

SAASTA SCIENCE OLYMPIAD, GRADES 4-6 – MEMORANDUM

	Answer	Explanation
1	C	The warmest day is the Thursday with 29 degrees. The warmer the day, the greater the chances of water particles evaporating into the air. Thus, on the Thursday the air had the most watervapour.
2	C	C. Every year
3	D	Water boiled at 100°C and freezes at 0°C. Placing ice cubes in boiled water will reduce the temperature but will not reach freezing point. Thus, the closest temperature after 10 minutes would be D = 60°C.
4		D: Most energy on Earth comes directly or indirectly from the Sun. Bloom's Level: Recall
5	C	In a solid the particles are closely arranged in a structured form. When it is heated, the particles gain energy and become gradually more agile. In liquids, the particles are further apart and move freely. When the liquid is heated, the particles have a lot of energy and move violently. The specific order d,e,a shows the breakdown of the solid when heat is introduced, c represents the liquid and b the gas.
6	A	A. The Earth rotates from West to East so it seems that these objects move East to West. Blooms Level: UNDERSTANDING (Since ALL the different celestial objects – Sun, Planets, Moon, Stars – seem to move from East to West it is logical that this is an illusion due to one cause viz Earth's rotation in the other direction).
7	B	Diabetes mellitus refers to a group of diseases that affect how your body uses blood sugar (glucose). Taking care of your diabetes, you must eat healthy food, get regular exercise, take your diabetes medicine every day, test your blood sugar regularly to manage it.
8	B	B: Photosynthesis – all multicellular life depends on photosynthesis. Bloom's Level: UNDERSTAND
9	D	High friction means that the surface will restrict movement; low friction means that little resistance; a smooth surface will not provide resistance. To move optimally tyres need very little resistance for good traction and movement.

10	A	A. The Sun, 8 major planets, many minor planets, moons, asteroids and comets. Blooms Level: RECALL
11	D	Paper clips are made of metal. Magnets have a force that pull most metals towards them.
12	D	D: All three answers are valid. Bloom's Level: UNDERSTAND
13	D	When metal is heated, it expands, when it is cooled it contracts. When the rod is cooled, it contracts and when the cylinder is heated it expands, this will make it easier for the two to fit into each other.
14	A	A. The Sun Blooms Level: RECALL (The "Solar Prominence" visible top left clearly identifies it as the Sun)
15	D	The Great Barrier Reef is in the Coral Sea, on Australia's north-eastern coast. It stretches more than 2,300km along the state of Queensland's coastline, beginning at the tip of Cape York Peninsula in the north and extending down to Bundaberg in the south.
16	D	D: Uses red and blue light in sunlight (Many people assume that GREEN light is the energy of photosynthetic reactions but in fact green is not used and is reflected. Photosynthesis is a multistage reaction using RED for one step and BLUE for another. This last point is not at the level of primary school learners.
17	A	The manufacturer place different weights on the hammock and observe what happens to the hammock. They are checking if the material used, can take the pressure without breaking.
18	A	A. The Moon reflects the light of the Sun Blooms Level: RECALL (The Moon reflects only 8% of the sunlight that illuminates it)
19	A	Opposite poles of a magnet attract each other, similar poles repel each other. It is the latter property that assist in magnetic levitation.
20	D	D. All of these are valid energy stores. Bloom's Level: Understanding
21	B	In their quest to develop new materials, product, using fossil fuels, etc. humans create a magnitude of waste products. These waste products are not always dispose of properly.
22	B	B. The Phases of the Moon Blooms Level: RECALL
23	A	The rate of dissolving depends on the surface area (solute in solid state), temperature (heat) and amount of stirring.

		When a solute is added to a solvent it dissolve. Solubility often increases with temperature, so you may be able to get more solute into a hot solvent than you would if the solvent was cool.
24	A	A. Vibrations of materials. Bloom's Level: Understanding
25	A	Limestone is usually a biological sedimentary that dissolve with heavy rains and syphon trough soil and rock. As the water evaporates the limestone crystalize and form stalactites and stalagmites in caves.
26	B	B. The Phases of the Moon Blooms Level: RECALL
27	C	Sublimation is the transition of a substance directly from a solid state to a gas state. It does not pass through the usual liquid state, and only occurs at specific temperatures and pressures.
28	A	A high-pitched sound (like a female singer) ... A. Is due to high frequency vibrations. Bloom's Level: Applying
29	B	Liquefied gas is a gas that has been turned into a liquid by cooling or compressing it.
30	C	C. 12 Blooms Level: ANALYSING (Sufficient information was given to allow learners to calculate the answer. There were two each from Apollo 11 to Apollo 17 excluding Apollo 13 which aborted the mission)
31	B	Herbivores eat plants, carnivores eat meat, omnivores eat both plant and meat. Butterflies, beetles and ants are insects. Animals that eat insects are Insectivores.
32	B	B. A will be lowest, and E will be highest. The key factor is the length of the air column NOT the length of the water column Bloom's Level: Applying
33	D	Fynbos vegetation can be found throughout Table Mountain National Park, Western Cape, South Africa. It is endemic to the area.
34	C	C. To keep them cool and provide them with air to breathe. Blooms Level: UNDERSTANDING (Requires learners to know that the Moon has no atmosphere and is very hot during the lunar day – the Apollo missions did not extend into the night)

35	D	Rickets a disease of children caused by vitamin D deficiency, characterized by imperfect calcification, softening, and distortion of the bones typically resulting in bowlegs.
36	D	D. Removing any one of these can extinguish a fire. (Fires need fuel AND heat AND air in order to burn) Bloom's Level: Applying
37	A	Plants are autotrophs, which means they produce their own food. They use the process of photosynthesis to transform water, sunlight, and carbon dioxide into oxygen, and simple sugars that the plant uses as fuel.
38	D	D. Because Pluto is very far away. Blooms Level: UNDERSTANDING Pluto is 5 billion kilometres from Earth – 9 years is about 85 thousand hours, and that is how long it took. It did not visit other planets although it flew past some of them. It was not delayed in the asteroid belt because (in spite of sci-fi movies) the asteroids are actually very far apart, and no detours were needed. Long distance space probes do not refuel once they are on their way).
39	B	Carbon dioxide molecules are heavier than air. Because of this, they push the oxygen in the air out of the way as they sink down over the flame and candle. When oxygen is pushed away, it can't react with the wax anymore. This makes the flame go out.
40	B	B. It is wasted as heat energy. NOTE: Energy can be converted from one form to another but always ends up as low-level thermal energy. Bloom's Level: Analysing
41	C	Vertebrates are animals that possess a backbone or spinal column and include mammals, birds, reptiles, amphibians, and fishes. Snakes is a reptile. Whales are mammals Frogs are amphibians Pigeons are birds Snoek is a fish
42	A	A. Because polar bears live in the Arctic while Penguins live in the Southern Hemisphere. Blooms Level: APPLYING (In the wild, Polar bears live only in the Northern Hemisphere and Penguins live only in the Southern Hemisphere)
43	D	A hydro-skeleton is a flexible skeleton supported by fluid pressure.

		Hydro-skeletons are common among simple invertebrate organisms like jellyfish.
44	C	C. Petrol is being used to power a <u>moving</u> taxi. Bloom's Level: Applying
45	D	There are typically around 270 bones in human infants, which fuse to become 206 to 213 bones in the human adult. The smallest bone in the body is a bone found inside your ear. These are tiny bones: the stapes and the incus.
46	D	D. The Earth rotating on its axis every 24 hours. Blooms Level: UNDERSTANDING (The Sun keeps to its central position and the Earth turns on its axis exposing different sides of the planet during each 24 hour rotation)
47	C	Exercises that target your biceps and triceps are essential for building bigger arms.
48	A	A. A decrease in rainfall and an increase of desert areas. Bloom's Level: Understanding
49	C	The burning of wood leads to the formation of new substances like ash(carbon), carbon dioxide gas, water vapour, heat and light. This change is irreversible and hence a physical and chemical change.
50	D	D. The Square Kilometre Array. Blooms Level: RECALL (The SKA is under construction, MeerKAT is complete, HartRAO dates from 1965, and SALT is an optical instrument)
51	C	All variables in the illustration are the same, only the type of water differs.
52	C	C. Gases from cars, trucks, factories and power stations burning <u>fossil fuels</u> . Bloom's Level: Applying
53	A	Most species of caterpillars are vegan and feed abundantly on whole plants. Caterpillars mainly eat leaves, shoots and seeds.
54	B	B. Layer B. Blooms Level: UNDERSTANDING (The central core is the hottest having retained residual heat from the collisions which formed the Earth AND from the heat given off by radioactive decay of uranium and thorium in the core – this last part is for teachers only)

55	B	Pollen from a flower's anthers (the male part of the plant) rubs off on the stigma (the female part). This happens with the aid of insects and or movement.
56	D	D. Wood. Bloom's Level: Recall
57	A	The trunk provides support and nutrients to the tree. The stem of a plant provides support and nutrients to the plant.
58	A	A. the Theory of Continental Drift. Blooms Level: RECALL
59	B	Physically counting just the white or dark rings.
60	B	B. Carbon dioxide Bloom's Level: Understanding
61	A	Flowers are the most important part of plant because the male and female reproductive organ are in flowers. Without flower pollination, fertilisation does not occur. Hence fruits and seeds are not formed
62	A	A. The tree was buried soon after death and the plant cells were filled and replaced by minerals like silica. Blooms Level: UNDERSTANDING (Fossilisation requires that an organism like a tree or a dinosaur or a hominid be buried quickly under anaerobic sediments that prevent rotting and scavenging. Under such conditions the once-living cells are infiltrated by minerals that retain the form of the original cells)
63	D	The seven living processes are: Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion and Nutrition. Only plants germinate and make their own food. Plant reproduce seeds that grow into seedlings and ultimately plants. Humans reproduce babies, that grow into infants, toddlers, teenagers and adults.
64	B	B. X will shoot the marble furthest because the elastic has the most potential energy stored. (More E_p = more E_k) Bloom's Level: Applying
65	B	Paper, sugar and cotton all originate from plants. Paper from wood. Sugar from sugar cane. Cotton from cotton plant
66	D	D. This so-called evidence is 'fake news' by dishonest scientists. Blooms Level: UNDERSTANDING

		(During extremely ancient times Gondwanaland – the Southern part of Pangea lay over the South Pole and extensive glaciation is evident in many places in the Karoo and even in Durban – this evidence includes glacial pavements and drop stones in Dwyka tillite).
67	C	Although mushrooms look like and resembles plantlike parts like a stem and a cap, mushrooms are not classified as plants, but as fungi.
68	D	D. silver, copper, gold, aluminium. Bloom's Level: Recall A very common misconception is that gold is the best conductor. However, the conductivities are as follows: Silver = 60 mho; copper = 57.7 mho; gold = 45 mho; aluminium = 36 mho [Gold happens to be the most malleable and is a noble metal, but the question is about conductivity. Due to cost issues, copper is the conductor of 1 st choice with aluminium as 2 nd choice. Gold is used in micro circuits because it is very ductile and can be formed into very THIN wires). Silver is seldom used because of cost AND because it oxidises easily – it is also only slightly better as a conductor than much cheaper copper.
69	D	Producers (plants) need direct sunlight to make their own food. Producers in the ocean are found below the ocean surface where they get enough direct sunlight to make their own food.
70	B	An apex predator, also known as a top predator, is a predator at the top of a food chain, without natural predators. The apex predator in the food web is the killer whale. If the killer whale dies out, there will be an increase in penguins and seals.
71	D	D. An asteroid about the size of Table Mountain struck Earth causing a mass extinction. (The Impactor struck what is now the Yucatan Peninsula near Chicxulub in Mexico) Blooms Level: RECALL
72	B	B. South Africa is a dry country, and our water supply is erratic and unreliable. Bloom's Level: APPLYING
73	A	A. Cooked meat makes nutrients more available which helped develop human brains. Blooms Level: UNDERSTANDING (The evidence was found and analysed by Dr. Bob Brain in 1984)

74	A	A. Only as in X Y is positive to positive, and Z is negative to negative. Bloom's Level: Understanding
75	A	The difference between the empty and filled bottles are: 1 = 700 grams 2 = 500 grams 3 = 400 grams 5 = 200 grams The biggest difference is in container 1, thus it can hold the most water.
76	D	D. All of the above statements are true. Blooms Level: APPLYING (The three statements cover the most astonishing hominid fossil discovers of the last 25 years and completely overshadow discoveries elsewhere in Africa – they are all true)
77	C	The hint here is that the basket is "watertight".
78	D	D. Only 1 and 3. The steel bolt and the brass key are conductors. The wooden ruler and plastic spoon are insulators. Bloom's Level: ANALYSE
79	B	They work by dissipating, rather than blocking, the energy of waves. Their design deflects most wave action energy to the side, making them more difficult to dislodge than objects of a similar weight presenting a flat surface.
80	C	C. The Moon and Sun work together during Full Moon and again during New Moon. Blooms Level: UNDERSTAND (At Full Moon and again at New Moon the Sun and Moon are in a line and their gravities work together to create an extra high, High Tide and six hours later an extra low, Low Tide. These extremes are called Spring tides.
81	D	Heat loss makes a gas to become a liquid then a solid. Heat gain makes a solid to become a liquid, adding more heat makes the liquid change into a gas.
82	A	A. It uses two different metals and a electrolyte liquid that can conduct electricity. At this level, there is no point in discussing electric potentials of metals. Bloom's Level: Analysing

83	D	As the temperature of water reaches 100°C, its boiling point. When the boiling starts, the temperature rise of water suddenly stops and is locked at 100°C , till all water is evaporated.
84	D	D. a star Blooms Level: RECALL
85	B	At X water gains heat and evaporates into the air. At Y the vapour is cooled down (lose heat) and condensed to form cloud (water droplets)
86	A	A. About 0,9 volts Bloom's Level: Applying
87	C	The lid on the container prevent the cold air inside the container to escape. The air in the surrounding area contains warmer vapour. When the warmer vapour collides with the outside of the cooler container, it condenses and form water droplets on the outside of the container. Over time the droplets get too heavy and run down the surface of the container and settle on the table.
88	D	D. The Earth's axis is tilted. Blooms Level: UNDERSTAND (Because the Earth's axis is tilted at 23,5° AND because the axis stays parallel throughout the year, in December the South Pole is canted towards the Sun and gets more intense near-vertical Sunrays giving the Southern Hemisphere summer, while in June the North Pole is canted towards the Sun and gets more intense near-vertical Sunrays giving the Northern Hemisphere summer.)
89	A	The wider the mouth of the container, the more it is exposed to the heat of the sun, thus more water will evaporate. Container 1 has got the smallest opening and must be the one that did not loose a lot of water. Container 2 has the widest opening and lost most of its water. Container 3 has the 2 nd largest opening and lost the second largest amount of water. Container 4 is tapered to the bottom, thus the water at the top got heated and evaporated, but lower down it was not heated enough.
90	B	B. Energy source B Bloom's Level: Understanding Note: A The Gariiep Hydroelectric PowerStation generates alternating current. C. Wind turbines generate alternating current. B. The photovoltaic panels produce direct current.

91	B	The shopping bag does not break easily and is not transparent.
92	B	<p>B. The large amount of CO₂ in the atmosphere of Venus creates a 'greenhouse effect.'</p> <p>Blooms Level: ANALYSING</p> <p>(The data given can be interpreted using several clues – Mercury is closest but has no atmosphere. Venus has excessive amounts of CO₂. Earth is further and has minimal CO₂ – there is actually no need to look at the data for Earth in this analysis.)</p>
93	B	Eyespots mimic the eyes of predators. In this case they act as a deterrent to predators, making attackers think they are larger and potentially dangerous animal. The shape size and pattern on the wings is part of the wing structure.
94	D	<p>D. It is not free if it costs the life of an innocent child.</p> <p>Bloom's Level: APPLYING</p> <p>. Often seen as a victimless crime, illegal connections are always without safety measures and use substandard, dangerous components.</p> <p>Furthermore, equipment is valuable (as any cable thief can verify) and salaries of Eskom workers must come from consumers.</p>
95	C	Water, egg and vinegar do not have vibrant colours. When egg white is beaten, it turns white in colour. Mustard and tomato sauce is bright red and bright yellow in colour.
96	B	<p>B. Near Sutherland in the Karoo Mountains</p> <p>Blooms Level: APPLYING</p> <p>(Learners need to know the Optical telescopes need dark skies and apply this knowledge to choosing a suitable site – the other three options are all in or near cities where light pollution is a major problem. In addition HartRAO is a radio telescope.)</p>
97	D	Distillation is the action of purifying a liquid by a process of heating and cooling. The distillation process goes through four stages in the following order: heating, vaporization, cooling and condensation
98	D	<p>Substance H is a liquid at 25°C and changes to a gas at 50°. At 50° none of the other substances had changed into a gas.</p> <p>Although substance F is also a liquid at 25°C, it only changed to a gas at 75°C. Substance G changed from a solid to a liquid at 25°C, but stayed a liquid at 75°C. It needed a higher temperature to change to a gas.</p> <p>Substance E did not change phase at any of the temperatures. It stayed a solid.</p>

		This means that H had the fastest rate of phase change.
99	B	Towel P had the biggest exposed surface area in contact with the surroundings, thus gained heat the fastest and the water on it evaporated the quickest, resulting in P having the least mass after one hour.
100	C	At 10 cm the reaction time was 0.14 seconds and at 15 cm it was 0.18 seconds. 12cm is more than 10 cm and less than 15 cm, therefore the reaction time will be more than 0.14 and less than 0.18.