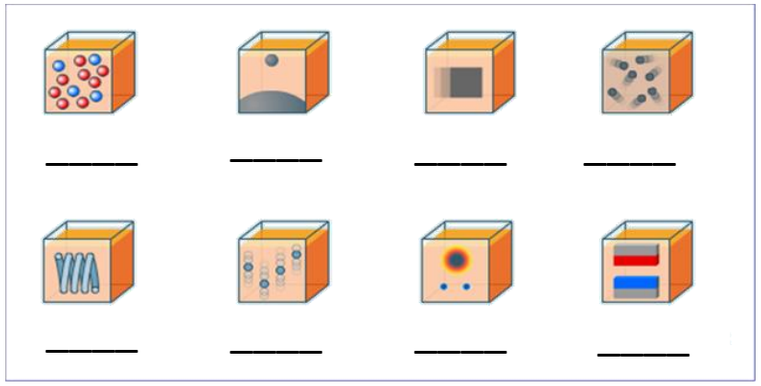
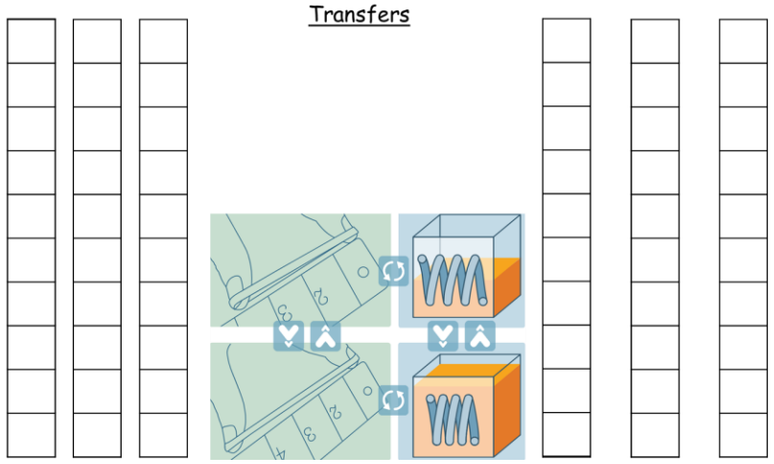
CP8 Revision Mat – Grade 4 - Grade 5



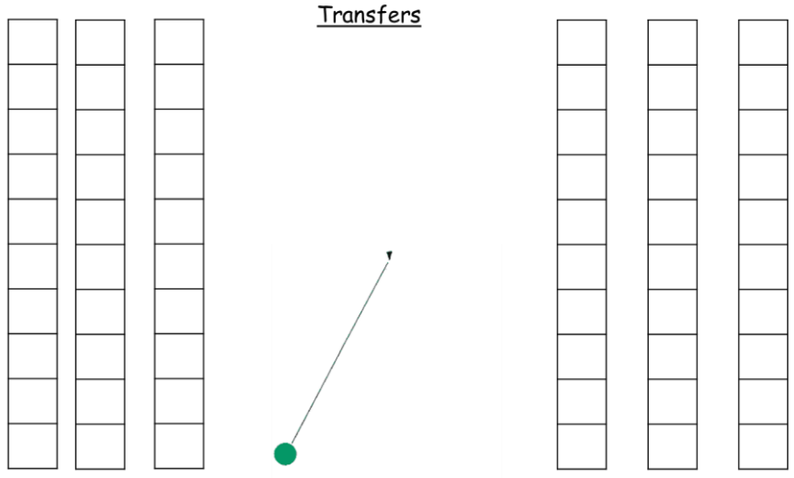
Describe the energy transfers in a stretching elastic band

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

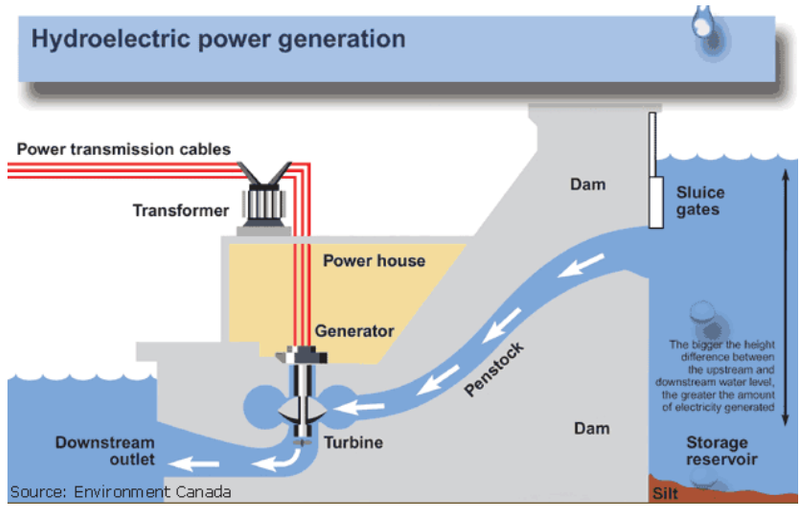


Describe the energy transfers in a swinging pendulum

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?

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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

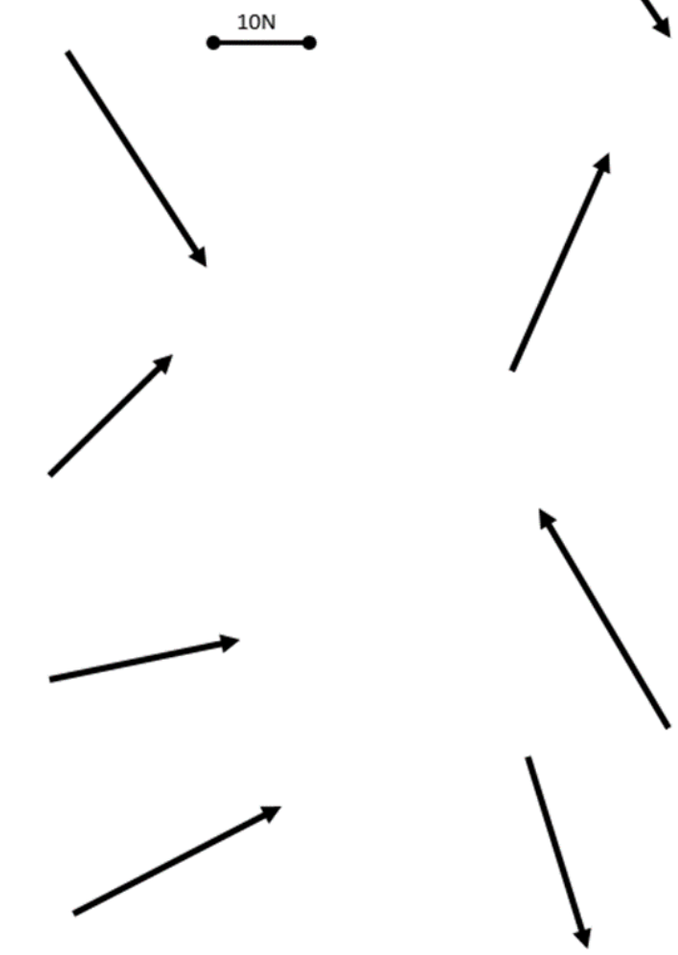
A mug resting on a table

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.

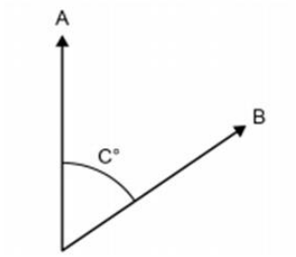
Resolve the forces below using the scale provided.



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:



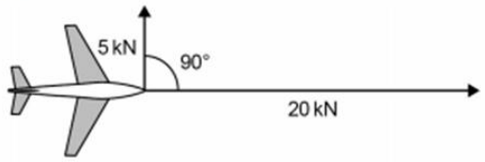
a A = 50 N, B = 25 N, C = 90°

b A = 100 N, B = 40 N, C = 60°

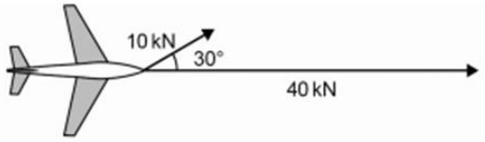
c A = 20 N, B = 50 N, C = 40°

2 The diagrams show aeroplanes flying in different wind conditions.

a



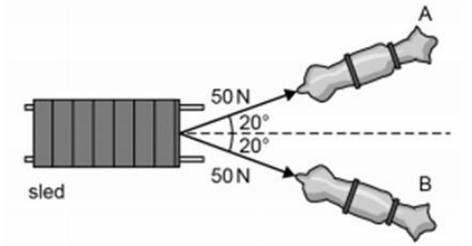
b



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.

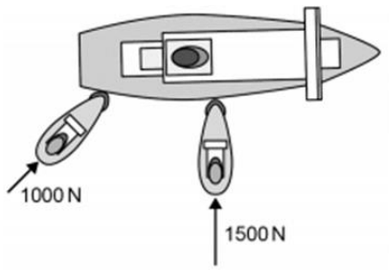


a Explain in which direction the resultant force is acting.

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°.

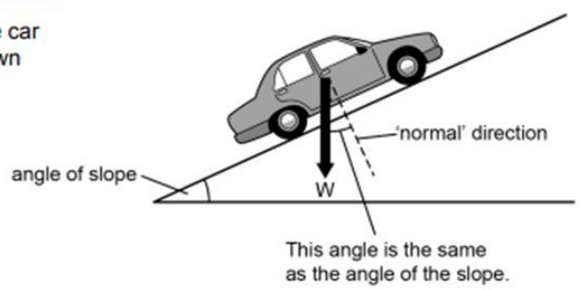


a What approximate size and in what approximate direction do you expect the resultant force to be? Explain your answer.

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.

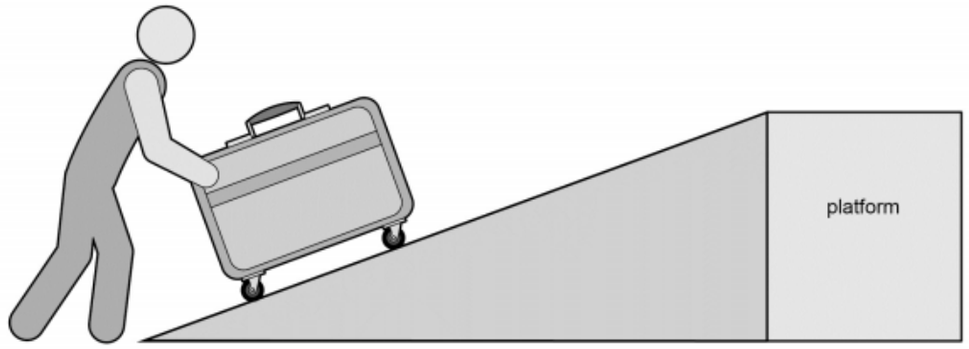
a Draw a sketch to show the slope and the direction in which the skier's weight is acting.

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°

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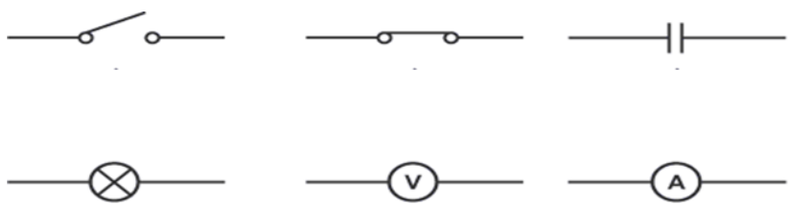
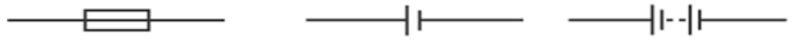
Describe the structure of the atom, including all the subatomic particles, their mass, charge and location.

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..

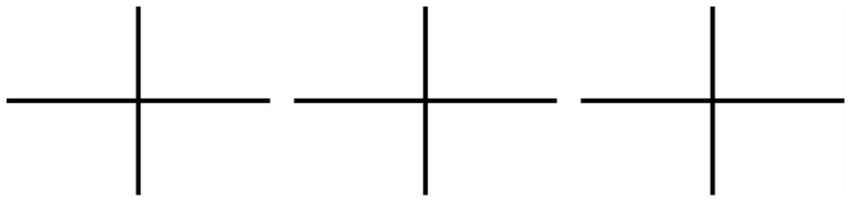
Name	Definition	Equation symbol	Unit	Unit Symbol
Energy transferred				
Charge flow				
Power				
Potential difference				
Resistance				
Charge flow				
Current				
Time				

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.

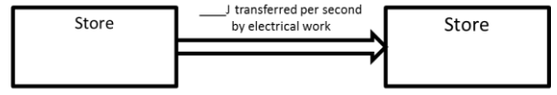
Explain the dangers of providing any connection between the live wire and earth.

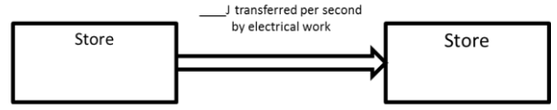
Describe the relationship between power ratings and the changes in stored energy when they are in use.

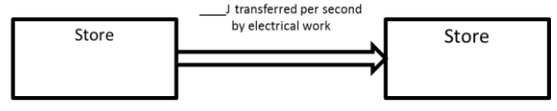
800W

1500W

500W







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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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		V	Potential Difference	

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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.
  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?

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0.8		15
0.4		2
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I	P	R
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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?

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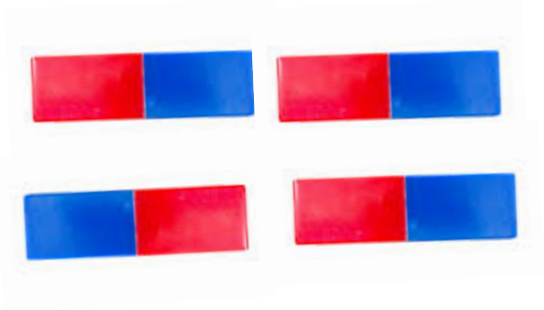
		E	Energy	
		V	Potential Difference	
		t	Time	

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.

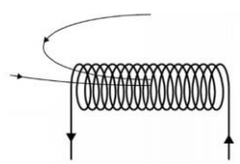
Describe how to show the shape of a magnetic field around bar magnet using a plotting compass and iron fillings.

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.

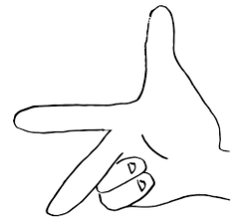
Annotate the diagram to show the shape of the magnetic field around a solenoid. Describe the shape and strength of the magnetic field.



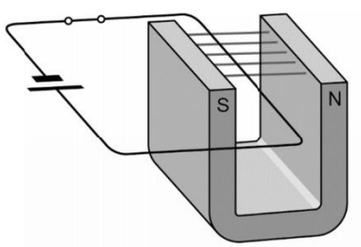
Describe the force interaction between a magnet and a current carrying conductor, refer to Newton's third law in your answer.

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.

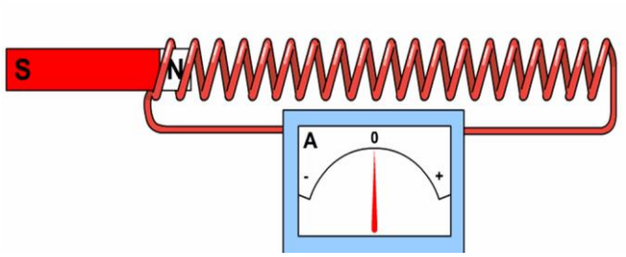


25	$F = B \times I \times l$	I	Current	
		F	Force on a Conductor in a Magnetic Field	
		l	Length	
		B	Magnetic Flux Density	

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

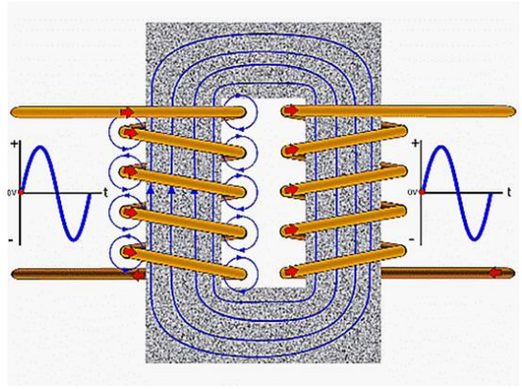
This is because the : and the lines interact..

If you keep the moving , you get an

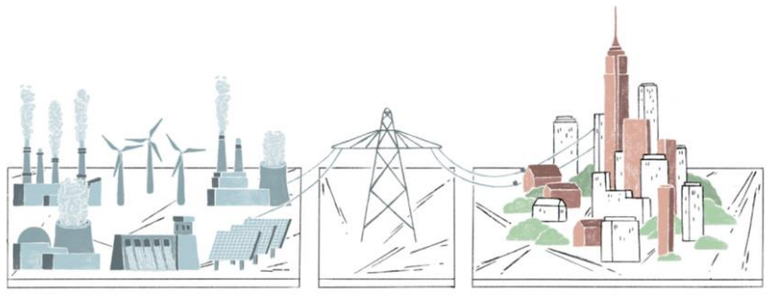
You can increase the by increasing the of the , the of the movement and more turns in the

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	