Year 7

Physics

revision pack

Contents:

Instructions:
1) When starting revising a big question use the short summary and your own knoweldge to make a spider diagram in the space provided. The practice questions for each big question are broken into sections.
2) Before starting the practice questions for a section read the pages in the self-study pack that are noted at the top of each section.
3) Attempt all the practice questions in your book or on lined paper.
4) Check the answers using the markscheme in a green pen. Add any missing information to your spider diagram.

Why do things move and change?

(A short summary of what we have learnt this year in answer to the big question above)

The motion of an object changes when a resultant force acts on it. Forces are pushes or pulls exerted by one object on another. Forces have size, measured in newtons, and direction. Forces are usually represented as arrows. Friction is a force that acts against motion and causes objects to slow down or stop.

Momentum describes how difficult it is to stop a moving object. Objects with a lot of momentum need large forces to stop them.

Physicists use the idea of “energy” to predict how much change is possible. Energy is transferred between different “stores” when a change happens.

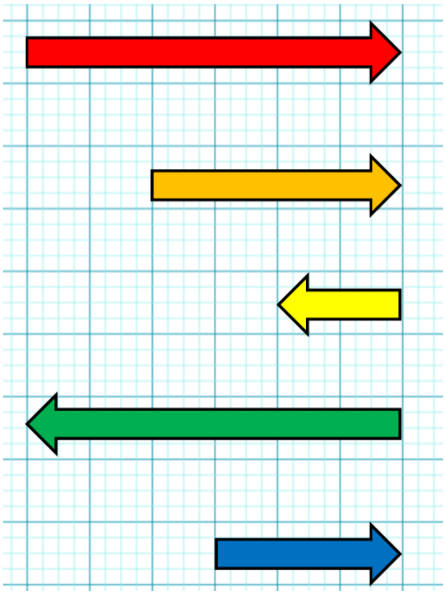
Task - Draw a spider-diagram summarising the information in the text above

Knowledge Practise & Application:

Practise questions to test your recall of important knowledge and ability to apply this knowledge. Italics note relevant self-study packs to refer to should you get stuck.

Part A: *P1 self-study pack – Lessons L01, L02 & L03*

1. What is the "motion" of an object?
2. What word describes how difficult it is to stop a moving object?
3. What piece of equipment is used to measure forces?
4. What are the units of force?
5. What is a force?
6. How does an arrow represent the size of a force?
7. How does an arrow show the direction of a force?
8. Where should a force arrow start (or finish) on an object?
9. What direction does an objects weight act in?
10. What force does a solid surface exert on an object that supports its weight?
11. How many forces are acting on an object which is "resting" on a solid surface?
12. Compare the size and direction of the weight and 'normal contact force' acting when an object is resting on a solid surface.
13. If an objects motion does not change the forces acting on it must be _____.



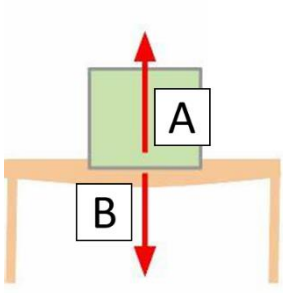
This question is on representing forces. One large box on the graph paper represents two newtons.

14. Which colour arrow(s) represent forces acting forwards?
15. Which colour arrow(s) represent forces with a size of 12 N
16. Which arrow(s) represent a force of 8 N?
17. Describe the force represented by the yellow arrow.
18. Describe the force represented by the blue arrow.

Two identical lorries are travelling down the road. Lorry A is travelling at 10 m/s, Lorry B at 2 m/s.

19. Which lorry is hardest to bring to a stationary stop?
20. Explain why.
21. Lorry B is then loaded with sand. What effect will this have on how difficult it is to stop at 2 m/s? Explain your answer.

The image shows a box on top of a table. The box is not moving.



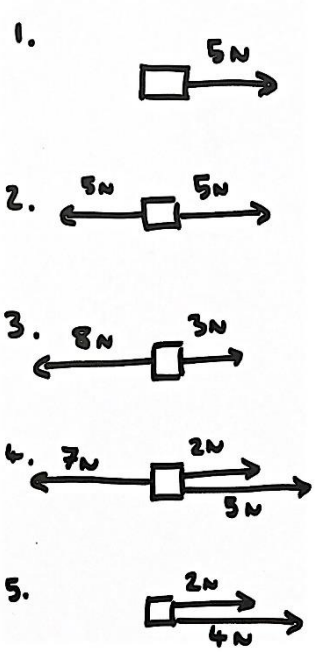
22. Name force A acting on the box
23. Name force B acting on the box.
24. Compare the size of force A and B.
25. Compare the direction of forces A and B.

Part B: *P1 self-study pack – Lessons L04 & L05.*

1. When is an object in “equilibrium”?
2. What happens to the motion of an object if the forces acting on it are balanced?
3. When does an object have a “resultant” force acting on it?
4. What two properties does a resultant force have?
5. Describe the motion of an object if it is stationary and the forces acting on it are balanced:
6. Describe the motion of an object if is moving and the forces acting on it are balanced:
7. Describe the change in motion of an object if the resultant force acting on it is in the same direction as it is moving:
8. Describe the change in motion of an object if the resultant force is in the opposite direction to its motion:
9. How might an object change even if the forces acting on the object are balanced?

The following diagrams (1-5) show forces acting on a box. Each box is stationary before the forces act. For each diagram:

10.
    a. Calculate the resultant force
    b. Decide whether each block move to the left, the right, or stay stationary?

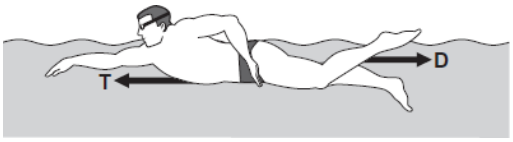


11. Calculate the resultant force of the speed boat:

12. A fisherman pulls a boat towards land. The forces acting on the boat are shown in the diagram. The fisherman exerts a force of 300 N on the boat. The sea exerts a resistive force of 250 N on the boat.

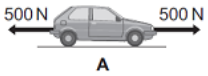
    a. Describe the motion of the boat.
    b. When the boat reaches land, the resistive force increases to 300 N. The fisherman continues to exert a force of 300 N. Describe the motion of the boat.
    c. Explain your answer to part (b).

13. The diagram shows the horizontal forces acting on a swimmer. The swimmer is moving at constant speed. Force **T** is 120 N.

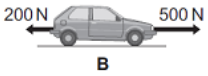


a. What is the size of force **D**?
b. By increasing force **T** to 140 N, the swimmer accelerates to a higher speed. Calculate the size of the initial resultant force acting on the swimmer.

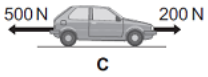
14. A car is being driven along a straight road. The diagrams, **A**, **B** and **C**, show the horizontal forces acting on the moving car at three different points along the road. Describe the motion of the car at each of the points, **A**, **B** and **C**.



A



B



C

Part C: *P1 self-study pack – Lessons L06, L07, L08 & L09.*

1. When is the force of friction present?
2. When an object is moving what direction will friction act in?
3. "A force is exerted on an object but can not move it". What force will be acting against that force?
4. Why does a pulling force need to be a certain size before an object starts moving?
5. What force usually causes moving objects to slow down?
6. Why can even smooth surfaces produce friction?
7. How do “bumps” on two surfaces cause the force of friction?
8. What can we use to reduce friction?
9. Which variable is the one scientists change in an investigation?
10. What do we call the variable scientists measure to judge the effect of the experiment?
11. What do you call variables scientists need to keep the same in an investigation?
12. Why do scientists need to control other variables to make an investigation valid (fair)?

A person is pushing a car.

13. To start with the person pushes the car but it does not move. Describe the forces acting on the car.
14. The person pushed harder and the car speeds up. Describe the forces acting on the car.
15. The person stops pushing and the car slows down. Describe the forces acting on the car.

Charlie is a car mechanic. During a cars service he applies oil to the moving parts of the engine.

16. Explain why the mechanic adds oil to the engine.

The mechanic wants to investigate which oil (Calor, BP, and Esso) is the best lubricant. He applies a 25 ml of each oil to a surface. He then uses a machine to push a plastic block with a force of 2 N. The further distance the block travels the better the lubricant. The table shows his results.

Type of Oil	Test 1 (cm)	Test 2 (cm)	Test 3 (cm)	Mean Average (cm)
Calor	2	3	4	3
BP	1	2	3	2
Esso	5	6	4	

17. Identify the independent variable.
18. Identify the dependent variable.
19. Identify two control variables.
20. Calculate the mean average for the Esso oil.
21. Explain why it is important the mechanic controls other variables.
22. What type of data is the type of lubricant. Explain your answer.

Part D: *P1 self-study pack – Lessons L10 & L11*

1. What do we call materials that can be used as source of energy?
2. What is an energy resource?
3. What happens to a fuel if it is used to produce motion?
4. What happens to the energy stored in a fuel when it is used to produce motion?
5. What unit is the energy transferred when a fuel is used is measured in?
6. When does a system store energy kinetically?
7. When does a system store energy gravitationally?
8. When does a system store energy chemically?
9. When does a system store energy thermally?
10. When does a system store energy elastically?
11. When does a system store energy electromagnetically?
12. When does a system store energy in a vibrational store?

A driver has the choice between two fuels for his car; Octane 91 and Octane 98. Octane 91 provides the car with 2000J per litre or Octane 98 2400 J per litre.

13. Explain why his car would move further with using Octane 98.

The questions below give some descriptions of objects. Identify the energy store for each.

14. A hot cup of tea
15. A moving car
16. A tennis ball stationary held above a persons head
17. A banana
18. A stretched elastic band
19. Two magnets repelling each other
20. A squashed spring inside a toy.
21. A battery inside an iPhone

For the following situations, describe the energy transfer involved.

22. A battery is used to heat up a radiator
23. A squashed spring pushes a ball high into the air
24. A moving ball crashes into a wall heating it up a little.
25. A moving ball gets hotter as it slows down.
26. A person jumps off a bridge and stretches a bungee jumping cord
27. A stretched bungee jumping cord springs back and lifts the person higher into the air
28. A scientist measures the energy stored in the initial and final store. In every case the final store is less than the initial store. Explain why.

Answers:

Part A:

1. How an object is moving
2. Momentum
3. Force meter / Newton meter
4. Newtons (N)
5. The push or pull one object exerts on another
6. The length of the arrow
7. Tip of arrow points in direction of force
8. Where a forces acts on an object
9. Down
10. Normal contact force
11. Two
12. Same size, opposite direction
13. Balanced
14. Red and Blue
15. Red and Green
16. Orange
17. 4 N backwards
18. 6 N forwards
19. Lorry A
20. It is travelling at a higher speed so has a higher momentum. Therefore it requires a greater force to stop.
21. It will make it harder as it has a higher mass so has higher momentum. Therefore it requires a greater force to stop.
22. Normal contact force
23. Weight
24. Equal size
25. Opposite direction

Part B:

1. Forces acting on it are balanced
2. There is no change in its motion
3. When the forces acting on it are unbalanced
4. Size and direction
5. Object remains stationary
6. Object remains at constant speed
7. Object speeds up
8. Object slows down
9. Shape of object might change

The following diagrams (1-5) show forces acting on a box. Each box is stationary before the forces act. For each diagram:

10.
    1) 5 N to the right
    2) 0 N stationary
    3) 5 N to the left
    4) 0 N stationary
    5) 6 N to the right

11. 950 N to the right/forwards
12. A fisherman pulls a boat towards land. The forces acting on the boat are shown in the diagram. The fisherman exerts a force of 300 N on the boat. The sea exerts a resistive force of 250 N on the boat.
    a. It speeds up towards the land / forwards
    b. Travels at a constant speed
    c. Resultant force is 0N and the boat is already moving so it object remains at a constant speed.
13. The diagram shows the horizontal forces acting on a swimmer. The swimmer is moving at constant speed. Force **T** is 120 N.
    a. 120 N
    b. 20 N
14. A - constant speed / velocity
    B - acceleration / speeding up
    C - deceleration / slowing down

Part C:

1. When an object moves over a surface (or when a force can not move an object)
2. Opposite direction to motion
3. Friction
4. Needs to be bigger than friction
5. Friction
6. Microscopic bumps on surface
7. Bumps of each surface exert a pushing force on the other surface.
8. Lubricant
9. Independent variable
10. Dependent variable
11. Control variables
12. Know the independent variable is the only thing effecting the results
13. Pushing force and friction are equal in size and opposite in direction
14. Pushing force is greater than friction and opposite in direction
15. Friction force is acting on the car and is greater than the driving force.

Charlie is a car mechanic. During a cars service he applies oil to the moving parts of the engine.

16. Oil acts as a lubricant.
    Liquid lubricant layer separates moving parts of engine slightly.
    So bumps push against each other less.
    Which reduces friction
17. Type of oil
18. Distance the block travels in cm
19. Force applied to the block / same type of block / volume of oil used / surface used.
20. 5 cm
21. To get valid data.
22. Discrete data as it can only take set values.

Part D:

1. An energy resource
2. Something that can be used as a source of energy
3. The fuel is used up
4. Energy is transferred
5. Joules
6. If objects are moving
7. If objects are higher then the lowest thing
8. If there are chemical substances which can react
9. If objects are hotter then the coldest thing
10. If springy objects are stretched or squashed.
11. If objects have opposite charges or poles that are attracting or repelling
12. If objects are moving back and forwards around a fixed point
13. Octane 98 are a larger source of energy than Octane 91.
    Because they can contain more chemicals
    This means they can transfer more energy to the car before the chemicals run out
    So the car will be able to move for longer
14. Thermal
15. Kinetic
16. Gravitational potential
17. Chemical
18. Elastic potential
19. Electrostatic
20. Elastic potential
21. Chemical
22. Energy is transferred from the chemical store of the battery to the thermal store of the radiator
23. Energy is transferred from the elastic store of spring to the gravitational store of ball
24. Energy is transferred from the kinetic store of ball to the thermal store of ball
25. Energy is transferred from the kinetic store of ball to the thermal store of ball
26. Energy is transferred from the gravitational store of person to the elastic store of bungee cord
27. Elastic store of bungee cord to the gravitational store of person
28. Some energy is always transferred to the surroundings

How does energy and information spread?

(A short summary of what we have learnt this year in answer to the big question above)

Humans can “detect” information about the world using our eyes and ears. We hear sound because vibrations can travel from vibrating sources through the particles in solids, liquids, and gases to our ears. Vibrations can travel through a medium as particles bump into each other passing along the vibrations. Sounds become quieter the further from the source the detector is. This is because sound radiates out from a source and becomes more spread out making the vibrations smaller.

We can “see” objects because light radiates out from luminous sources and scatters off objects into our eyes. Light is a form of radiation which travels as rays in straight lines from a source. Light radiates in all directions from a source. The nearer you are to a source of light the brighter it seems. This is because as light rays travels away from the source they spread out so the source seems dimmer (less bright).

Humans can see sources of light because rays hit the retina at the back of the eye and are detected. We see in colour because “white” light is made of different colours of light. Most objects only reflect certain colours from white light so “appear” to be the colour of light they reflect.

Task - Draw a spider-diagram summarising the information in the text above

Knowledge Practise & Application:

Practise questions to test your recall of important knowledge and ability to apply this knowledge. Italics note relevant self-study packs to refer to should you get stuck.

Part A: *P2 self-study pack – Lessons L01, & L02.*

1. What does a source of sound do to produce a noise?
2. What is passed between particles as a sound travels through a medium?
3. Large vibrations produce a _____ sound
4. Fast vibrations produce a _____ sound
5. Does sound travel fastest through solids, liquids or gases?
6. Does sound travel slowest through solids, liquids or gases?
7. Why can't sound travel in a vacuum?

8. Copy and complete the sentences:
   Sound is produced by objects that are … This makes the air molecules … and produces a sound wave. Sound travels fastest in … and slowest in …, and it cannot travel through a …
9. True or false. Light can travel through a vacuum.
10. Rank the following states of matter in terms of the speed at which sound can travel through them (fastest -> slowest)

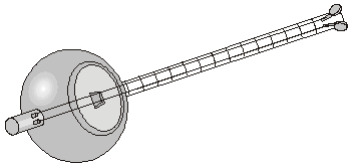
Solid, Liquid, Gas.

11. Explain why sound travels slower in a gas compared to a solid.

Astronauts who have landed on the Moon had to wear spacesuits. The spacesuits were filled with air because there is a vacuum on the Moon. The astronauts had radios in their helmets. Without the radios, they could not hear each other speaking.

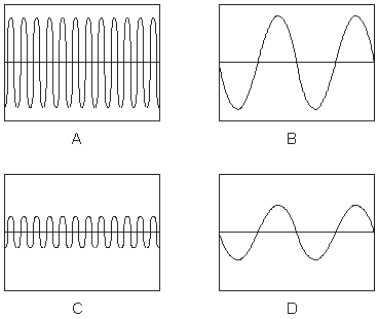
12. Why does sound not travel on the Moon?
13. If the radios broke, the astronauts could put their helmets together so that they touched. Then they could hear each other's voices. Why could they hear each other's voices when their helmets were touching?

The dotar is a musical instrument with two strings. Aftal plays the dotar very quietly.



14. What must he do to the strings to make a louder sound?
15. Aftal makes the strings tighter so they vibrate more quickly. How does this affect the sound produced by the strings?
16. One of the strings is thicker than the other, so it vibrates more slowly. In what way is the sound made by the thicker string different from the sound made by the thinner string?

17. Aftal played the dotar near a microphone connected to an oscilloscope (a machine that produces a graph of the sound). The diagrams below show the patterns made by four sounds.
    a. How does the sound shown in trace A differ from the sound in trace B?
    b. How does the sound shown in trace A differ from the sound in trace C?



Part B: *P2 self-study packs – Lessons L03, L04, & L05.*

1. Describe how light travels
2. What word describes an object that light can not pass through?
3. Describe how shadows form
4. What word describes an object that light can travel through
5. How does light "radiate" from a source?
6. Describe what happens when light reaches an opaque object
7. Explain why light appears brighter close to a source
8. Objects that produced their own light are called _____ objects
9. What type of surfaces can produce a "reflected image"?
10. Describe what happens when light hits a rough ("non-reflective") surface.
11. Describe what happens when light hits a smooth ("reflective") surface
12. Copy and complete:
    Light is produced by a **source/detector** and radiates out in **one/all** directions. The light radiation can only travel in **straight/curved** lines and **can/can not** bend around objects.

Some primary school children are playing outside at breaktime. The image shows a shadow produced by some children.

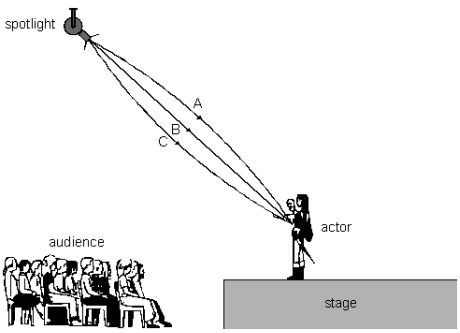
13. Explain how the shadow is produced.

The list below is of everyday items.

The sun, bricks, windows, wood, water, torch.

14. Identify the luminous object(s) in the list
15. Identify the opaque object(s) in the list
16. Identify the transparent object(s) in the list

An actor is on a stage in a theatre. A spotlight is shining on him. A ray of light travels from the spotlight to the actor.



17. Which line shows the ray? Give the correct letter.
18. Explain your answer.

Two friends are walking towards McDonalds at night-time. They notice that the yellow sign appears brighter the closer they get.

19. Explain to the boys why this is the case.

The image shows a perfectly still lake. In the lake you can see a reflected image of the sun.

20. Explain why you can see the reflected image
21. Explain why would happen if the wind got up and the water started to become choppy (not smooth).

Part C: *P2 Topic – L06, L07, L08, L09 & L10.*

23. Name the part of the eye that allows light to pass through
24. Describe how we see luminous objects
25. Describe how we see non-luminous objects
26. Which part of the eye detects light?
27. Name the three primary colours of light
28. How can white light be produced?
29. What happens to brightness when light sources are combined?
30. What colour is sunlight?
31. What can be used to split white light into a spectrum?
32. How do scientists prove their ideas?
33. What colours do black objects reflect?
34. What colours do white objects reflect?
35. What colour will a white object appear in different colours of light?
36. What colour will a black object appear in different colours of light?
37. Why does an object appear coloured?
38. When does a coloured object appear black?

Charley is experimenting with combining different primary colours of light.

39. Using your knowledge, complete the table to predict the results of her experiments.

Colour of light 1	Colour of light 2	Colour of light 3	Colour of mixed light	Change in brightness
Red	Green			
Red	Blue			
Blue	Green			
Blue	Green	Red		

40. The image shows a rainbow.

Describe how rainbows form.

Different objects are light up.

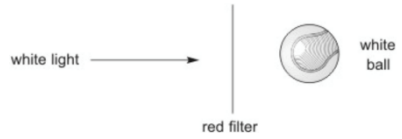
41. Complete table identifying colour of the objects in different lights. Give a reason for each answer.

Object:	**Colour of Light:**	**Colour object appears to us:**	**Explanation:**
White Car	White		
Black Car	White		
White Jumper	Blue		
Black pen lid	Blue		
Black football	No light		
White football	No light		

Peter had two different coloured tennis balls as shown below. He shone white light through a red filter onto each ball.

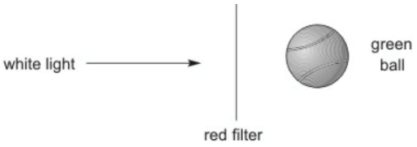
Experiment 1

42. The white ball appeared red. Explain why this ball appeared red.

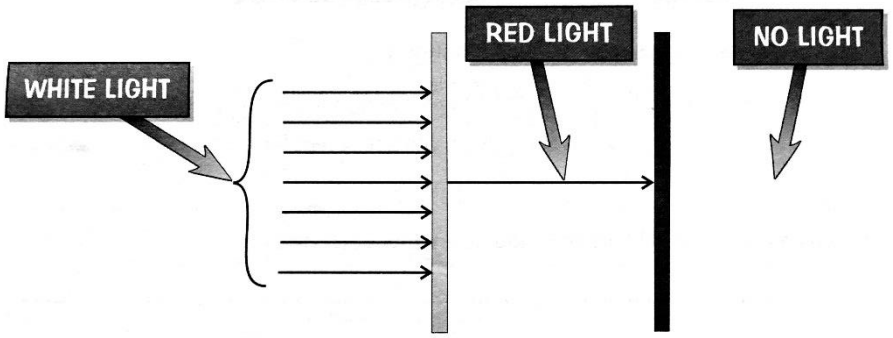


Experiment 2

43. What colour did this ball appear? Explain your answer.



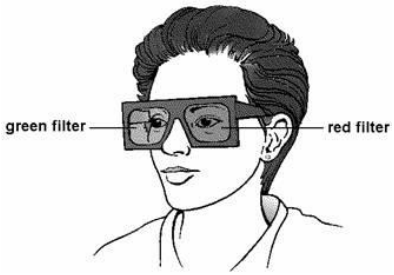
The diagram below shows light encountering two colour filters.



44. What colour is the first filter?
45. What do you know about the colour of the second filter?

Jane puts on a pair of special glasses as shown below. The glasses have coloured filters in them.

46. Jane looks at a lamp through the green filter. The lamp gives out white light, but appears to be green. Explain how this is possible.
47. Jane looks at a red lamp. What colour will the lamp appear to Jane, if she looks at it through the red filter? Explain your answer.
48. What colour will the lamp appear to Jane, if she looks at it through the green filter? Explain your answer.



Answers:

Part A:

1. Vibrate
2. Vibrations
3. Large vibrations produce a **loud** sound
4. Fast vibrations produce a **high pitched** sound
5. Solids
6. Gases
7. There are no particles to vibrate.
8. Vibrating, Vibrate, Solids, Gas, Vacuum.
9. True
10. Solid -> Liquid -> Gas
11. Particles are closer together in solids & liquids.
    So vibrations are passed on faster
12. Sound does not travel in a vacuum
13. The sound can travel from one helmet to the other without passing through a vacuum
14. Pluck them harder ('make the strings vibrate more or move more')
15. The sound has a higher pitch
16. The sound from the thicker string has a lower pitch
17.
    a. The sound in A has a higher pitch
    b. The sound in A is louder

Part B:

1. As rays in straight lines
2. Opaque
3. When light from a source cannot pass through an opaque object
4. Transparent
5. Straight lines in all directions
6. Some light bounces off scattering in all directions
7. Light from the source is less spread out
8. Objects that produced their own light are called **luminous** objects
9. Very smooth surfaces
10. Light is reflected in all directions (scattered)
11. Light is reflected off at the same angle
12. Light is produced by a **source** and radiates out in **all** directions. The light radiation can only travel in **straight** lines and **can not** bend around objects.
13. The light source (the sun) send out rays of light in straight lines.
    The light rays that do not get blocked by the children light up the floor behind them.
    The light rays that hit the opaque children are blocked by it and can not travel through it.
    The area the light rays do not shine on looks dark and is called a shadow.
14. Sun and torch
15. Bricks, wood, torch, sun
16. Water, windows
17. B
18. Light travels in straight lines
19. The light source (the light bulbs) send out rays of light radiation in straight lines in all directions.
    Far away from the McDonalds sign the lights appear dimmer because the light is more spread out
    As the friends gets closer to the sign the light is less spread out so it appears brighter.
20. The water is a really shiny surface
    So most of the light rays from a source bounce off (or reflect) at the same angle.
21. The water becomes a rough surface
    So the reflected light is scattered in all different directions.
    Water like this means the light from the source goes in all different directions so no image is produced.

Part C:

1. Pupil
2. When some of the light produced by them enters the eye
3. When some of the light scattered off them enters the eye
4. Retina
5. Red, blue and green
6. Combining red, blue and green light
7. Increases
8. White
9. Prism
10. Carry out experiments & collect evidence
11. None (they absorb all colours of light)
12. All colours of light
13. The same colour as the light
14. Black
15. They reflect some colours of light and absorb all the other colours of light
16. If the colour of light shone on them is one that they do not reflect.
17.

Colour of light 1	Colour of light 2	Colour of light 3	Colour of mixed light	Change in brightness
Red	Green		Yellow	Increase
Red	Blue		Purple (Magenta)	Increase
Blue	Green		Cyan / Light Blue	Increase
Blue	Green	Red	White	Increase

18. Light passes through drops of water.
    Water drops act as prisms
    Splitting light into all the colours of the spectrum.
19.

Object:	**Colour of Light:**	**Colour object appears to us:**	**Explanation:**
White Car	White	**White**	**White objects reflect all colours of light**
Black Car	White	**Black**	**Black objects absorb all colours of light**
White Jumper	Blue	**Blue**	**White objects reflect blue light**
Black pen lid	Blue	**Black**	**Black objects absorb blue light and do not reflect any light**
Black football	No light	**Does not appear**	**No light so no light reflected off object into eye.**
White football	No light	**Does not appear**	**No light so no light reflected off object into eye.**

20. Only red light passes through the filter and the ball reflects red light
21. Black because the green ball does not reflect red light or the light that passes through the filter
    Or the ball absorbs red light
22. Red
23. It must not be another red filter
24. All the other colours are absorbed apart from green.
25. Red because red light passes through the filter
26. Black because red light will not pass through
    Or a green filter absorbs red light

What is matter?

(A short summary of what we have learnt this year in answer to the big question above)

All matter is made of particles that are constantly moving. This is called the kinetic particle model. Physicists use the kinetic particle model to explain how materials behave.

The temperature of a material measures how fast the particles in a material are moving. Hot materials transfer energy to cooler materials. This happens because fast moving particles collide with, and transfer energy to, slower moving particles. Objects that have a high temperature feel “hot” when we touch them. This is because the faster moving particles are colliding with particles in our skin and transferring energy to them.

Objects that are hotter than the coldest thing store energy thermally. Objects that are hotter than their surroundings will dissipate their energy as they cool. They will cool until they are the same temperature as the surroundings. The temperature of the surroundings will increase a little.

Task - Draw a spider-diagram summarising the information in the text above

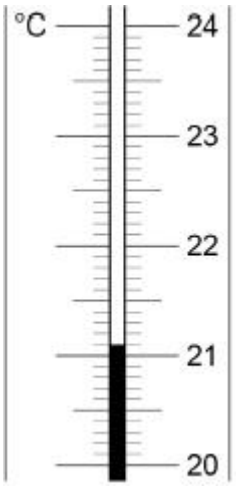
Knowledge Practise & Application:

Practise questions to test your recall of important knowledge and ability to apply this knowledge. Italics note relevant self-study packs to refer to should you get stuck.

Part A: *P3 self-study pack – Lessons L01, & L02.*

1. What does temperature measure?
2. What do we use to measure temperature?
3. What are the units of temperature?
4. What happens to the particles in a solid as it gets hotter?
5. What happens to the particles in a liquid or gas if it gets hotter?
6. Why do hot objects "feel" hot if we touch them?
7. What happens to the size of an object as it gets hotter?
8. Why do objects expand when they are heated?

Students are investigating how hot water will get if left in direct sunlight.
The image shows a thermometer.



9. The units have been rubbed off the thermometer. What units should be on this?
10. The thermometer is placed into a beaker of water. What is the temperature of the water?
11. The water is left out in the sun. The highest temperature reached was 35.5 °C Determine the temperature change of the water.
12. Explain why the thermometer reading went up as the water temperature increased.
13. Explain why the water temperature increases when it is heated by the sun.

A chef is cooking some pasta. He accidently touches the boiling water as he places the pasta into it. He burns his hand.

14. Explain why he burns his hand when touching the water.

Tommy is on holiday with his family. He leaves his beach ball out in the sun when having lunch. When he returns he notices that it feels more inflated (harder to compress). The temperature of the gas particles inside the beach ball has increased.

15. Explain why the beach ball feels more inflated.

Part B: *P3 self-study pack – Lessons L03, L04, & L05.*

1. What is transferred when a hot object heats a cooler object?
2. How is energy transferred by particles when an object is cooling?
3. A _____ object will always heat a colder object.
4. What will happen to an object that is hotter than its surroundings?
5. What does a material having a "high thermal conductivity"
6. mean?
7. Do insulators have a high or low thermal conductivity?
8. What does the thermal store of energy measure?

Hannah makes a cup of tea. It has a start temperature of 100 °C. She then gets distracted by her phone and forgets to drink it. 30 minutes later it has a temperature of 18 °C, this is the same temperature as the air.

9. Explain why the temperature of the tea decreases over time
10. Calculate the temperature change of the cup of tea over 30 minutes.
11. Explain why the tea stops cooling when it reaches the same temperature as the air.
12. Hannah then repeats this experiment this time measuring the tea after 10 minutes. She notices the temperature is 40 °C. What has the tea decreased a lot in temperature in the first 10 minutes?
13. The experiment is completed again using an insulated mug. Predict if the final temperature will be higher or lower than in the first experiment.

The table below shows the time it takes for 3 objects to be heated to 200 °C above a Bunsen burner. The three objects are metals or non-metals.

Object:	**Time taken to heat to 200 °C (s)**
A	90
B	45
C	670

14. Which object(s) are metals?
15. Which object(s) are non-metals?
16. Explain why metals are better conductors of heat than non-metals.
17. Predict why object B heats up to 200°C quickest.

Mohammed is buying a new sauce pan.

18. Explain why lots of the saucepans are made of copper
19. Explain why lots of the saucepans have plastic handles.

The image shows four cups of tea (A-D).

20. Compare A and B.
    a. Which tea has the higest temperature? Explain your answer.
    b. Which tea has the most thermal energy? Explain your answer.
21. Compare C and D.
    a. Which tea has the higest temperature? Explain your answer.
    b. Which tea has the most thermal energy? Explain your answer.
22. Compare B and C.
    a. Which tea has the higest temperature? Explain your answer.
    b. Which tea has the most thermal energy? Explain your answer.

35 °C

Small tea – 65 °C

65 °C

large tea – 65 °C

Answers:

Part A:

1. How fast particles are moving
2. Thermometer
3. Degrees Celsius
4. Particles vibrate faster
5. Particles move faster
6. Particles transfer energy. As fast moving particles collide with particles in our skin
7. It expands
8. Particles move faster. So take up more space
9. °C
10. 21.1°C
11. 14.4 °C
12. The bulb of a thermometer is placed in the water.
    The particles in the water crash into the particles in the thermometer transferring energy
    The particles in the thermometer start to move around faster and take up more space
    The liquid expands and moves down the hollow tube. Explain why the water temperature increases when it is heated by the sun.
13. If a liquid is heated its particles gain energy and start moving faster.
    If the particles are moving faster the material is hotter.
    Temperature measures the “hotness” of a material in degrees Celsius.
    Temperature is a measure of how fast particles are moving.
14. Particles in water are moving over each other quickly
    As water is at a high temperature
    Water particles will crash into particles in hand with a lot of force.
    Transferring energy and will damage skin
15. The temperature of the gas particles has increased.
    This means they are moving faster
    So take up more space
    Therefore the beach ball feels more inflated.

Part B:

1. Energy
2. Faster moving particles collide with slower moving particles (and transfer energy)
3. A **hotter** object will always heat a colder object.
4. It will cool down (until it is the same temperature as its surroundings)
5. The material can conduct energy quickly when heated
6. Low thermal conductivity
7. The number of particles in an object and how fast the particles are moving

Hannah makes a cup of tea. It has a start temperature of 100 °C. She then gets distracted by her phone and forgets to drink it. 30 minutes later it has a temperature of 18 °C, this is t he same temperature as the air.

8. Tea starts at much higher temperature then air
   So the water particles moving fast and have a large store of energy.
   Water particles crash into slower moving air particles and transfer energy.
   Water particles have less energy so start moving a little slower, whereas air particles gain energy and move a little faster
   Particles colliding into each other slowly transfers more and more energy to the air
   Until the water is the same temperature as the air.
   We call this process dissipation (slowly losing energy to the surroundings by heating)
9. 72 °C
10. Temperature is equal to transfer of thermal energy stops.
11. The rate of cooling slows down as the temperature difference decreases. Therefore in the first 10 minutes more energy transfer and therefore cooling happens.
12. It will be higher.
13. A and B
14. C
15. They have free electrons, which can move around transferring energy between particles very quickly
16. It has more free electrons than A.
17. Copper is used for frying pans as it is a good conductor.
    Copper has a high thermal conductivity because it can conduct energy quickly.
    Copper can conduct electricity quickly because it has free electrons.
    Free electrons can move around the material transferring energy between particles.
18. Plastic is used in handles as it is a good insulator
    It is a good insulator because it has a low thermal conductivity as it conducts energy slowly.
    Plastic does not contain free electrons
    So energy is only transferred by particles that are vibrating quickly colliding with the particles they are next to.
19.
    a. B because it has a higher degrees celcius value.
    b. B because the two objects are the same size, but B is hotter so will store more energy thermally.
20.
    a. Both the same value for temperature measured in degrees celcius.
    b. D because it has a higher mass, the larger an object the more particles it contains and therefore more energy it stores.
21.
    a. Both the same value for temperature measured in degrees celcius.
    b. B because it has a higher mass (more tea), the larger an object the more particles it contains and therefore more energy it stores.