

**ZIMBABWE SCHOOL EXAMINATIONS COUNCIL**  
General Certificate of Education Ordinary Level

**MARKING SCHEME**

**NOVEMBER 2021 SESSION**

**COMBINED SCIENCE 4003/2**

1. (a) Biomass - the total mass of living matter in a given area/total mass of organisms in a given area/AW; [1]
- (b) (i) X - producers; [1]
- (ii) energy is lost at each trophic level; more at the bottom/less at the top/AW; energy lost at each level/AW; [2]
- (iii) sunlight/light; [1]
- (iv) the numbers of Z will decrease; there is less food available/AW; [2]
2. (a) glucose;  $\rightarrow$  lactic acid (less energy); [2]
- (b) reduction of surface area/AW;   
*waxy / thicker* cuticle;   
 less stomata on the upper side; (A) converse   
 presence of hairs;   
 sunken stomata;   
*max 2. max [2] max [2]*
- (c) thin walls; faster diffusion;   
 permeable walls; allow materials in and out/Allows exchange to take place;   
 small lumen; resistance in the flow of substances;   
 allows exchange to take place;   
*max [2] max [2]*
3. (a) (i) breakdown of a compound by passing an electric current through it/AW; [1]
- (ii) A : bromine;   
 B : lead; [2]
- (b) (i) carbon/graphite/platinum; [1]
- (ii) conducts electricity;   
 inert/does not react with products/ does not react with the electrolyte; [2]
- (c) to prevent rusting/decorative purpose; [1]
4. (a) (i) distillation; [1]
- (ii) (process)B; [1]
- (iii) temperature;   
 particle size;   
 stirring/AW;   
*max [2] max [2]*
- (b) particles are disorderly; particles are far apart; particles have a lot of energy;   
*any two. max 2 [2]*

5. (a) (i) Energy is never created or destroyed; only changed from one form into another; [2]
- (ii) potential;  $\rightarrow$  kinetic (+ sound); [2]
- (b) coal is burnt <sup>to heat water</sup> inside a boiler/AW;  
to generate steam at (high temperature and) high pressure/AW;  
the steam is used to rotate turbines/AW;  
the power generators connected to the turbines generate electricity/AW; max [3]
6. (a) (i)  $P = \rho hg$ ; [1]
- (ii)  $P = \rho hg / 1200 (\text{kgm}^{-3}) \times 1.5 (\text{m}) \times 10 (\text{ms}^{-2})$   
 $= 18000 (\text{Pa}) / 18 (\text{kPa})$ ; [2]
- (b) (i) the siphoning tube is full of liquid/lower end sucked; end of tube in the bucket ~~is~~ at liquid level; end of tube in bucket higher than end of tube in 20 litre container/AW; max [2]
- (ii) air is drawn from the siphoning tube (by suction);  
creating a partial vacuum in the tube/AW; bucket  
atmospheric pressure exerting on liquid in open container forces liquid into the tube;  
gravitational force makes liquid to flow continuously down the tube; max [2]
7. (a) put into a pit;  
burn;  
(put into a deep pit and) bury it/AW;  
(plastics and glass can be) recycled; max [3]
- (b) (i) stops houseflies from visiting toilets/reduces transmission of diseases (by vectors); ensures a clean and usable environment; avoids bad odour/AW;  
avoids breeding place for pathogens; max [3]
- (ii) brooms;  
mops;  
disinfectants;  
gloves/protective clothing;  
cloth;  
(toilet) brush;  
water; max [3]
- (c) environmental management policy formulation/  
implementation of environmental management/AW; [1]

8. (a) 1. testes: produces sperms / sex hormones;  
 2. sperm duct: passage of sperms (from testis to urethra);  
 3. prostate gland: secretes nutrients/enzymes (which activate sperms); [3]
- (b) (i) adult worms mate and lay eggs;  
 eggs pass out through faeces/urine;  
 eggs hatch into larvae and enter water snails;  
 larva multiplies into free living larva and enter into water;  
 larva penetrate through human skin to start new cycle; max [4]
- (ii) boil/ chlorinate drinking water;  
 deposit faeces/urine in toilets;  
 avoid ~~swimming in~~ <sup>contact with</sup> contaminated water/AW; [3]
9. (a) (i) a meal consisting of all food nutrients in their correct proportions; [1]
- (ii) prevents constipation/assists in bowel movement/helps in digestion; [1]
- (iii) (green) peas/beans;  
 eggs;  
 milk;  
 (A) correct source. max [2]
- (b) pap/AW ~~(carbohydrate)~~;  
 beef ~~(protein)~~;  
 green vegetables ~~(fibre + mineral ions)~~;  
 fruit/fruit juice ~~(vitamins)~~;  
 water; ~~accept~~ any correct combinations  
 (A) max [4]
- (c) air droplets;  
 by contact;  
 fluids of infected person;  
 eating infected animal meat; max [2]
10. (a) (i) X; (and) Z; [2]
- (ii) have same number of electrons in the outermost shell/AW; [1]
- (iii) X; [1]
- (iv) ionic (bonding); [1]
- (b) (i) ~~elements~~ <sup>atoms</sup> with the same proton number but different mass numbers/AW; [1]
- (ii) 16; [1]

- (c) Y is a metal while Z is a non-metal;  
 Y has high melting ~~and~~ boiling point while Z has low melting ~~and~~ boiling point;  
 Y is a good electrical conductor while Z is an electrical insulator;  
 Y is a good thermal conductor while Z is a poor thermal conductor; ~~max [3]~~

(A) correct physical properties of metal and non metal. ~~max~~ [3]

11. (a) (i) a substance that is burned to produce heat or power/AW; [1]

(ii) heating/warming;  
 lighting;  
 powering engines; ~~max~~ [2]

(iii) solar;  
 water;  
 wind; (A) correct source [3]

(b) (i) carbon dioxide; (A) any correct gas. [1]

(ii) high temperatures;  
 floods;  
 droughts;  
 high risk of veld fires;  
 high chances of storm damage; ~~max [3]~~ max [3]

12. (a) reaction between an acid and a base; to produce a salt and water; [2]

(b)  $C = \frac{m}{V}$ ;

$C = \frac{n}{V}$ ; [2]

(c) (i) saponification; [1]

(ii) (vegetable) oil ~~is~~ heated;  
 heated with sodium hydroxide;  
 brine/AW added;  
 to separate soap [4]

(iii) glycerine / glycerol; [1]

13. (a) (i)  $P = VI/110 \times 2;$

$= 220 \text{ W};$

$\text{units} = \frac{220}{1000} \times 1 \text{ hour} / 0,22 \text{ kWh};$  CFE

$\text{cost} = 0.22 \text{ kWh} \times 50 \text{ c} / 11 \text{ cents};$  CFE [4]

(ii) temperature; (A) correct limitation [1]

(iii) live wire;  
neutral wire; [2]

(b) (i) height (of the conductor) above the building;  
earth (by the conductor)/AW; [2]

(ii) wearing red clothes during a thunderstorm attracts lightning/AW;  
lightning bolts are a result of witchcraft/AW; [1]

(A) correct myth.

14. (a) (i) current flows in the coil;  
coil is in the magnetic field;  
magnetic field is produced around the coil;  
the two magnetic fields interact;  
producing a force;  
causing the coil to rotate;  
commutator reverses direction of current;  
this maintains the rotation;

max [5]

(ii) magnetic strength;  
number of turns;  
amount of current;

[3]

(b) heating;  
lighting;  
powering of appliances;

max [2]

15. (a) (i) a force that opposes motion;

[1]

(ii)  $25\text{N} - 7\text{N};$   
 $18 \text{ N};$

[2]

(b) car brakes;  
tyre treads;  
shoe soles/AW;

(A) any correct application

max [2]

- (c) (i) clockwise moments equal anticlockwise moments at equilibrium/AW; [1]
- (ii)  $\frac{120 (N) \times 10 (cm)}{60 (cm)}$  ;  
20 N; [2]
- (iii) effort increases (in size)/AW; [1]
- (iv) lubrication; [1]