FULL NAME .... DUE DATE ....

SCIENCE CLASS .... TEACHER ....

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Combined Sciences: Physics Homework/Extension Sheet T2pt1.3

1. Which of these is a vector?

(1 mark)

- [ ] **A:** distance
- [ ] **B:** force
- [ ] **C:** mass
- [ ] **D:** temperature

2. A trolley takes 0.40 s to travel from the top to the bottom of a slope. The length of the slop was 3.0 m long. What was the trolley's average speed?

(2 marks)

- [ ] **A:** 1.2 m/s
- [ ] **B:** 7.5 m/s
- [ ] **C:** 0.13 m/s
- [ ] **D:** 2.6 m/s

3. How long would it take a car that is accelerating at a constant rate of 2 m/s^2 to increase its velocity by 10 m/s?

use $a = (v - u) \div t$

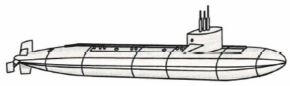
(2marks)

- [ ] **A:** 5 s
- [ ] **B:** 20 s
- [ ] **C:** 0.2 s
- [ ] **D:** 8 s

4. A submarine was at rest under the sea. It starts to move forwards while still travelling at a constant depth.

(a) Draw a free body force diagram for all of the forces acting on the submarine as it starts to move forwards

(2 marks)



The lengths of the arrows on a free body force diagram should be proportional to the sizes of the forces.

(b) After several minutes the resistive forces acting on the submarine become equal to the forward thrust, Use Newton's 1st law of motion to explain what happens to the velocity of the submarine.

(2 marks)

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....

(c) The submarine starts to surface by filling ballast tanks with air. When this happens the upthrust experienced by the submarine is 5 500 000 N. The weight of the submarine is 5 450 000 N.

(i) Calculate the resultant force acting on the submarine as it starts to surface

(1 marks)

resultant force = ... N

(ii) The mass of the submarine is 545 000 kg. Use your answer to part (i) and Newton's 2nd law of motion to calculate the average acceleration experienced by the submarine while it is surfacing.

(3 marks)

acceleration = ... m/s^2

	distance travelled = average speed × time	
	acceleration = change in velocity ÷ time taken	$a = \frac{(v-u)}{t}$
	force = mass × acceleration	$F = m \times a$
	weight = mass × gravitational field strength	$W = m \times g$
HT	**momentum = mass × velocity**	$\boldsymbol{p = m \times v}$
	change in gravitational potential energy = mass × gravitational field strength × change in vertical height	$\Delta GPE = m \times g \times \Delta h$
	kinetic energy = 1/2 × mass × (speed)^2	$KE = \frac{1}{2} \times m \times v^2$
	efficiency = $\frac{\text{(useful energy transferred by the device)}}{\text{(total energy supplied to the device)}}$	
	wave speed = frequency × wavelength	$v = f \times \lambda$
	wave speed = distance ÷ time	$v = \frac{x}{t}$
	work done = force × distance moved in the direction of the force	$E = F \times d$
	power = work done ÷ time taken	$P = \frac{E}{t}$
	energy transferred = charge moved × potential difference	$E = Q \times V$
	charge = current × time	$Q = I \times t$
	potential difference = current × resistance	$V = I \times R$
	power = energy transferred ÷ time taken	$P = \frac{E}{t}$
	electrical power = current × potential difference	$P = I \times V$
	electrical power = (current)^2 × resistance	$P = I^2 \times R$
	density = mass ÷ volume	$\rho = \frac{m}{V}$

	force exerted on a spring = spring constant × extension	$F = k \times x$
	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 \times a \times x$
HT	**force = change in momentum ÷ time**	$\boldsymbol{F = \frac{(mv - mu)}{t}}$
	energy transferred = current × potential difference × time	$E = I \times V \times t$
HT	**force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length**	$\boldsymbol{F = B \times I \times l}$
	For transformers with 100% efficiency, potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_P \times I_P = V_S \times I_S$
	change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta\theta$
	thermal energy for a change of state = mass × specific latent heat	$Q = m \times L$
	energy transferred in stretching = 0.5 × spring constant × (extension)^2	$E = \frac{1}{2} \times k \times x^2$

Metric prefixes

how to convert	abbreviation	prefix
x 1000 ↓	**T**	tera-
x 1000 ↓	**G**	giga-
x 1000 ↓	**M**	mega-
x 1000 ↓	**k**	kilo-
	no prefix	
÷ 1000 ↑	**m**	milli-
÷ 1000 ↑	**µ**	micro-
÷ 1000 ↑	**n**	nano-
÷ 1000 ↑	**p**	pico-

Time

how to convert	abbreviation	Unit of time
x 7 ↓	**wk**	week
x 24 ↓	**d**	day
x 60 ↓	**h or hr**	hour
x 60 ↓	**min**	minute
	s, seconds	
÷ 1000 ↑	**ms**	millisecond
÷ 1000 ↑	**µs**	microsecond
÷ 1000 ↑	**ns**	nanosecond
÷ 1000 ↑	**ps**	picosecond