

2024 LIFE SCIENCES OLYMPIAD, GRADES 10 – 11

SOLUTIONS

QUESTION	ANSWER	EXPLANATION
1	A	The taste buds sensitive to bitter taste is situated at the back of the tongue, sweet on the tip, sour on the sides etc.
2	B	There is less oxygen at higher altitudes to bind to haemoglobin. There is not less Hb or more atmospheric pressure. Haemoglobin also doesn't have a higher affinity for oxygen at higher altitudes.
3	C	Carbohydrates, glucose is the primary source of energy, followed by lipids and then proteins.
4	C	Vitamin C prevents scurvy and is found in citrus fruit like oranges, lemons and tomatoes
5	C	During mitosis the nucleus only divides once to produce two daughter cells which are identical to each other and the parent cell.
6	C	Smallest particle of matter is the atom which combines to form molecules. Molecules combine and form organelles which in turn form cells. Lots of cells with the same structure and function form a tissue.
7	D	Roots in plants anchors the plant firmly in the soil and it absorbs water and mineral salts for the plant. The leaves produces glucose and the xylem conducts water and salts to the stem.
8	D	The upper bone in the fore limb of the greyhound is the humerus. The femur is the upper bone in the lower limb, the radius is the bone in the lower arm and the tibia is the bone in the lower leg.
9	A	The neck joint has universal movements sideways, forwards and backwards.
10	D	A balanced diet contains all the essential compounds and elements such as carbohydrates, lipids, fats, mineral salts, fibre, vitamins and water in the correct proportions to prevent disorders.
11	C	Pancreatic juice (4 - pancreas), bile (2 - liver) and intestinal juice (5 - small intestine) are alkaline and are added to the acidic chyme to make it more alkaline
12	A	Part 3 is the stomach. The small intestine is the part that follows on the stomach. The parts of the small intestine in the correct order are: duodenum, jejunum and ileum.
13	B	Natural immunity occurs after an infection when the body produce antibodies. Artificial immunity occurs after a vaccination when the produce antibodies.
14	A	TB is prevented by vaccinations. Cholera by disinfecting and chlorinating water. Malaria by avoiding mosquito bites .Disinfecting and chlorinating the water will kill mosquitoes and bacteria in the water.
15	A	HIV can be spread by sexual contact and not direct contact, in the air or through food and water.
16	C	Exoskeleton is a skeleton on the outside of the body. It prevents dehydration of the body in insects and spiders
17	B	Alcohol inhibits the secretion of ADH by the hypothalamus, less water reabsorbed from kidney tubules, more water lost in urine hence large volume of urine excreted
18	B	A hypothesis is an informed prediction made of the expected results of an investigation. It is in the form of a statement. It must include the independent and the dependant

		variables
19	C	The dependant variable cannot be controlled by the investigator. It must be measured or counted [number of woodlice in dark and light side]
20	A	The independent variable is controlled by the investigator and manipulated during the investigation [light and dark]
21	D	During respiration organisms take in oxygen and use it to break down glucose in cells to provide the body with energy. Carbon dioxide and water is produced. Organisms can respire in the absence of oxygen, it is called anaerobic respiration
22	B	Left side of the heart and aorta contain oxygenated blood. Pulmonary artery and umbilical arteries in females are the only arteries in the body that contains deoxygenated blood
23	D	Petals, anther, stigma, ovule and ovary correct in that order
24	A	The aim of an investigation always start with, to determine, to test etc.
25	A	A conclusion must include the independent and the dependant variable of an investigation. The independent variable cause the dependant variable in the investigation
26	B	The average blood pressure of all people is around 120/80 mmHg 120 Systolic and 80 Diastolic
27	B	2 incisors, 1 canine, 2 premolars and 3 molars on each side of the upper and lower jaw. Times 4 = 32 teeth [16 upper jaw and 16 lower jaw]
28	D	All true except D. Arteries have thick muscular walls because it carries blood under high pressure from the heart and that cause the lumen to be smaller than similar-sized veins.
29	C	Garden soil usually consists of loam which has a high water-holding capacity and drains slowly
30	A	Mutualism in which the hawkmoth benefits because it obtains nutrients from the orchid and the orchid benefits because it gets pollinated by the hawkmoth. Now sexual reproduction follows pollination and the orchid can produce seeds to form new orchids
31	C	The haploid nucleus of the sperm cell fuse with the haploid nucleus of the ovum to produce a diploid zygote nothing else.
32	C	During wine-making anaerobic respiration occurs which in the absence of oxygen the glucose in the fruit is broken down into alcohol and carbon dioxide.
33	C	Children undergoing rapid growth spurts in infancy and adolescence would not suffer from anaemia all others will cause not enough iron.
34	D	Saturated fats clogs up arteries, lack of exercise, smoking and stress not good for the heart
35	D	Bicycles release no greenhouse gases into the atmosphere. All other options release greenhouse gases into the atmosphere
36	D	Waves on ocean generated by wind.
37	B	There is no antibodies to match the shape of the antigens on bacteria N , that is the reason why it will cause a severe infection ... no antibodies to kill it.
38	B	Fossils provide evidence that life has evolved over time. No complete record of evolutionary history and nature never takes leaps in evolution. Evolution is also not a frequent common process.
39	B	The reason why there are gaps in the fossil record is because not all fossils have been found yet and soft bodies organisms rarely form fossils. Other options all wrong
40	B	Stromatolites are autotrophic prokaryotes referred to as oxygen pumps because it produced oxygen during photosynthesis for the evolution of aerobic organisms.
41	D	Natural selection in present times occurred where the few pathogens that were present at the start of the infection were resistant to the drugs. They continued to reproduce and caused another infection
42	A	The producer in this food web is the grass because it has chlorophyll to produce glucose during photosynthesis. It also forms the base or 1 st trophic level of the food web.

43	B	If the hyena was removed from this food web, the springbok and zebra populations will increase and then the lion population will also increase because there is more food available to them.
44	D	The arrows show the direction in which the energy flow from the producer to the herbivores then carnivores. Energy is lost as it moves from one trophic level to the next.
45	A	Calculation: $20\text{kJ} [\text{new growth-part of the body of the young horse}] / 1000\text{kJ} [\text{total grass eaten}] \times 100 [\text{percentage}] = 2\%$
46	C	Most concentrated urine will be produced after profuse sweating, losing a lot of water while sweating. All other options doesn't involve profuse sweating.
47	D	Poaching is the illegal removal of organisms from their habitat nothing else.
48	C	The demand for rhino horn is increasing in Asian countries hence increase in rhino poaching in South Africa.
49	C	Calculation: $1200\text{l used per family} / \text{family of } 4 = 300\text{ml per person}$ All other options are wrong.
50	A	The greater the availability of water, the more it will be used by all families. All other options wrong.
51	B	Maybe people will waste less water if they must pay more when using more.
52	D	The dichotomous key is used to identify unknown organisms and gives two choices in each step. In each step you must make a decision based on the characteristics of the unknown organism. In this case the band-tail puffer.
53	A	Convulsions are not caused by UV radiation. All the other issues are caused by UV radiation.
54	A	Young children commonly have a higher pulse rate than the elderly because they are more active than the elderly. All other options are wrong.
55	C	Ventral side is the lower/bottom part of an organism, dorsal is top/upper part, posterior side is the back part and anterior is the front part.
56	D	Calculation: $10 \times 40 = 400$ times
57	C	Modern technology allows scientists to access remote areas and study microorganisms
58	A	Indigenous species occurs naturally in a country.
59	B	Biodiversity refers to a variety of different living organisms round the world.
60	C	Endemic means it is only found naturally in one biome, region or province in a country
61	B	Constant/fixed variables influence validity.
62	A	Sample size and repetition of investigation influence reliability
63	D	In the control you exclude the factor you are testing for so no alcohol.
64	C	GMO's can be modified to become more resistant to droughts and pests.
65	C	It takes billions of years for light from galaxies very far away to reach us. This light started towards earth when the Universe itself was still young. This is why we measure enormous distances in space by comparing them to how long it will take light to 'go the di
66	C	Calculation: $6.5 [1998] - 7.2 [1978]$ million km^2
67	B	The Southern Cross is four bright stars in the southern hemisphere that are placed as if at the ends of a cross. Two of the Southern Cross's major stars points to the South Pole
68	B	The air is not very windy in the Karoo. All other options correct.
69	C	East and North Africa are the only countries on the bar graph that shows an increase in food insecurity, all other countries shows a decrease in food insecurity.

70	A	Fuel cells convert chemical energy of fuel into electrical energy.
71	D	The atomic forces between the uranium atoms are relatively weak, making uranium good for fission to release lots of energy.
72	C	By passing electricity through water to split it into hydrogen and oxygen
73	B	Swim parallel to the shoreline to escape the rip current. This will allow you more time to be rescued or to swim back to shore once the current eases. All other options will not save you.
74	C	Tsunamis are caused by earthquakes near the ocean floor which cause massive waves and displace water.
75	D	A – Cradle of Humankind by Sterkfontein caves north of Johannesburg in Gauteng
76	C	Yes no one knows the impact of GMO's on human health. All other options are reasons why people are for genetic engineering
77	D	Humans and Chimpanzees are more closely related according to the phylogenetic tree.
78	C	Read off from phylogenetic tree.
79	C	It enables various vegetables to be MORE resistant to drought and insects. All the other options are correct.
80	D	During DNA replication the DNA makes an identical copy of itself. All other options adds alters or delete genes
81	B	Organisms with traits well suited to their environment survive and reproduce more successful. All other options not right.
82	B	Read off from Snellen chart line 5.
83	B	So that learner drivers cannot memorise the patterns and cheat on the test.
84	D	Not all different body tumours, only testicular tumours according to the extract.
85	A	Establish MORE nurseries and nature reserves to grow this plant. All other options are correct strategies to prevent exploitation of this plant.
86	A	Food chains/webs in an environment can be destroyed. All other options are not consequences of exploitation.
87	C	Produce offspring for organisms that are infertile and cannot have their own offspring. All other options are disadvantages of cloning.
88	D	All items are sources of stem cells hence option D. All other options are limited sources of stem cells.
89	B	Interfere with religion and culture because it's unethical and we cannot play God. All other options are arguments for stem cells.
90	A	Hairs raised to an almost vertical position on the skin to trap air between it. Air is a poor conductor of heat so heat cannot escape easily through the skin on a cold day. It actually insulates the skin.
91	B	Type 1 diabetes is thought to be caused by an autoimmune reaction (the body attacks itself by mistake) This reaction destroys the beta cells in the pancreas that make insulin
92	C	Aerobic exercises have a longer duration that is why it increases endurance and stamina whereas anaerobic exercises have a shorter duration that is why it increases muscle mass and strength.
93	A	It increases according to the graphs.
94	B	Blood insulin concentration rises and falls only three times a day when eating fewer larger meals according to the second graph.
95	A	Does not produce enough insulin to lower the blood glucose level back to normal when eating fewer larger meals with lots of glucose.

96	A	To calculate their BMI. All other options wrong.
97	D	Calculation: $41/100 \times 1510 = 619$ women
98	A	Do not smoke if your BMI is ≥ 30 . All other options wrong.
99	C	Chewing is a voluntary action because you can control it. All the other options are involuntary.
100	D	Will increase when suddenly see someone you like. All other options wrong.