AQA Physics Practice Paper Answers

Paper 1

1 a Kinetic energy = 0.5 × mass × speed^2. Or $\frac{1}{2}mv^2$

b Kinetic energy
= 0.5 × mass × speed^2

Kinetic energy
= 0.5 × 3 × 10^2

= 150 J or joules

c Kinetic energy
= 0.5 × mass × speed^2

Kinetic energy
= 0.5 × 8 × 10^2

= 400 J or joules

d $E_k = 0.5 \times m \times v^2$ rearrange to

$v = \sqrt{\frac{2 \times E_k}{m}}$

[Accept alternative direct substitution method into original equation then rearrange]

$v = \sqrt{\frac{2 \times 576}{8}} = 12$ m/s

e Speed of dog relative to cat = 12 – 10 = 2 m/s

speed = $\frac{\text{distance}}{\text{time}}$ rearrange to

time = $\frac{\text{distance}}{\text{time}}$

time = $\frac{10}{2} = 5$ seconds

2 a Light as a pathway transferring energy by radiation

b Elastic potential

c Vibrational/mechanical

d Chemical

e Kinetic

f Gravitational potential

3 Bradley increases his chemical store by eating his breakfast; When he is cycling up the hill he is depleting his chemical store; meanwhile he is increasing his gravitational store; and increasing his kinetic store; At the top of the hill his gravitational store is at a maximum; As he descends his gravitational store decreases and his kinetic store increases (If he is free-wheeling his chemical store remains fairly constant); On hitting his brakes at the bottom, a redistribution takes place from his (and the bike's) kinetic energy store to the thermal store of the brake disk, wheels and other parts where friction takes place.

4 a Atoms must be approximately the same size; In liquid diagram spaces cannot be any bigger than actual atoms; In gas diagram at least approximately 75% of box should be empty space;

Solid: ordered, regular close together, vibration around a fixed point.

Liquid: close together, disordered, multidirectional weaker bonds.

Gas: far apart, high speed, random motion.

b Particles/atoms/molecules

c Keep the marbles together in a uniform/ordered/regular pattern, then vibrate them slightly.

d Shake the marbles hard/so some of the marbles fall out of the tray; High speed molecules that evaporate are like the marbles that leave the tray; Only the fastest marbles with the highest energy in the kinetic store will leave the tray.

5 $E = m \times c \times \Delta\theta$

$E = 0.25 \times 4200 \times 10$

$E = 10\,500$ J or joules

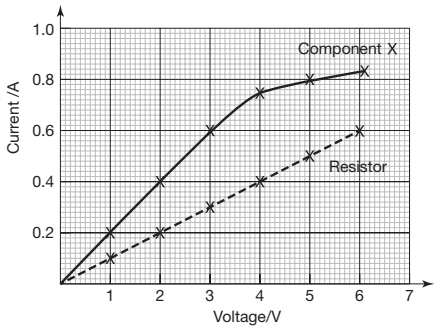
6 $E_p = mgh$ rearrange to:

$m = \frac{E_p}{g \times h}$; 6 kJ = 6000 J

m = $\frac{6000}{10 \times 12}$; = 50 kg

7 a Correctly labelled axis and units; correctly plotted points

b Resistor straight line with ruler; and filament lamp straight line then curve



c Filament lamp; Device only ohmic within a limited range; Then resistance increases as potential difference (or temperature) increases.

d 10 Ω; evidence of using line of best fit, not single value, to calculate the resistance.

8 a $E_p = mgh$

$E_p = 2000 \times 10 \times 90$

$E_p = 1\,800\,000$ J

$E_p = 1800$ kJ

b $E_p = mgh$ and $E_k = \frac{1}{2}mv^2$

All potential energy store converted to kinetic energy of carriage and passengers; [Expressed in words or as equation]

$mgh = 0.5 \times m \times v^2$

$v = \frac{g \times h}{0.5}$

$v = \frac{10 \times 90}{0.5} = 42.4$ m/s

9 a Volume = length × breadth × height = 4 × 2 × 3
= 24 cm^3

b density = $\frac{\text{mass}}{\text{volume}} = \frac{192}{24}$; = 8 g/cm^3

c g/cm^3 → kg/m^3 = 8 × 1000; = 8000 kg/m^3

d Side B because it has a smaller area; and area is inversely proportional to pressure.

e Conversion of mass to weight = × 10 N/kg because $W = mg$

Conversion of cm^2 to m^2 ÷ 10 000

Area of face $A = 4 \times 3 = 12$ cm^2

Pressure = $\frac{\text{force}}{\text{area}}$ = $\frac{0.192 \times 10}{\frac{12}{10\,000}} = 1600$ Pa

= 1.6 kPa

Paper 2

1 Non-contact forces: gravity; and electrostatic.

Contact forces: friction; and air resistance.

2 a N/kg

b m/s^2

c force

d Nm

3 **a** Triangle area $= 0.5 \times b \times h$
rectangle area $= b \times h$

triangles:
$0.5 \times 15 \times 40 = 300$ m and
$0.5 \times 20 \times 10 = 100$ m; (both triangle areas required)

rectangle: $20 \times 40 = 800$

Total distance $= 300 + 100 + 800 = 1200$ m

b Acceleration $= \frac{\text{change in velocity}}{\text{time taken}}$

$= \frac{50 - 40}{35 - 15} = \frac{10}{20}$; $= 0.5$; m/s^2

c Constant speed

d Deceleration/negative acceleration/slowing down

H4 **a** Momentum of bullet: $p = mv$
$= 0.020 \times 500 = 10$; kg m/s
(moment undirection $\rightarrow$ not required)

b Velocity of block and bullet
$= \frac{\text{momentum of bullet}}{\text{combined mass}}$;

$= \frac{10}{10 + 0.020}$;

$= 0.99$ or 1 m/s

c $E_k = \frac{1}{2} 0.5 \times 10.02 \times 1^2$;
$= 5.01$ J or joules

d All E_k is conserved and transferred to gravitational store of block so: $E_k = E_p$

$mgh = 5.01$ J; necessary to rearrange to $h = \frac{5.01}{m \times g}$

$h = \frac{5.01}{m \times g} = \frac{5.01}{10.02 \times 10} = 0.05$ m
(accept 5 cm or 50 mm)

5 $p = m \times v = 1000 \times 20$
$= 20\,000$ kg m/s

Change in momentum
= force $\times$ time, rearrange to:

force $= \frac{\text{change in momentum}}{\text{time}}$

$= \frac{20\,000}{0.05} = 400\,000$ N

6 The speed of the light wave is reduced in the block; The light wave is refracted; The wavelength is also decreased inside the block; The light ray bends towards the normal.

7 Place magnet on a large piece of paper (A3); Draw around magnet with a pencil (so it doesn't move during the experiment); Place the compass near the magnet and draw a dot in front of arrow point; Move compass so tail of compass is over the dot and draw a new dot; Continue to move the compass so that in each position it aligns itself with the magnetic field of the magnet; At the end, join the lines and remember to include the arrows showing direction north to south.

H8 **a** Clockwise

b Clockwise

c No the motors will not all rotate at the same speed; B will rotate faster than A and C; B has more cells, so there will be a greater current in the coil (than A and D) so a greater force.

d Stronger magnet; or increase number of turns.