

**SOUTH AFRICAN AGENCY FOR SCIENCE AND TECHNOLOGY ADVANCEMENT**

**55th LIFE SCIENCES OLYMPIAD**

**GRADES 10 -12**

**2019**

**INSTRUCTIONS**

Please read the instructions carefully before answering the questions

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This is a multiple choice paper. Please answer all the questions on the answer sheet provided. Each question is followed by answers marked A, B, C, and D. **Only one answer is correct**. Choose the correct answer and shade the corresponding circle on the answer sheet completely, using an HB pencil.

NB! The answer sheets are marked electronically – do not make any other dots or marks on the answer sheet. Select only one answer for each question or your answer will be discarded**. Ensure that you shade your selection clearly.**

Note that the question numbers 1 to 100 on the answer sheet moves from top to bottom in several columns. Ensure that the number of your selection on the answer sheet corresponds with the number of the question in your examination paper. Should you make a mistake, please erase the incorrect answer completely

The use of **non-programmable** electronic calculators is permitted.

**To avoid disqualification** - You are required to complete **all** the information requested on the answer sheet. Please complete the information in script, as well as shade the corresponding blocks. If the corresponding blocks are not shaded appropriately, your results will be returned without a name and you will be disqualified. Do not fold the answer sheets.

Three hours are allowed to answer the questions

1. **Cirrhosis is a chronic disease of the liver marked by degeneration of cells, inflammation, and fibrous thickening of tissue. It is typically a result of**

A hepatitis and alcoholism.

B acute food poisoning.

C sensitivity to antibiotics, especially penicillin.

D blood poisoning.

1. **The pistil of a flower is**

A the male organs, producing sperm cells

B the female organs of a flower, comprising the stigma, style, and ovary.

C the part producing hormones (auxins and gibberellins)

D a whorl that encloses the petals and forms a protective layer around a flower in bud

1. **An ectopic pregnancy literally means**

A one in which the embryo/fetus develops in an abnormal place such as either of the Fallopian tubes.

B pregnancy that follows artificial insemination.

C pregnancy that leads to identical twins.

D pregnancy that leads to fraternal twins.

1. **Green papaya fruit is included as a component in powdered meat tenderizers, and is also marketed in tablet form to remedy digestive problems.**

**This is because**

A it is rich in an enzyme called papain, a protease which is able to break down tough meat fibers.

B it is rich in an enzyme called papain, a lipase which is able to break down saturated fats.

C it is rich in an enzyme called trypsin, a protease which is able to break down tough meat fibers

D it is rich in an enzyme called pancreatic lipase, which is able to break down saturated fats.

1. **Biotin (vitamin B7) deficiency can be caused by excessive consumption of raw egg whites over a long period (months to years). This is quite a risk for ill-advised young bodybuilders. The reason for this is that**

A raw eggs carry Salmonella bacteria which eat up all the biotin once inside a human

B egg white contains high levels of iron and zinc, all which bind biotin tightly and must be oxidized by boiling or frying

C all the biotin in the egg is concentrated in the yolk and thus eating only egg white deprives one of this vitamin

D egg white contains high levels of avidin, a protein that binds biotin strongly and must be denatured by boiling or frying the egg before eating

1. **Consumption of large doses of vitamin c leads to kidney stones because**

 A in the body, excess Vitamin C is degraded to oxalic acid which combines with calcium in the kidneys to form the insoluble calcium oxalate.

 B excess Vitamin C is excreted unchanged and crystallizes out in the kidneys.

 C Vitamin C tightly binds to metal ions and forms crystals in the kidneys.

 D also called ascorbic acid, Vitamin C corrodes tubes in the kidneys and forms iron salts.

1. **Treatment of tuberculosis normally requires a combination of several drugs taken over a period of several months to achieve total cure.**

**The reason for this is that**

 A the cause of TB, Mycobacterium tuberculosis, divides very slowly and can thus survive short-term anti-biotic bombardment.

 B Mycobacterium tuberculosis, divides very rapidly and many daughter cells survive and multiply again during short-term

 anti-biotic bombardment.

 C all anti-TB drugs have very short half-lives in the human body thus large doses have to be given over very long periods.

 D none of the above

1. **The table below shows how much energy, in kilojoules, is needed by John to do various activities in 1 hour.**

|  |  |  |
| --- | --- | --- |
| Sleeping | School work | Running |
| 300 kJ | 650 kJ | 2 400 kJ |

**How much energy will be needed by John to run for 30 minutes?**

A 600

B 1 200

C 800

D 460

1. **Which one of the following is an exception to the risks associated with smoking?**

**Smoking …**

A increases availability of oxygen in the blood.

B leads to narrowing of blood vessels.

C interferes with the smooth operation of the heart.

D interferes with the process of aerobic respiration.

1. **The following is formed in the stratosphere when the ultra-violet (UV) rays of the sun react with oxygen.**

A The greenhouse effect

B Water vapour

C The ozone layer

D Acid rain

1. **People with greenhouses should paint the glass white to …**

A reflect most of the sun’s rays

B absorb heat and store it

C prevent the greenhouse effect

D attract more insects for pollination

1. **When may sneezing and/or coughing not necessarily be a sign of any illness?**

 A When entry of pathogens through the skin is prevented

 B When mucus containing pathogens is expelled from the body

 C When sneezing slowly spreads disease

 D When coughing is able to destroy the bacteria

1. **HIV is a retrovirus because …**

A it affects the white blood cells only

B its DNA is not replicated when that of the host cell does

C it incorporates its genetic material into that of the host cell

D it spreads very rapidly

1. **In a fatal accident involving a lorry and a minibus taxi, one passenger who apart from losing both legs, bled profusely and lost a lot of blood as a result. The passenger, whose blood type was A had to receive blood donated by the public.**

**Which blood group would be the most convenient to donate to the patient?**

A group B

B group O

C group AB

D group AB and A

1. **A plant tissue through which manufactured food is transported is the .....?**

A Phloem

B Xylem

C Cambium

D Cortex

1. **Some features, such as finger print patterns and the shape of the hand are permanent while others like the lines on the hands change daily.**

**Which TWO of the following form the basis for such changes?**

A Diet and Exercise

B Diet and gaseous exchange

C Ill-health and exercise

D Exercise and gaseous exchange

**USE THE FOLLOWING INFORMATION TO ANSWER QUESTIONS 17, 18, 19 & 20.**

**Yellow fever is an acute viral hemorrhagic disease. The yellow fever virus is transmitted by the bite of the often crepuscular female mosquito, Aedes aegypti, and is found in tropical areas in South America and Africa. It has no known cure but a vaccine against it, vaccine 17D, was developed in 1937 by the South African microbiologist Max Theiler, whilst working at the Rockefeller Institute.**

1. **A crepuscular animal is one that is active during**

A. daytime.

B. twilight.

C. nighttime.

D. NONE of the above.

1. **The 17D vaccine was and is still produced**

 A. from the attenuated virus cultured in chicken eggs.

 B. from the brains of mice infected with yellow fever.

 C. from the blood serum of those who suffered and survived yellow fever.

 D. NONE of the above.

1. **Another hemorrhagic disease is Ebola. This disease is caused by**

 A. the Ebola virus, which belongs to the family Filoviridae.

 B. the Ebola virus, which belongs to the family Rhabdoviridae.

 C. the Ebola virus, which belongs to the family Paramyxoviridae.

 D. the Ebola bacterium, which belongs to the same family as Mycobacterium tuberculosis.

1. **In recognition of saving millions of lives by developing the yellow fever vaccine, Max Theiler was awarded …**

 A. the Nobel Prize in Medicine or Physiology in 1951.

 B. the J.D. Rockefeller Prize, by John Davison Rockefeller, Jr. in 1951.

 C. the USA’s National Medal of Science, by President George W. Bush in 2002.

 D. SouthAfrica’s Orderof Mapungubwe, by President Thabo Mbeki in 2002.

1. **Haemophilia is a group of hereditary genetic disorders that impair the body’s ability to control blood clotting, which is used to stop bleeding when a blood vessel is broken. It is a recessive, X-chromosome-linked disorder, which means:**

A. it affects females more severely since they carry two X-chromosomes

B. it affects males less since they carry only one X-chromosome thus less of the defective gene

C. it affects both males and females equally

D. it is more likely to show up in males than females

1. **There are no cure for hemophilia, but several therapeutic interventions can be made to manage the disease. Which one of the following can be safely used in this regard?**

A. regular infusions of clotting factor: factor VIII in haemophilia A or factor IX in haemophilia B

B. regular administration of aspirin, which has anti-inflammatory and anti-platelet effects and can decrease the risk of a heart attack

C. regular co-administration of warfarin and vitamin K, both required for blood clotting

D. NONE of the above

**Carefully study the following structure, isolated from some plant, and answer questions 23 – 26.**



1. **The depicted structure is a triacyl glyceride because**

 A. it is an ester of three fatty acids and 1,2,3-propanetriol.

 B. it is an ester of three α,β-unsaturated acids and glycerol.

 C. it is an ester of three alkynyl acids and glycerol.

 D. it is an ester of three α,β-unsaturated acids and 1,2,3-propanetriol.

1. **Which of the fragments labeled A, B and C are deemed essential fatty acids?**

 A. A & B

 B. A & C

 C. B & C

 D. A, B & C

1. **Which of the fragments labeled A, B and C is an omega-6-fatty acid?**

A. C

B. A

C. B

D. NONE of the above

1. **Which of the fragments labeled A, B and C is a geometric isomer of oleic acid, abundant in olive oil and human adipose tissue?**

A. A

B. B

C. C

D. NONE of the above

1. **Another water purification/treatment method is the use of ozone. Which of the following is/are advantages of ozone over chlorine use?**

A. Ozone has a very high oxidation potential

B. Ozone is a cost-effective method of treating water, since it is produced or demand

C. Ozone does not remain in the water after treatment or leave a taste or odour

D. ALL of the above

1. **Cholera is an infection of the small intestines caused by the bacterium Vibrio cholera and ransmitted primarily through contaminated drinking water of food. Inside the small intestine, cholera bacteria …**

A. produce the cholera toxin, an oligometric complex made up of six protein subunits, which leads up secretion of H2O, Na+, K+, CI¯ and HCO3¯ into the lumen of the small intestine leading to profuse diarrhoea and rapid dehydration

B. produce the cholera toxin, a concoction of chemicals which leads to secretion of H2O, Na+, K+, CI¯ and HCO3¯ into the lumen of the small intestine leading to profuse diarrhoea and rapid dehydration

C. produce the cholera toxin, a powerful antibiotic that kills all intestinal flora and leads to diarrhoea for the body to expel them

 D produce the cholera toxin, a nephrotoxin that shuts down the kidneys and leads to diarrhoea as the body’s only mode of excretion

1. **Which gland secretes a hormone that affects the modulation of wake/sleep patterns and seasonal functions?**

A. The testicles (in males) and ovaries (in females).

B. The pituitary gland.

C. The adrenal glands.

D. NONE of the above.

1. **Which vitamin imparts the yellow colour to vitamin supplement solutions, and the unusual fluorescent yellow colour to the urine of persons who take vitamin supplements?**

A. Vitamin A (from carrots)

B. Vitamin D

C. Biotin

D. Riboflavin

1. **Why doesn’t cheese decay during the maturing process?**

A. It is kept at a low temperature where all bacteria are inactive.

B. The milk is pasteurised and heated to eliminate bacteria initially.

C. Preservatives are added to kill the bacteria.

D. Bacteria ferment the cheese and acids produces by the bacteria help preserving the cheese.

1. **Under which conditions will plants have a low transpiration rate?**

A. High temperatures

B. High humidity

C. Strong winds

D. More light

1. **The part of the brain YOU are using to answer all the questions in this examination is the…..**

A. Brain stem.

B. Cerebellum

C. Medulla oblongata

D. Cerebrum

1. **Some bacteria are resistant to penicillin because they produce an enzyme called beta-lactamase. How does this enzyme render penicillin ineffective?**

A. By opening the 4-memebered ring in penicillin

B. By opening the 5-memebered ring in penicillin

C. By oxidising the sulfur in the penicillin core structure

D. NONE of the above

1. **Which of the following are the most common symptoms of diabetes?**

A. increased thirst, frequent urination, glucose in the urine.

B. enlarged spleen, swollen liver and kidneys due to the need for frequent glomerular filtration

C. increased thirst, blurred vision, and incontinence

D. ALL of the above

1. **Which of the following are the long-term effects of untreated diabetes?**

A. cardiovascular disease, chronic renal failure and retinal damage

B. liver damage, loss of motor coordination and blindness

C. renal failure, auto-immune disorders and frequent comas

D. NONE of the above

1. **The American psychologist William Herbert Sheldon proposed that the human physique be classed according to what are called somatotypes, named after the three germ layers of embryonic development. Which of the following correctly matches the somatotype and its characteristic(s)?**

A. Ectomorph: characterized by long and thin muscles/limbs and low fat storage; usually referred to as slim. Ectomorphs are not predisposed to store fat or build muscle

B. Mesomorph: characterized by medium bones, solid torso, low fat levels, and wide shoulders with a narrow waist; usually referred to as muscular. Mesomorphs are predisposed to build muscle but not store fat

C. Endomorph: characterized by increased fat storage, a wide waist and a large bone structure, usually referred to as fat Endomorphs are predisposed to storing fat.

D. ALL of the above

1. **Down’s syndrome is an example of a genetic disorder, characterised by decreased muscle tone, stockier build, asymmetrical skull, slanting eyes and mild to moderate developmental disability. The cause of this disorder is**

A. deletion of one copy of chromosome 21, hence this poor development

B. an extra copy of chromosome 21

C. a trisomy of chromosome 18

D. NONE of the above

1. **Which of the following is NOT true about reptiles?**

A. All reptiles breathe using lungs

B. Like in all animals, reptilian muscle action produces heat

C. Reptile kidneys are unable to produce liquid urine more concentrated than their body fluid

D. Their poikilotherm metabolism has very high energy requirements

1. **Many fungi are parasites on plants, animals (including humans), and other fungi. Which of the following is NOT a fungal disease?**

A*. Pneumocystis* pneumonia

B. Blast disease in rice, wheat and rye.

C. Rust in wheat, barley and rye.

D. Kaposi’s sarcoma in AIDS sufferers.

1. **Bacteria are vital in recycling nutrients, with many steps in nutrient cycles depending on these organisms. Which of the following bacteria is involved in the nitrogen cycle?**

A. *Eschericia coli*

B. *Nitrosomonas europaea*

C. *Acetobacter aceti*

D. *Pseudomonas aeruginosa*

1. **Some bacteria are useful in food processing, such as in the production of yoghurt, cheese and wine. Which of the following bacterial species is not useful in food production?**

A. Lactobacillus casei

B. Oenococcus oeni

C. Vibrio alginolyticus

D. NONE of the above.

1. **Antibacterial agents (antibiotics) are commonly classified based on their mechanism of action, chemical structure, or spectrum of activity. Which of the following is not a mode of action of known antibacterial drugs?**

A. Inhibition of peptidoglycan synthesis.

B. Inhibition of protein synthesis.

C. Inhibition of lipid biosynthesis.

D. Inhibition of microtubule depolymerization

1. **Huge quantities of fertilizer are produced annually in the world. This is applied to the soil by farmers in order to increase the amount of plant nutrients in the soil. The most important nutrient element(s) required by plants is/are:**

A. Nitrogen, Phosphorus and Potassium

B. Nitrogen, Phosphorus and Calcium

C. Nitrogen and Phosphorus only

D. Nitrogen only

1. **Baking powder is added as one of the ingredients in baking to make cakes rise. How does it work?**

A. Baking powder is magnesium carbonate and it gives off carbonic acid when heated, causing rising.

B. Baking powder is a mixture of sodium bicarbonate and tartaric acid and these two react together giving off CO2 when water is added to cause rising.

C. Baking powder contains yeast, which releases CO2 on heating, causing rising.

D. NONE of the above

1. **What causes global warming?**

A. Trapping of sunlight by greenhouse gases, especially water vapor, methane and carbon dioxide.

B. Trapping of sunlight by greenhouse gases, especially carbon dioxide, sulfur dioxide and hydrogen.

C. Trapping of sunlight by carbon dioxide and ozone

D. Excess heat from the sun as it grows bigger every year, like other stars.

1. **Which of the following has the greatest potential to provide all of the world’s electricity needs without any damage to the environment?**

A. Nuclear energy

B. Solar energy

C. Wind power

D. Hydroelectricity

**Study the following picture of a food pyramid and answer questions 48 – 57 below.**



1. **Which of the following foods are the richest sources of potassium?**

A. Potatoes, bananas and white beans

B. Whole wheat bread, yoghurt and fish

C. Carrots, pasta and eggs

D. Broccoli, cucumbers and olive oil.

1. **Which foods are the richest sources of a vitamin that prevents scurvy?**

A. Spinach

B. Yoghurt

C. Carrots

D. Chicken.

1. **Although consumption of leafy green vegetables is important, caution must be exercised since some of them contain oxalic acid. Why is the presence of oxalic acid in these vegetables a problem?**

A. Oxalic acid causes liver cancer

B. Oxalic acid is poisonous and leads to the formation of kidney stones.

C. Oxalic acid leads to atherosclerosis

D. None of the options A. to C.

**“An apple a day keeps the doctor away.”**

1. **What is this statement intended to mean?**

A. That apples contain the highest content of sugars, vitamins, fiber and minerals than any fruit and thus good for health.

B. That in addition to sugars, fiber and vitamins, apples also contain high levels of immune boosting compounds that keep us healthy.

C. The statement is not supposed to be taken literally but is meant to promote consumption of fresh fruits in general.

D. None of the options A. to C.

1. **Although wine, when taken in moderation, has been proven to confer certain health benefits, it is not included in the food pyramid. A reason for this could be that**

A. The same benefits can be obtained from eating the grapes themselves and not their fermented juice.

B. The pyramid was probably drawn by religiously biased scientists who want to discourage alcohol consumption.

C Wine contains sulfites added as preservatives, which nullify any health benefits the wine could offer.

D. Wine contains yeast extracts and bacteria used in fermentation, some of which can cause liver cirrhosis.

1. **Which of the following foods are, in the strict scientific sense, NOT fruits?**

A. Tomatoes, pumpkins and olives.

B. Apples, apricots and avocado pears.

C. Peanuts, chestnuts and hazel nuts.

D. None of the options A. to C.

1. **Which of the following correctly lists foods that contain high levels of cholesterol?**

A. Red meat, chicken and olive oil.

B. Olive oil, sunflower seeds and pecan nuts.

C. Avocado pears, whole cereal grains and chicken.

D. NONE of the options A. to C.

1. **Herbs and spices, while they offer some benefits and improve the flavor of food, are not shown in the pyramid. A possible reason could be:**

A. They make the food taste too good, leading to people eating too much and becoming obese.

B. Some spices are actually toxic so excluding herbs and spices altogether was the best decision.

C. The pyramid only shows what constitutes a healthy diet and the methods of food preparation are left to the individual.

D. The herbs and spices trade is a multi-billion dollar business and including them in the pyramid would have led to rejection of the pyramid by companies whose products are not shown.

1. **The organic way of producing food means?**

A. Using cultivation methods and business practices that are fair and empowering to farm laborers.

B. Growing food without the use of artificial fertilizers, pesticides and herbicides.

C. Having sales contracts with retailers to make sure that produce from farms reaches the consumer within hours after harvest (i.e., very fresh).

D. Using antibiotics and not toxic herbicides and pesticides in farms to prevent plant and animal diseases.

1. **Which of the following foods are best avoided by those who suffer from phenylketonuria?**

A. Nuts

B. Meat

C. Dairy products

D. ALL of the above

1. **Lichen is a mutuality relationship between …**

A. algae and bacteria.

B. algae and moss plants.

C. algae and fungi.

D. fungi and a moss.

1. **Why does the liver contain a lot of iron and recommended for consumption by those who suffer anemia?**

A. The iron of broken down hemoglobin is stored in the liver.

B. Erythrocytes are manufactured in the liver and a lot of iron is needed.

C. Iron is broken down in the liver to more usable molecules.

D. Iron is used in the production of bile.

1. **What are stem cells?**

A. Embryonic cells with no predetermined route of development.

B. Cells harvested from the brain stem.

C. The first cells after mitosis.

D. The cells found in the fluid of the spinal cord.

1. **Which characteristic is found in insect-pollinated flowers?**

A. Small, inconspicuous flowers with no scent.

B. Stamens and stigmas hang outside the flower.

C. Pollen produced in large quantities.

D. Stamens and pollen are sticky.

1. **In which organelle is ATP found abundantly?**

A. Golgi apparatus

B. Chloroplast

C. Mitochondrion

D. Ribosome

1. **What is the main function of the cilia in the respiratory tract of humans? They….**

A. promote the liberation of carbon dioxide.

B. secrete mucus.

C. remove mucus.

D. enlarge the surface area for gaseous exchange.

1. **Which of the following diseases cannot, in any way, be attributed to water?**

A. Cholera

B. Malaria

C. Scurvy

D. Yellow fever

1. **A patient whose gallbladder is surgically removed, is most likely to encounter problems with….**

A.. Production of acids.

B. Excretion of urea.

C. Breakdown of fats.

D. Absorption of mineral salts.

1. **The reason why it is important to keep newly born babies in warm clothing is that they….**

A. are very susceptible to diseases and the clothing serves as a barrier to germs.

B. are most used to confinement and not used to openness.

C. have a large surface area to volume ratio and lose a lot of heat.

D. have a small surface area to volume ratio and lose a lot of heat.

1. **Where best would you grow a garden fern?**

A. Open, windy place.

B. Sunny, dry place.

C. Dry, shady place.

D. Moist, shady place.

1. **Why are arteries thicker walled than veins?**

A. Arteries carry oxygenated blood.

B. Arteries branch to form arterioles.

C. Arteries carry blood under pressure.

D. Arteries convey blood to all organs.

1. **Certain genera of Gram-positive bacteria can form highly resistant, dormant structures called endospores. Which of the following bacteria does not form endospores?**

A. *Bacillus anthracis*

B. *Clostridium tetani*

C. *Escherichia coli*

D. NONE of the above

1. **If you put an unripe banana in a bag with a ripe apple, it will quickly ripen because of the hormone …………. produced by the apple.**

A. cytokinin

B. gibberellin

C. abscisic acid

D. NONE of the above.

1. **The reservoir for carbon on earth is….**

A. coal, oil and natural gas.

B. plants.

C. CO2 in the atmosphere.

D. methane (CH4) in the atmosphere.

1. **The biological process whereby carbon is returned to its reservoir is**

A. photosynthesis.

B. burning of fossil fuels.

C. cellular respiration.

D. nitrification.

1. **Leukemia is generally difficult to treat because …**

A. it affects the blood, a liquid organ, thus precluding surgery.

B. the question statement is false, leukemia is fully curable by treatment with platinum salts.

C. the question statement is false, leukemia is fully curable by bone marrow transplantation.

D. the question statement is false, leukemia is simply treated by repeated blood transfusions and bone marrow transplants.

1. **The black mamba (Dendroaspis polylepis) is the longest venomous snake in Africa, with its venom consisting mainly of neurotoxins. Its bite delivers about 100–120 mg of venom on average and the mortality rate is nearly 100%, unless the snakebite victim is promptly treated with antivenin. Where in South Africa are you LEAST LIKELY to encounter a black mamba in the wild?**

A. Rural KwaZulu-Natal

B. Central Limpopo

C. Rural outskirts of Gauteng

D. North-West Province

1. **Which vitamin is essential for the synthesis of DNA and has led to the invention of the anticancer drug methotrexate?**

A. Vitamin B1.

B. Vitamin B12

C. Vitamin B9

D. Vitamin B3

1. **The terms *anemophily* and *hydrophily* refer, respectively, to …**

A. pollination by wind, and by water.

B. clinging tightly, of seeds to ovaries, and swimming of pollen grains in the style.

C. plant growth in rocky areas, and plant growth in water.

D. plant death due to lack of water, and water retention by plants.

1. **The frontal lobe of the brain comprises …**

A. the rearmost lobe in each cerebral hemisphere of the brain.

B. the part of the brainstem that links the medulla oblongata and the thalamus

C. gray matter relaying sensory information and acting as a centre for pain perception.

D. areas concerned with behaviour, learning, personality, and voluntary movement.

1. **Depending on the temperature in the room you are writing this exam in, you might be shivering because it is cold, or sweating because it is too warm (or just having cold sweats due to nervousness). The part of your brain responsible for this is …**

A. the medulla oblongata

B. the pituitary gland

C. the pons

D. None of the above

1. **Which of the following is TRUE about enzymes?**

A. Enzymes do they alter the equilibrium of reactions they caalyze.

B. Enzymes are mainly globular proteins but some are RNA.

C. To generate the name of an enzyme, the suffix -ase is added to the name of its substrate.

D. ALL of the above are TRUE.

1. **Which one of the following carbohydrate molecules has the most carbon atoms?**

A. Glucose

B. Starch

C. Sucrose

D. Maltose

1. **The pH scale of 1 to 14 uses a mathematical device which expresses hydrogen ion concentrations as ...**

A. a logarithmic decrease.

B. a logarithmic increase.

C. an arithmetical increase.

D. an arithmetical ratio of the concentration of H ions to OH ions.

**Questions 82 and 83 are based on the accompanying diagram.**

 

1. **The cells marked Q, are …**

A. columnar epithelial cells.

B. squamous epithelial cells.

C. ciliated epithelial cells.

D. cuboidal epithelial cells

1. **The blood vessel labelled R is a branch of the…**

A. pulmonary vein.

B. hepatic portal vein.

C. hepatic vein.

D. pulmonary artery.

1. **Which ONE of the following reactions takes place in the liver of humans?**

A. Urea → amino acids

B. Starch → maltose

C. Glycogen → glucose

D. Bile → haemoglobin

1. **Which equation summarizes the dark reactions in photosynthesis?**
	* 1. 12 H2O + 12NADP + nP → 12 NADPH2 + 6 O2 + nATP
		2. 6 CO2 + 12 NADPH2 + n ATP → C6H12O6 + 12 NADP + 6 H2O + nADP + nP
	1. 12 NADPH2 + 6O2 +nATP → 12 H2O + 12 NADP + nADP + nP
	2. 6 CO2 + 12 H2O + nATP → C6H12O6 + 6 O2 + 6 H2O + nADP + nP
2. **Which of the following are decomposers of dead organisms?**

|  |  |  |  |
| --- | --- | --- | --- |
|   | Bacteria | Fungi | Viruses |
| A. | No | Yes | No |
| B. | Yes | Yes | Yes |
| C. | No | Yes | Yes |
| D. | Yes | Yes | No |

**A father has blood type A. He has 4 children with the following blood types:**

 Child 1 – A

 Child 2 – O

 Child 3 – AB

 Child 4 – B

1. **What is the bloodgroup of the mother, for the above mentioned children?**

A. A

B. B

C. O

D. AB

1. **In Drosophila, the male sex is determined by the chromosomes XY and the female by XX. A recessive mutation in the X chromosome of a male was produced by exposure to radium. The effect of this mutation could appear in the phenotype of a ...**

* + 1. female in the F1 generation.
		2. male in the F1 generation.
		3. female in the F2 generation.
		4. male in the F2 generation.

1. **The control centre in the body that will be activated when an athlete is dehydrated is the…**

1. cerebellum.
2. cerebrum.
3. corpus callosum.
4. pituitary gland.

**The list below gives some of the stages involved in gamete and zygote formation.**

1 Prophase I

2 Prophase II

3 Metaphase I

4 Fertilisation

1. **Which ONE of the following combinations of the above stages contributes to genetic variation?**

A. 1, 2 and 3

B. 1, 3 and 4

C. 2 and 3

D. 3 and 4

1. **Which factor determines sex in the honey bee?**

 A. Queen substance.

 B. A chromosome mechanism.

 C. Feeding of the larvae.

 D. Type of comb cell in which larvae and pupae develop.

1. **The zone of maximum elongation in a root is characterized by …**

A. replication of DNA.

B. cell division.

C. formation of cell vacuoles.

D. differentiation of cells.

1. **The osmotic pressure of molar sucrose at 12°C is 23,3 atmospheres. If the sap of a plant cell had an osmotic pressure equal to that of 0,4 molar sucrose solution, what would be the osmotic pressure in atmospheres..**

A. 0,9

B. 5,6

C. 9,32

D. 11,1

1. **Which of the following can be absorbed into the blood without digestion happening?**

A. Sucrose

B. Proteins

C. Lipids

D. Vitamins

1. **When the concentration of potassium ions in equivalents per litre in sea water was 0.012, the concentration of potassium ions in the cells of a marine plant was 0.509. This is evidence of ...**

A. the effect of an osmotic gradient between sea water and the cell sap of the plant.

B. the physical diffusion of the potassium ions.

C. control of the movement of the ions by metabolic activity.

D. a cell sap

1. **The most favourable feature for a man lifting a weight which required an energy output of 1 000 joules would be high …**

A. tidal volume of the lungs.

B. heart output when at rest.

C. blood glucose level.

D. capacity for oxygen debt.

1. **A learner did a mark-recapture exercise in a local stream. He first caught 50 crabs and marked them with paint. These crabs were released. 5 days later 100 crabs were caught. 20 of these crabs had paint marks on them, meaning they had also been in the first catch. What is the estimated crab population?**

A. 180

B. 250

C. 510

D. 5 000

1. **Which substance increases in the blood plasma when there is an uptake of carbon dioxide?**

A. Carbonic acid.

B. Potassium bicarbonate.

C. Sodium bicarbonate.

D. Sodium chloride.

1. **Which of the following constitute the vascular tissue in plants?**

A. Fibres and stone cells.

B. Root-hairs and root caps.

C. Collenchyma and sclerenchyma.

D. Sieve tubes and tracheids.

1. **In an investigation it was found that 10% of the bases in a molecule of DNA were thymine. What was the ratio of** **thymine to guanine in the same molecule?**

A. 1 : 2

B. 1 : 3

C. 1 : 1

D. 1 : 4

~ The End ~