# CP1 Revision Mat – Grade 4 - Grade 5

| physical quantity | unit name | unit symbol |
|---|---|---|
| length | | |
| mass | | |
| time | | |
| electric current | | |
| temperature | | |
| amount of substance | | |
| frequency | | |
| force | | |
| energy | | |
| power | | |
| pressure | | |
| Electric charge | | |
| Electric potential difference | | |
| Electric resistance | | |
| Magnetic flux density | | |

1. Describe what a physical quantity is. (2)

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.....

.....

2. Describe what SI base and derived units are. (2)

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.....

3. Recall the SI base units (6) and derived units (9) for physical quantities including the unit symbols.

| SI base units | | |
|---|---|---|
| **physical quantity** | **unit name** | **unit symbol** |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Derived units | | |
|---|---|---|
| **physical quantity** | **derived unit** | **abbreviation** |
| | | |
| | | |
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| | | |
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| | | |
| | | |
| | | |

4. Put the following prefixes for multiples and submultiples in the correct order of size with the largest first. (3)

**micro, nano, kilo, giga, mega, milli, centi**

5. Write the following in the shortest form using multiples and submultiples e.g. 45 000W = 45kW (5)

a. 0.000 05 V

b. 12000 g

c. 0.000025 m

d. 11 000 000 V

e. 0.000 0079 A

6. Write the following values without using multiples or submultiples e.g. 5.2 kW = 5200 W (5)

a. 6.8 kV

b. 15 mA

c. 30 μ Ω

d. 20 kHz

e. 17.5 nA

7. Convert the following. (5)

a. 7.5 minutes into seconds

b. 3.5 hours into seconds

c. 12 minutes into seconds

d. 4.25 hours into seconds

e. 0.45 hours into seconds

9. An estimate for the thickness of a layer of graphene is 0.335 nanometres.

1 nanometre is the same as $10^{-9}$ metres.
What is the thickness of a sheet made from 6 500 layers of graphene?
Give your answer in metres, to 3 significant figures, in standard form. (3)

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.....

.....

8. The masses of the four "gas giants" are given in the table. (4)

| **Planet** | Jupiter | Saturn | Uranus | Neptune |
|---|---|---|---|---|
| **Mass (kg)** | $1.90 \times 10^{27}$ | $5.96 \times 10^{26}$ | $8.68 \times 10^{25}$ | $1.02 \times 10^{26}$ |

a. Arrange the four planets by order of mass, from the lightest to the heaviest.

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.....

b. The mass of the Earth is $5.98 \times 10^{24}$ kg. (2)

Approximately how many times greater is Saturn's mass than that of the Earth?

.....

.....

.....

c. i. The radius of Neptune is $2.43 \times 10^{7}$ m.
Use the equation

**volume of a sphere** $= \frac{4}{3} \times \pi r^3$

to find the volume of Neptune in $m^3$.
Use 3.14 as the value for $\pi$. (2)

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.....

.....

ii. Calculate the density of Neptune.
Give your answer in $kg/m^3$. (3)

.....

.....

.....

| | | | | |
|---|---|---|---|---|
| 1 | $d = s \times t$ | $d$ | | |
| | | $s$ | | |
| | | $t$ | | |
| 2 | $a = \frac{\Delta v}{t}$ | $a$ | | |
| | | $\Delta v$ | | |
| | | $t$ | | |
| 3 | $F = m \times a$ | $a$ | | |
| | | $F$ | | |
| | | $m$ | | |
| 4 | $W = m \times g$ | $g$ | | |
| | | $m$ | | |
| | | $W$ | | |
| **5** | $p = m \times v$ | $m$ | | |
| | | $p$ | | |
| | | $v$ | | |
| 6 | $E_P = m \times g \times \Delta h$ | $h$ | | |
| | | $g$ | | |
| | | $E_P$ | | |
| | | $m$ | | |
| 7 | $E_K = \frac{1}{2} \times m \times v^2$ | $E_K$ | | |
| | | $m$ | | |
| | | $v$ | | |
| 8 | $efficiency = \frac{useful\ energy\ out}{total\ energy\ in}$ | | | |
| 9 | $v = f \times \lambda$ | $f$ | | |
| | | $\lambda$ | | |
| | | $v$ | | |
| 10 | $v = \frac{d}{t}$ | $d$ | | |
| | | $t$ | | |
| | | $v$ | | |
| 11 | $W = F \times d$ | $d$ | | |
| | | $F$ | | |
| | | $W$ | | |

| | | | | |
|---|---|---|---|---|
| 12 | $P = \frac{E}{t}$ | $E$ | | |
| | | $P$ | | |
| | | $t$ | | |
| 13 | $M = F \times d$ | $d$ | | |
| | | $F$ | | |
| | | $M$ | | |
| 14 | $E = V \times Q$ | $Q$ | | |
| | | $E$ | | |
| | | $V$ | | |
| 15 | $Q = I \times t$ | $Q$ | | |
| | | $I$ | | |
| | | $t$ | | |
| 16 | $V = I \times R$ | $I$ | | |
| | | $V$ | | |
| | | $R$ | | |
| 17 | $P = I \times V$ | $I$ | | |
| | | $P$ | | |
| | | $V$ | | |
| 18 | $P = I^2 \times R$ | $I$ | | |
| | | $P$ | | |
| | | $R$ | | |
| 19 | $\rho = \frac{m}{V}$ | $\rho$ | | |
| | | $m$ | | |
| | | $V$ | | |
| 20 | $F = k \times e$ | $e$ | | |
| | | $F$ | | |
| | | $k$ | | |
| 21 | $P = \frac{F}{A}$ | $A$ | | |
| | | $F$ | | |
| | | $P$ | | |

| | | | | |
|---|---|---|---|---|
| 22 | $v^2 - u^2 = 2 \times a \times d$ | $a$ | | |
| | | $d$ | | |
| | | $v$ | | |
| | | $u$ | | |
| **23** | $F = \frac{(mv - mu)}{t}$ | $F$ | | |
| | | $mv$ | | |
| | | $mu$ | | |
| | | $t$ | | |
| 24 | $E = V \times I \times t$ | $I$ | | |
| | | $E$ | | |
| | | $V$ | | |
| | | $t$ | | |
| **25** | $F = B \times I \times l$ | $I$ | | |
| | | $F$ | | |
| | | $l$ | | |
| | | $B$ | | |
| 26 | $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ | $N_P$ | | |
| | | $N_S$ | | |
| | | $V_P$ | | |
| | | $V_S$ | | |
| 27 | $V_p \times I_p = V_s \times I_s$ | $I_P$ | | |
| | | $I_S$ | | |
| | | $V_P$ | | |
| | | $V_S$ | | |
| 28 | $E = m \times c \times \theta$ | $\theta$ | | |
| | | $E$ | | |
| | | $m$ | | |
| | | $c$ | | |
| 29 | $E = m \times L$ | $E$ | | |
| | | $m$ | | |
| | | $L$ | | |
| 30 | $P_1 \times V_1 = P_2 \times V_2$ | $P_1$ | | |
| | | $P_2$ | | |
| | | $V_1$ | | |
| | | $V_2$ | | |
| 31 | $E = \frac{1}{2} \times k \times e^2$ | $E$ | | |
| | | $e$ | | |
| | | $k$ | | |
| **32** | $p = h \times \rho \times g$ | $\rho$ | | |
| | | $g$ | | |
| | | $h$ | | |
| | | $p$ | | |

1. **If a force of 13N is applied over a distance of 71m, how much work is done?**
2. **A frog covers 17metres in 34 seconds, what is its speed?**
3. **If a circuit has a potential difference of 6V and a current of 4A what is the circuit's resistance?**
4. **If the force applied to a spring is 300N and the spring extends by 2metres, what is the spring constant?**
5. **A 200W toaster takes 2 minutes to toast some bread. How much energy was used?**
6. **A 2kg box was lifted onto a 3metre shelf (g =10N/kg) how much Gravitational potential energy has it gained?**
7. **A 110kg rugby player runs at a velocity of 6 metres per second, what is his momentum?**
8. **A 12kg dog has an acceleration of 2m/s², how much force was needed for this acceleration?**
9. **Usain Bolt has a mass of 90kg and runs at a velocity of 11m/s, what is his kinetic energy?**
10. **A washing machine uses a 3A current and runs on a potential difference of 230V, what is the power rating of the machine?**
11. **A lorry of mass 20 000kg produces a force of 30kN, calculate the acceleration.**
12. **A Bugatti covers 32km in 20minutes, what is its speed in a) m/s b) km/h?**
13. **How much does a 71kg girl weigh on the moon? (g=1.kN/kg)**
14. **A cricket ball of mass 200g travels at 20m/s, what is it's a) momentum b) kinetic energy?**
15. **How much work must be done to push a 1750kg car back home, a distance of 3.4km?**

1. **If a force of 71 N is applied over a distance of 110m, how much work is done?**
2. **A frog covers 0.5 km in 25 seconds, what is its speed?**
3. **If a circuit has a potential difference of 6kV and a current of 400mA what is the circuit's resistance?**
4. **If the force applied to a spring is 316MN and the spring extends by 0.2metres, what is the spring constant?**
5. **A 0.34kW toaster takes 21 seconds to toast some bread. How much energy was used?**
6. **A 2g box was lifted onto a 300mm shelf (g =10N/kg) how much Gravitational potential energy has it gained?**
7. **A 150 000g rugby player runs at a velocity of 10km/h, what is his momentum?**
8. **A 15 000 000 mg dog has an acceleration of 4.5 m/s², how much force was needed for this acceleration?**
9. **Usain Bolt has a mass of 90kg and runs at a velocity of 30km/h, what is his kinetic energy?**
10. **A washing machine uses a 6000 mA current and runs on a potential difference of 0.4kV, what is the power rating of the machine?**

# CP2 Revision Mat – Grade 4 - Grade 5

Explain the difference between vector and scalar quantities and provide specific examples.

Define velocity

Calculate the speed travelled between a) 0s-6s b) 6s-15s c) 15s-20s in Figure 1.

Analyse Figure 2 to:

a. Calculate the acceleration between a) 0s-6s b) 6s-15s c) 15s-20s

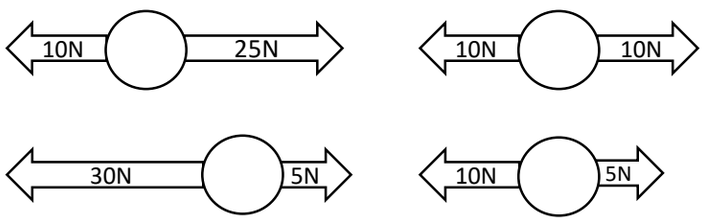
b. Calculate the distance travelled between a) 0s-6s b) 6s-15s c) 15s-20s

Describe three methods for measuring the speed of an object.

State the acceleration due to gravity_____.

State Newton's First Law

Calculate the resultant force on these objects and describe the motion of the object.




Define weight

Describe how weight is measured

Describe how the weight of an astronaut changes during a trip to the surface of the moon and back.

Figure 1. Distance-Time graph

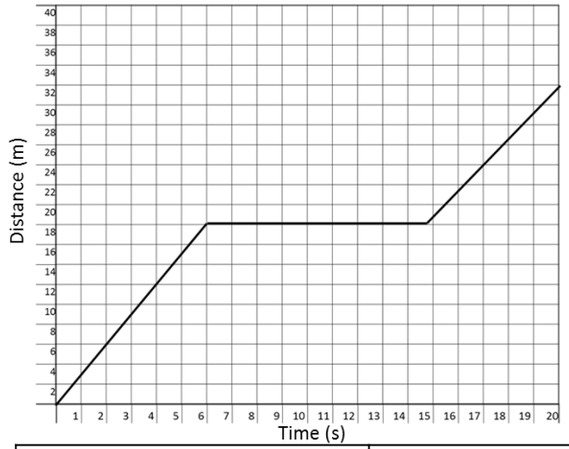
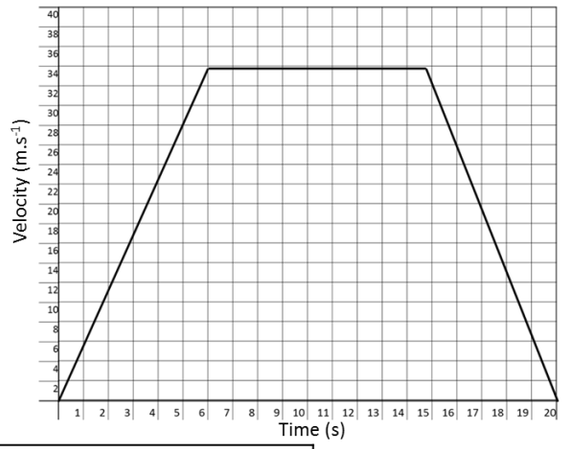
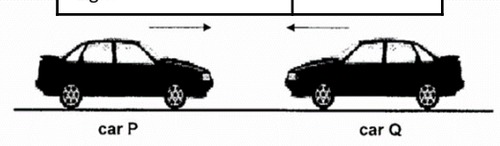



Figure 2. Velocity-Time graph



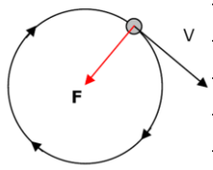

| Everyday Experience | Speed ($m.s^{-1}$) |
|---|---|
| Walking | |
| Running | |
| Cycling | |
| Driving | |
| Sound | |
| Wind | |
| Light | |




| Factor effecting Stopping Distance | Effect on Stopping Distance & Explanation |
|---|---|
| Mass of the vehicle | |
| Speed of the vehicle | |
| Drivers reaction time | |
| Quality of brakes | |
| State of the road | |
| Amount of friction between tyres and road | |

Describe a method to investigate the relationship between force, mass and acceleration by varying the masses added to trolleys.

***Explain why we say this object is accelerating.***




Explain methods of measuring human reaction times and recall typical results

Define the term stopping distance.

Describe how stimulants, depressants and distractions effect reaction time.

Explain the dangers caused by large decelerations and estimate the forces involved in typical situations on a public road

***Describe in full, the term inertial mass.***

State Newton's third law

***Identify the action reaction pairs.***

***Describe the conservation of momentum in collisions***

***Describe examples of momentum in collisions***

***In a crash test two identical cars of mass 900 kg move towards each other. Before impact, Car P has a speed of 14 m/s and Car Q has a speed of 18 m/s.***

***i) Work out the total momentum of the two cars before impact.***

***ii) After impact the cars move off together to the left. Calculate the speed that the two cars move off at after impact.***

| $d$ | $s$ | $t$ |
|---|---|---|
| | 15 | 28 |
| | 7 | 17 |
| 700 | | 35 |
| 500 | | 60 |
| 200 | 8 | |
| 1700 | 75 | |

| $d$ | $s$ | $t$ |
|---|---|---|
| | 0.3 | 180 |
| | 55.5 | 0.4 |
| 450 | | 22 |
| 320 | | 16 |
| 52 000 | 64.5 | |
| 6400 | 330 | |

| $a$ | $\Delta v$ | $t$ |
|---|---|---|
| | 30 | 10 |
| | 40 | 5 |
| 2 | | 30 |
| 10 | | 19 |
| 6 | 84 | |
| 3 | 24 | |

| $a$ | $\Delta v$ | $t$ |
|---|---|---|
| | 4 | 5 |
| | 8 | 50 |
| 5.3 | | 22 |
| 4 | | 6.2 |
| 30 | 9 | |
| 5 | 1250 | |

| $g$ | $m$ | $W$ |
|---|---|---|
| | 400 | 2000 |
| | 1.9 | 50 |
| 1.6 | | 34 |
| 10 | | 82 |
| 10 | 5 | |
| 10 | 90 | |

| $g$ | $m$ | $W$ |
|---|---|---|
| | 175 | 1825 |
| | 0.4 | 0.55 |
| 9.81 | | 254 |
| 2.5 | | 12 000 |
| 9.81 | 0.05 | |
| 23 | 45.3 | |

| $a$ | $F$ | $m$ |
|---|---|---|
| | 35 | 7 |
| | 84 | 6 |
| 5 | | 10 |
| 7 | | 94 |
| 8 | 64 | |
| 10 | 125 | |

| $a$ | $F$ | $m$ |
|---|---|---|
| | 4 | 0.64 |
| | 7.1 | 238 |
| 6.8 | | 1237 |
| 9.42 | | 0.56 |
| 3.5 | 20.5 | |
| 7.25 | 109 | |

| | | | | |
|---|---|---|---|---|
| 1 | $d = s \times t$ | $d$ | Distance Travelled | m |
| | | $s$ | Speed | m/s |
| | | $t$ | Time Taken | s |
| 2 | $a = \frac{\Delta v}{t}$ | $a$ | Acceleration | $m/s^2$ |
| | | $\Delta v$ | Change in Velocity | m/s |
| | | $t$ | Time Taken | s |
| 3 | $F = m \times a$ | $a$ | Acceleration | $m/s^2$ |
| | | $F$ | Force | N |
| | | $m$ | Mass | kg |
| 4 | $W = m \times g$ | $g$ | Gravitational Field Strength | N/kg |
| | | $m$ | Mass | kg |
| | | $W$ | Weight | N |
| **5** | $p = m \times v$ | $m$ | Mass | kg |
| | | $p$ | Momentum | kg m/s |
| | | $v$ | Velocity | m/s |

| $m$ | $p$ | $v$ |
|---|---|---|
| | 100 | 5 |
| | 98 | 7 |
| 7 | | 3 |
| 5 | | 12 |
| 50 | 125 | |
| 15 | 105 | |

| $m$ | $p$ | $v$ |
|---|---|---|
| | 460 000 | 15 |
| | 0.27 | 90 |
| 20 000 | | 4.5 |
| 0.0056 | | 82 |
| 325 | $7.5 \times 10^4$ | |
| $1.3 \times 10^3$ | 351 | |

1. Weight – assume g=9.8N/kg on Earth:

a. Calculate the weight of a 45kg girl

b. A box weighs 49N. What is its mass?

c. A 85kg astronaut in orbit weighs only 23mN. What is the gravitational field strength?

2. Distance and speed:

a. Calculate the distance a car will travel in 30s when moving at 12m/s.

b. How long will it take a pupil to walk to a lesson 70m away at 1.5m/s?

c. What is the speed (in m/s) of a car that travels 30km in 45 minutes?

3. Acceleration and speed:

a. Calculate the acceleration of a sprinter who takes 0.70s to reach their maximum speed of 11m/s.

b. A penny dropped accelerates at $9.8m/s^2$. How fast will it travel when it hits the bottom 3.6s later?

c. How many seconds will it take a car to accelerate from 45km/hr to 90km/hr at $1.5m/s^2$?

4. Force and acceleration:

a. Calculate the force necessary to accelerate a 10kg mass by $17m/s^2$.

b. What acceleration will a car of mass 1100kg experience if a force of 550N acts on it?

c. An aircraft's engines provide a thrust of 240kN. What is its mass if it accelerates by $8.0m/s^2$?

**5. Momentum:**

a. Calculate the momentum of a bullet of mass 0.010kg travelling at 400m/s.

b. A bike and rider have a combined momentum of 1000kgm/s. If their velocity is 12m/s, what is their combined mass?

c. What is the velocity of a 58g tennis ball with a momentum of 2.4kgm/s?

# CP3 Revision Mat – Grade 4 - Grade 5

3.3 Draw and annotate diagrams to represent a) a bike pressing the brakes b) a burning match c) a swinging pendulum

Explain what is meant by conservation of energy

_____
_____
_____
_____

Describe the stores and pathways when:
a an object is projected upwards or up a slope

_____
_____

b a moving object hitting an obstacle

_____

c an object being accelerated by a constant force

_____
_____

d a vehicle slowing down

_____
_____

e bringing water to a boil in an electric kettle

_____
_____

When there are energy _____ in a closed system there is _____to the total energy in that system

Explain using the term “dissipate” what happens when a mechanical system is in operation.

_____
_____
_____
_____

Describe the un-useful energy transfers in these systems.

a) Pressing brakes on a bike

_____
_____

a) Electricity flowing through power lines

_____
_____

a) A running engine

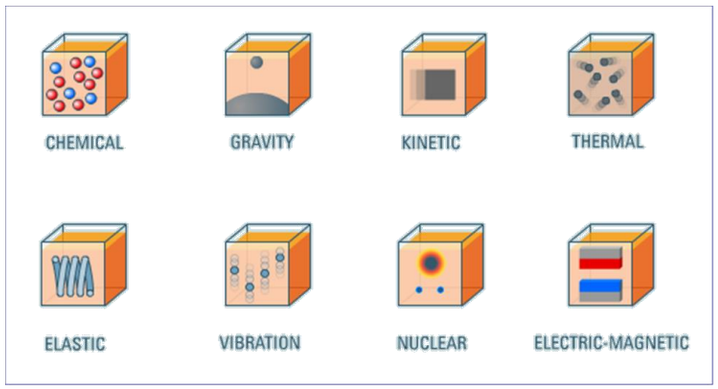
_____
_____

a) A swinging pendulum

_____
_____

a) A mug of coffee

_____
_____




| Energy Source | Formation / Generation | Uses | Advantages | Disadvantages |
|---|---|---|---|---|
| Fossil fuels | | | | |
| Nuclear fuels | | | | |
| Bio-fuel | | | | |
| Wind | | | | |
| Hydroelectricity | | | | |
| Tides | | | | |
| Solar | | | | |

Explain how lubrication and insulation can stop reduce these un-useful energy transfers.

_____
_____
_____
_____

Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling.

_____
_____
_____
_____

Explain how efficiency can be increased in energy systems.

_____
_____
_____
_____

Explain patterns and trends in the use of energy resources including fossils fuel use and renewable resources.

_____
_____
_____
_____

| | |
|---|---|
| 8 | $efficiency = \frac{useful\ energy\ out}{total\ energy\ in}$ |

| *Efficiency* | *Useful Out* | *Total In* |
|---|---|---|
| | 1500 | 2000 |
| | 60 | 300 |
| 0.50 | | 2000 |
| 0.20 | | 600 |
| 0.90 | 200 | |
| 0.05 | 4000 | |

| *Efficiency* | *Useful Out* | *Total In* |
|---|---|---|
| | 10 | 200 |
| | 1050 | 1500 |
| 6% | | 50 000 |
| 57% | | 2530 |
| 85% | 5990 | |
| 35% | 2100 | |

1. <u>Efficiency and energy:</u>
   a. Calculate the efficiency of a device that usefully shifts 20J of energy when supplied with 50J.
   b. A microwave oven has an efficiency of 60%. How much does the internal energy store of a bowl of baked beans increased when 80 000J of energy is supplied to the oven?
   c. A wind farm has an efficiency of 0.17. If it supplies 120TJ of energy to the National Grid, how much energy was in the wind's kinetic store?
2. <u>Efficiency and power:</u>
   a. Calculate the efficiency of a 60W lightbulb that emits 2.0W of visible light.
   b. A washing machine has an efficiency of 20%. If the power supplied is 1 200W, how much power is usefully shifted?
   c. Steam trains have very low efficiencies – around 5.0%. If it needed 50MW to pull the carriages, what power must have been supplied?

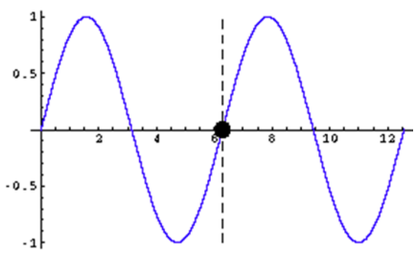
# CP4 Revision Mat – Grade 4 - Grade 5

Waves transfer _____ and _____ without transferring _____.

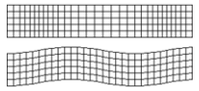
Describe how you could prove that sound waves travel through air, not that air travels from source to receptor.

Describe how you could prove that water waves travel through water, not that water travels from source to receptor.

Identify and define the terms: frequency, wavelength, amplitude, period, wave velocity and wave-front as applied to waves. Annotate the diagram appropriately.



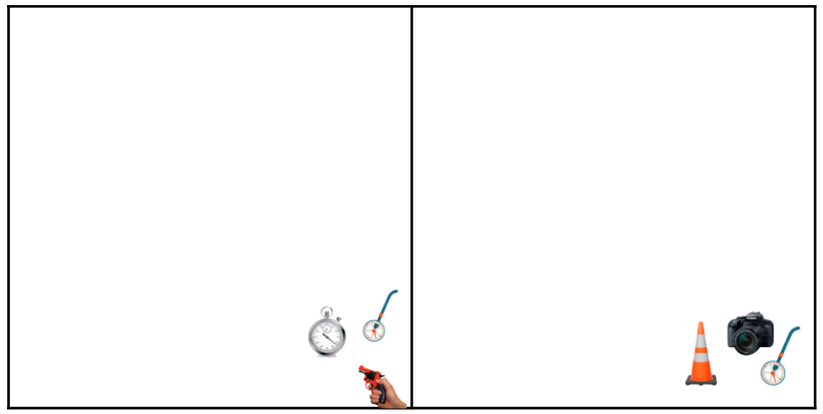

Describe longitudinal waves:



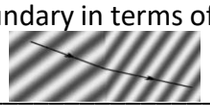
Describe transverse waves:

Describe the difference between longitudinal and transverse waves by referring to sound, electromagnetic, seismic and water waves

Describe how to measure the velocity of sound in air and ripples on water surfaces.



Explain how waves will be refracted at a boundary in terms of the change of direction and speed



Explain why different object have different colours.

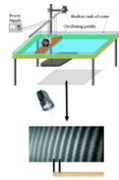
Explain why white objects are white and black objects are black.

Explain why some objects are translucent and some are transparent.

Explain how colour filters work.

What would a blue and yellow jersey look like underneath a yellow filter. Explain your answer.

Explain how to measure the speed, frequency and wavelength of a wave in a solid bar and waves in a ripple tank. Include a simple apparatus list and the calculations you would use.



1. Calculate the following, giving your answer in standard form, correct to three significant figures.

(a) $6.7 \times 10^3 + 4.8 \times 10^4$

.....

(b) $1.62 \times 10^7 - 9.83 \times 10^5$

.....

(c) $2.04 \times 10^9 \times 3.66 \times 10^3$

.....

(d) $3.427 \times 10^8 \div 6.841 \times 10^4$

.....

**(4 Marks)**

2. Calculate the following, giving your answer in standard form, correct to three significant figures.

(a) $9.5 \times 10^{-3} + 7.3 \times 10^{-2}$

.....

(b) $4.82 \times 10^{-9} - 6.31 \times 10^{-11}$

.....

(c) $4.12 \times 10^4 \times 9.59 \times 10^{-8}$

.....

(d) $1.01 \times 10^{-7} \div 2.37 \times 10^3$

.....

**(4 Marks)**

3. Grains of sand range in size from $2 \times 10^{-3} m$ to $64 \times 10^{-2} m$

(a) What is the difference between the smallest and largest grains of sand?

Give your answer in metres, in standard form.

.....

(b) What is your answer to part (a), when written in **millimetres**?

.....

**(2 Marks)**



5. The sun is approximately $1.5 \times 10^{11} m$ from Earth. Given speed of light is approximately $3 \times 10^8 ms^{-1}$, how long does it take light from the sun to reach Earth?

Give your answer in minutes and seconds.

.....

**(2 marks)**

6. The formula that links wavelength (λ) and frequency (*f*), is

$$\lambda \times f = 3 \times 10^8 ms^{-1}$$

(a) Green light has a wavelength of approximately $5 \times 10^{-7} m$. Calculate its frequency giving your answer in standard form.

..... *Hz*

(b) Red light has a frequency of approximately $4 \times 10^{14} Hz$. Calculate its wavelength giving your answer in standard form.

..... *m*

**(4 marks)**

7. If $x = 4.1 \times 10^5$, $y = 7.7 \times 10^{-2}$ and $z = 3.9 \times 10^7$, calculate the following, giving your answers in standard form to 3 sig. fig.

(a) $\frac{x+y}{z}$

.....

(b) $\frac{y^2}{x}$

.....

(c) $\sqrt{\frac{xy}{(z-x)}}$

.....

**(6 marks)**

| | | | | |
|---|---|---|---|---|
| 9 | $v = f \times \lambda$ | $f$ | Frequency | Hz |
| | | $\lambda$ | Wavelength | m |
| | | $v$ | Wave Speed | m/s |
| 10 | $v = \frac{d}{t}$ | $d$ | Distance | m |
| | | $t$ | Time | s |
| | | $v$ | Wave Speed | m/s |

| $f$ | $\lambda$ | $v$ |
|---|---|---|
| | 0.3 | 7 |
| | 0.4 | 5 |
| 25 | | 256 |
| 450 | | 330 |
| 2 | 12 | |
| 125 | 20 | |

| $f$ | $\lambda$ | $v$ |
|---|---|---|
| | 1500 | 400 |
| | $7.5 \times 10^{-7}$ | 30 000 000 |
| 525 | | 215 |
| $7 \times 10^{14}$ | | 30 000 000 |
| 1.2 | 256 | |
| 360 000 | 0.0004 | |

| $d$ | $t$ | $v$ |
|---|---|---|
| | 300 | 500 |
| | 0.25 | 80 |
| 30 000 | | 750 |
| 10 680 | | 445 |
| 144 000 | 720 | |
| 2112 | 6 | |

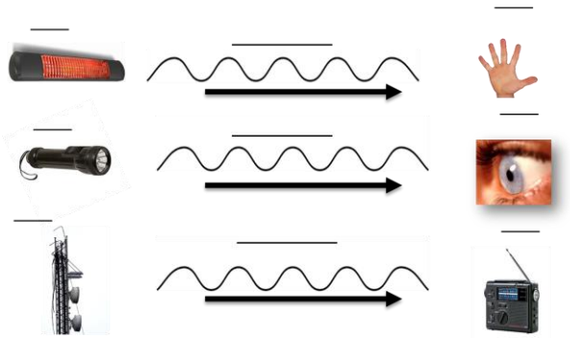
| $d$ | $t$ | $v$ |
|---|---|---|
| | 20 | 17 |
| | 10 | 15 |
| 1062 | | 64 |
| 336 | | 14 |
| 500 | 25 | |
| 59 | 0.05 | |

1. Wave speed equation:
   a. Calculate the speed of a water wave with a wavelength of 10m and a frequency of 0.25Hz.
   b. The speed of sound is 340m/s. What is the wavelength of a sound wave with a frequency of 256Hz?
   c. All electromagnetic waves travel at the same speed: $3.0 \times 10^8$m/s. What is the frequency of green light, having a wavelength of 540nm?

# CP5 Revision Mat – Grade 4 - Grade 5

All electromagnetic waves are _____, that they travel at _____, in a vacuum

Identify the sources and receivers of the examples below.

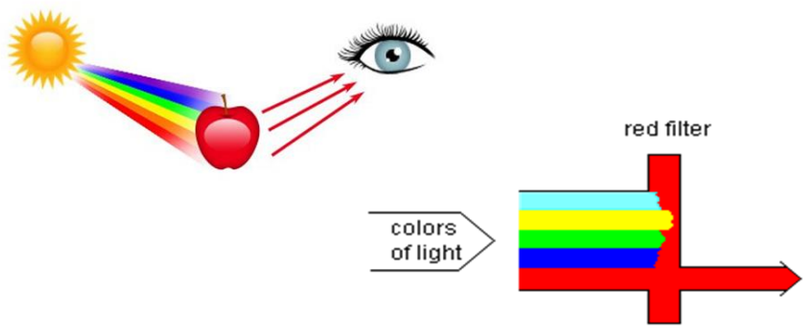


5.9 Describe an investigation into the angles of incidence and refraction in a perspex block.

***Explain how radio waves can be generated, transmitted and received using electrical circuits.***

Fill in the table and indicate which type of E.M. radiation can be seen with the naked eye.

| F & λ | Type | Application |
|---|---|---|
| Low<br>Long<br>↕<br>High<br>Short | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |




Explain what happens when atomic nuclei change
a regarding radiations over a wide frequency range
b the result of absorption of a range of radiations

***Explain how and why different substances absorb, transmit, refract or reflect electromagnetic waves in ways that vary with wavelength***

***Explain the effects of difference in the velocities of electromagnetic waves in different substances***

| E.M. | Associated Dangers |
|---|---|
| microwaves | |
| infrared | |
| ultraviolet | |
| x-rays and gamma rays | |

1. Calculate the following, giving your answer in standard form, correct to three significant figures.

(a) $6.7 \times 10^3 + 4.8 \times 10^4$

.....

(b) $1.62 \times 10^7 - 9.83 \times 10^5$

.....

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.....

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.....

**(4 Marks)**

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(a) What is the difference between the smallest and largest grains of sand?

Give your answer in metres, in standard form.

.....

(b) What is your answer to part (a), when written in **millimetres**?

.....

**(2 Marks)**



5. The sun is approximately $1.5 \times 10^{11} m$ from Earth. Given speed of light is approximately $3 \times 10^8 ms^{-1}$, how long does it take light from the sun to reach Earth?

Give your answer in minutes and seconds.

.....

**(2 marks)**

6. The formula that links wavelength (λ) and frequency (*f*), is

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..... *Hz*

(b) Red light has a frequency of approximately $4 \times 10^{14} Hz$. Calculate its wavelength giving your answer in standard form.

..... *m*

**(4 marks)**

7. If $x = 4.1 \times 10^5$, $y = 7.7 \times 10^{-2}$ and $z = 3.9 \times 10^7$, calculate the following, giving your answers in standard form to 3 sig. fig.

(a) $\frac{x+y}{z}$

.....

(b) $\frac{y^2}{x}$

.....

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.....

**(6 marks)**

| | | | | |
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| | 0.4 | 5 |
| 25 | | 256 |
| 450 | | 330 |
| 2 | 12 | |
| 125 | 20 | |

| $f$ | $\lambda$ | $v$ |
|---|---|---|
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| | $7.5 \times 10^{-7}$ | 30 000 000 |
| 525 | | 215 |
| $7 \times 10^{14}$ | | 30 000 000 |
| 1.2 | 256 | |
| 360 000 | 0.0004 | |

| $d$ | $t$ | $v$ |
|---|---|---|
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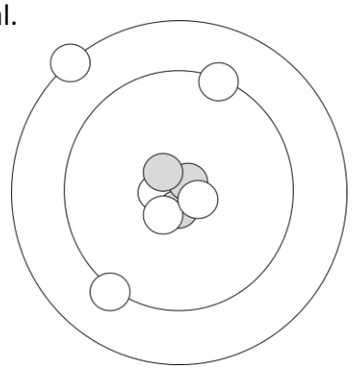
| | 0.25 | 80 |
| 30 000 | | 750 |
| 10 680 | | 445 |
| 144 000 | 720 | |
| 2112 | 6 | |

| $d$ | $t$ | $v$ |
|---|---|---|
| | 20 | 17 |
| | 10 | 15 |
| 1062 | | 64 |
| 336 | | 14 |
| 500 | 25 | |
| 59 | 0.05 | |

1. Wave speed equation:
   a. Calculate the speed of a water wave with a wavelength of 10m and a frequency of 0.25Hz.
   b. The speed of sound is 340m/s. What is the wavelength of a sound wave with a frequency of 256Hz?
   c. All electromagnetic waves travel at the same speed: $3.0 \times 10^8$m/s. What is the frequency of green light, having a wavelength of 540nm?

# CP6 Revision Mat – Grade 4 - Grade 5

Label the atom with the names, masses and charges of the subatomic particles and the general areas of the atom. The atom is neutral.



The diameter of a nucleus is_____m and the diameter of an atom is_____m.

Define the term isotope and complete the table below:

| Element | | Mass No | Atomic No | Protons | Neutrons | Electrons |
|---|---|---|---|---|---|---|
| $^{12}_{6}C$ | $^{14}_{6}C$ | | | | | |
| | | | | | | |
| $^{35}_{17}Cl$ | $^{37}_{17}Cl$ | | | | | |
| | | | | | | |

Explain why isotopes can still be neutral.

_____
_____
_____
_____
_____

Explain why some electrons can change orbits.

_____
_____
_____
_____
_____

Explain how atoms can become ionised referring to the electron orbits only.

_____
_____
_____
_____
_____

| Type of nuclear decay | Symbol | Cause of Decay | Structure | Charge | Mass | Ionisation (High – Low) | Penetration (High – Low) |
|---|---|---|---|---|---|---|---|
| Alpha | | | | | | | |
| Beta minus | | | | | | | |
| Positron | | | | | | | |
| Gamma | | | | | | | |

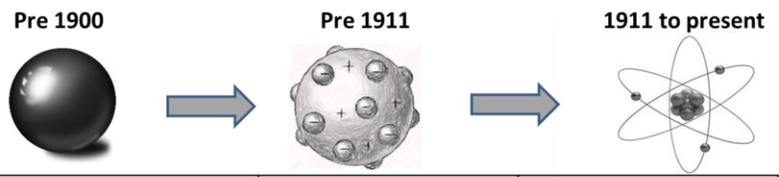
Explain what is meant by background radiation including the most common sources.

_____
_____
_____
_____
_____

Describe a method for measuring and detecting radioactivity using Photographic film and a Geiger–Müller tube

_____
_____
_____
_____
_____

Complete the table below describing the changing atomic model.




| | | |
|---|---|---|
| | | |

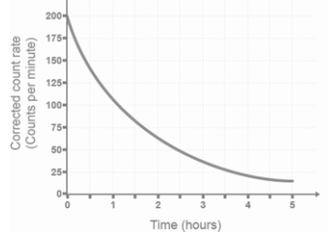
| Decay | Effect on Mass Number | Effect on Proton Number |
|---|---|---|
| Alpha | | |
| Beta minus | | |
| Positron | | |
| Gamma | | |
| Neutron | | |

Balance the nuclear equations below.

$$^{238}_{92}U \longrightarrow Th + {}^{4}_{2}He$$

$$^{14}_{6}C \longrightarrow N + {}^{0}_{-1}e$$

$$Tc \longrightarrow {}^{99}_{43}Tc + \gamma$$




Define the term half life and identify the half life in the

_____
_____

Explain how half life can be predicted and the conditions required for this to occur.

_____
_____
_____
_____

A frozen mammoth body has been found in ice in Norway. The Norwegian government has given you a 1 kg sample of the body. For 1 kg of living mammoth flesh, the activity would be 4000 becquerel (Bq) from carbon-14 decay. Your sample gives a reading of 250 Bq. Half life is 5700 years.

A How many half-lives must have passed for the activity to change from 4000 Bq to 250 Bq?

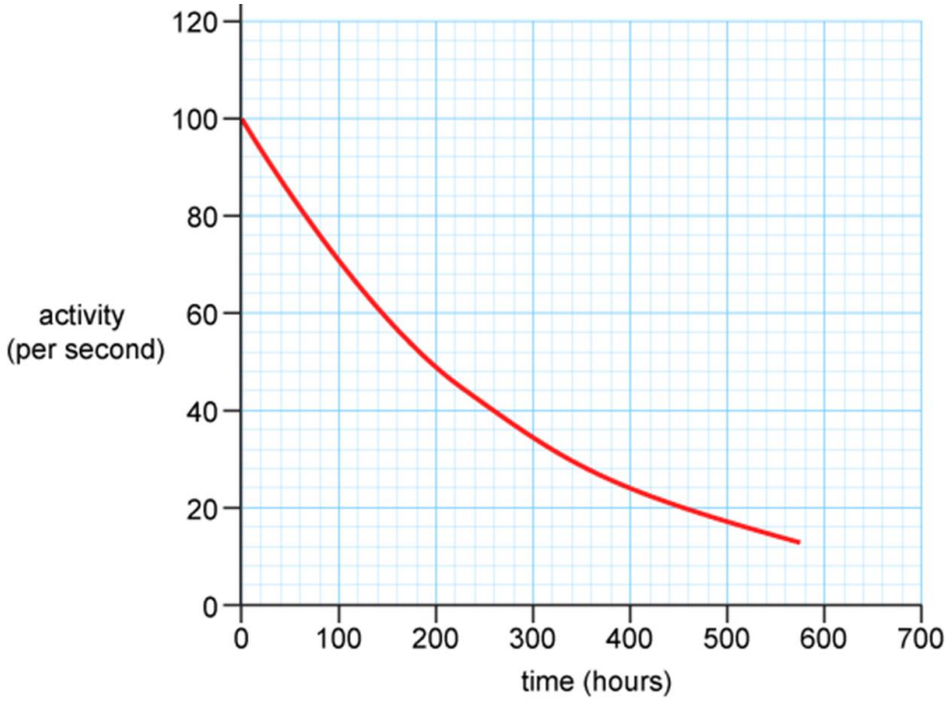
_____
_____

B How long ago did the mammoth die?

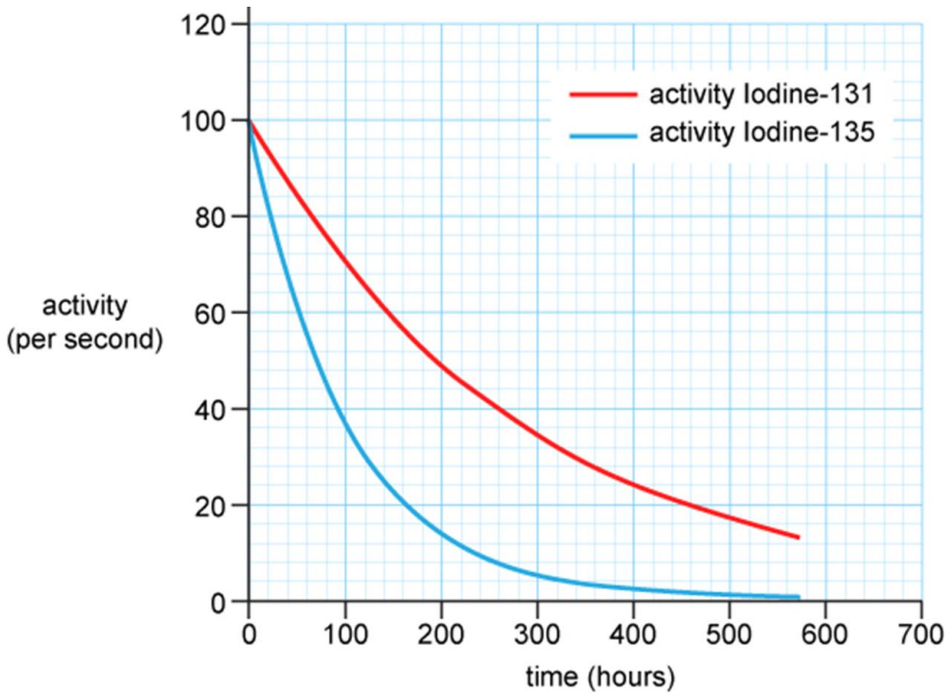
_____
_____

Describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed

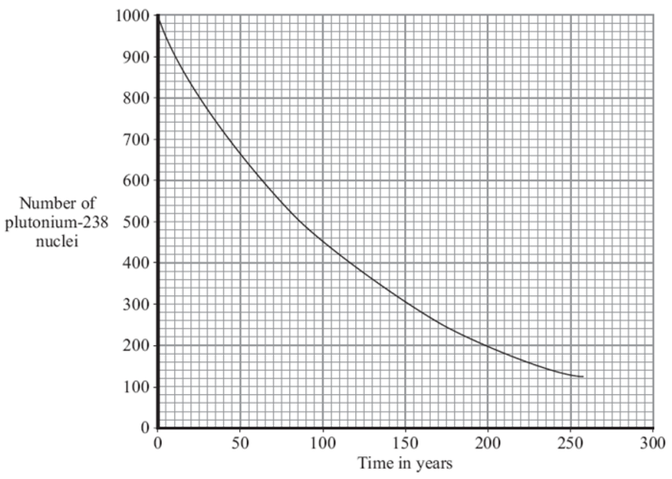
_____
_____
_____
_____
_____
_____




What is the half-life of these isotopes.




1. What are possible unit for half life?
2. A radioactive isotope has a half life of 14 days. It has an initial count rate of 1080Bq. What will the count rate be after 4 weeks?
3. A radioactive isotope has a half life of 15 minutes. It has an initial count rate of 36000 Bq. What will the count rate be after 1.5 hours?
4. A radioactive isotope has a half life of 5000 years. What fraction of the radioactive material will remain after 20000 years?
5. A radioactive isotope has a count rate 0f 4000Bq and a half life of 12 hours. How long will it take the count rate to drop to 500Bq?
6. Use the graph to find the half-life of Plutonium-238.




1. A radioactive isotope has a count rate 0f 6400Bq and a half life of 4days. What fraction of the isotope will have decayed after 20 days? What will the count rate now be?
2. Before an isotope is placed near the detector a counter givers a reading of 14Bq. When the isotope is placed near the reading increases to 2234Bq. When tested 30 minutes later the count rate has dropped to 569 Bq. What is the half life of the substance?
3. Uranium-238 has a half-life of 4500 million years. Complete the graph to show the number of nuclei in a sample of U-238 will change over time. Initially there are 100,000 nuclei in the sample.