Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Wednesday 20 November 2024

Morning (Time: 1 hour 15 minutes)

Paper reference **4PH1/2P**

Physics
UNIT: 4PH1
PAPER: 2P

You must have:
Ruler, calculator, Equation Booklet (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over

P75953A

P 7 5 9 5 3 A 0 1 2 0

Pearson

FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time $E = I \times V \times t$

frequency = $\frac{1}{\text{time period}}$ $f = \frac{1}{T}$

power = $\frac{\text{work done}}{\text{time taken}}$ $P = \frac{W}{t}$

power = $\frac{\text{energy transferred}}{\text{time taken}}$ $P = \frac{W}{t}$

orbital speed = $\frac{2\pi \times \text{orbital radius}}{\text{time period}}$ $v = \frac{2 \times \pi \times r}{T}$

(final speed)^2 = (initial speed)^2 + (2 × acceleration × distance moved)
$v^2 = u^2 + (2 \times a \times s)$

pressure × volume = constant $p_1 \times V_1 = p_2 \times V_2$

$\frac{\text{pressure}}{\text{temperature}}$ = constant $\frac{p_1}{T_1} = \frac{p_2}{T_2}$

force = $\frac{\text{change in momentum}}{\text{time taken}}$ $F = \frac{(mv - mu)}{t}$

$\frac{\text{change of wavelength}}{\text{wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}}$ $\frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$

change in thermal energy = mass × specific heat capacity × change in temperature
$\Delta Q = m \times c \times \Delta T$

Where necessary, assume the acceleration of free fall, $g = 10\ \text{m/s}^2$.

DO NOT WRITE IN THIS AREA

Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 This question is about nuclear decay.

(a) Which of these is the same as a beta particle?

(1)

☒ **A** electromagnetic wave

☒ **B** electron

☒ **C** helium nucleus

☒ **D** neutron

(b) Which of these is the same as an alpha particle?

(1)

☒ **A** electromagnetic wave

☒ **B** helium nucleus

☒ **C** neutron

☒ **D** proton

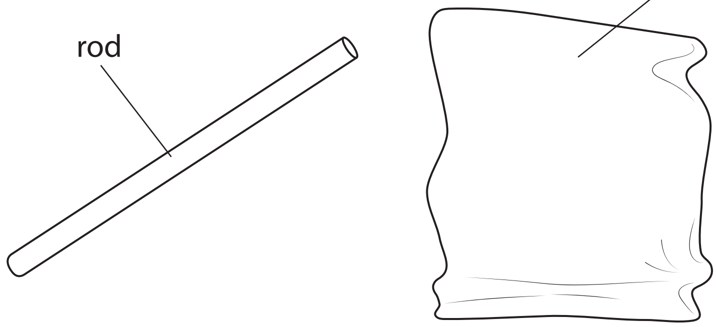
(c) Complete the nuclear equation for an alpha decay.

(3)

$$^{241}_{95}\text{Am} \rightarrow {}^{237}_{\square}\text{Np} + {}^{\square}_{\square}\alpha$$

(Total for Question 1 = 5 marks)

2 The diagram shows a rod and a cloth.



When the rod is rubbed with the cloth, the cloth becomes positively charged and the rod becomes negatively charged.

(a) Explain how the cloth has become positively charged.

(2)

....

....

....

....

(b) The negatively charged rod makes contact with a metal object connected to the ground.

There is an ammeter in series with the object and the ground.

(i) Explain why the ammeter shows a current for a short time and then shows no current.

(2)

....

....

....

....

(ii) State the formula linking charge transferred, current and time.

(1)

(iii) The mean current displayed on the ammeter is 6.8×10^{-6} A.

The current lasts for 3.7 ms.

Calculate the charge transferred.

(3)

charge = ... C

(Total for Question 2 = 8 marks)

3 (a) State the principle of conservation of momentum.

(1)

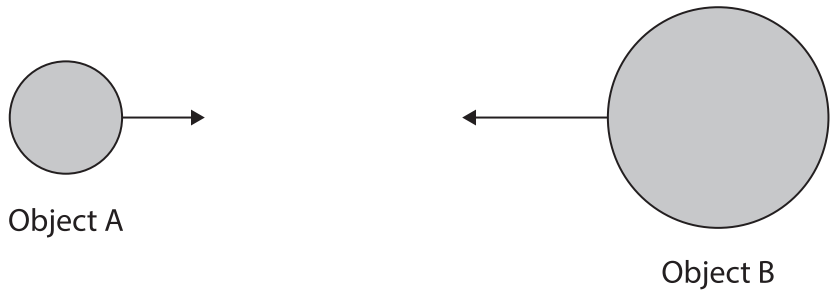
....

....

....

(b) The diagram shows object A and object B moving in opposite directions.

The arrows show the direction of the velocities of the two objects.



Before the collision object A has a momentum of 39 kg m/s.

After the collision object A and object B stick together and stop moving.

(i) State the magnitude of the momentum of object B before the collision.

(1)

momentum = ... kg m/s

(ii) State the formula linking momentum, mass and velocity.

(1)

(iii) The mass of object A is 8.1 kg.

Calculate the velocity of object A before the collision.

(2)

velocity = ... m/s

(iv) The time taken for the collision is 0.56 s.

Calculate the average force on object A.

(2)

force = ... N

(v) Give the direction and magnitude of the force on object B from object A.

(2)

magnitude = ... N

direction = ...

(Total for Question 3 = 9 marks)

4 Diagram 1 shows a Hertzsprung–Russell (HR) diagram.

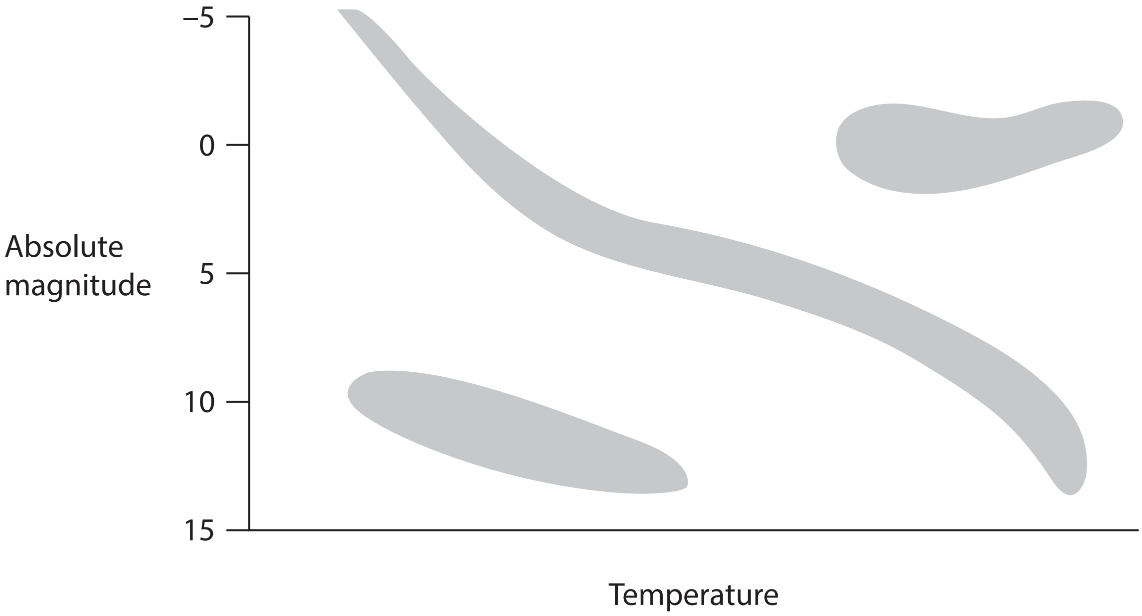


Diagram 1

(a) (i) Draw a cross to show the position of the Sun on the HR diagram.

(1)

(ii) In approximately 4 billion years, the Sun will enter the next stage of its evolution.

Draw a circle on the HR diagram around the area that will include the Sun in the next stage of its evolution.

(1)

(b) Describe the stars that are in the top left corner of the HR diagram.

(2)

....

....

....

....

(c) Diagram 2 shows how the brightness of two stars, star A and star B, changes with time.

These stars are called Cepheid variables.

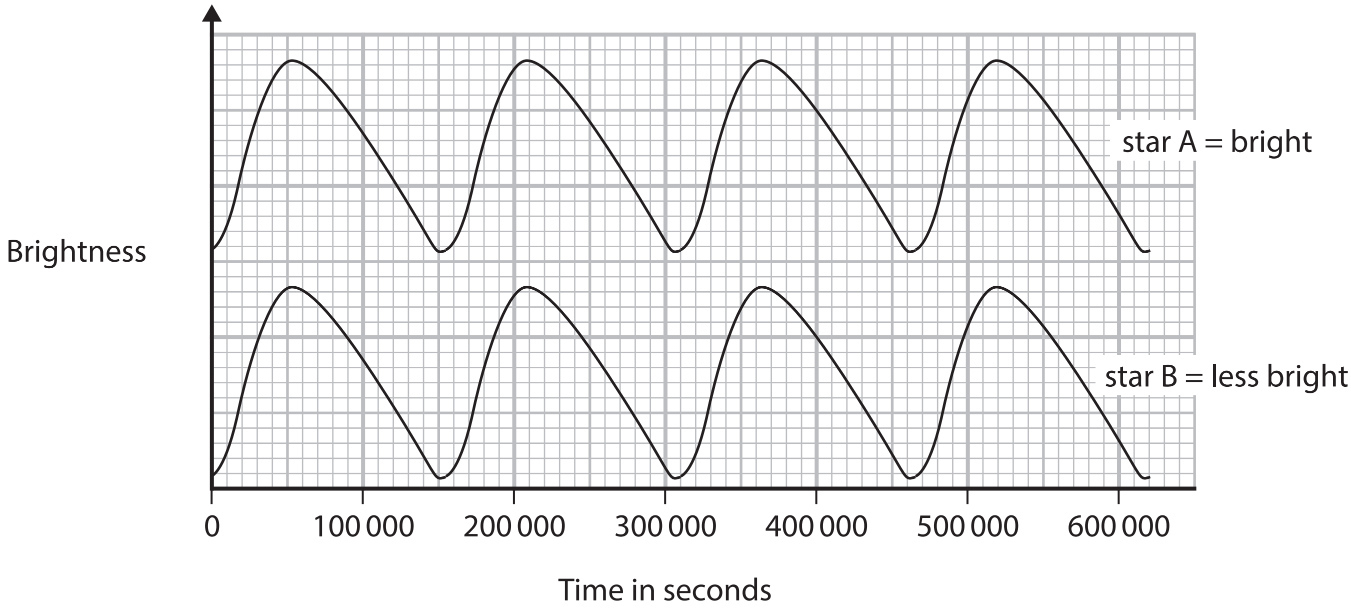


Diagram 2

(i) Determine the period of the variation in brightness for these stars.

(2)

period = ... s

(ii) Calculate the frequency of the variation in brightness for these stars.

(2)

frequency = ... Hz

(iii) State what is meant by the term **absolute magnitude**.

(1)

....

....

....

(iv) Star A and star B have the same absolute magnitude but star A is always brighter than star B in the night sky.

Explain how this is possible.

(2)

....

....

....

....

....

....

(Total for Question 4 = 11 marks)

5 Diagram 1 shows the apparatus a student uses to determine the specific heat capacity of a liquid.

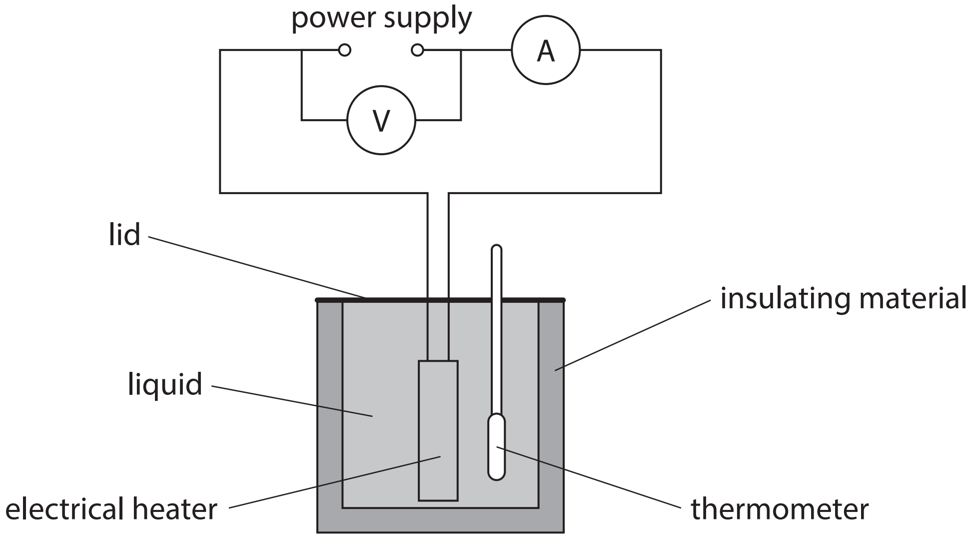


Diagram 1

(a) Describe a suitable method the student could use to determine the specific heat capacity of the liquid.

(5)

....

....

....

....

....

....

....

....

....

....

....

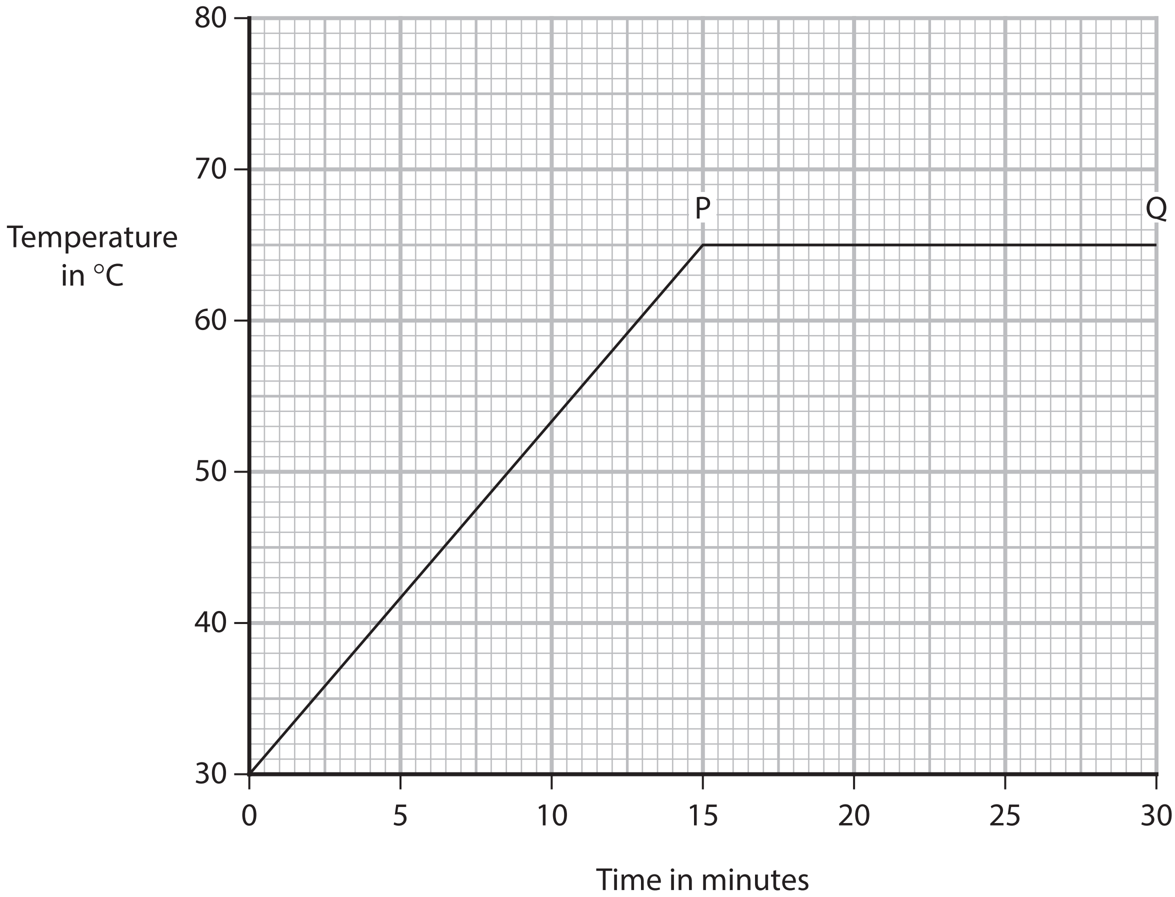
....

....

....

....

(b) The graph shows the student's results.



(i) What is happening to the liquid between points P and Q on the graph?

(1)

☒ **A** melting

☒ **B** freezing

☒ **C** boiling

☒ **D** condensing

(ii) Use the graph to determine the change in temperature of the liquid after 15 minutes of heating.

(1)

temperature difference = ... °C

(iii) The power of the heater is 48 W and the mass of the liquid is 0.53 kg.

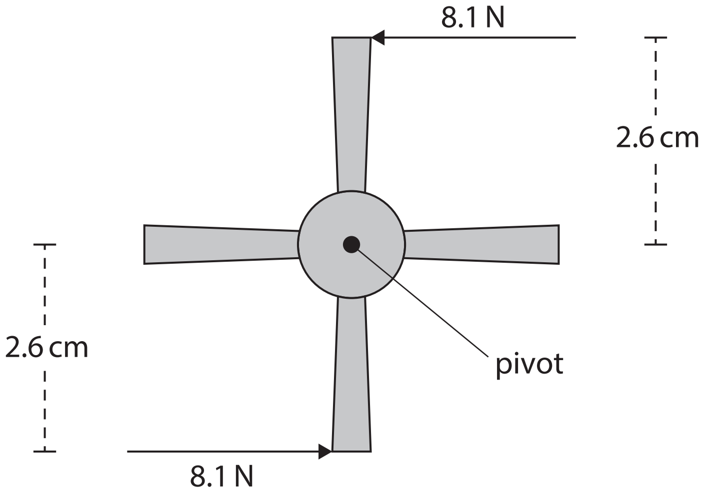
Calculate the specific heat capacity of the liquid.

(3)

specific heat capacity = ... J / kg °C

(Total for Question 5 = 10 marks)

6 The diagram shows forces used to turn a tap.



(a) (i) State the formula linking moment, force and perpendicular distance from a pivot.

(1)

(ii) Calculate the total moment of the two forces required to turn the tap around the pivot.

Give your answer in N cm.

(3)

total moment = ... N cm

DO NOT WRITE IN THIS AREA

(b) The tap is used to put some water in a bucket.

Describe the arrangement and motion of the water particles in liquid water.

You may draw a diagram to help your answer.

(3)

....

....

....

....

....

....

(Total for Question 6 = 7 marks)

7 The photograph shows a wind turbine used for supplying energy on a large scale.

(Source: © Pla2na / Shutterstock)

(a) (i) Describe a change in the turbine's energy stores from when the turbine is at rest to when it is moving at full speed.

(2)

....

....

....

(ii) Describe a change in the turbine's energy stores when the wind is blowing but the turbine moves at constant speed.

(2)

....

....

....

(b) (i) State the formula linking efficiency to useful energy output and total energy output.

(1)

(ii) The wind transfers 1.2×10^6 J of energy to the turbine.

The total mass of the turbine blades is 16 000 kg.

The wind causes the turbine blades to accelerate from rest to an average speed of 7.6 m/s.

Calculate the efficiency of the turbine.

(4)

efficiency = ...

(Total for Question 7 = 9 marks)

8 A student investigates the speed of sound by making a loud sound in front of a large wall a long distance away.

The diagram shows the positions of the student and the wall.

The sound reflects off the wall and back to the student.

(a) Give an appropriate method for measuring the distance between the student and the wall.

(2)

....

....

....

....

....

....

(b) The student uses a stopwatch to determine the time taken for the sound to travel from them to the wall and back again.

The distance from the student to the wall is 65 m.

The student measures a time of 0.35 seconds when the sound has travelled to the wall and back again.

Calculate the speed of sound from the student's data.

(3)

speed of sound = ... m/s

DO NOT WRITE IN THIS AREA

(c) Evaluate this method for determining an accurate value for the speed of sound.

(4)

....

....

....

....

....

....

....

....

(d) Explain an improvement to the student's method.

(2)

....

....

....

....

....

....

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 70 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

Pearson Edexcel International GCSE (9–1)

Wednesday 20 November 2024

Morning (Time: 1 hour 15 minutes)

Paper reference **4PH1/2P**

Physics

UNIT: 4PH1
PAPER: 2P

Equation Booklet

Do not return this Booklet with the question paper.

Turn over ▶

P75953A

V:1/1/1/1/1/

P 7 5 9 5 3 A

Pearson

These equations may be required for both International GCSE Physics (4PH1) and International GCSE Combined Science (4SD0) papers.

1. Forces and Motion	
average speed = $\frac{\text{distance moved}}{\text{time taken}}$	
acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{(v - u)}{t}$
(final speed)^2 = (initial speed)^2 + (2 × acceleration × distance moved)	$v^2 = u^2 + (2 \times a \times s)$
force = mass × acceleration	$F = m \times a$
weight = mass × gravitational field strength	$W = m \times g$
2. Electricity	
power = current × voltage	$P = I \times V$
energy transferred = current × voltage × time	$E = I \times V \times t$
voltage = current × resistance	$V = I \times R$
charge = current × time	$Q = I \times t$
energy transferred = charge × voltage	$E = Q \times V$
3. Waves	
wave speed = frequency × wavelength	$v = f \times \lambda$
frequency = $\frac{1}{\text{time period}}$	$f = \frac{1}{T}$
refractive index = $\frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})}$	$n = \frac{\sin i}{\sin r}$
$\sin(\text{critical angle}) = \frac{1}{\text{refractive index}}$	$\sin c = \frac{1}{n}$

4. Energy resources and energy transfers	
efficiency = $\frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$	
work done = force × distance moved	$W = F \times d$
gravitational potential energy = mass × gravitational field strength × height	$GPE = m \times g \times h$
kinetic energy = $\frac{1}{2}$ × mass × speed^2	$KE = \frac{1}{2} \times m \times v^2$
power = $\frac{\text{work done}}{\text{time taken}}$	$P = \frac{W}{t}$
5. Solids, liquids and gases	
density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$
pressure = $\frac{\text{force}}{\text{area}}$	$p = \frac{F}{A}$
pressure difference = height × density × gravitational field strength	$p = h \times \rho \times g$
$\frac{\text{pressure}}{\text{temperature}}$ = constant	$\frac{p_1}{T_1} = \frac{p_2}{T_2}$
pressure × volume = constant	$p_1 \times V_1 = p_2 \times V_2$
8. Astrophysics	
orbital speed = $\frac{2 \times \pi \times \text{orbital radius}}{\text{time period}}$	$v = \frac{2 \times \pi \times r}{T}$

The equations on the following page will only be required for International GCSE Physics.

These additional equations may be required in International GCSE Physics papers 2P and 2PR.

1. Forces and Motion	
momentum = mass × velocity	$p = m \times v$
force = $\dfrac{\text{change in momentum}}{\text{time taken}}$	$F = \dfrac{(mv - mu)}{t}$
moment = force × perpendicular distance from the pivot	
5. Solids, liquids and gases	
change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta T$
6. Magnetism and electromagnetism	
relationship between input and output voltages for a transformer	$\dfrac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \dfrac{\text{primary turns}}{\text{secondary turns}}$
input power = output power	$V_p I_p = V_s I_s$ for 100% efficiency
8. Astrophysics	
$\dfrac{\text{change in wavelength}}{\text{reference wavelength}} = \dfrac{\text{velocity of a galaxy}}{\text{speed of light}}$	$\dfrac{\lambda - \lambda_0}{\lambda_0} = \dfrac{\Delta\lambda}{\lambda_0} = \dfrac{v}{c}$

END OF EQUATION LIST