Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Tuesday 20 January 2026

Afternoon (Time: 1 hour 20 minutes)

Paper reference **WPH16/01**

Physics

International Advanced Level
UNIT 6: Practical Skills in Physics II

You must have:
Scientific calculator, ruler

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 your working out** in calculations and **include units** where appropriate.

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- The list of data, formulae and relationships is printed at the end of this booklet.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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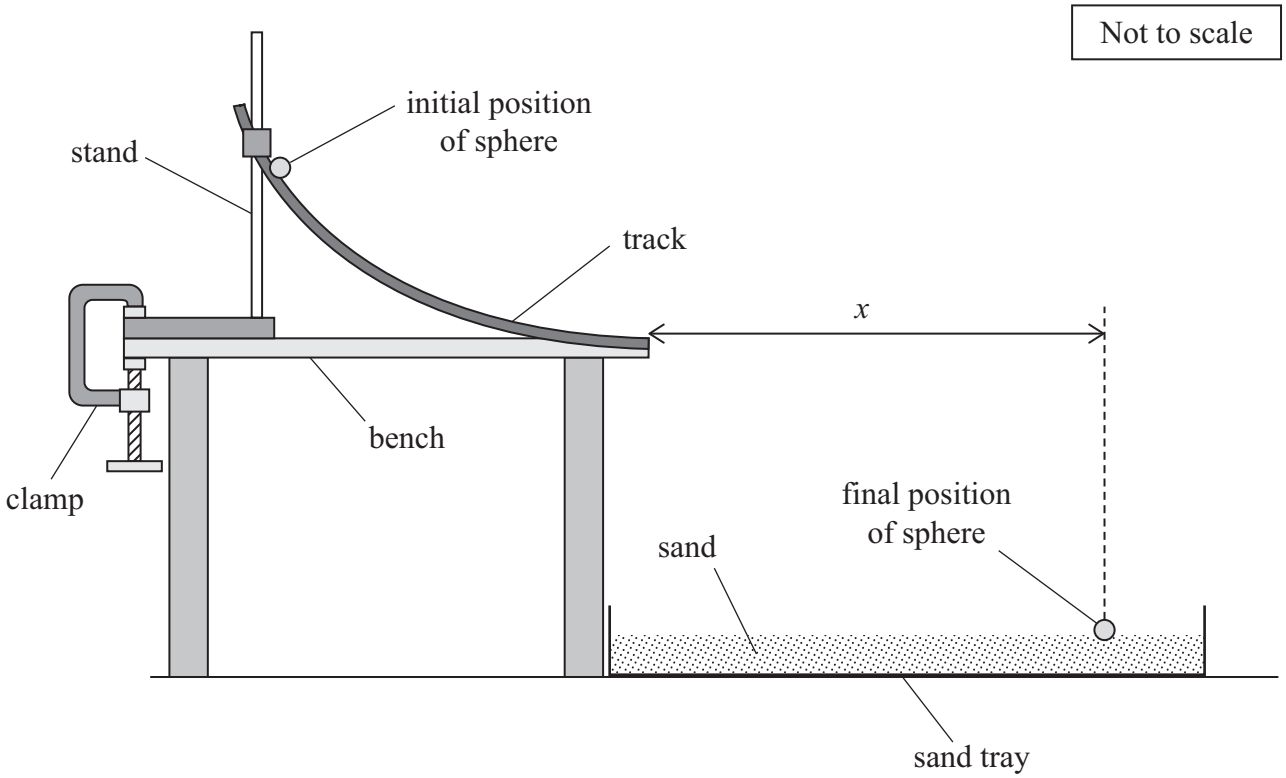
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Pearson

Answer ALL questions.

1 Two students, student A and student B, investigated the projectile motion of a sphere using the apparatus shown.



(a) Student A placed the sphere on the track at the initial position. He released the sphere and it moved down the track. The sphere then travelled through the air to its final position in the sand tray. The surface of the sand was horizontal.

He placed a metre rule on the ground as near to the sand tray as possible.

He measured the horizontal distance x between the end of the track and the final position of the sphere.

Describe a method to determine an accurate value for x.

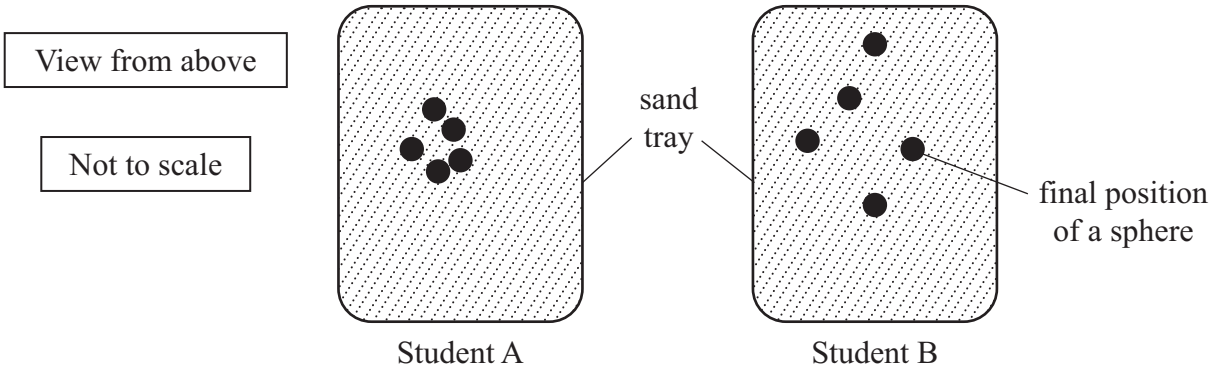
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(b) Student A repeated the experiment using 5 identical spheres and measured x for each sphere. Student B used the same apparatus to determine another set of values for x.

The diagrams below show the final positions of the spheres for both students.



(i) Explain why the final position of the spheres varied for the repeated experiments.

(2)

(ii) Student A made the following statement.

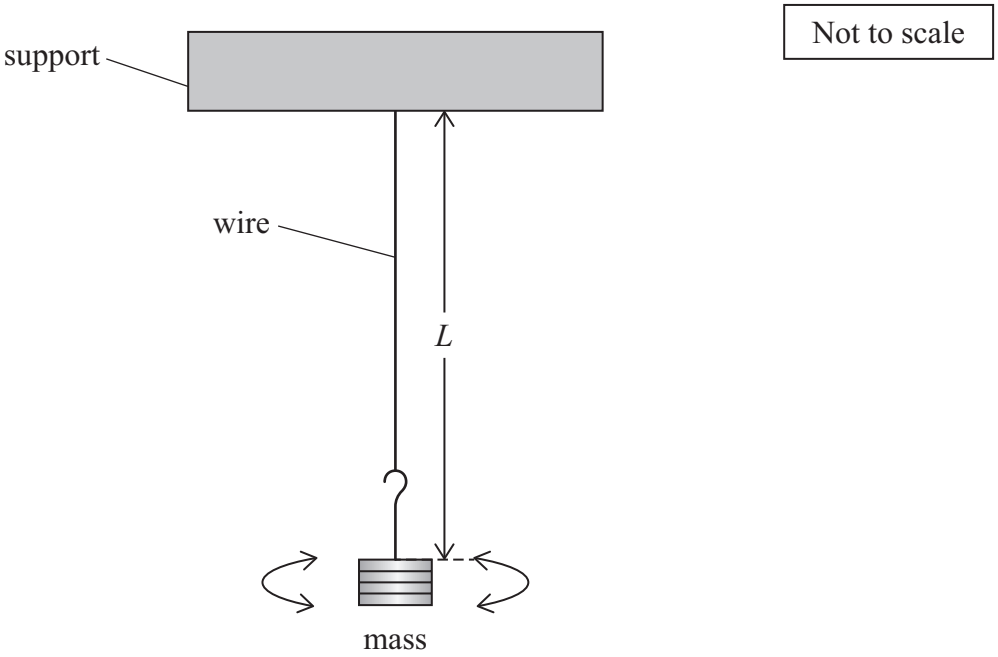
"*My values of x are more precise than Student B's values, so they are more accurate*."

Explain whether student A's statement is valid.

(4)

(Total for Question 1 = 9 marks)

2 A student used the apparatus shown to investigate the rotational oscillations of a mass suspended from a wire. The wire remained vertical while the mass was rotating.



The student rotated the mass through a small angular displacement.

She released the mass. The mass made rotational oscillations around the vertical wire.

The student determined the time period T of the oscillations with a stopwatch.

The student used a metre rule to measure the length L.

For this investigation, the relationship between T and L is given by

$$T = 2\pi\sqrt{\frac{R^2L}{5K}}$$

where R is the radius of the mass and K is a constant.

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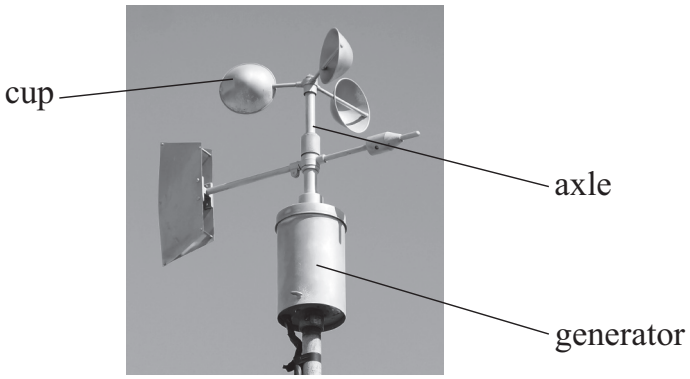
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Devise a method the student could use to determine a value for K.

Your method should include the use of a suitable graph.

(Total for Question 2 = 6 marks)

3 The photograph shows an anemometer. An anemometer is an instrument used to measure wind speed.

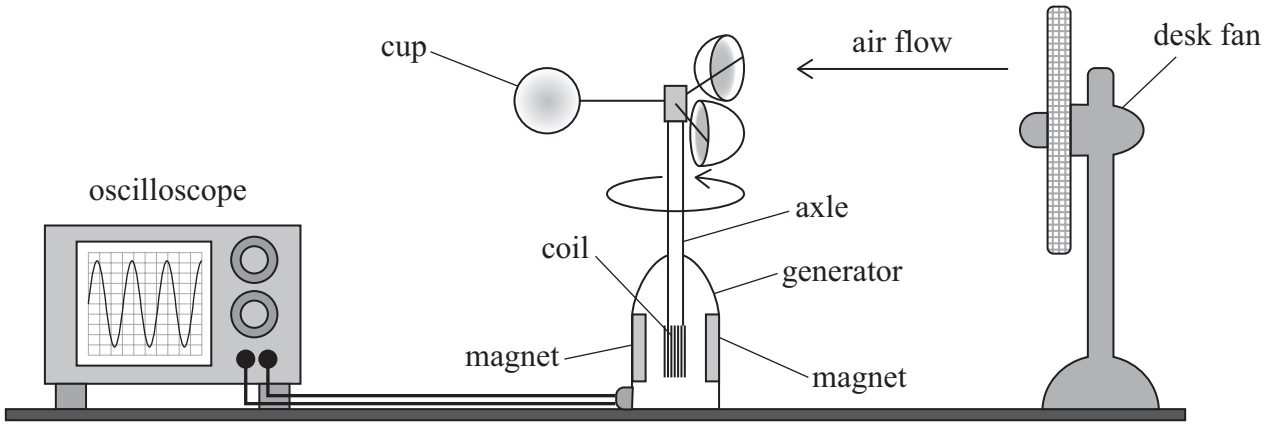


(Source: © wk1003mike/Shutterstock)

As wind speed increases, the air flow past the cups also increases. When air flows past the cups, the cups and the axle rotate.

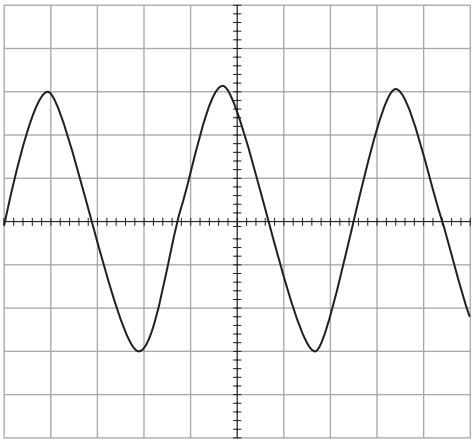
(a) A student investigated the output from an anemometer using the apparatus shown.

She used a desk fan to move the cups at a steady speed.



The axle is attached to a coil inside the generator. As the axle rotates, the coil rotates in the magnetic field between the magnets.

The coil output was displayed on the oscilloscope screen as shown below.



↔
one division

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(i) The horizontal scale was set to 200 ms per division.

Determine the linear velocity of the cups.

distance from axle to centre of cup = 18 cm

(4)

linear velocity of cups = ...

(ii) The student changed the setting on the desk fan to increase the speed of the air flow.

Describe how the output shown on the oscilloscope changes as the air flow past the cups increases.

(2)

(b) The Beaufort Wind Force Scale is a numerical scale used to estimate wind speed from the observed effects of the wind.

It is suggested that mean wind speed v is related to the Beaufort scale number B as

$$v = pB^z$$

where p and z are constants.

(i) Explain how a graph of $\log v$ against $\log B$ could be used to determine the values of p and z.

(2)

(ii) The table shows values of mean wind speeds v and their Beaufort scale number B.

v / m s^{-1}	B		
2.45	2		
4.40	3		
6.70	4		
9.35	5		
12.30	6		

Plot a graph of $\log v$ against $\log B$ on the grid opposite.

Use the additional columns in the table to record your processed data.

(6)

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(iii) Determine the value of z from the graph.

(3)

$z =$ .....

(iv) Determine the value of p from the graph.

(3)

$p =$ .....

(v) When the Beaufort scale number is 10, weather conditions are defined as a storm.

Determine the mean wind speed v for a storm.

(2)

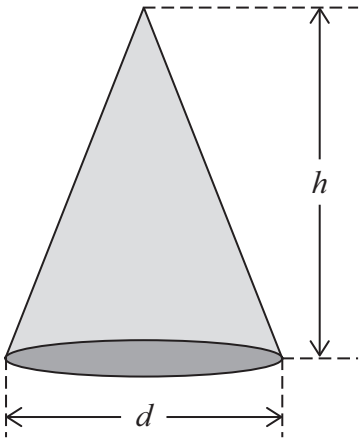
$v =$ .....

(Total for Question 3 = 22 marks)

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4 A student made measurements on a metal cone as shown.



Not to scale

The base of the cone is circular.

The volume V of the cone is given by

$$V = \frac{\pi d^2 h}{12}$$

where d is the diameter of the base and h is the height of the cone.

(a) The student used a metre rule to measure h.

Describe a technique he should use to determine an accurate value for h.

(3)

(b) The student recorded the following measurements for d.

d / mm	29.82	29.84	29.88	29.87

He determined a mean value for h as 2.93 cm ± 0.02 cm

The student used a digital mass balance to measure the mass of the metal cone as 60.5 g.

(i) Show that the density ρ of the metal is about 8.9 g cm^{-3}.

(4)

(ii) Show that the percentage uncertainty in ρ is about 1%

(4)

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(iii) In a textbook, it states that the density of brass is $8.53\,g\,cm^{-3}$

Deduce whether the cone could be made from brass.

(2)

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(Total for Question 4 = 13 marks)

TOTAL FOR PAPER = 50 MARKS

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List of data, formulae and relationships

Acceleration of free fall	$g = 9.81 \text{ m s}^{-2}$	(close to Earth's surface)
Boltzmann constant	$k = 1.38 \times 10^{-23} \text{ J K}^{-1}$	
Coulomb's law constant	$k = 1/4\pi\varepsilon_0$	
	$= 8.99 \times 10^{9} \text{ N m}^2 \text{ C}^{-2}$	
Electron charge	$e = -1.60 \times 10^{-19} \text{ C}$	
Electron mass	$m_e = 9.11 \times 10^{-31} \text{ kg}$	
Electronvolt	$1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$	
Gravitational constant	$G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$	
Gravitational field strength	$g = 9.81 \text{ N kg}^{-1}$	(close to Earth's surface)
Permittivity of free space	$\varepsilon_0 = 8.85 \times 10^{-12} \text{ F m}^{-1}$	
Planck constant	$h = 6.63 \times 10^{-34} \text{ J s}$	
Proton mass	$m_p = 1.67 \times 10^{-27} \text{ kg}$	
Speed of light in a vacuum	$c = 3.00 \times 10^{8} \text{ m s}^{-1}$	
Stefan-Boltzmann constant	$\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$	
Unified atomic mass unit	$u = 1.66 \times 10^{-27} \text{ kg}$	

Unit 1

Mechanics

Kinematic equations of motion

$$s = \frac{(u + v)t}{2}$$

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

Forces

$$\Sigma F = ma$$

$$g = \frac{F}{m}$$

$$W = mg$$

Momentum

$$p = mv$$

Moment of force

$$\text{moment} = Fx$$

Work and energy

$$\Delta W = F\Delta s$$

$$E_k = \frac{1}{2}mv^2$$

$$\Delta E_{grav} = mg\Delta h$$

Power

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

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

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Efficiency

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

$$\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$$

Materials

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

Stokes' law $F = 6\pi\eta r v$

Hooke's law $\Delta F = k\Delta x$

Elastic strain energy $\Delta E_{el} = \frac{1}{2} F \Delta x$

Young modulus $E = \frac{\sigma}{\varepsilon}$ where

Stress $\sigma = \frac{F}{A}$

Strain $\varepsilon = \frac{\Delta x}{x}$

Unit 2

Waves

Wave speed	$v = f\lambda$
Speed of a transverse wave on a string	$v = \sqrt{\frac{T}{\mu}}$
Intensity of radiation	$I = \frac{P}{A}$
Refractive index	$n_1 \sin\theta_1 = n_2 \sin\theta_2$
	$n = \frac{c}{v}$
Critical angle	$\sin C = \frac{1}{n}$
Diffraction grating	$n\lambda = d\sin\theta$

Electricity

Potential difference	$V = \frac{W}{Q}$
Resistance	$R = \frac{V}{I}$
Electrical power, energy	$P = VI$
	$P = I^2R$
	$P = \frac{V^2}{R}$
	$W = VIt$
Resistivity	$R = \frac{\rho l}{A}$
Current	$I = \frac{\Delta Q}{\Delta t}$
	$I = nqvA$
Resistors in series	$R = R_1 + R_2 + R_3$
Resistors in parallel	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

Particle nature of light

Photon model	$E = hf$
Einstein's photoelectric equation	$hf = \phi + \frac{1}{2}mv^2_{\max}$
de Broglie wavelength	$\lambda = \frac{h}{p}$

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Unit 4

Further mechanics

Impulse	$F\Delta t = \Delta p$
Kinetic energy of a non-relativistic particle	$E_k = \frac{p^2}{2m}$
Motion in a circle	$v = \omega r$
	$T = \frac{2\pi}{\omega}$
	$a = \frac{v^2}{r}$
	$a = r\omega^2$
Centripetal force	$F = ma = \frac{mv^2}{r}$
	$F = mr\omega^2$

Electric and magnetic fields

Electric field	$E = \frac{F}{Q}$
Coulomb's law	$F = \frac{Q_1 Q_2}{4\pi\varepsilon_0 r^2}$
	$E = \frac{Q}{4\pi\varepsilon_0 r^2}$
	$E = \frac{V}{d}$
Electrical potential	$V = \frac{Q}{4\pi\varepsilon_0 r}$
Capacitance	$C = \frac{Q}{V}$
Energy stored in capacitor	$W = \frac{1}{2}QV$
	$W = \frac{1}{2}CV^2$
	$W = \frac{1}{2}\frac{Q^2}{C}$
Capacitor discharge	$Q = Q_0 e^{-t/RC}$

Resistor-capacitor discharge $I = I_0 e^{-t/RC}$

$$V = V_0 e^{-t/RC}$$

$$\ln Q = \ln Q_0 - \frac{t}{RC}$$

$$\ln I = \ln I_0 - \frac{t}{RC}$$

$$\ln V = \ln V_0 - \frac{t}{RC}$$

In a magnetic field $F = Bqv \sin \theta$

$$F = BIl \sin \theta$$

Faraday's and Lenz's laws $\mathscr{E} = \frac{-\mathrm{d}(N\phi)}{\mathrm{d}t}$

Nuclear and particle physics

In a magnetic field $r = \frac{p}{BQ}$

Mass-energy $\Delta E = c^2 \Delta m$

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Unit 5

Thermodynamics

Heating

$$\Delta E = mc\Delta\theta$$

$$\Delta E = L\Delta m$$

Ideal gas equation

$$pV = NkT$$

Molecular kinetic theory

$$\tfrac{1}{2}m\langle c^2\rangle = \tfrac{3}{2}kT$$

Nuclear decay

Mass-energy

$$\Delta E = c^2\Delta m$$

Radioactive decay

$$A = \lambda N$$

$$\frac{\mathrm{d}N}{\mathrm{d}t} = -\lambda N$$

$$\lambda = \frac{\ln 2}{t_{\frac{1}{2}}}$$

$$N = N_0 \mathrm{e}^{-\lambda t}$$

$$A = A_0 \mathrm{e}^{-\lambda t}$$

Oscillations

Simple harmonic motion

$$F = -kx$$

$$a = -\omega^2 x$$

$$x = A\cos\omega t$$

$$v = -A\omega\sin\omega t$$

$$a = -A\omega^2\cos\omega t$$

$$T = \frac{1}{f} = \frac{2\pi}{\omega}$$

$$\omega = 2\pi f$$

Simple harmonic oscillator

$$T = 2\pi\sqrt{\frac{m}{k}}$$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Astrophysics and cosmology

Gravitational field strength	$g = \frac{F}{m}$
Gravitational force	$F = \frac{Gm_1m_2}{r^2}$
Gravitational field	$g = \frac{Gm}{r^2}$
Gravitational potential	$V_{grav} = \frac{-Gm}{r}$
Stefan-Boltzmann law	$L = \sigma AT^4$
Wien's law	$\lambda_{max}T = 2.898 \times 10^{-3}\,\text{m K}$
Intensity of radiation	$I = \frac{L}{4\pi d^2}$
Redshift of electromagnetic radiation	$z = \frac{\Delta\lambda}{\lambda} \approx \frac{\Delta f}{f} \approx \frac{v}{c}$
Cosmological expansion	$v = H_0 d$

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