

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)

Thursday 22 May 2025

Morning (Time: 1 hour 10 minutes) **Paper reference 4WSD5/1P**

Science (Double Award) (Modular)

Physics

UNIT 5: 4WSD5

PAPER: 1P

You must have:
Ruler, calculator, protractor, 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 the calculations and state the units where required.

Information

- The total mark for this paper is 60.
- 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 ►

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FORMULAE

You may find the following formulae useful.

$$\text{average speed} = \frac{\text{distance moved}}{\text{time taken}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$a = \frac{(v - u)}{t}$$

$$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$$

$$v^2 = u^2 + (2 \times a \times s)$$

$$\text{Force} = \text{mass} \times \text{acceleration}$$

$$F = m \times a$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$W = m \times g$$

$$\text{power} = \text{current} \times \text{voltage}$$

$$P = I \times V$$

$$\text{energy transferred} = \text{current} \times \text{voltage} \times \text{time}$$

$$E = I \times V \times t$$

$$\text{voltage} = \text{current} \times \text{resistance}$$

$$V = I \times R$$

$$\text{charge} = \text{current} \times \text{time}$$

$$Q = I \times t$$

$$\text{energy transferred} = \text{charge} \times \text{voltage}$$

$$E = Q \times V$$

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$$

$$\text{work done} = \text{force} \times \text{distance moved}$$

$$W = F \times d$$

$$\text{gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

$$GPE = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2$$

$$KE = \frac{1}{2} \times m \times v^2$$

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

$$P = \frac{W}{t}$$

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\rho = \frac{m}{V}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

$$p = \frac{F}{A}$$

$$\text{pressure difference} = \text{height} \times \text{density} \times \text{gravitational field strength}$$

$$p = h \times \rho \times g$$

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

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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 electric kettles which are domestic appliances.

(a) Which of these can protect a kettle by breaking the electrical circuit?

(1)

- ☐ **A** cell
- ☐ **B** diode
- ☐ **C** fuse
- ☐ **D** resistor

(b) A kettle contains a heating element.

A heating element is a metal wire that increases in temperature when there is a current in the wire.

Explain why the current in the wire causes the temperature of the wire to increase.

(2)

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(c) Some kettles have a metal case.

Explain how an earth wire connected to this type of kettle protects the user of the kettle.

(4)

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(Total for Question 1 = 7 marks)

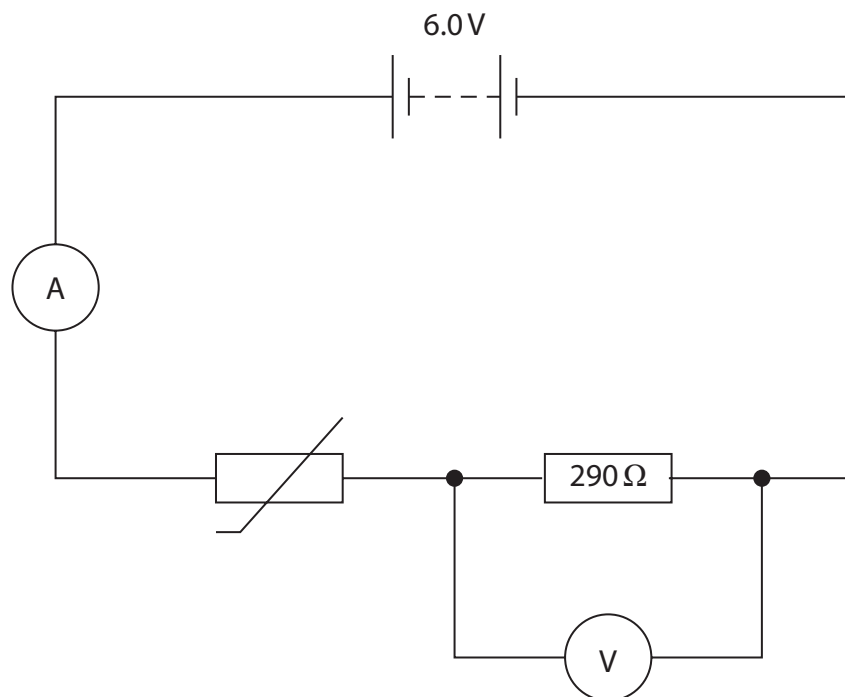
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2 A student builds this electric circuit to measure the temperature of a room.



(a) At 20°C, the voltage across the thermistor is 3.9V.

(i) Explain why the reading on the voltmeter is 2.1V.

(2)

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- (ii) The resistor in the circuit has a resistance of $290\ \Omega$.

Calculate the current in the resistor.

Use the formula

$$\text{voltage} = \text{current} \times \text{resistance}$$

(3)

$$\text{current} = \dots\dots\dots \text{ A}$$

- (iii) State the reading on the ammeter.

(1)

$$\text{ammeter reading} = \dots\dots\dots \text{ A}$$

- (iv) Calculate the resistance of the thermistor.

(3)

$$\text{resistance} = \dots\dots\dots \Omega$$

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(b) The student observes that as the temperature of the room increases, the voltmeter reading also increases.

(i) Explain this observation.

(3)



(ii) The student wants to use the circuit as a temperature-measuring device.

They have this additional equipment

- a large beaker
- water at different temperatures
- a thermometer

Describe what measurements the student needs to take so that the circuit could be used as a temperature-measuring device.

Assume that the thermistor in the circuit is waterproof.

You may draw a diagram to help your answer.

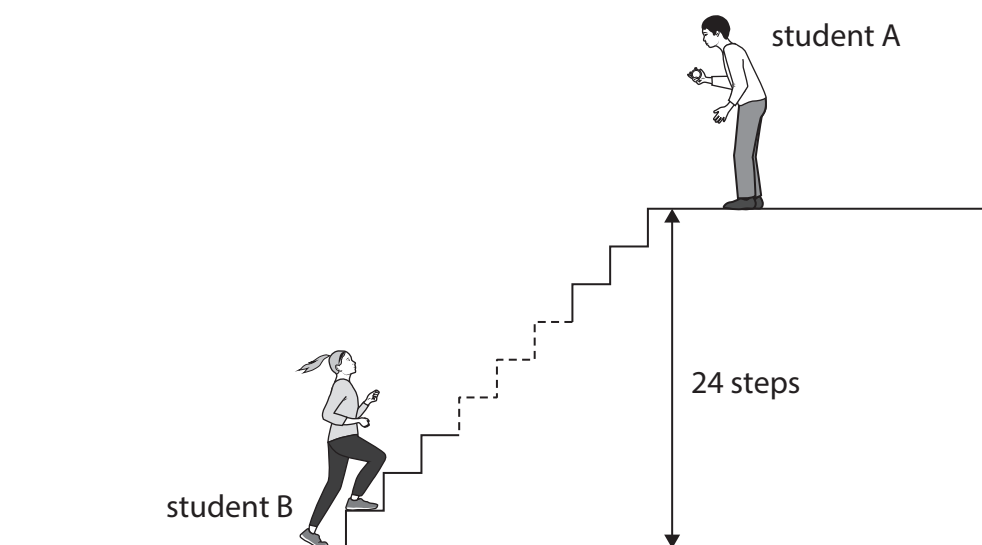
(3)

(Total for Question 2 = 15 marks)



- 3 Two students do an experiment to determine their power when running up a set of steps.

The diagram shows how they set up their experiment. Not all of the steps are shown in the diagram.



This is the students' method.

- student A stands with a stopwatch at the top of the steps
- student A starts timing on the stopwatch and shouts "go" at the same time
- student B begins to run up the steps when she hears student A shout
- student A stops timing when student B reaches the top of the steps

The students repeat their method two more times.

- (a) Give a reason why the times recorded may not be accurate.

(1)

(b) There are 24 steps in total and each step has a height of 19 cm.

(i) Student B has a mass of 67 kg.

Show that student B gains about 3000 J of energy in her gravitational store when she runs up the set of steps.

(3)

(ii) The table shows the times recorded for student B.

Time in s
4.28
4.95
4.65

Calculate the mean time from this data.

Give your answer to three significant figures.

(2)

mean time = s

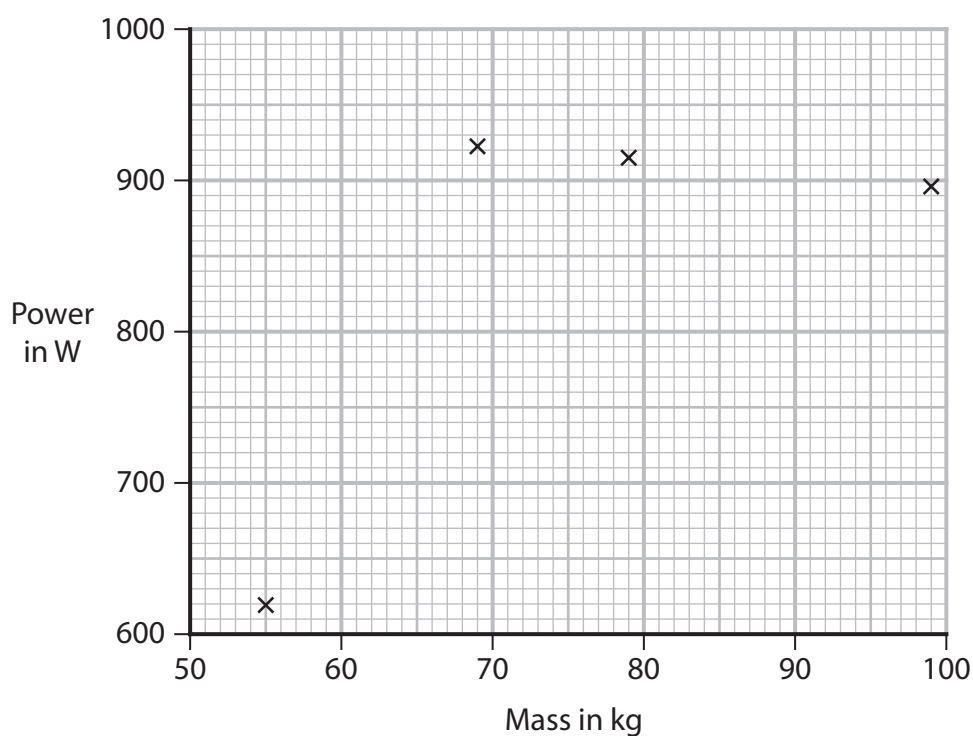
(iii) Calculate the mean power of student B transferring energy to her gravitational store as she runs up the steps.

(2)

mean power = W

- (c) The students extend their investigation by calculating the power for students of different masses running up the steps.

The graph shows their results.



The students conclude that the greater the mass of the person, the greater the power of the person when running up the steps.

Comment on the students' conclusion.

(4)

(Total for Question 3 = 12 marks)



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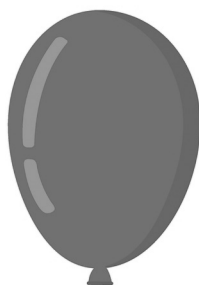
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4 Diagram 1 shows a balloon filled with air.



(Source: © Wise ant/Shutterstock)

Diagram 1

- (a) The air in the balloon has a mass of 0.010 kg and a volume of 0.0056 m^3 .

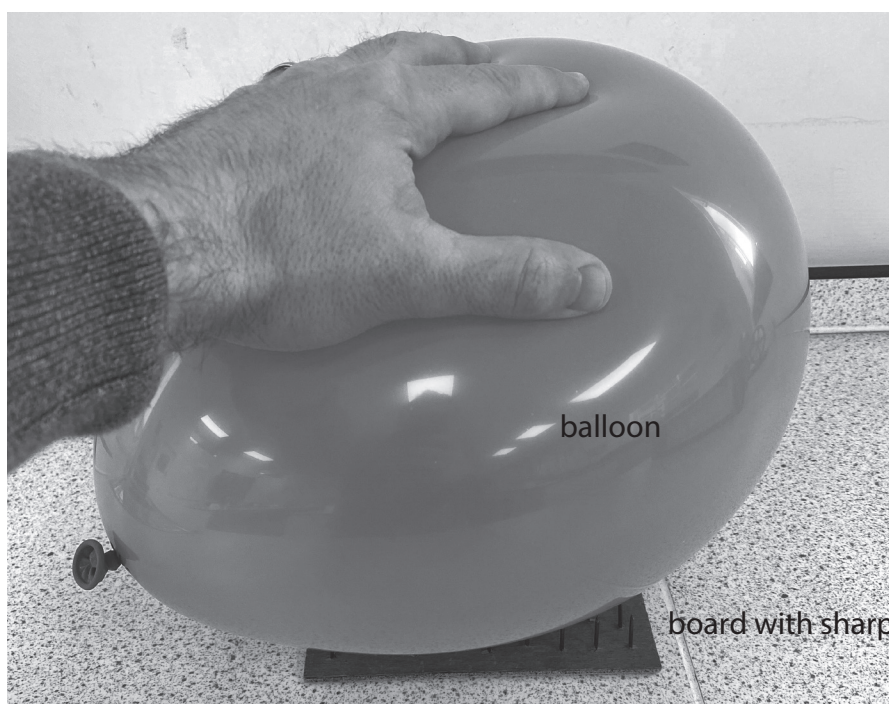
Calculate the density of the air in the balloon.

(2)

density = kg/m^3



- (b) A teacher does a demonstration using an inflated balloon and a board with many sharp nails.



The teacher pushes the balloon onto the board of nails. The balloon does not pop.

The teacher then pops the balloon using a single nail.

Explain why the balloon does not pop when pushed onto the board of nails.

(3)

(Total for Question 4 = 5 marks)

- 5 A student compares two different jackets by wearing each of them outside on a cold day, as shown in the photographs.



Jacket X



Jacket Y

Jacket X is a thick, black padded jacket.

Jacket Y is a thin, white jacket.

The student has the same body temperature whilst wearing each jacket.

The temperature of the surroundings is 0°C .

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Comment on the energy transferred from the student to the surroundings when they are wearing each jacket.

Refer to conduction, convection and radiation in your answer.

(6)

(Total for Question 5 = 6 marks)



6 A car is driven along a straight horizontal road.

- (a) Which row of the table shows the change to thinking and braking distance when the speed of the car increases?

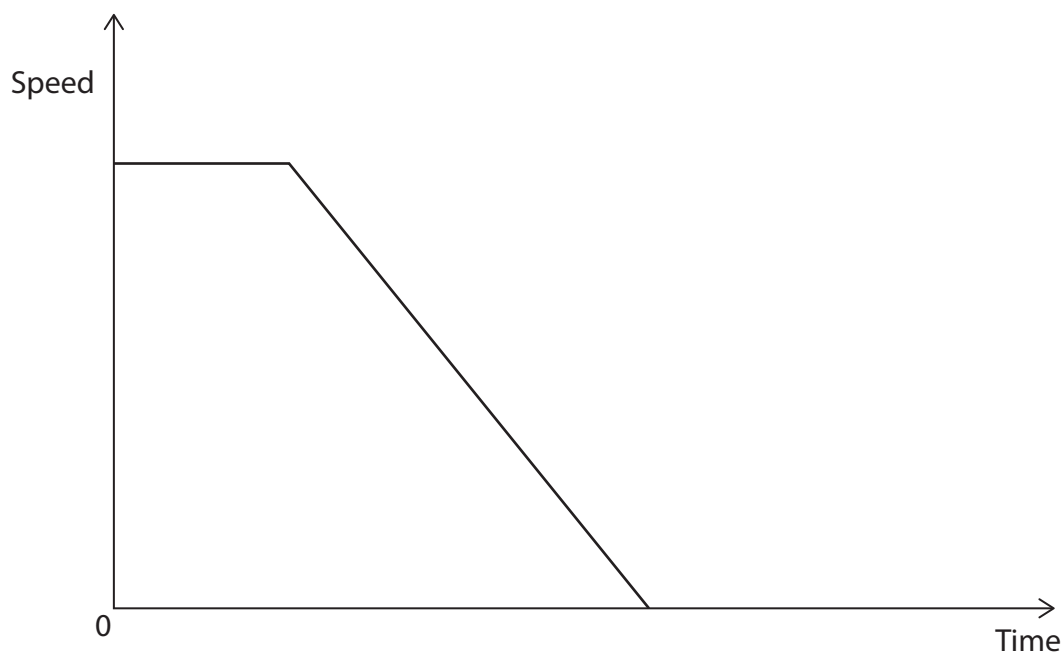
(1)

	Thinking distance	Braking distance
☐ A	increases	increases
☐ B	stays the same	increases
☐ C	increases	stays the same
☐ D	stays the same	stays the same

- (b) A truck drives along a straight horizontal dry road.

The driver of the truck has to stop due to an obstacle on the road.

The graph shows how the speed of the truck varies with time from when the driver sees the obstacle.



- (i) Draw another line on the graph to show how the speed of the truck would vary with time if the road had been icy.

(2)

- (ii) The initial kinetic energy of the truck is $6.3 \times 10^5 \text{ J}$.

The mass of the truck is $7.5 \times 10^3 \text{ kg}$.

Calculate the initial speed of the truck.

(4)

speed = m/s

- (iii) The truck brakes until it stops.

Explain why the work done by the braking force is equal to the kinetic energy of the truck before it started to brake.

(2)

- (iv) The braking distance for the truck is 14 m.

Calculate the braking force of the truck.

(2)

braking force = N

Question 6 continues on the next page.



(v) Which of these describes how energy is transferred by the braking force to stop the truck?

(1)

- ☐ **A** mechanically
- ☐ **B** electrically
- ☐ **C** by heating
- ☐ **D** by radiation

(c) The table shows the stopping distance data for a truck travelling at different speeds.

Speed in m/s	Stopping distance in m
10	14
15	27
20	45
25	65
30	100

Evaluate whether the stopping distance for a truck is directly proportional to speed.

(3)

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(Total for Question 6 = 15 marks)

TOTAL FOR PAPER = 60 MARKS



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Paper
reference

4WSD5/1P

Science (Double Award) (Modular)
Physics

UNIT 5: 4WSD5

PAPER: 1P

Equation Booklet

Do not return this Booklet with the question paper.

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These equations may be required for both International GCSE Physics (4WPH1) and International GCSE Double Award (4WSD5) papers.

1. Forces and Motion

$$\text{average speed} = \frac{\text{distance moved}}{\text{time taken}}$$

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

$$a = \frac{(v - u)}{t}$$

$$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$$

$$v^2 = u^2 + (2 \times a \times s)$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$F = m \times a$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$W = m \times g$$

2. Electricity

$$\text{power} = \text{current} \times \text{voltage}$$

$$P = I \times V$$

$$\text{energy transferred} = \text{current} \times \text{voltage} \times \text{time}$$

$$E = I \times V \times t$$

$$\text{voltage} = \text{current} \times \text{resistance}$$

$$V = I \times R$$

$$\text{charge} = \text{current} \times \text{time}$$

$$Q = I \times t$$

$$\text{energy transferred} = \text{charge} \times \text{voltage}$$

$$E = Q \times V$$

3. Waves

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$v = f \times \lambda$$

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

$$f = \frac{1}{T}$$

$$\text{refractive index} = \frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})}$$

$$n = \frac{\sin i}{\sin r}$$

$$\sin(\text{critical angle}) = \frac{1}{\text{refractive index}}$$

$$\sin c = \frac{1}{n}$$



4. Energy resources and energy transfers

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$$

$$\text{work done} = \text{force} \times \text{distance moved} \quad W = F \times d$$

$$\text{gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

$$GPE = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2 \quad KE = \frac{1}{2} \times m \times v^2$$

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

5. Solids, liquids and gases

$$\text{density} = \frac{\text{mass}}{\text{volume}} \quad \rho = \frac{m}{V}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}} \quad p = \frac{F}{A}$$

$$\text{pressure difference} = \text{height} \times \text{density} \times \text{gravitational field strength}$$

$$p = h \times \rho \times g$$

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

$$\text{pressure} \times \text{volume} = \text{constant} \quad p_1 \times V_1 = p_2 \times V_2$$

8. Astrophysics

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

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 $\times$ velocity

$$p = m \times v$$

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

$$F = \frac{(mv - mu)}{t}$$

moment = force $\times$ perpendicular distance from the pivot

5. Solids, liquids and gases

change in thermal energy = mass $\times$ specific heat capacity $\times$ change in temperature

$$\Delta Q = m \times c \times \Delta T$$

6. Magnetism and electromagnetism

relationship between input and output voltages for a transformer

$$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$$

input power = output power

$$V_p I_p = V_s I_s$$

for 100% efficiency

8. Astrophysics

$\frac{\text{change in wavelength}}{\text{reference wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}}$

$$\frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta \lambda}{\lambda_0} = \frac{v}{c}$$

END OF EQUATION LIST

