) $F = p$
   area
   1.4 o

   (c) (i)

   (ii)

5. (a) vertic
   = 20
   use o
   accep
   $s = \frac{u}{2}$
   = 21

   (b) use o
   highe
   = 2.1
   total
   horize
   = 22.
   use o
   = 91

6. (a) *Any f*
   - N
   - u
   - s
   - s
   - u

   and
   plot a
   in ma
   draw
   any re

   (b) the m
   so the
   makin
   small

7. (a) the sl
   when
   result

   (b) meas

   Use s

   speed
   plot a
   accel

(c) (i) sensible scales including zero on both axes and scaled so that points co
directions [1]
axes labelled with quantity and unit separated by / [1]
all points plotted to within 1 mm [1]
line of best fit drawn [1]
(ii) no because all the points are on or close to the line [1]
accept yes if a point has been plotted incorrectly
(iii) (total) mass of the accelerating system [1]
do not accept mass of the trolley or m... to cause acceleration

8. (a) use of $v^2 = u^2 + 2as$ or $v^2 = 2$... ...ation [1]
$v^2 = 33.35$ [1]
$v = 5.8$ ms^{-1} [1]
(b) ... ...ation [1]
... or kgms^{-1} [1]
... include unit
(c) the fragments have initial speed greater than zero just after impact [1]
sum of momentum of fragments is the same as that of the rock before impac

9. in inelastic collisions, kinetic energy of the particles decreases [1]
the speed of the particles will decrease after each collision [1]
so the temperature of the gas would decrease with time [1]

10. (a) use of $\frac{1}{2}kx^2$ or substitution [1]
0.20 J [1]
(b) (i) idea that magnitude of momentum of both trolleys is equal [1]
$mv_A = 3mv_B$ or $v_B = \frac{v_A}{3}$ [1]
(ii) total kinetic energy of the system = 0.20 J [1]
ratio of kinetic energies A : B = 3 : 1 [1]
kinetic energy of A = 0.15 J and B = 0.05 J [1]
velocity of A = 0.87 ms^{-1} [1]
velocity of B = 0.29 ms^{-1} [1]

11. (a) $= \frac{}{0.12 \times 0.12}$ [1]
000 (Nm^{-2}) [1]
$\text{strain} = \frac{0.024}{0.12}$ [1]
$= 0.2$ [1]
$E = \frac{7600}{0.2} = 3.8(2) \times 10^4$ Pa or 38(.2) kPa [1]
(b) thin so it stretches more easily [1]
long so that changes in length are easier to measure [1]

Preview of Answers Ends Here