

Units

Q: 1 What is speed measured in?

A: m/s



Units

Q: 2 What is acceleration measured in?

A: m/s^2
Metres per second squared



Units

Q: 3 What are work, kinetic energy, gravitational potential energy, energy transferred measured in?

A: J
Joules



Units

Q: 4 What is momentum measured in?

A: kgm/s



Units

Q: 5 What is power measured in?

A: W
Watts



Units

Q: 6 What is resistance measured in?

A: Ω
Ohms



Units

Q: 7 What is charge measured in?

A: C
Coulombs



Units

Q: 8 What is potential difference measured in?

A: V
Volts



Units

Q: 9 What is current measured in?

A: A
Amps



Forces

Q: 10 Explain why making a car more streamlined has an effect on its top speed.

A: Air resistance will decrease so a higher speed is reached before the resultant force is zero.



Forces

Q: 11 What two forces cause a motor boat to move?

A: The force from the water on the boat in the forward direction and the force from the propeller of the boat on the water in the opposite direction.



Forces

Q: 12 What is meant by the term resultant force?

A: A single force that has the same effect as all the forces combined/ the overall force



Forces

Q: 13 When an aircraft moves along the runway to take off, its acceleration decreases although the push of the engine remains constant. Why?

A: As speed increases, air resistance increases reducing the resultant force



Forces

Q: 14 When the motor inside a toy is switched off, the toy starts to accelerate downwards. What happens to the momentum of the toy and why?

A: Increases as the velocity increases.



Forces

Q: 15 Explain why a toy accelerates upwards when the fan inside the toy rotates faster.

A: Because there is a greater change in momentum as the velocity of the air increases so the upward force increases and is greater than the downward force.



Forces

Q: 16 Explain why objects are wrapped in polystyrene for protection.

A: When the object is dropped the polystyrene increases the time to stop which decreases the rate of change of momentum and therefore the force on the object.



Forces

Q: 17 How is velocity different from speed?

A: Velocity includes direction, velocity is a vector



Forces

Q: 18 When a tube is filled with air, a coin inside the tube will fall faster than a piece of paper. Why?

A: Air resistance has a greater effect on the paper.



Forces

Q: 19 The forward force on a tractor is exactly balanced by the resisting forces on the tractor. Describe the motion of the tractor.

A: Tractor is moving at constant speed.



Forces

Q: 20 Describe how the horizontal forces acting on a car change during the first 2 seconds of acceleration.

A: driving force increases, friction forces increase, the driving force is bigger than friction



Forces

Q: 21 Using the idea of forces explain why a parachutist reaches terminal velocity.

A: Leaving plane: weight only force. Air resistance increases. Weight > air resistance so accelerates downwards. When air resistance = weight, terminal velocity reached.



Forces

Q: 22 Using the idea of forces explain what happens when a parachutist opens his parachute.

A: The open parachute increases the surface area so air resistance increases as well. Air resistance is now > weight, so the velocity decreases. When weight = air resistance again a new, lower terminal velocity has been achieved.



Forces

Q: 23 Define braking distance.

A: The distance a vehicle travels before stopping, once the brakes are applied



Forces

Q: 24 Name two resistive forces that act on a vehicle.

A: Air resistance, friction between tyres and the road



Forces

Q: 25 State factors that affect thinking distance.

A: Tiredness, alcohol, drugs, speed, age, using a mobile phone, visibility (weather)



Forces

Q: 26 State factors that affect braking distance.

A: Icy or wet road, worn tyres, road surface, mass of car, speed of car, brakes are in bad condition



Forces

Q: 27 Why does applying the brakes increase the temperature of the brakes?

A: Friction between brakes and the wheel transfers kinetic energy to thermal energy



Forces

Q: 28 State & explain the benefits of a regenerative braking system (system that slows car down and recharges the car battery in a hybrid car).

A: the range of the car is increased, the efficiency of the car is increased as the decrease in kinetic energy is not converted to thermal energy but work is done to charge the battery.



Forces

Q: 29 When you slide down a slide, your speed at the bottom of the slide is much less than the calculated value. Why?

A: Work is done against friction as the slide is not smooth. Kinetic energy is therefore transferred to thermal energy.



Forces

Q: 30 Explain why the top speed of a car is higher than the top speed of a van.

A: Top speed is reached when forward force = drag force (air resistance/friction). The drag force of a car is smaller due to it being more streamlined. Drag force = forward force for the car at higher speed.



Forces

Q: 31 How can the velocity of a car change although the speed remains constant?

A: Because the direction is changing



Forces

Q: 32 During a collision the front end of a car becomes buckled. Why is such a collision described as inelastic?

A: In an inelastic collision, kinetic energy is lost. Here it does the work to crumple the car.



Forces

Q:33 A car cannot accelerate above a certain maximum speed. Why not?

A: there is a maximum forward force when you push the accelerator pedal. Air resistance increases with speed until it is equal to the forward force so there is no net force.



Forces

Q: 34 In terms of force and deceleration, what would happen if a climber, who used a non-elastic rope, fell?

A: deceleration would be great, because force = mass x acceleration. The force on the climber would be great. The rope might exceed its elastic



Forces

Q: 35 Define direct proportionality.

A: Straight line through the origin



Q: 36 Bent metal ruler, stretched elastic band, springs on a playground ride, moulded plastic model- which objects are storing elastic potential energy? Explain your answer.

A: Elastic band and springs because they will go back to their original shape



Forces

Q: 37 How much momentum does a car have when it stops at a traffic light?

A: Zero, as its velocity is zero



Forces

Q: 38 Crash test dummies are fitted with electronic sensors. Why?

A: To measure the forces exerted on the dummies during a collision



Forces

Q: 39 What is meant by the phrase 'momentum is conserved'?

A: Momentum before a collision = momentum after a collision



Forces

Q: 40 In a collision, momentum is not always conserved. Why?

A: An external force acts on the colliding objects



Forces

Q: 41 Explain why air bags reduce the risk of the driver sustaining serious head injuries.

A: air bags reduce the time taken for the head to stop so decrease the change in momentum and reduce the force on the head



Forces

Q: 42 If the speed of a car doubles, the amount of energy transferred in a collision quadruples. Why?

A: greater speed means greater kinetic energy ($\frac{1}{2} \text{ mass} \times \text{velocity squared}$). $2 \text{ squared} = 4$, so the value for the kinetic energy quadruples



Forces

Q: 43 Define momentum.

A: product of mass and velocity



Forces

Q: 44 Why is it easier to drag an object up a ramp instead of lifting it?

A: You only work against a component of gravity, not the direct force.



Forces

Q: 45 Could a skydiver ever hover in calm weather conditions?

A: no, as terminal velocity cannot be eliminated, only reduced.



Electricity

Q: 46 What is the frequency of the mains electricity supply in the UK?

A: 50Hz



Electricity

Q: 47 Give an advantage of using a RCCB to switch off a circuit rather than a fuse.

A: Faster acting, can be reset



Electricity

Q: 48 How does an increase in temperature affect a thermistor?

A: Increase in temperature decreases resistance of thermistor



Electricity

Q: 49 What is the difference between ac and dc current?

A: The dc flows in one direction, the ac changes direction twice per cycle



Electricity

Q: How do a fuse and the earth wire protect against an electric shock in a faulty metal kettle where the metal casing becomes live?

A: A current flows from the live wire to the earth wire and this current causes the fuse to melt



Electricity

Q: 51 Describe the structure of a cable that is used to connect a hob to the mains electricity supply.

A: cable must contain a live, neutral and earth wire and should be insulated with plastic



Electricity

Q: 52 Define electric current.

A: Flow of charge/ electrons



Electricity

Q: 53 Define potential difference.

A: work done or energy transferred per coulomb of charge
 $V = W/Q$



Electricity

Q: 54 Why does the resistance of a light bulb increase with p.d.?

A: Metals contain ions and free electrons. As temperature increases, ions vibrate faster and the electrons collide more often with the ions so their velocity decreases



Electricity

Q: 55 Why is it dangerous to use a piece of aluminium as a fuse?

A: A large current will flow through aluminium metal but the aluminium will not melt so the wiring in the appliance might overheat and cause a fire



Electricity

Q: 56 Why do your hairs stand on end when you are connected to the Van de Graaff generator?

A: Because each hair has the same negative charge and negative charges repel



Electricity

Q: 57 What name is given to the rate of flow of charge?

A: Current



Electricity

Q: 58 Explain why it is a good idea for electricians to wear boots with rubber soles.

A: Rubber is a good insulator and it increases the overall resistance so gives a smaller shock



Electricity

Q: 59 From a safety point of view, is 50Hz a suitable frequency?

A: No, as this frequency is the lowest current at which people cannot let go.

Or

Yes, changing the frequency changes the current only by a small amount.



Electricity

Q: 60 Fine powders poured through a pipe can become negatively charged. How?

A: Friction between powder and pipes causes electrons to transfer from the pipe to the powder



Electricity

Q: 61 Place a charged rod on an insulated balance. Take a second charged rod and hold it above the rod on the balance. The reading on the balance increases. Why?

A: The two rods repel, creating a downwards force on the rod that is placed on the balance



Electricity

Q: 62 Define double insulated.

A: The case of an appliance is made of plastic and there is no connection between the inner and outer insulated parts of the appliance.



Electricity

Q: 63 How do you calculate the total resistance of two resistors in series?

A: Addition of both resistance values



Electricity

Q: 64 What is the mains pd in the UK?

A: 230V



Electricity

Q: 65 What are the colours of the live, earth and neutral wire inside a 3 pin plug?

A: Live is brown, earth is yellow and green and neutral is blue



Electricity

Q: 66 An appliance requires 5A. What size fuse do you use-1,3, 5 or 13A?

A: 13A



Electricity

Q: 67 How does the resistance of an LDR change with light intensity?

A: The higher the light intensity the lower the resistance



Electricity

Q: 68 How does a spray gun work which is used to cover car panels in paint?

A: Each paint droplet is given the same charge so the droplets repel. The car panels are given the opposite charge. The droplets are attracted to the panels and cover the panels evenly



Electricity

Q: 69 In a parallel circuit the potential difference across each component is.....

A: The same



Electricity

Q: 70 In a series circuit the potential difference of the power supply is....

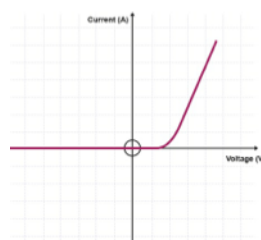
A: Shared by the components



Electricity

Q: 71 Draw a current-voltage graph for a diode.

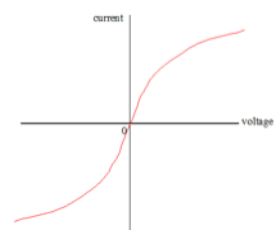
A:



Electricity

Q: 72 Draw a current-voltage graph for a filament lamp.

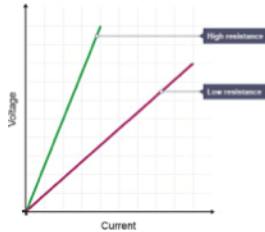
A:



Electricity

Q: 73 Draw a current-voltage graph for a metal wire.

A:



Electricity

Q: 74 People working with computer chips are required to wear a special bracelet that is attached to a wire that joins to earth. Why?

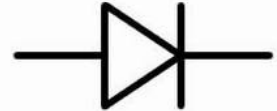
A: So that any negative charge that builds up on the person can flow through the wire to earth.



Electricity

Q: 75 What is the circuit symbol for a diode?

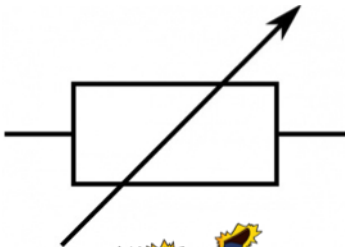
A:



Electricity

Q: 76 What is the circuit symbol for a variable resistor?

A:



Electricity

Q: 77 What is the circuit symbol for a thermistor?

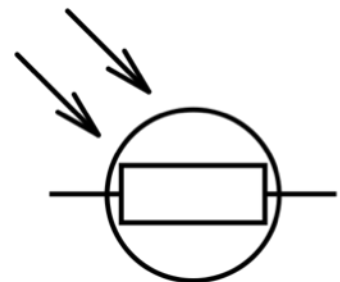
A:



Electricity

Q: 78 What is the circuit symbol for an LDR?

A:



Electricity

Q: 79 What is the circuit symbol for an LED?

A:



Electricity

Q: 80 Where would you find a thermistor inside your home?

A: inside a thermostat to control the heating



Electricity

Q: 81 Which type of resistor is found in a circuit that automatically switches on lights when it gets dark?

A: An LDR



Radioactivity

Q: 82 Name one man-made source of background radiation.

A: Nuclear power stations, nuclear weapons testing, nuclear accidents, radiotherapy, X rays



Radioactivity

Q: 83 What are isotopes?

A: Atoms of the same element with the same atomic number but different mass numbers. (same number of protons but different number of neutrons)



Radioactivity

Q: 84 What is the plum pudding model of an atom?

A: The mass is evenly distributed and positive particles are spread throughout the atom. Electrons are embedded in the mass of positive charges.



Radioactivity

Q: 85 What did the gold foil experiment reveal about the atomic structure?

A: The atom is mainly empty space with a tiny positive nucleus that is surrounded by negative electrons which orbit the nucleus at some distance



Radioactivity

Q: 86 Define half life.

A: Time taken for the count rate to decrease by half



Radioactivity

Q: 87 What type of radioactive isotope would be most suitable for irradiating food?

A: A gamma emitter to pass through the food packaging. One with a long half life so the level of radiation is constant over a number of years



Radioactivity

Q: 88 Why are some people worried about eating irradiated foods?

A: They think it might cause cancer or illness



Radioactivity

Q: 89 Why does beta decay not cause a change in mass number?

A: A neutron is converted into a proton and electron. The proton has the same mass as the neutron. Only the atomic number increases by one.



Radioactivity

Q: 90 What is alpha decay?

A: When a helium nucleus, made of two protons and two neutrons, is emitted from the nucleus of an atom. The mass number decreases by four and the atomic number by two.



Radioactivity

Q: 91 Which type of radiation should be used to control the thickness of aluminium sheets?

A: Beta as alpha would never penetrate and with gamma the count rate would remain unchanged even if the thickness changed



Radioactivity

Q: 92 Define radioactive.

A: An unstable nucleus that decays



Radioactivity

Q: 93 Alpha particles are unlikely to cause harm outside the body but are likely to kill if inside the body. Why?

A: alpha particles cannot penetrate into the body. As they are the most ionising, they damage cells and tissues, cause cancer, DNA mutations, kill cells once inside the body



Radioactivity

Q: 94 How does a smoke detector work?

A: A radioactive source emits alpha particles which ionise the air inside a sensor which causes a small electric current. Smoke getting into the sensor changes the current which sets off an alarm. Beta or gamma emitters are not used as neither particle would be stopped by smoke



Radioactivity

Q: 95 Which two types of radiation would pass through a sheet of card?

A: Beta and gamma



Radioactivity

Q: 96 Which two types of radiation would be deflected by an electric field?

A: Alpha and beta



Radioactivity

Q: 97 Which type of radiation has the greatest range in air?

A: Gamma



Radioactivity

Q: 98 Give two reasons to justify the use of nuclear power stations.

A: No greenhouse gases produced, a lot of energy produced for a small mass of fuel, reliable, only a small volume of waste produced



Radioactivity

Q: 99 Which type of radioactive isotope would a doctor inject into a patient's bloodstream?

A: A gamma emitter with a short half life as gamma rays are least dangerous inside the body, can penetrate the body and be picked up by a tracer; short half life so safe levels are soon reached



Radioactivity

Q: 100 What is used inside a badge that monitors radiation?

A: Photographic paper/X ray film which goes darker as the level of radiation increases



Radioactivity

Q: 101 What makes thorium and uranium different elements?

A: the different number of protons inside the nucleus



Radioactivity

Q: 102 What is a beta particle?

A: A fast moving electron



Radioactivity

Q: 103 Why are people worried about radioactive waste that is buried underground?

A: increased risk of illness or cancer for people who live nearby especially if there is a leakage as safe levels are not reached for hundreds or thousands of years



Radioactivity

Q: 104 How does fission of uranium nuclei take place in nuclear reactors?

A: A uranium atom is hit by a neutron. The uranium nucleus splits into smaller nuclei and releases further neutrons and energy. The released neutrons go on to cause further fission and large amounts of energy



Radioactivity

Q: 105 What is the role of control rods inside a nuclear reactor?

A: To absorb excess neutrons so that the chain reaction slows down or is stopped



Radioactivity

Q: 106 List natural sources of background radiation.

A: Radon gas, rocks, food and drink, cosmic rays



Radioactivity

Q: 107 How do you stop gamma rays?

A: With several metres of lead or concrete



Radioactivity

Q: 108 How do you stop beta particles?

A: 3mm of aluminium



Stars

Q: 109 what happens to cause the stable period in the life cycle of a star to end?

A: It runs out of hydrogen so nuclear fusion slows down



Stars

Q: 110 What will happen to the Sun after the stable period ends?

A: Temperature decreases and change to red giant, temperature increases and change to white dwarf



Stars

Q: 111 What happens to the elements produced in a supernova?

A: distributed through the universe



Stars

Q: 112 Why are stars able to give out energy for millions of years?

A: Hydrogen is turned to helium by nuclear fusion. Stars have a massive supply of hydrogen



Stars

Q: 113 Why does the Sun remain stable for millions of years?

A: Inward force of gravity is equal to the outward force of radiation pressure for millions of years



Stars

Q: 114 How did the elements come to be formed?

A: Nuclear fusion of hydrogen forms helium; heavy elements are formed by the fusion of lighter elements during a supernova



Stars

Q: 115 Describe how a star forms.

A: Dust and gas is pulled together by gravity



Stars

Q: 116 What happens to massive stars after the red super giant stage?

A: Outer layers are thrown into space which scatters gas and dust into space and distributes the elements throughout space. The core left behind forms a neutron star or black hole if sufficient mass is left behind



Stars

Q: 117 Why do scientists believe the Solar System was formed from the material produced when earlier stars exploded?

A: Solar System contains elements heavier than hydrogen and helium which were formed by nuclear fusion in a supernova



Stars

Q: 118 What is a black hole?

A: matter with such high density that light is pulled in



Stars

Q: 119 What is produced as the gases from a star spiral into a black hole?

A: X rays



Stars

Q: 120 Why are fusion reactors not used to generate electricity?

A: They currently are only experimental and use more energy than they release



Stars

Q: 121 Why do scientists continue to try and develop nuclear fusion power plants?

A: provide unlimited energy, no radioactive waste produced, want to show that it can be done

