Gcse physics equation sheet aqa 9- 1

- Discuss how the practical could have been improved, first in pairs, then groups of four, then groups of eight. Finally, someone in each group shares ideas for improvement with the class. [O1, O2, O3]
- Show the kinetic and potential energy animation to highlight the energy transfers. Link back to the practical and discuss how it relates to magnetic potential energy, kinetic energy and gravitational potential energy. [O1, O2, O3]

Explain

- Challenge students' thinking and understanding of kinetic energy and potential energy from the practical activities using the evaluation sections of the practical sheets (these sections are identical). [O1, O2, O3]

Consolidate and apply

The students should then be issued with the investigating kinetic energy worksheet appropriate to their ability:

- Low demand: Worksheet 1.2.1 [O1, O2, O3]
- Standard demand: Worksheet 1.2.2 [O1, O2, O3]
- High demand: Worksheet 1.2.3 [O1, O2, O3]

Extend

Ask students able to progress further to do the following:

- Each student or student pair suggests and explains other examples of changes to and from kinetic energy. [O1, O3]
- Alternatively, each student or student pair explains the changes in energy involved when a rocket is launched into space and returns. [O1, O3]

Plenary suggestions

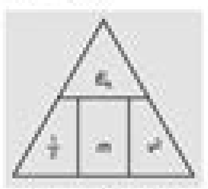
Ask me a question: Ask the students to write a question about something from the topic and then a mark scheme for the answer. Encourage them to come up with ones worth more than one or two marks and to try out their questions on one another.

Heads and tails: Ask each student to write a question about something from the topic on a coloured paper strip and the answer on another colour. In groups of six to eight, hand out the strips so that each student gets a question and an answer. One student reads out his or her question. The student with the right answer then reads it out, followed by his or her question, and so on.

Answers to questions

Worksheet Question 1 (1.2.1 – a–f; 1.2.2 – a, d, e, f, g; 1.2.3 – a, c, f, g, h, i, j)

a) the energy of movement
b) any sensible answers; basically, anything where things have to move
c) increase mass; increase speed
d) $E_k = ½ mv^2$
e)



f) Either the motor was still on, which added to the kinetic energy, or the kinetic energy was more than zero at the top of the roller coaster (or both).
f) 6995.48 J; ≈7000 J
g) 0.058 kg
h) 341 m/s
i) 422 662.9127 kg; ≈4.23 × 10^5 kg
j) 960 J

Worksheet Question 2 (1.2.1 – a–d; 1.2.2 – a–e; 1.2.3 – a–f)

a) 83 400 J
b) 83 400 J
c) transferred into other forms (all to kinetic energy assumed in part (d))
d) 83 400 J (assuming all transferred to kinetic energy)
e) 52.7 m/s

Practical sheet evaluation

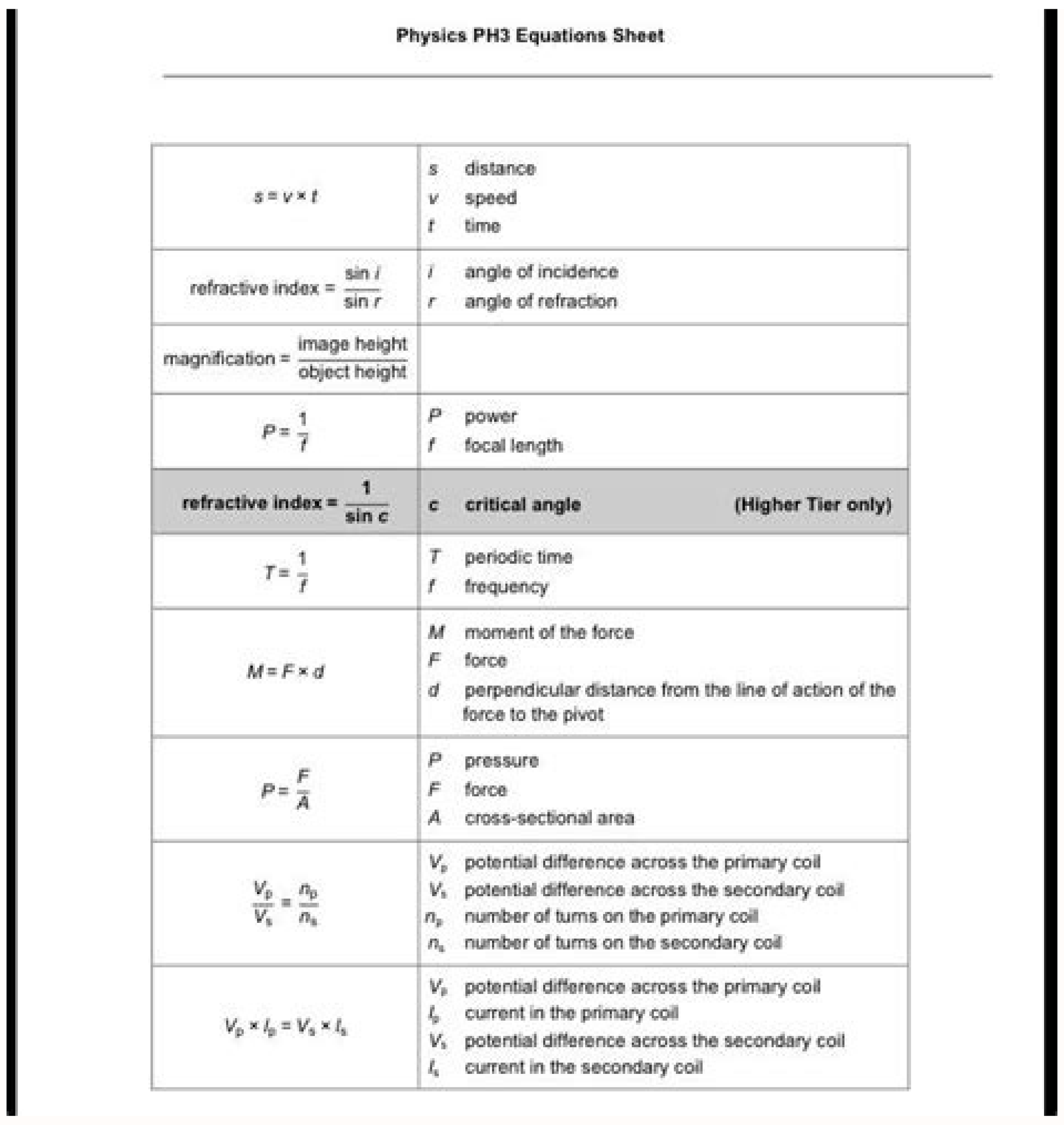
1. any sensible answers, e.g. calculate change in gravitational potential energy, calculate change in kinetic energy
2. For identical ball bearings, the greater the speed, the higher the kinetic energy.
3. For ball bearings at the same speed, the greater the mass, the higher the kinetic energy.
4. to ensure almost no kinetic energy to start with (so didn't need to take away from value of starting magnetic potential energy)
5. some kinetic energy transferred into heat energy or as sound due to friction
6. any sensible answers, e.g. mechanism to hold magnets in place, determine kinetic energy of first ball bearing

GCSE Physics Formula by topic

Students need to be able to recall….

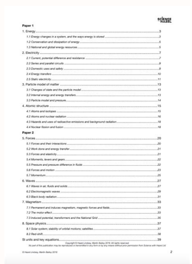
SP1	
distance travelled = average speed × time	d = s x t
acceleration = change in velocity ÷ time taken	a = (v – u) / t
SP2	
force = mass × acceleration	F = m × a
weight = mass × gravitational field strength	W = m × g
momentum = mass × velocity (Higher)	p = m × v
work done = force × distance moved in the direction of the force	E = F x d
kinetic energy = ½ × mass × (velocity)²	KE = ½ × m × v²
SP3	
efficiency = (useful energy transferred by the device) / (total energy supplied to the device)	
gravitational potential energy = mass × gravitational field strength x change in vertical height	ΔGPE = m × g × Δh
kinetic energy = ½ × mass × (velocity)²	KE = ½ × m × v²
SP4	
wave velocity = frequency x wavelength	v = f x λ
wave speed = distance / time	v = d / t
SP8	
kinetic energy = ½ × mass × (velocity)²	KE = ½ × m × v²
gravitational potential energy = mass × gravitational field strength x change in vertical height	ΔGPE = m × g × Δh
work done = force × distance moved in the direction of the force	E = F x d
power = work done ÷ time taken	P = E / t
SP9	
moment of a force = force × distance normal to the direction of the force	
SP10	
charge = current × time	Q = I x t
energy transferred = charge moved × potential difference	E = Q × V
potential difference = current × resistance	V = I x R
power = energy transferred (joule, J) ÷ time taken	P = E / t
electrical power = current × potential difference	P = I x V
electrical power = current squared × resistance	P = I² x R
SP14	
density = mass ÷ volume	ρ = m / V
SP15	
force exerted on a spring = spring constant × extension	F = k × x

Equation number	Word equation	Symbol equation
1	weight = mass × gravitational field strength (g)	$W = m g$
2	work done = force × distance (along the line of action of the force)	$W = F s$
3	force applied to a spring = spring constant × extension	$F = k e$
4	moment of a force = force × distance (normal to direction of force)	$M = F d$
5	pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$
6	distance travelled = speed × time	$s = v t$
7	acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{\Delta v}{t}$
8	resultant force = mass × acceleration	$F = m a$
9 HT	momentum = mass × velocity	$p = m v$
10	kinetic energy = 0.5 × mass × (speed)²	$E_k = \frac{1}{2} m v^2$
11	gravitational potential energy = mass × gravitational field strength (g) × height	$E_p = m g h$
12	power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
13	power = $\frac{\text{work done}}{\text{time}}$	$P = \frac{W}{t}$
14	efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
15	efficiency = $\frac{\text{useful power output}}{\text{total power input}}$	
16	wave speed = frequency × wavelength	$v = f \lambda$
17	charge flow = current × time	$Q = I t$
18	potential difference = current × resistance	$V = I R$
19	power = potential difference × current	$P = V I$
20	power = (current)² × resistance	$P = I^2 R$
21	energy transferred = power × time	$E = P t$
22	energy transferred = charge flow × potential difference	$E = Q V$
23	density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$



Physics PH3 Equations Sheet

$s = v \times t$	s distance v speed t time
refractive index = $\frac{\sin i}{\sin r}$	i angle of incidence r angle of refraction
magnification = $\frac{\text{image height}}{\text{object height}}$	
$P = \frac{1}{f}$	P power f focal length
refractive index = $\frac{1}{\sin c}$	**c critical angle (Higher Tier only)**
$T = \frac{1}{f}$	T periodic time f frequency
$M = F \times d$	M moment of the force F force d perpendicular distance from the line of action of the force to the pivot
$P = \frac{F}{A}$	P pressure F force A cross-sectional area
$\frac{V_p}{V_s} = \frac{n_p}{n_s}$	V_p potential difference across the primary coil V_s potential difference across the secondary coil n_p number of turns on the primary coil n_s number of turns on the secondary coil
$V_p \times I_p = V_s \times I_s$	V_p potential difference across the primary coil I_p current in the primary coil V_s potential difference across the secondary coil I_s current in the secondary coil



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