

Quiz

Disc 1

Section 1

1. Name the correct unit of speed?
2. What is the difference between velocity and speed?
3. A mouse travels 30cm in 5 seconds, calculate the speed of the mouse
4. Use a formula triangle to write an equation for distance
5. Calculate the distance travelled by sound in 2.5 seconds given that the speed of sound is 340m/s

Solutions:

1) ms^{-1}

2) Velocity is the distance travelled per second in a particular direction, speed is the distance travelled per second in any particular direction

3) 0.06 ms^{-1}

4) Distance = speed x time

5) Distance = $340 \times 2.5 = 850\text{m}$

Section 2

1. What does the gradient represent on a distance time graph?
2. What does the gradient represent on a velocity time graph?
3. What does the area represent on a velocity time graph?
4. Look at the distance time graph, calculate the speed between R and S

Solutions:

1) Speed

2) Acceleration

3) Distance travelled

4) 2.2 ms^{-1}

Section 3

1. A car is travelling at a constant speed, all the forces acting on the car are balanced. Can the car accelerate?
2. What is the net force acting on a object that has balanced forces?
3. Find the resultant force on a ball of mass 0.20 Kg falling towards the ground with an acceleration of 2.0 m/s^2

4. What is the weight of an astronaut of mass 90Kg when he is on the surface of the moon. The acceleration of free fall is 1.6 m/s^2

Solutions

- 1) No
- 2) 0
- 3) 0.4 Newtons
- 4) 144 Newtons

Section 4

- 1) What happens when an object slides or rubs against a rough surface
- 2) What is another name given to air resistance
- 3) A car is travelling at a constant velocity of 80Km/h on the motorway. The force between the car tyres and the road surface is 2100N.
 - a) What is the acceleration of the car
 - b) Calculate the size of the drag on the car

Solutions

- 1) Frictional forces act on the object
- 2) Drag
- 3) Acceleration = 0 (car is travelling at constant velocity) Drag = 2100N

Section 5

- 1) If a driver is under the influence of drugs or alcohol what will happen to the thinking distance?
- 2) What happens to the braking distance if the road is icy?
- 3) Calculate the thinking distance for a car travelling at 15 m/s if the reaction time of the driver is 0.8seconds.
- 4) Calculate the braking distance and the stopping distance for the car in question 3, given that it takes a total time of 4.5 seconds to stop.

Solutions

- 1) Thinking distance will increase
- 2) Braking distance will increase
- 3) Distance = speed x time = $15 \times 0.8 = 12$ metres
- 4) Braking Time = $4.5 - 0.8 = 3.7$ seconds
Braking Distance = area under graph so $(3.7 \times 15) \div 2 = 27.75$
Total Stopping distance = $12 + 27.75 = 39.75$

Section 6

- 1) A man is holding a book without moving it. Is there any work done on the book?
- 2) A woman lifts a book weighing 5N to a height of 1.5 metres. Calculate the work done
- 3) A girl of weight 500N runs up a small hill. She climbs a vertical height of 90 metres in a time of 3.0 minutes. Calculate the power developed by the girl.
- 4) A cyclist suddenly slams on the brakes and comes to a rest. What happens to the work done by the brakes to stop the cyclist?

Solutions

- 1) No
- 2) Work done = force x distance = $5 \times 1.5 = 7.5$ Joules
- 3) Power = work done / time =
Work done = $500 \times 90 = 45\,000$
time = $3 \times 60 = 180$ s
Power = $45\,000 \div 180 = 250$ W
- 4) Energy is transferred to heat

Section 7

- 1) Calculate the kinetic energy of a 0.080 kg ball thrown at a speed of 10 m/s
- 2) Gravitational potential energy is due to the position of an object above the ground. Is this true?
- 3) Calculate Gravitational potential energy of a man of mass 80Kg sitting on a wall at a height of 2.5m ($g = 10\text{N/kg}$)
- 4) The man in the above question jumps off the wall. Calculate Kinetic the energy of the man before he hits the ground.

Solutions

- 1) $K.E = \frac{1}{2} mv^2$
 $= \frac{1}{2} \times 0.080 \times 10 \times 10$
 $= 4$ Joules
- 2) Yes it is
- 3) $E = mgh = 80 \times 10 \times 2.5 = 2000$ Joules
- 4) 2000 Joules as it is the same as the gravitational potential energy.

Section 8

- 1) What do you use to measure electric current and how should it be placed in the circuit?
- 2) Name the unit of electric current
- 3) What particle is responsible for electric current in metal?
- 4) In an electric circuit the current is 1.2 A which flows for 100 seconds, calculate the charge.

Solutions

- 1) Ammeter, needs to be placed in series
- 2) Amperes
- 3) Electron
- 4) 120 coulombs

Section 9

- 1) What is the unit of voltage?
- 2) By what other name is voltage known as?
- 3) How do you place a voltmeter in a circuit?
- 4) What two amounts do you need to measure resistance in a circuit?
- 5) Calculate the resistance of a component with a potential difference of 30 volts carrying a current of 5 amps

Solutions

- 1) Volts
- 2) Potential difference
- 3) In parallel
- 4) Current and voltage
- 5) Resistance = voltage \div current = $30 \div 5 = 6$ ohms

Section 10

- 1) What is the rule that is used to determine the direction of the force experienced by a current carrying wire placed in a magnetic field.
- 2) An a.c generator generates electricity by cutting lines of magnetic flux. What happens to the current if the rotating coil is spun faster?
- 3) What happens across the ends of a wire when it is moved in a magnetic field?

Solutions

- 1) Flemmings left hand rule
- 2) The size of the current increases also the frequency increases.
- 3) An induced voltage occurs

Section 11

1. Which are better thermal conductors, metals or non metals?
2. What are better insulators of heat? Liquids, solids or gases?
3. What type of waves travel through a vacuum and carry energy?
4. What type of surfaces absorb and radiate the most amount of energy?
5. Why doesn't convection occur in solids?

Solutions

- 1) Metals
- 2) Liquids
- 3) Infra red
- 4) Black
- 5) Atoms are held rigidly and therefore cannot move

Section 12

- 1) Name the two types of wave
- 2) Why cannot sound travel through a vacuum
- 3) What determines the loudness of sound
- 4) Calculate the wavelength of a sound wave of frequency 10Hz, the speed of sound being 340m/s in air
- 5) What determines the pitch of sound

Solutions

- 1) Transverse and longitudinal
- 2) No particles in a vacuum to vibrate
- 3) The amplitude of the wave determines the loudness
- 4) Wavelength = velocity ÷ frequency = $340 \div 10000 = 0.034$ metres.
- 5) Frequency determines pitch

Section 13

1. Name the three types of radiation
2. How can gamma rays be stopped?
3. Why is radiation harmful to humans?

Solutions

- 1) Alpha, Beta, Gamma
- 2) Concrete block or by lead.
- 3) Kills human cells, alters DNA

Section 14

- 1) Name the layer in the earth's surface that is between the liquid outer core and the earth's crust.
- 2) Which waves travel more slowly S waves or P waves?
- 3) Which waves push building up and down?
- 4) In the mantle the paths of both P and S waves are curved, why is this so?

Solutions

- 1) Mantle
- 2) S waves travel more slowly at around 5 km/s
- 3) P waves
- 4) The waves are curved due to refraction

Section 15

- 1) What does a galaxy consist of?
- 2) What is a supernova?
- 3) What is a nebula?
- 4) Name the planets in our solar system
- 5) What is our galaxy called?

Solutions

- 1) Millions of stars
- 2) A red giant that has exploded
- 3) The core of a red giant
- 4) Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune
- 5) The milky way

Disc 2

Section 1

1. Which structures are found in both animal and plant cells?
2. Name one difference between a plant cell and an animal cell
3. What is meant by diffusion
4. What is meant by osmosis

Solutions

1. Cell membrane, nucleus, cytoplasm
2. Animal cells do not contain chloroplasts
3. Diffusion is the movement of molecules from a high concentration to a low concentration
4. Osmosis is the movement of water through the cell membrane

Section 2

1. What is photosynthesis?
2. Which gas is needed for photosynthesis?
3. Which gas is given off during photosynthesis?
4. What happens to enzymes at:
 - a) Very high temperatures
 - b) Very low temperatures

Solutions

- 1) Conversion of water and carbon dioxide into glucose and oxygen with the aid of light
- 2) Carbon dioxide
- 3) Oxygen
- 4) a) Enzyme is destroyed
b) Enzyme becomes inactive

Section 3

- 1) Why is it vital that blood clots?
- 2) What element is used to clot blood?
- 3) What is Atherosclerosis?

Solutions

- 1) To prevent blood loss
- 2) Platelets
- 3) It is the build up of cholesterol in the blood vessels

Section 4

- 1) What are motor neurons?
- 2) What are sensory neurons?
- 3) What part of the brain detects the temperature of the blood?
- 4) What is the function of the cerebellum?

Solutions

- 1) These are cells that control muscular contraction
- 2) These are cells that respond to stimulus such as light
- 3) Hypothalamus
- 4) It co-ordinates smooth movements

Section 5

- 1) What is the function of the hormone insulin?
- 2) What is the knot of capillaries in the kidney called?
- 3) What is the function of the Kidneys?

Solutions

- 1) To control the level of glucose in the blood
- 2) The glomerulus
- 3) The function is to filter out toxic urea

Section 6

- 1) What does the hypothalamus do?
- 2) What temperature must the blood be kept at?
- 3) What does the pancreas make and what is the function of each hormone?

Solutions

- 1) Controls the temperature of the body
- 2) 37 degrees Celsius
- 3) Pancreas makes insulin and glucagon. Insulin reduces the amount of glucose in the blood, glucose increases it.

Section 7

- 1) What is an allele?
- 2) What does heterozygous mean?
- 3) What is a Diploid?
- 4) What is Mitosis?

Solution

- 1) An allele is a type of gene that may be dominant or recessive
- 2) Heterozygous means that both alleles for a gene are the same
- 3) A Diploid means that the chromosomes in a body cell are in pairs one set comes from the father and the other from the mother
- 4) Mitosis is a form of cell division where the cell divides to form two identical cells

Section 8

- 1) Beginning with the production of a sperm in a testis and ending with the site of fertilisation in a woman, list all the parts of the journey.
- 2) Give the alternative terms for selective breeding.
- 3) Does selective breeding produce new genetic features? Give reasons for your answer
- 4) Is selective breeding always a success. Give reasons for your answer

Solution

- 1) Testis produce sperm, then during ejaculation sperm released into the sperm duct then prostate gland adds semen. Semen released through the urethra when the penis is inserted into the vagina, sperm travels up the cervix to the uterus and towards the fallopian tube.
- 2) Artificial selection
- 3) No it doesn't. Sexual reproduction can produce a new combination of features but no new genes. That needs mutation.
- 4) It isn't always a success. The aim is to produce offspring with a better combination of features but this is not often achieved you have to try again.

Section 9

- 1) What does a decomposing material give off?
- 2) What air pollutant is guilty of acid rain?
- 3) Name some important water pollutants
- 4) What is absorbed by plants to make protein?

Solution

- 1) Ammonia
- 2) Sulphur Dioxide
- 3) Oil, Herbicide, pesticides, heavy metal ions, fertiliser, sewage
- 4) Nitrates are absorbed by plants

Disc 3

Section 1

- 1) Which two particles make up the nucleus of an atom?
- 2) What is the mass of an electron compared to the mass of a proton?
- 3) What is the charge on a proton?
- 4) Around the nucleus there are electrons, they are found in different energy levels called what?

Solution

- 1) Neutrons and Protons
- 2) Negligible
- 3) Positive charge
- 4) Shells

Section 2

- 1) What are covalent structures that only have a few atoms in them called?
- 2) Why does hydrogen chloride have a low melting point?
- 3) Why does hydrogen chloride not conduct electricity?
- 4) Why do diamond and graphite have high boiling points?

Solution

- 1) Simple covalent
- 2) Hydrogen chloride is a simple covalent substance and it has a low melting point because there are weak forces between the molecules.
- 3) Hydrogen chloride does not conduct electricity because there are no free ions or electrons.
- 4) Diamond and graphite have high boiling points because there are lots of strong covalent bonds that require a lot of energy to break them.

Section 3

- 1) Describe in detail how crude oil is formed
- 2) What is a hydrocarbon?
- 3) How is crude oil separated?
- 4) By what property are hydrocarbons separated in a fractionating column?

Solution

- 1) Crude oil is formed by the long term effects of heat and pressure on decaying organic material in the absence of air.
- 2) A hydrocarbon is a compound containing carbon and hydrogen only.
- 3) Crude oil is separated by fractional distillation.
- 4) Hydrocarbons are separated according to their boiling point or size of their molecule.

Section 4

- 1) What are Alkenes?
- 2) What does the term unsaturated mean?
- 3) How would you distinguish chemically between a sample of octane and octene?
- 4) What is polymerisation?

Solution

- 1) Alkenes are hydrocarbons that have carbon to carbon double covalent bonds. These unsaturated hydrocarbons are reactive and are useful for making other substances.
- 2) Unsaturated means there is a double bond between two carbon atoms in a compound.
- 3) By adding bromine water. The octene (alkene) would decolourise it. The octane (alkane) would not.
- 4) Polymerisation is the process of joining many small molecules containing a double bond (monomers) to form a long chain.

Section 5

- 1) Why does copper need to be purified?
- 2) Name the three products formed during the electrolysis of brine
- 3) Name the three raw materials added to the blast furnace
- 4) What sub atomic particle is gained during a reduction reaction?

Solution

- 1) Copper needs to be purified to remove any impurities as these reduce its electrical conductivity.
- 2) Hydrogen, chlorine and sodium hydroxide.

3) Iron ore, Coke and limestone

Section 6

- 1) What is a reversible reaction?
- 2) What symbol is used to represent a reversible reaction?
- 3) What temperature and pressure are used in the production of ammonia?
- 4) Give a use for ammonia

Solution

- 1) A Reversible reaction is one that can go forwards and backwards
- 2) The symbol is two arrows one on top of the other with the bottom arrow facing in the opposite direction.
- 3) A temperature of 450 degrees Celsius and a pressure of 200 atmospheres is used
- 4) Ammonia is used to make nitric acid, fertiliser and explosives.

Section 7

- 1) Name the three different types of rock
- 2) What do large scale movements of the Earth's crust cause to form?
- 3) How is metamorphic rock formed?
- 4) Give an example of each of biological, chemical and physical weathering

Solution

- 1) Igneous rocks, metamorphic rock and sedimentary rock
- 2) They cause mountain ranges to form
- 3) Metamorphic rock is formed by the effects of heat and pressure recrystallising other rocks
- 4) Biological - plant root growth
Chemical - acid rain
Physical – freeze thaw

Section 8

Work out the formula of each of these compounds:

- 1) Sodium oxide
- 2) Magnesium chloride
- 3) Carbon sulphide
- 4) Sodium carbonate

Solution

- 1) Na_2O
- 2) MgCl_2
- 3) CS_2
- 4) Na_2CO_3

Section 9

Balance these equations

- 1) $\text{Ca} + \text{O}_2 \rightarrow \text{CaO}$
- 2) $\text{Cr} + \text{HCl} \rightarrow \text{CrCl}_3 + \text{H}_2$
- 3) $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \text{HCl}$
- 4) $\text{Na} + \text{O}_2 \rightarrow \text{Na}_2\text{O}$

Solution

- 1) $\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$
- 2) $2\text{Cr} + 6\text{HCl} \rightarrow 2\text{CrCl}_3 + 3\text{H}_2$
- 3) $\text{CH}_4 + 4\text{Cl}_2 \rightarrow \text{CCl}_4 + 4\text{HCl}$
- 4) $4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$

Section 10

- 1) Calculate the relative formula mass of
 - i) MgO
 - ii) H_2SO_4
- 2) Calculate the empirical formula of
 - i) A compound containing 1.4 g of lithium and 16g of oxygen
 - ii) A compound containing 0.28g of silicon and 1.42g of chlorine

Solution

- 1) i) 40
ii) 98
- 2) i) Li_2O
ii) SiCl_4

Section 11

- 1) What is the trend in reactivity of the group 1 metals
- 2) Give two properties of non metals
- 3) Why is neon such an unreactive gas
- 4) Why is Bromine more reactive than iodine

Solution

- 1) Reactivity increases as you go up the group
- 2) Don't conduct electricity, low melting point, brittle / crumbly when solid.
- 3) Neon is unreactive because it has a full outer shell of electrons. This means the atoms do not wish to gain or lose any electrons.
- 4) Bromine is more reactive than iodine because bromine atoms are smaller hence the outer shell is closer to the nucleus that is why it is easier to gain an extra electron

Section 12

- 1) What must particles possess if a successful collision is to occur?
- 2) Give reasons as to why increasing the temperature increases the rate of chemical reaction
- 3) Explain why doubling the concentration of a reactant should in theory double the rate of a reaction

Solution

- 1) A sufficient amount of energy, in other words the activation energy
- 2) Increasing the temperature means the particles will move more quickly, meaning more collisions so particles will have the activation energy so there will be more successful
- 3) Doubling the concentration will mean twice as many reactant particles, hence there should be twice as many collisions therefore twice the amount of reactions.

Section 13

- 1) What does exothermic mean?
- 2) How does an exothermic reaction differ from an endothermic reaction?
- 3) What scale is used to show how acidic or how alkaline a substance is?

Solution

- 1) Energy is given out in the reaction in the form of heat to its surroundings
- 2) Endothermic reactions take in energy where as endothermic reactions give out energy
- 3) The PH scale