Paper 1	Paper 2
CP1 Key Concepts	CP8 Forces Doing Work
CP2 Motion and Forces	CP9 Forces and Effects
CP3 Conservation of Energy	CP10 Electricity 1
CP4 Waves	CP10 Electricity 2
CP5 Light and EM	CP12 Magnetism and Motors
CP6 Radioactivity	CP13 EM Induction
	CP14 – 15 Particles, Forces and Matter

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**

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)	1.90×10^{27}	5.96×10^{26}	8.68×10^{25}	1.02×10^{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 5.98×10^{24} kg. (2)

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

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c. i. The radius of Neptune is 2.43×10^{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 π. (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		
		Δv		
		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		
		λ		
		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	$\rho = \frac{m}{V}$	ρ		
		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	$E = m \times c \times \theta$	θ		
		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	$p = h \times \rho \times g$	ρ		
		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

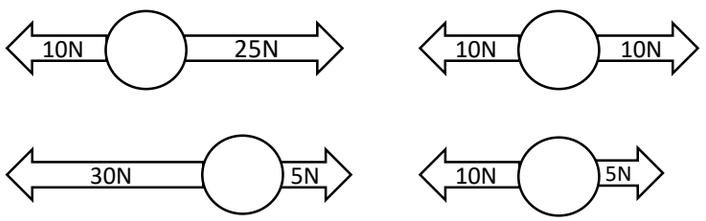
b. Calculate the distance travelled between a) 0s-6s b) 6s-15s c) 15s-20s

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

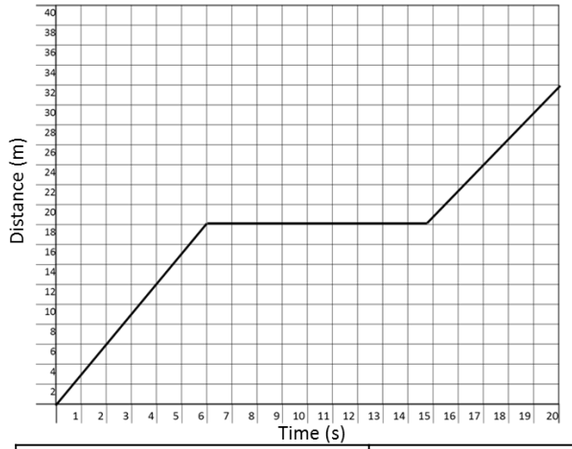
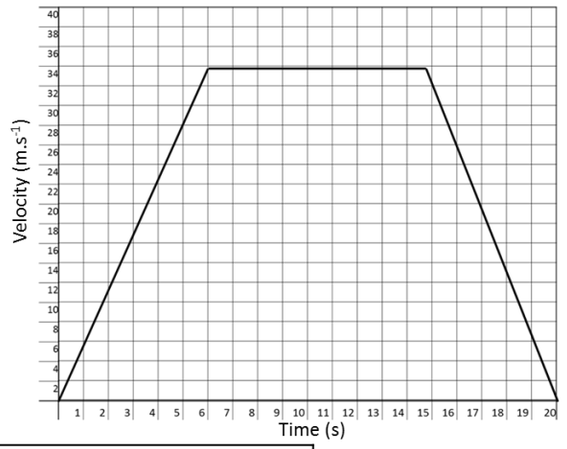


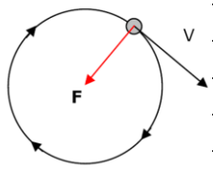
Figure 2. Velocity-Time graph



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.

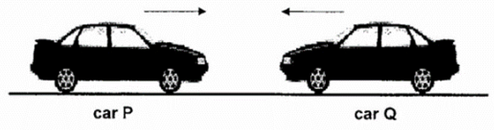
Explain why we say this object is accelerating.



Explain methods of measuring human reaction times and recall typical results

Define the term stopping distance.

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



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	Δv	t
	30	10
	40	5
2		30
10		19
6	84	
3	24	

a	Δv	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
		Δv	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	7.5×10^4	
1.3×10^3	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

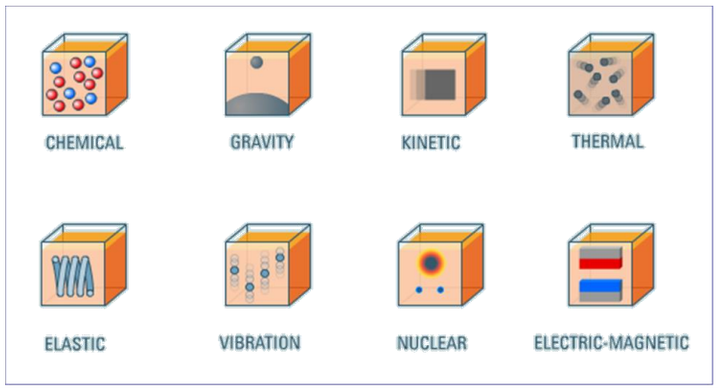
_____
_____

a) A swinging pendulum

_____
_____

a) A mug of coffee

_____
_____



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.

_____
_____
_____
_____

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

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?

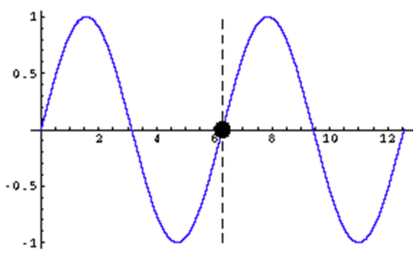
CP4 Revision Mat – Grade 4 - Grade 5

Waves transfer _____ and _____ without transferring _____.

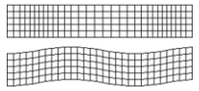
Describe how you could prove that sound waves travel through air, not that air travels from source to receptor.

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.



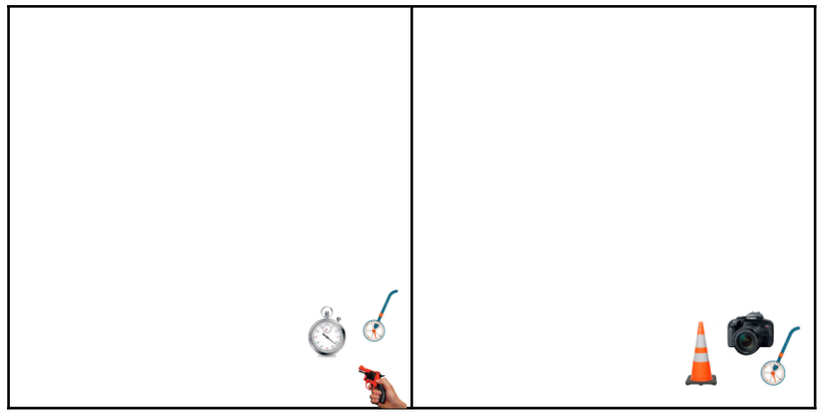
Describe longitudinal waves:



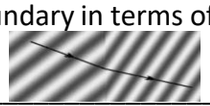
Describe transverse waves:

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.

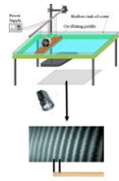
Explain why white objects are white and black objects are black.

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
		λ	Wavelength	m
		v	Wave Speed	m/s
10	$v = \frac{d}{t}$	d	Distance	m
		t	Time	s
		v	Wave Speed	m/s

f	λ	v
	0.3	7
	0.4	5
25		256
450		330
2	12	
125	20	

f	λ	v
	1500	400
	7.5×10^{-7}	30 000 000
525		215
7×10^{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	

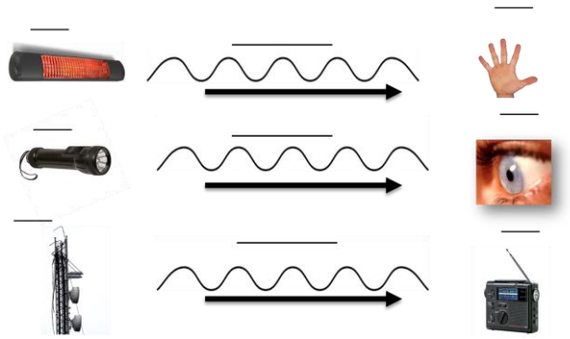
d	t	v
	20	17
	10	15
1062		64
336		14
500	25	
59	0.05	

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: 3.0×10^8m/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.

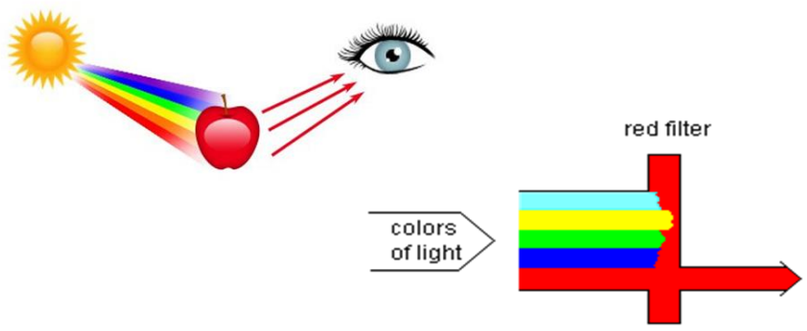


5.9 Describe an investigation into the angles of incidence and refraction in a perspex block.

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 Long ↕ High 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) $1.62 \times 10^7 - 9.83 \times 10^5$

.....

(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
		λ	Wavelength	m
		v	Wave Speed	m/s
10	$v = \frac{d}{t}$	d	Distance	m
		t	Time	s
		v	Wave Speed	m/s

f	λ	v
	0.3	7
	0.4	5
25		256
450		330
2	12	
125	20	

f	λ	v
	1500	400
	7.5×10^{-7}	30 000 000
525		215
7×10^{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: 3.0×10^8m/s. What is the frequency of green light, having a wavelength of 540nm?

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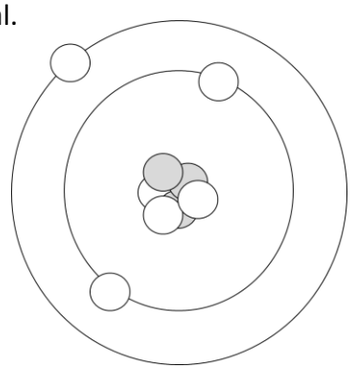
Label the atom with the names, masses and charges of the subatomic particles and the general areas of the atom. The atom is neutral.



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							

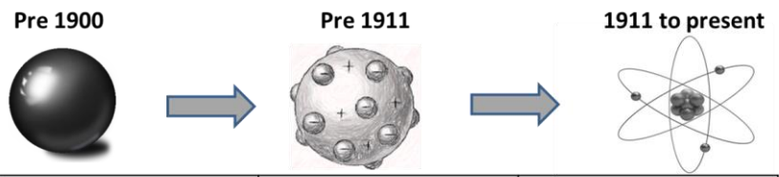
Explain what is meant by background radiation including the most common sources.

_____
_____
_____
_____
_____

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.



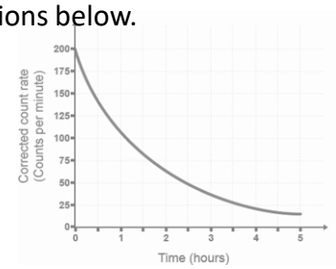
Decay	Effect on Mass Number	Effect on Proton Number
Alpha		
Beta minus		
Positron		
Gamma		
Neutron		

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?

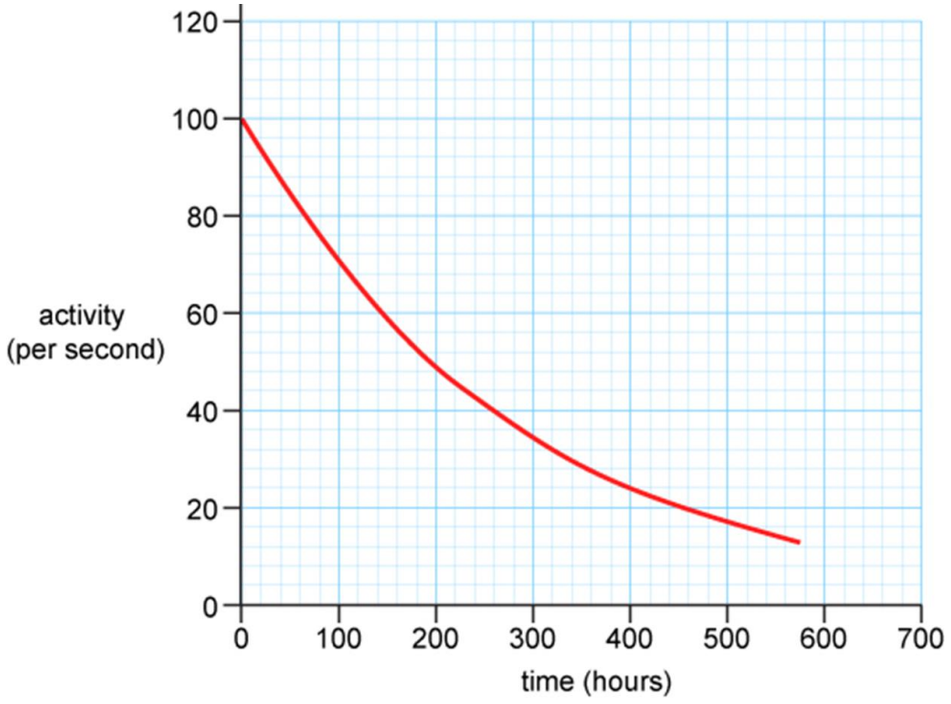
_____
_____

B How long ago did the mammoth die?

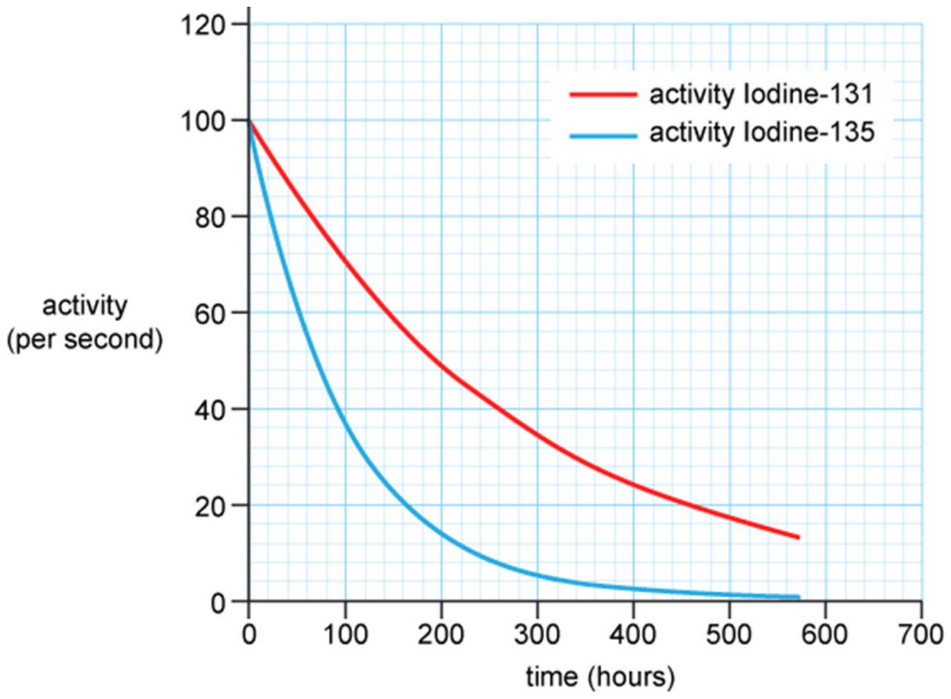
_____
_____

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

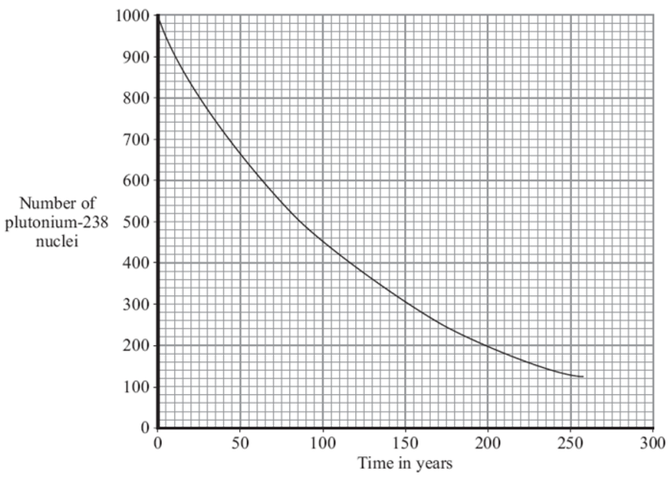
_____
_____
_____
_____
_____
_____



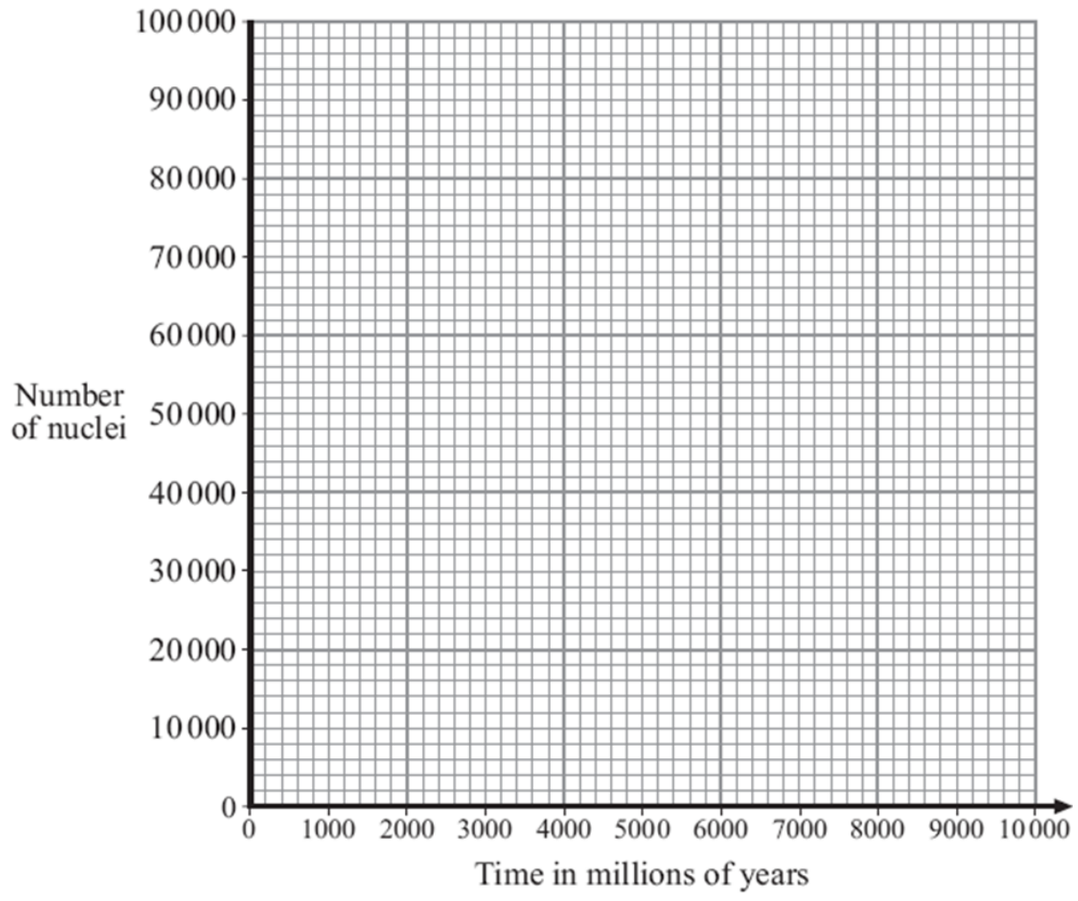
What is the half-life of these isotopes.



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.



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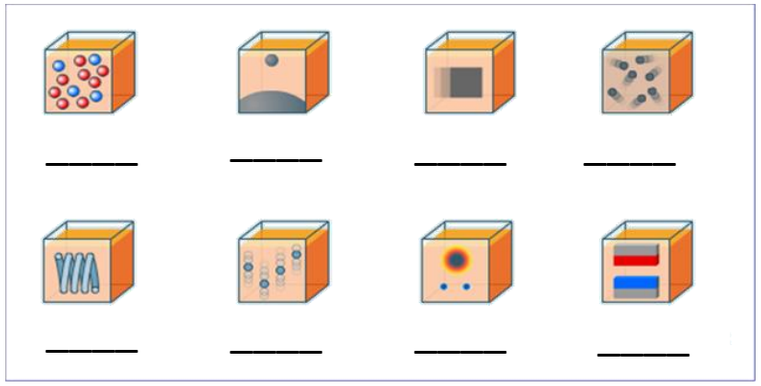
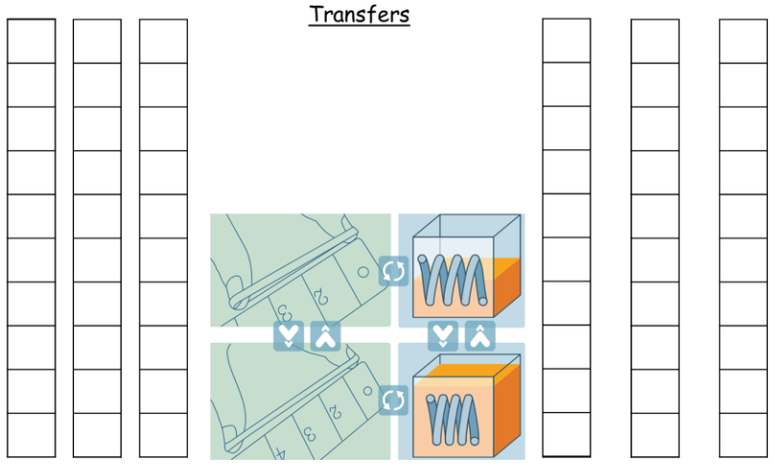


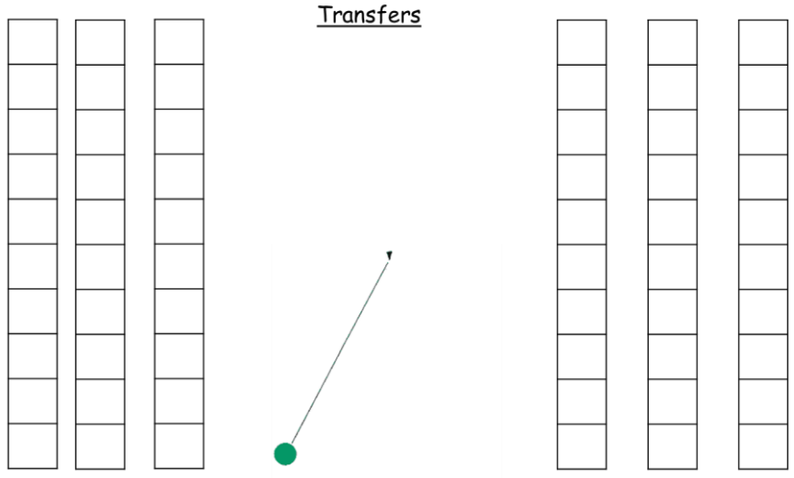
Describe the energy transfers in a stretching elastic band

Energy Store(s) | Transfers | Energy Store(s)

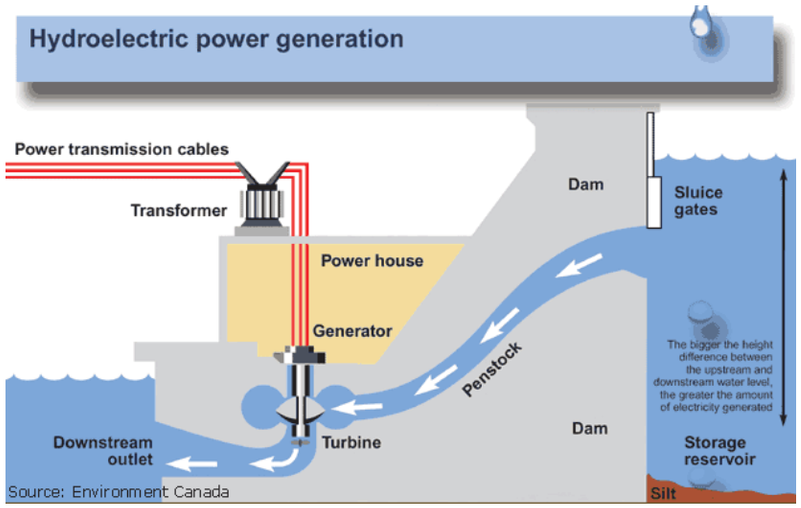


Describe the energy transfers in a swinging pendulum

Energy Store(s) | Transfers | Energy Store(s)



Where there are energy _____ in a closed _____ there is no _____ to the total _____ in that system



Describe the changes involved in the way energy is stored in the system above. Starting at the Sluice Gates on the right. Include the energy stores and transfers at each stage.

Draw a simple box and arrow diagram to show the energy transfers from sluice gates to the penstock; the penstock to the turbine; the turbine to the generator; and the generator to a household electric heater.

Mr McKelvie was pushing a box over the ground, filled with test papers to mark. He pushed it from 2S2 to 2S6. Describe how to measure the work done including the calculation needed.

Mr McKelvie had to use more force than was needed to push the box over the floor. If the distance was 24m and the mass was 85Kg. Why did Mr McKelvie need 2200N of force to push the box.

Explain what Mr McKelvie could have done to reduce the amount of work needed to push the box along the corridor?

Explain the term dissipated.

Explain what happens to dissipate energy in an engine and what the effect of that dissipation is.

Define the term power and explain the difference between work and power.

12		E	Energy Transferred	
		P	Power	
		t	Time	

E	P	t
	50	3
	1000	15
4800		120
7440		14
96	3	
110	550	

E	P	t
	24	54.2
	120.4	7.3
842 240		175
4650		12.4
1311	43	
66 500	536	

11		d	Distance Moved in Direction of Force	
		F	Force	
		W	Work Done	

d	F	W
	50	300
	8	120
1.5		128
150		36 000
12	5	
2.5	50	

d	F	W
	125	100 000
	200	6120
135		4050
0.003		6
0.5	750	
3.75	7.2	

- Power and energy:
  a. Calculate the power of a torch when the battery's chemical energy store empties by 45J in 30s.
  b. A rower develops a power of 600W. How long will the 1 900 000J of chemical energy in a Mars bar allow them to row?
  c. A mobile phone has an average power of 0.50W. How much chemical energy must be stored in the battery if it can power the phone for an entire day?
- Power and work:
  a. Calculate the power of a machine that does 700J of work in 35s.
  b. How long does it take a machine rated at 250W to do 75J of work?
  c. A car develops a power of 20kW when driving along a motorway. If it is driven for 2 hours, how much work does the car do against air resistance?
- (Electrical) energy transferred and power:
  a. Calculate the energy transferred by a 6.0W light bulb in 60s.
  b. How long will a 50W heater take to deliver 200J of energy?
  c. What is the power of a shower that delivers 3.7MJ of energy in 7.0 minutes?

- Work done:
  a. Calculate the work done when a box is pushed 20m against 7.0N of friction.
  b. What is the force if 24J is needed to move 6.0m?
  c. It takes 30MJ to fire a sounding rocket that weighs 750N. How high does the rocket go?

CP9 Revision Mat – Grade 4 - Grade 5

Describe how the following forces interact including the action reaction pairs. Use labelled force diagrams in your answers:

A satellite orbiting Mars.

A charged balloon sticking to a wall

A magnet stuck on a fridge

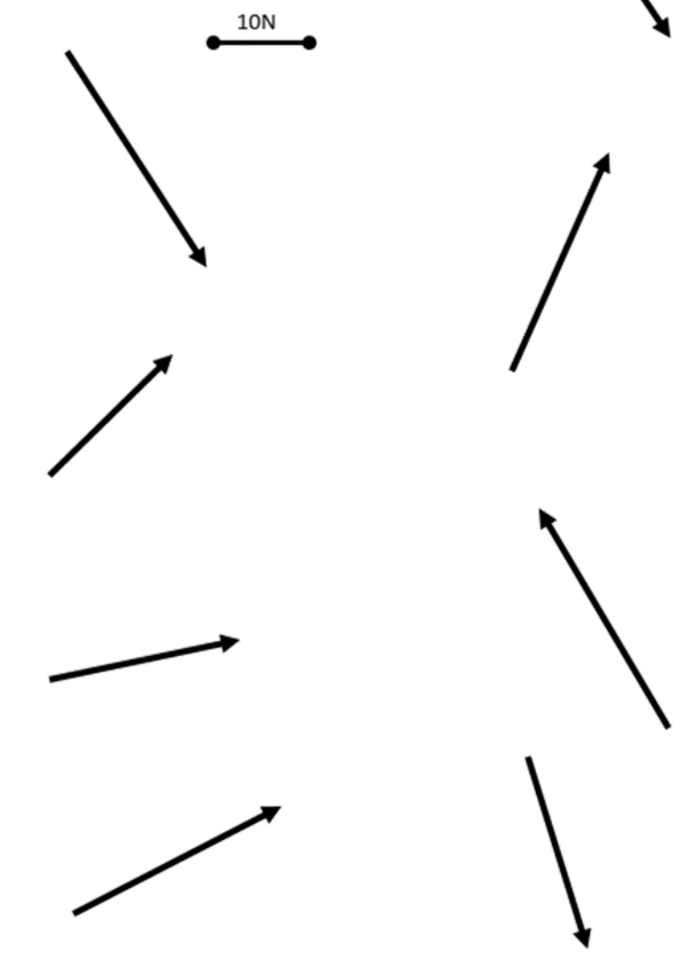
A mug resting on a table

A box being pushed along the floor.

Explain why forces are represented as vectors while scalar objects are not including examples.

Explain how to reduce the effects of friction on objects that are being affected by contact forces.

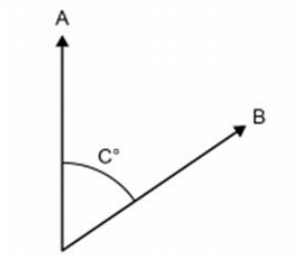
Resolve the forces below using the scale provided.



The F-25 Raptor takes off at an angle of 75^0 with a force of 170kN. Use a scale drawing to calculate the vertical and horizontal components of the resultant force.

The wind at an airport was blowing 50^0 compared to the runway with a force of 15kN. The engine gives out 30KN of force 120^0 from the runway. What is the resultant force? Explain if the plane will land safely.

1 The diagram shows two forces at an angle. Draw **scale diagrams** to work out the size and direction of the **resultant force** if:



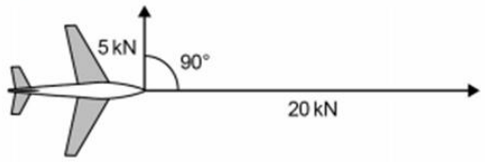
a A = 50 N, B = 25 N, C = 90°

b A = 100 N, B = 40 N, C = 60°

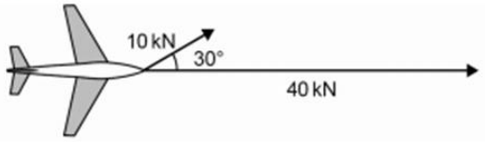
c A = 20 N, B = 50 N, C = 40°

2 The diagrams show aeroplanes flying in different wind conditions.

a



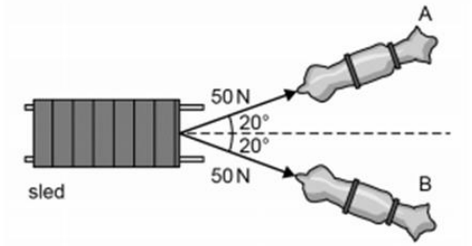
b



For each aeroplane:

- explain the approximate direction in which the resultant force acts
- draw a scale diagram to help you work out the size and direction of the resultant force
- give the direction of the resultant as an angle from the direction in which the aeroplane is pointing.

3 The diagram shows a sled being pulled by two dogs. The sled is moving along the direction shown by the dotted line.

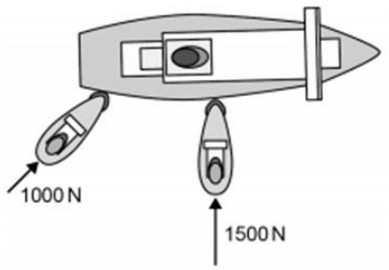


a Explain in which direction the resultant force is acting.

b Suggest approximately what size you expect the resultant force to be. Explain your reasoning.

c Draw a scale diagram to help you work out the size and direction of the resultant force.

4 Two tug boats are pushing a ship. The angle between the two 'pushes' is 45°.

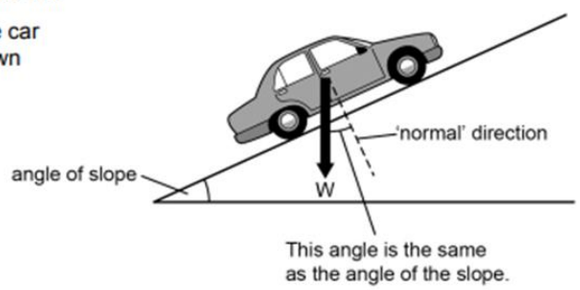


a What approximate size and in what approximate direction do you expect the resultant force to be? Explain your answer.

b Draw a scale diagram to help you work out the size and direction of the resultant force.

5 When a car is driven up a hill, part of its weight is acting normal to the surface, and part is acting to pull it down the hill.

Use scale diagrams to **resolve** the weight of the car into **components** normal to the surface and down the hill for these conditions.



a weight = 1200 N, angle = 10°

b weight = 2000 N, angle = 5°

c weight = 1500 N, angle = 20°

6 A skier is going down a steep slope that is at an angle of 60° to the horizontal. The weight of the skier and her skis is 800 N.

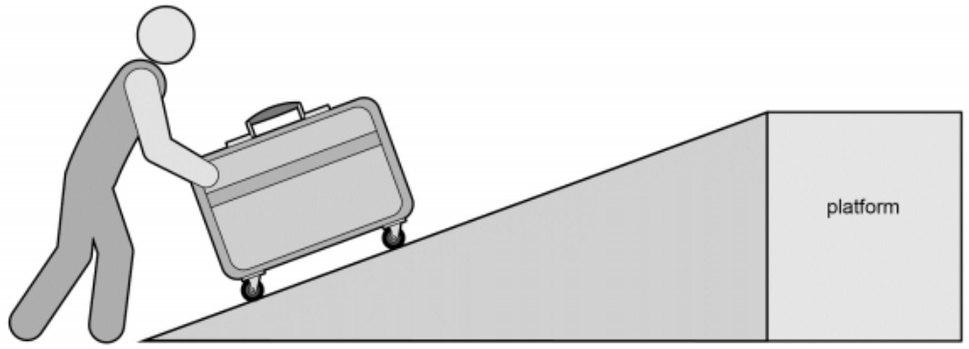
a Draw a sketch to show the slope and the direction in which the skier's weight is acting.

b Draw a scale diagram to help you work out the component of the skier's weight that is acting to accelerate her down the hill.

c How big would the force pulling the skier down the hill be if the angle of the slope were only 30°? (You need to draw another scale diagram to work this out.)

Ramps can make it easier to lift things.

The weight of the object being moved acts vertically downwards, but the person pushing it only needs to exert a force equal to the component of the weight acting down the ramp.



7 Draw scale diagrams to work out the force needed to push the suitcases below.

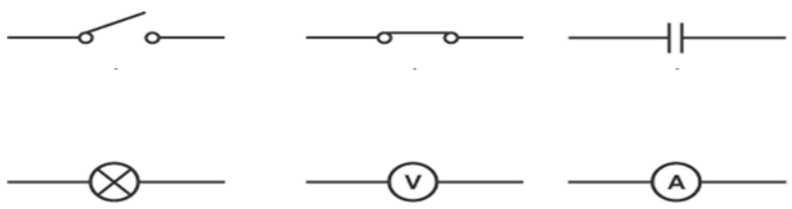
a weight = 1000 N, angle of ramp = 15°

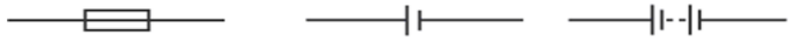
b weight = 500 N, angle of ramp = 35°

CP10 Revision Mat – Grade 4 - Grade 5

Describe the structure of the atom, including all the subatomic particles, their mass, charge and location.

Label the circuit symbols:





Draw two circuits, one series and one parallel. Include two resistors, 3 ammeters (per branch from parallel) and a voltmeter over each resistor..

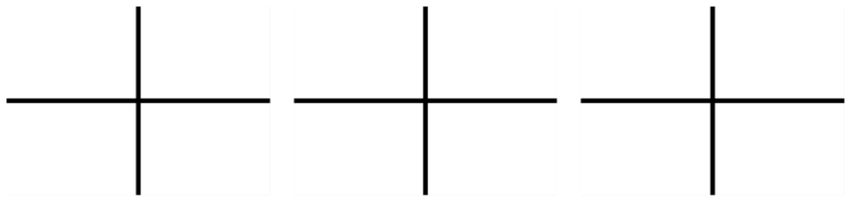
Name	Definition	Equation symbol	Unit	Unit Symbol
Energy transferred				
Charge flow				
Power				
Potential difference				
Resistance				
Charge flow				
Current				
Time				

Compare the voltage, current and resistance in series and parallel circuits. Use general equations were possible.

Explain why, if two resistors are in series, the net resistance is increased, whereas with two in parallel the net resistance is decreased

Explain how to design circuits to test the current, voltage and resistance in series and parallel circuits.

Complete the graphs and explain the trends seen for Ohmic resistors, filament lamps and diodes.



Describe how the resistance changes for LDRs and Thermistors.

Explain the term “resistance”. Fully.

Explain how to design circuits to test the current, voltage and resistance in series and parallel circuits.

Complete the graphs and explain the trends seen for Ohmic resistors, filament lamps and diodes.

14		Q	Charge	
		E	Energy Transferred	
		V	Potential Difference	

Q	E	V
	16800	734
	500 000	2400
2.4		3
3		17
27	15	
0.6	72	

Q	E	V
	0.23	15.1
	175 000	1825
785		5
4.3		1.5
74	239	
30	600	

- Electrical energy transferred and charge:
  a. Calculate the energy transferred by 4.0C in 6.0s.
  b. How much charge must flow through 8.0V to do 4.0J of work?
  c. A spark transfers 0.20μC of charge doing 0.040J of work – what was the p.d.?

15		Q	Charge	
		I	Current	
		t	Time	

Q	I	t
	3	57
	13	60
180		18
0.6		36
160	0.4	
40	0.7	

Q	I	t
	0.015	107
	10.2	25.6
0.0155		0.0075
10.8		54.2
0.50	0.04	
560	3.2	

- Charge flow:
  a. Calculate the charge carried by a current of 2.0A in 6.0s.
  b. How long will it take a current of 10A to transfer 200C of charge?
  c. What current flows from a mobile phone's battery if it transfers 300C per hour?

16		I	Current	
		V	Potential Difference	
		R	Resistance	

I	V	R
	9	3
	2	120
0.5		18
0.25		1.2
2	6	
3	18	

I	V	R
	230	17
	230	19 000
450		33
0.025		1300
0.05	350	
32	42 000	

- "Ohm's Law"
  a. Calculate the potential difference across a 3.0Ω resistor with 4.0A flowing through.
  b. What is the resistance of a 230V lamp with 0.25A flowing in it?
  c. A 4.7kΩ resistor is connected to a 1.5V cell. How much current flows?

17		I	Current	
		P	Electric Power	
		V	Potential Difference	

I	P	V
	9000	2
	55	0.5
4	9	
6	225	
1.4		3
0.2		1.25

I	P	V
	15000	250
	24 000	12
0.05	225	
850	17000	
6.1		230
1.2		5.13

- Electrical power and p.d.:
  a. Calculate the power of a 230V lamp with 0.25A flowing in it.
  b. What p.d. is needed across a 0.040W LED to cause a current of 0.020A?
  c. A 3kW kettle is connected to the mains. How much current will flow?

18		I	Current	
		P	Electrical Power	
		R	Resistance	

I	P	R
	36	4
	6	24
0.8		15
0.4		2
2	1280	
4	53	

I	P	R
	2.4	60
	52.4	1000
0.21		260
0.004		33×10^6
3.2	4813	
0.89	375	

- Electrical power and resistance:
  a. Calculate the power of a 16Ω resistor with 4.0A flowing through it.
  b. What is the resistance of a 1200W heater when 3A flows?
  c. How much current flows through a 2.0mW LED with a resistance of 0.50Ω?

24	$E = V \times I \times t$	I	Current	
		E	Energy	
		V	Potential Difference	
		t	Time	

I	E	V	t
	0.6	240	10×10^{-6}
	54 300	11.9	1200
0.25		5	72×10^3
1.5		30	120
40×10^{-3}	8.6		180
2.55	195		17
50×10^{-3}	9.94×10^5	230	
3.5	1890	12	

CP10 Revision Mat – Grade 4 - Grade 5

Explain what happens when there is a current moving through a resistor (use the keywords dissipate, ions, transfer and work).

Explain how to reduce unwanted energy transfers through wires.

Describe the advantages and disadvantages of the heating effect of an electric current.

Describe the energy transfers below, you may use a labelled diagram:

A battery powered torch

A mains powered fan

A battery powered toothbrush

A mains powered washing machine.

Describe the difference between A.C and D.C. current.

Describe the UK domestic energy supply in terms of current, voltage and frequency.

Explain the difference between the live and neutral wires in domestic mains input wires.

Explain the function of the earth wire.

Explain the function of fuses and circuit breakers.

Explain why switches and fuses should be connected in the live wire of the domestic circuit.

Describe the potential differences in a properly wired mains plug.

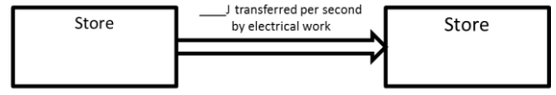
Explain the dangers of providing any connection between the live wire and earth.

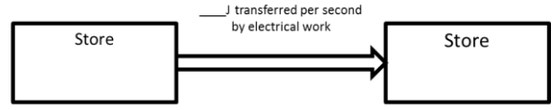
Describe the relationship between power ratings and the changes in stored energy when they are in use.

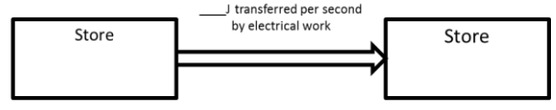
800W

1500W

500W







14		Q	Charge	
		E	Energy Transferred	
		V	Potential Difference	

Q	E	V
	16800	734
	500 000	2400
2.4		3
3		17
27	15	
0.6	72	

Q	E	V
	0.23	15.1
	175 000	1825
785		5
4.3		1.5
74	239	
30	600	

- Electrical energy transferred and charge:
  a. Calculate the energy transferred by 4.0C in 6.0s.
  b. How much charge must flow through 8.0V to do 4.0J of work?
  c. A spark transfers 0.20μC of charge doing 0.040J of work – what was the p.d.?

15		Q	Charge	
		I	Current	
		t	Time	

Q	I	t
	3	57
	13	60
180		18
0.6		36
160	0.4	
40	0.7	

Q	I	t
	0.015	107
	10.2	25.6
0.0155		0.0075
10.8		54.2
0.50	0.04	
560	3.2	

- Charge flow:
  a. Calculate the charge carried by a current of 2.0A in 6.0s.
  b. How long will it take a current of 10A to transfer 200C of charge?
  c. What current flows from a mobile phone's battery if it transfers 300C per hour?

16		I	Current	
		V	Potential Difference	
		R	Resistance	

I	V	R
	9	3
	2	120
0.5		18
0.25		1.2
2	6	
3	18	

I	V	R
	230	17
	230	19 000
450		33
0.025		1300
0.05	350	
32	42 000	

- "Ohm's Law"
  a. Calculate the potential difference across a 3.0Ω resistor with 4.0A flowing through.
  b. What is the resistance of a 230V lamp with 0.25A flowing in it?
  c. A 4.7kΩ resistor is connected to a 1.5V cell. How much current flows?

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		P	Electric Power	
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	9000	2
	55	0.5
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6	225	
1.4		3
0.2		1.25

I	P	V
	15000	250
	24 000	12
0.05	225	
850	17000	
6.1		230
1.2		5.13

- Electrical power and p.d.:
  a. Calculate the power of a 230V lamp with 0.25A flowing in it.
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		P	Electrical Power	
		R	Resistance	

I	P	R
	36	4
	6	24
0.8		15
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2	1280	
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I	P	R
	2.4	60
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  a. Calculate the power of a 16Ω resistor with 4.0A flowing through it.
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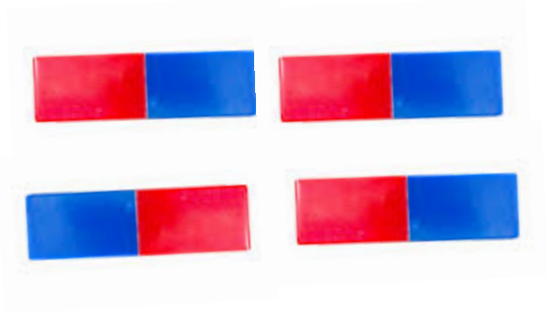
		E	Energy	
		V	Potential Difference	
		t	Time	

I	E	V	t
	0.6	240	10×10^{-6}
	54 300	11.9	1200
0.25		5	72×10^3
1.5		30	120
40×10^{-3}	8.6		180
2.55	195		17
50×10^{-3}	9.94×10^5	230	
3.5	1890	12	

CP12 Revision Mat – Grade 4 - Grade 5

Annotate the diagram and indicate of the magnets will attract or repel.



Describe the uses of permanent and temporary magnetic materials including cobalt, steel, iron and nickel

Explain the difference between permanent and temporary magnets.

Describe the shape and direction of the magnetic field around bar magnets. Draw and annotate a bar magnet showing a strong magnetic field and a weak magnetic field.

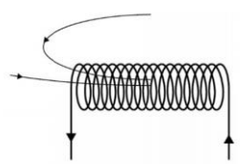
Describe how to show the shape of a magnetic field around bar magnet using a plotting compass and iron fillings.

Describe how to show the shape of a magnetic field around the Earth using a compass.

Describe how to show that a current can create a magnetic effect around a long straight conductor, include the shape and direction of the magnetic field.

Describe the factors that effect the strength of the magnetic field around a long straight conductor with a current flowing through it.

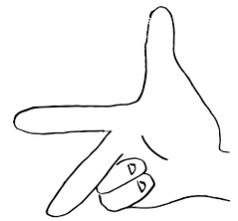
Annotate the diagram to show the shape of the magnetic field around a solenoid. Describe the shape and strength of the magnetic field.



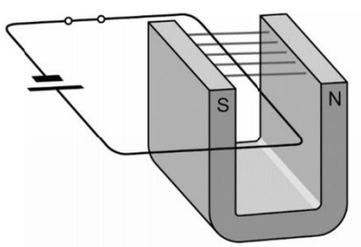
Describe the force interaction between a magnet and a current carrying conductor, refer to Newton's third law in your answer.

Explain the causes of magnetic forces referring to magnetic fields.

Annotate the diagram and describe Fleming's left-hand rule.



Annotate the diagram and explain the directions of the forces on the wire and the magnet and compare their sizzes.

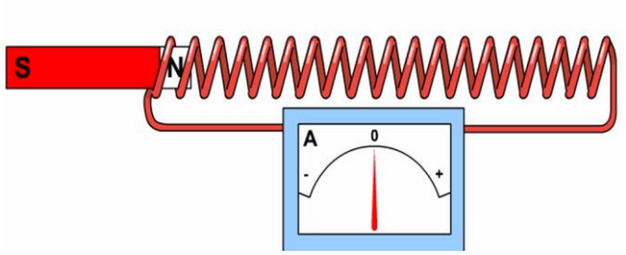


25	$F = B \times I \times l$	I	Current	
		F	Force on a Conductor in a Magnetic Field	
		l	Length	
		B	Magnetic Flux Density	

I	F	l	B
	18	7.1	0.19
	0.09	0.05	0.33
8.0		0.40	0.20
2.1		0.30	0.05
0.19	0.4		1.5
4.3	12		0.07
12	8.4	4.7	
5	0.024	0.06	

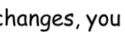
CP13 Revision Mat – Grade 4 - Grade 5

Describe the factors that affect the size and direction of the induced potential difference from the diagram below.



Use the pictures to describe the factors that affect induced potential difference.

When the  in a  changes, you get an **induced** and 

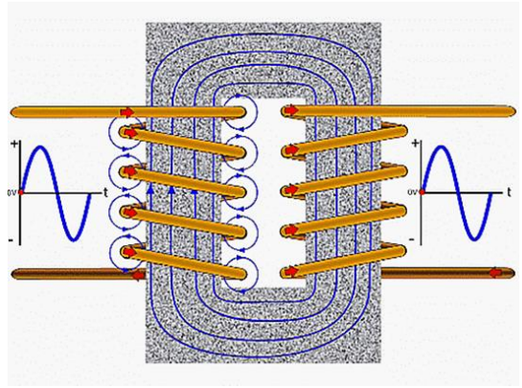
This is because the  : and the  lines interact..

If you keep the  moving , you get an

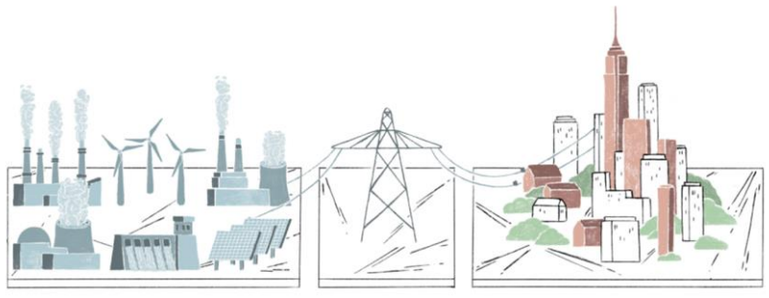
You can increase the by increasing the of the  , the of the movement and more turns in the 

The that is induced the change, trying to return things to the way it was.

Explain how an alternating current in one circuit can induce an alternating current in another circuit in a transformer.



Annotate the diagram to show the size of the potential difference at the production stage, the transmission stage and the domestic stage.



Describe the function of the step-up and step-down transformers.

Explain why, in the national grid, electrical energy is transferred at high voltages.

Explain why, in domestic uses, electrical energy is transferred at low voltages.

Explain where and why step-up and step-down transformers are used in the transmission of electricity in the national grid.

26	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$	N_P	Number of Turns on the Primary Coil	
		N_S	Number of Turns on the Secondary Coil	
		V_P	Potential Difference in the Primary Coil	
		V_S	Potential Difference in the Secondary Coil	

V_p	V_s	N_p	N_s	Step-up or step-down?
100	300	20		
400 000	25 000	40		
230	7.2		18	
12	240		50	
120		1000	250	
24		450	150	
	28	180	50	
	62	4600	230	

27	$V_p \times I_p = V_s \times I_s$	I_P	Current in the Primary Coil	
		I_S	Current in the Secondary Coil	
		V_P	Potential Difference of the Primary Coil	
		V_S	Potential Difference of the Secondary Coil	

V_p	V_s	I_p	I_s	Step-up or step-down?
	1003	3.1	1.3	
	31	0.5	3.45	
922		0.15	2.1	
500	5		2	
110	230		4.1	
128000	230		5.0	
6	24	3		
30	40	20.0		

CP14 and CP15 Revision Mat – Grade 4 - Grade 5

In the boxes below, use 9 particles to develop a diagram for solids, liquids and gases. Explain the different states of matter in terms of movement and arrangement of particles.

Explain the differences in density between the different states of matter using particle theory.

Explain what is meant by the conservation of mass.

Explain the difference between chemical and physics changes.

Explain how heating a system changes the energy stored in the system. Refer to heating and changing state in your answer.

Describe the terms “specific heat capacity” and “specific latent heat”.

Explain the difference between “specific heat capacity” and “specific latent heat”.

Explain the causes of gas pressure referencing particles.

Explain why heating a gas causes an increase in gas pressure.

Describe the term “absolute zero”.

Explain the difference between “specific heat capacity” and “specific latent heat”.

Convert these temperatures from °Celsius to Kelvin: 0°C, -12°C, 1400°C 7 and these temperatures from Kelvin to °Celsius: OK, 100K, 300K.

Explain why stretching, bending or compressing requires more than one force.

Describe the difference between elastic and inelastic distortion.

Describe the difference between linear and non-linear relationships between force and extension.

19

ρ	Density
m	Mass
V	Volume

ρ	m	V
	160	0.06
	10 000	0.5
3500		3.38
685		5.3
7700	60	
1900	0.0073	

ρ	m	V
	500	0.185
	0.5	4.1
11×10^3		0.032
1.2		3.5×10^5
2.1×10^9	8.4	
8.52×10^3	613	

- Density:
  a. Calculate the density of a piece of metal, mass 3000kg and volume 0.70m^3.
  b. What is the volume of 65kg of air with a density of 1.1kg/m^3?
  c. What is the mass of 3.0cm^3 of salt water if it has a density of 1 100kg/m^3?

20

e	Extension
F	Force Exerted
k	Spring Constant

e	F	k
	900	30
	0.5	40
3		2.5
0.8		400
180	60	
0.25	10	

e	F	k
	820	0.04
	10.4	28
0.037		43
0.04		30
79	16 000	
3.4×10^{-3}	40	

- Force and extension of a spring:
  a. Calculate the force needed to extend a spring with a spring constant of 20N/m by 0.020m.
  b. If a spring stretches by 0.020m when 26N is attached, what is the spring constant?
  c. A car's suspension has *four* springs, *each* with a spring constant of 1.2×10^5N/m. By how much will the car sink when an 900N passenger gets into the car?

28

$$E = m \times c \times \theta$$

θ	Change in Temperature
E	Energy Transferred
m	Mass
c	Specific Heat Capacity

E	m	c	θ
	2	4200	80
	100	2100	50
7200		900	4
7200		390	4
1600	0.3		35
9 000 000	15		17
450 000	5.8	130	
198 000	8.9	850	

29

$$E = m \times L$$

E	Energy Transferred
m	Mass
L	Specific Latent Heat

E	m	L
	70	1400
	5	334×10^3
80		500
195 800		1100
634 000	2.3	
950	0.38	

E	m	L
	0.018	2.3×10^6
	0.82	3.3×10^5
512		8540
115 000		22.6×10^3
756	0.03	
1.05×10^7	167	