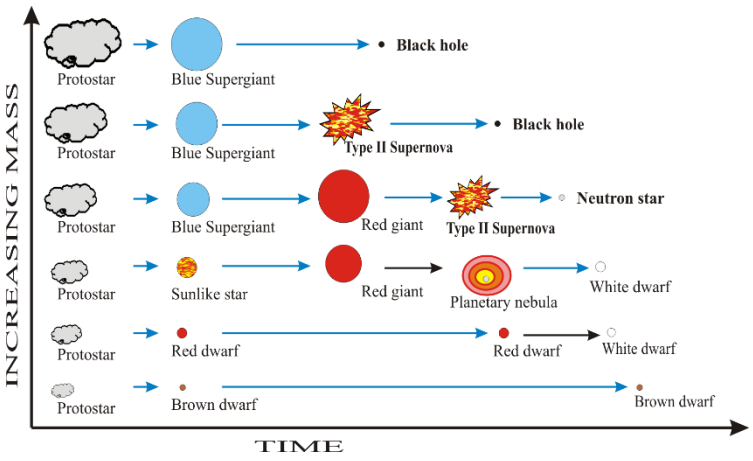
QUESTION	ANSWER	EXPLANATION
1	B	Gas, liquid and solid. Straight forward
2	C	Uranium, which is used as fuel in nuclear power plants, is a finite resource. We've already mined the most accessible sources, and at current rates of use, all cost-effective sources of uranium will be exhausted in about a century. Nuclear power generates long-lived radioactive waste that must be managed for thousands of years. Propane gas is a fossil fuel derived from natural gas processing and crude oil refining, making it a non-renewable resource. Although propane is a cleaner-burning fuel compared to other fossil fuels, it still releases carbon dioxide (CO_2) into the atmosphere when burned.
3	C	Kinetic energy is the energy that an object or a particle has by reason of its motion. In illustration wind , and in illustration the flow of water, is used to turn the turbines to generate electricity.
4	A	Sperms are produced in testes, then it moves into vas deferens then into urethra [penis] which take it out of the body.
5	A	1 day
6	A	A. The total mass off All of the water on and inside the Earth is only 0,02% of the total mass of the whole rocky planet. Although we often refer to Earth as a "Water Planet" this is misleading. Earth is the "3rd ROCK from the Sun" and (relative to the 12000 km diameter of the planet) the deepest ocean trench is a mere 11 kilometres. Earth's mass is 6×10^{24} kg and the total mass of the oceans plus the ice caps is only 1.4×10^{21} kg . We can write this as 6000×10^{21} versus 1.4×10^{21} to get a better comparison, or just 6000:1,4 as you will realise, we are NOT a water planet.
7	A	A dynamo is an electrical generator that converts mechanical energy, in this case kinetic energy due to the turning of the bicycle wheel, into electrical energy through a process called electromagnetic induction. This process, discovered by Michael Faraday in 1831, is a fundamental principle in the field of electromagnetism.
8	B	The blackbird is a predator because it hunts, kills and eats the ladybird.
9	C	The Greenfly population will increase because their natural predators, the ladybirds are no more there to feed on them.
10	B	They are still in the sky but we cannot see them because of the bright sunshine.
11	D	Mercury
12	B	According to the laws of electrostatics, opposite charges attract and like charges repel. Sphere X is negatively charged, and it attracts Sphere Y. This implies that Sphere Y is positively charged because opposite charges attract. Sphere X repels Sphere Z. This implies that Sphere Z is also negatively charged because like charges repel.
13	B	Cell membranes are present in all cells.

14	D	**Background:** In 2006 a spacecraft called New Horizons was launched by NASA. Nine years later in it finally flew past Pluto at 49600 km/h after covering 5,3 billion kilometres. It took great, clear photographs of the Pluto System. It collected data on Pluto with its 5 moons. We have now concluded that Pluto and Charon (the largest moon) actually form a linked binary pair orbited by the 4 smaller moons. So our Solar System has 8 major planets, several minor planets, and one Binary Planet Pair. Pluto has failed to clear out its orbit and is surrounded by lots of space debris. Pluto's status as a planet was changed because there are dozens of objects in the Kuiper Belt which were not cleared up.
15	B	You would freeze to death. {Although your body heat will boil the liquid oxygen away, you will be dead within seconds}
16	C	In a series circuit, the current flowing through each component is the same. Therefore, options A and D can be eliminated because they suggest a difference in current, which is not possible in a series circuit. The brightness of a bulb is determined by its power dissipation, which is given by the formula $P = I^2 R$, where P is power, I is current, and R is resistance. Since the current I is the same for both bulbs in a series circuit, the bulb with the higher resistance R will have a higher power dissipation P, and therefore will glow brighter. So, if bulb X glows brighter than bulb Y, it means that the resistance of bulb X is bigger than that of bulb Y.
17	C	Vitamin C is found in citrus fruit, tomatoes and spinach.
18	C	Venus lies closer to the Sun than does Earth. The only way that Venus can block some sunlight is if it lies closer to the Sun than does Earth.
19	A	In history, the ancient Greeks had weapons made of bronze, while the later Romans had weapons made of iron. The reason that the Bronze Age happened <u>before</u> the Iron Age is... Bronze consists of metals that have lower melting points than iron has. Only after furnaces capable of melting iron were invented could the Iron Age start.
20	A	Reflection involves the bouncing back of light from a surface, while refraction involves the bending of light as it passes from one medium to another. The light is therefore refracted and not reflected.
21	C	Carbon dioxide is a waste product and should not be taken along on a space flight. All other substances are needed by the body for normal metabolism
22	A	The gravity of an orbiting exoplanet causes the distant star to wobble back and forth as the planet moves around it.
23	A	The glass bowl of the thermometer expands first causing the mercury to drop into it. This is just a matter of timing
24	D	With switch S open, current will flow through both resistors. With switch S closed, R_1 is short circuited. Current will bypass R_1 and flow only through R_2.
25	D	Some organelles that occur in plant cells are not the same in animal cells.
26	C	More massive exoplanets will cause a bigger wobble of the star. C gives more information about the "Wobble Method". A, B, and D gives no information.

27	C	It expands because external air pressure decreases – until it bursts. Hydrogen is the lightest gas so the balloon will rise. As it does, the outside air pressure decreases so the greater internal pressure makes the balloon get bigger and bigger as it rises. Eventually the rubber will fail and the balloon will burst and fall to the ground probably many kilometres from the start.
28	A	R = V/I. The gradient of the graph is given by gradient = $\Delta y/\Delta x$, i.e. I/V = 1/R. R is therefore inversely proportional to the gradient. X has the steepest gradient and therefore the smallest resistance. Z has the least steep gradient and therefore the largest resistance.
29	A	The investigator controls the different types of heart diseases that's why it's the independent variable.
30	D	Reliability of an investigation depends on the sample size and repetition.
31	B	40 234 838 400 000 km. 31556736 seconds x 4,25 years x 300 000 km/s = 40 234 838 400 000 km
32	D	Rusting of iron. A, B and C are PHYSICAL processes and only a change of state has occurred. Rusting is a chemical reaction ($4Fe + 3O_2 \rightarrow 2Fe_2O_3$).
33	A	The parcel will follow a curved path known as a parabolic trajectory. This is due to two independent motions: **Horizontal Motion:** The parcel will continue moving at the same horizontal speed as the helicopter (80 km/h) due to the principle of inertia. This is because an object in motion tends to stay in motion unless acted upon by an external force. In this case, there's no horizontal force acting on the parcel after it's dropped. **Vertical Motion:** At the same time, the parcel will accelerate downwards due to gravity. This vertical motion will be a uniformly accelerated motion, starting from rest (when it's dropped) and gaining speed as it falls.
34	D	Correct order of digestive organs is stomach, pancreas, liver and gall bladder.
35	A	In March, 2029 January 2025 + 4,25 years (i.e. 4 years 3months) = March 2029
36	C	Photosynthesis: carbon dioxide + water → Glucose + oxygen Photosynthesis requires the continual ADDING of SUNLIGHT.
37	D	X does not light up while Y would be brighter
38	D	Respiration occurs in all parts of the rat and the plant.
39	D	Although the gas molecules are moving very quickly, at that altitude they are spread out very thinly, so their "heat content" is actually very low. The molecules are "hot" but there are very few of them, so the "heat content" of the gas is actually fairly low.
40	B	Water in a pressure cooker boiling to become steam B is a Change of State from liquid to Gas

41	A	Typically, electrical devices in our homes are connected in parallel, not in series. Here's why: **Voltage:** In a parallel circuit, each device operates at the same voltage (which is the voltage of the power supply, typically 120V or 240V depending on the country). In a series circuit, the voltage would be divided among the devices, which is not practical for home appliances that need a certain voltage to operate correctly. **Independence:** Devices connected in parallel can operate independently. This means you can turn one device on or off without affecting others. In a series circuit, if one device fails (like a bulb burning out), it would interrupt the circuit and all devices would stop working. **Current:** In a parallel circuit, each device draws only as much current as it needs, and a failure in one device won't affect the current supply to others. In a series circuit, the same current flows through all devices.
42	B	HIV is spread sexually from one person to the other.
43	A	Line spectra are caused by electrons changing energy levels in an atom. Spectroscopy is one of the most useful tools in astronomy as we can identify elements in distant stars. Even helium was first discovered when astronomers found a new line spectrum in sunlight. As the universe expands, the line spectra of receding stars gets stretched (red-shifted) which allows us to calculate how fast they are moving away. This was discovered by Edwin Hubble in 1929. The effect is similar to the Doppler Effect for Sound – an ambulance siren has a high pitch as it moves towards you, but a low pitch after it passes you. Similarly light from an approaching star is "blue shifted" while the light from a receding star is "red shifted."
44	B	The diamond could catch on fire and burn to form carbon dioxide if the temperature reaches around 1000 degrees Celsius. B is a simple combustion reaction: carbon in any form is a fuel.
45	C	Both solar and wind energy do not emit greenhouse gases that cause climate change. Therefore, using them to produce hydrogen does not contribute to global warming. Solar and wind energy are renewable, meaning they are replenished naturally and continuously. Using these sources for hydrogen production ensures that the process is sustainable and does not deplete resources.
46	C	In a hydrogen fuel cell, hydrogen gas (H_2) and oxygen gas (O_2) are used as fuel. The products of a hydrogen fuel cell are electricity, water, and heat.
47	B	South Africa produces between 80% and 85% of the world's Iridium and 75% of the world's Platinum, resources needed as a catalyst to produce hydrogen. South Africa has an abundance of solar and wind energy resources, which can be used to produce clean and sustainable hydrogen.
48	D	When green hydrogen is used as a fuel, it only produces water as a byproduct, emitting no greenhouse gases. Green hydrogen is produced by using electricity from renewable sources to split water into hydrogen and oxygen. This process, known as electrolysis, does not produce greenhouse gases if the electricity comes from renewable sources.
49	A	Photosynthesis requires water, carbon dioxide and radiant energy. It produces glucose and oxygen.
50	B	Metamorphic rocks. This can be read off the diagram
51	A	to lower the temperature and increase the pressure

		To liquefy oxygen the molecules need to slowed down. Cooling alone is not enough.
52	B	During inhalation the diaphragm and intercostal muscles contract and air flows into the lungs.
53	C	Water Ripples in the rock clearly indicate that the sediments settled down in water
54	A	He placed the crown in a full container of water and measured the volume of water that overflowed. This is the well-known Archimedes Principle. Finding the volume of an irregular solid simply involves measuring the amount of water it displaces. Archimedes was struggling to solve the problem of the volume of the Crown. He climbed into his bath tub (which happened to be full). This caused the water to overflow. He got so excited that he jumped out of his bath and ran down the street naked, shouting "Eureka" which means "I have found it."
55	C	The most concentrated urine is formed after profuse sweating in which the body loses a lot of water. A strenuous game of netball will cause a person to sweat a lot.
56	A	They were deposited in ancient seas when cyanobacteria released oxygen. It is called "Banded Iron Stone." We can clearly see how the layers of sediment were deposited and slowly turned into rock. This happened because stromatolites released oxygen into the water as a waste product from photosynthesis. Initially the oxygen bonded with Fe^{2+} ions oxidizing them to more stable, insoluble Fe^{3+} ions which were deposited on the seafloor. Billions of years later as continents have moved we can now mine the Fe_2O_3 ore
57	D	Aluminium.
58	D	It will become a red giant and then shrink to become a white dwarf. The Sun's lifespan is represented by the third row from the bottom. 
59	B	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ 3 Carbons, 8 Hydrogens and 10 Oxygen atoms on each side of the equation
60	D	SALT observes its targets using visible light. Mirrors are used by Optical Telescopes to catch starlight. Antennae are used by Radio Telescopes to catch Radio Waves

		Sir John Herschel's Reflector SALT at Sutherland – 2024 Cape Town 1835 • In 1835, Herschel's telescope had a 0,46m mirror which was then the largest in the Southern Hemisphere. • In 2024, the South African Large Telescope, with an 11-meter mirror diameter, is currently the largest in the Southern Hemisphere • Herschel's Telescope had to be pointed at his target by men operating ropes and pulleys. • SALT uses Electric motors controlled by computers.

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