

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව  
இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம்  
Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka

34 E II

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2020  
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2020  
General Certificate of Education (Ord. Level) Examination, 2020

විද්‍යාව II  
விஞ்ஞானம் II  
Science II

පැය තුනයි  
மூன்று மணித்தியாலம்  
Three hours

අමතර කියවීමේ කාලය - මිනිත්තු 10 යි  
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்  
Additional Reading Time - 10 minutes

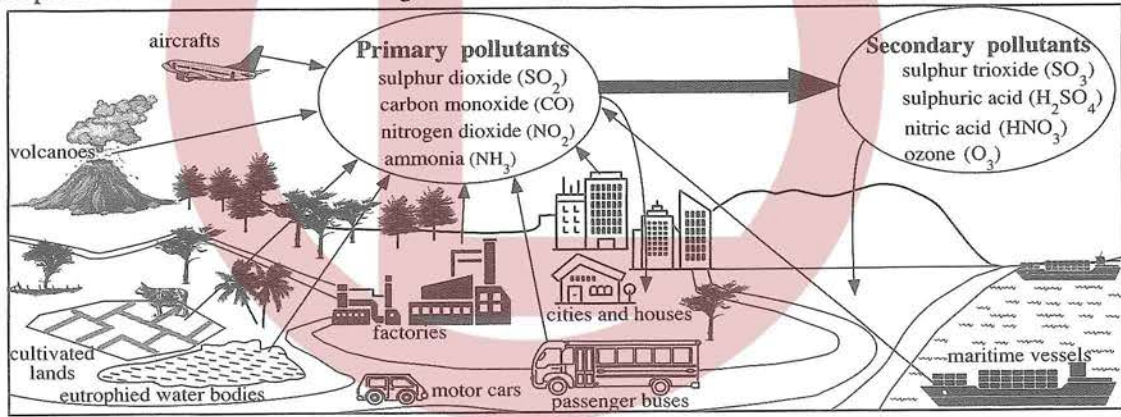
Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index Number: .....

- Instructions: \* Write your answers in neat handwriting.  
\* Answer the four questions in Part A, in the space provided.  
\* Of the five questions in Part B answer three questions only.  
\* After answering, tie Part A and the answer script of Part B together and hand over.

Part A

1. (A) The following figure indicates several common sources of pollutants and the gaseous pollutants produced by them. The primary pollutants indicated in it are the gaseous pollutants directly added to the atmosphere. The secondary pollutants produced from the primary pollutants undergoing chemical changes in the atmosphere are also indicated in the figure.



Select an **example** relevant to each of the following statements from the figure and fill in the blanks in the table.

(i)	A pollutant source producing primary pollutants without human interference.	.....
(ii)	A secondary pollutant affecting living beings favourably in the upper regions of the atmosphere and unfavourably in the lower regions of the atmosphere.	.....
(iii)	A primary pollutant producing secondary pollutants which contribute to acid rains.	.....
(iv)	A primary pollutant with basic properties that liberates from the eutrophied water bodies.	.....
(v)	A secondary pollutant that falls on soil and contributes to provide a main nutrient essential for plant growth.	.....
(vi)	If the food mileage is shortened, the amount of gaseous pollutants released from this pollutant source is reduced.	.....
(vii)	If this mode of transport is selected, your carbon foot print during an inland tour can be minimized.	.....

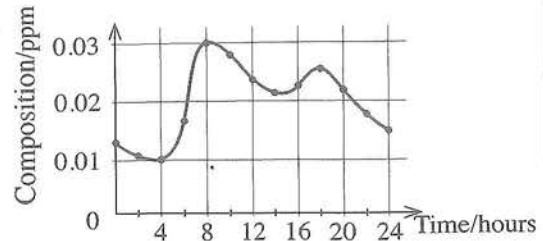
[See page two

(B) In a populated city, the atmospheric nitrogen dioxide gas ( $\text{NO}_2$ ) composition was measured during a day starting from Sunday midnight to Monday midnight. The variation graph of the composition of  $\text{NO}_2$  drawn using those data is given below. Answer the following questions based on the graph.

- (i) What is the maximum and minimum  $\text{NO}_2$  composition existed on the relevant day?

maximum: ..... minimum: .....

- (ii) In which hour of the day is the maximum  $\text{NO}_2$  composition recorded? .....



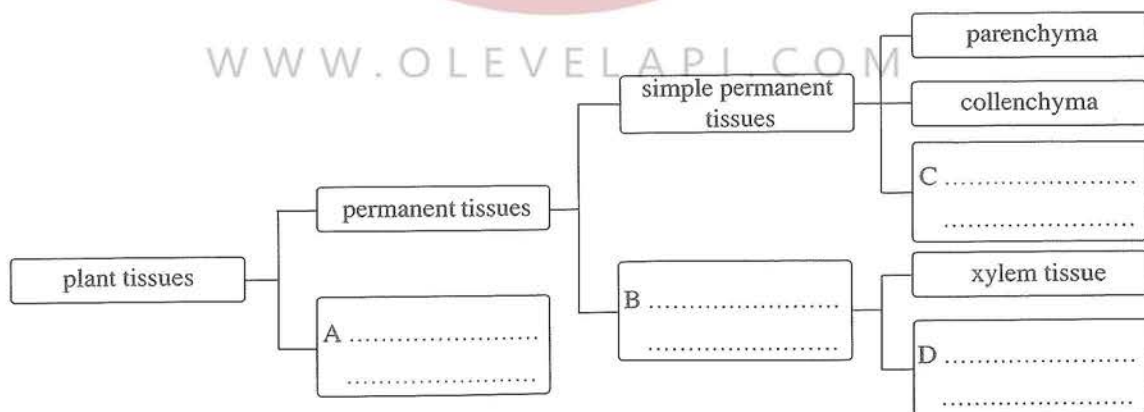
- (iii) According to the above graph, in the above city, two occasions are seen in which the  $\text{NO}_2$  composition assumes a high value in a day. Give a reason for it. ....
- (iv) In the above city, the increase in the  $\text{NO}_2$  composition in the forenoon is greater than that of the afternoon. Give a reason for it? .....
- (v) Name another primary gaseous pollutant which would indicate a variation that corresponds to the variation of  $\text{NO}_2$  composition during the relevant day in the above city. ....

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2. (A) Given below is an incomplete table about four organelles existing in a cell and their main functions. Fill in the blanks and complete the table.

Organelle	Function
(i) Nucleus	.....
(ii) .....	providing energy required for metabolic activities
(iii) Golgi complex	.....
(iv) .....	protein transport

(B) (i) An incomplete chart indicating the classification of plant tissues is shown below. Write the tissue types relevant to the boxes A, B, C and D on the dotted lines given and complete the table.



- (ii) What is the type of tissue in which photosynthesis occurs most? .....
- (iii) Name the type of tissue which contains sieve tube elements. ....

[See page three]



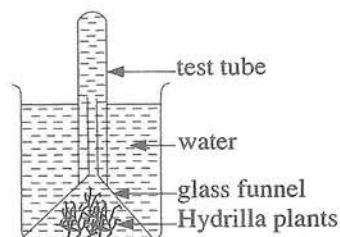
(C) An apparatus set by a group of students to investigate a product of photosynthesis is shown in the diagram.

(i) What is the gas collected in the test tube when this apparatus is kept in sunlight? .....

(ii) State a test that can be done to identify that gas and the observation you make during the test.

Test : .....

Observation : .....



(iii) A new apparatus similar to the above apparatus was made by putting water saturated with carbon dioxide gas instead of normal water.

(a) State an observation that could be expected with regard to the evolution of gas bubbles in the new apparatus when comparing with the evolution of gas bubbles in the first apparatus under similar environmental conditions.

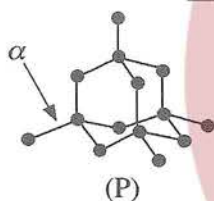
(b) Give reasons for the observation you mentioned above.

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3. (A) The following figures indicate the lattice structures of three solid substances P, Q and R.

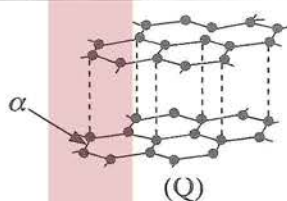
(i) Identify them and fill in the relevant blanks selecting the names of those substances and the lattice structures from the box given below.

sodium chloride, diamond, graphite, ionic, atomic



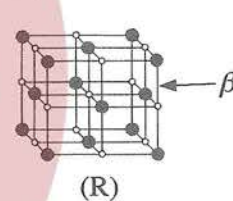
substance : .....

lattice : .....



substance : .....

lattice : atomic



substance : .....

lattice : .....

(ii) Write the names of the chemical bonds labelled  $\alpha$  and  $\beta$  in the lattice structures.

$\alpha$  : .....

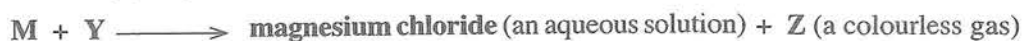
$\beta$  : .....

(iii) Of the substances P, Q and R,

(a) which substance conducts electricity in the solid state? .....

(b) which substance has the highest hardness? .....

(B) Given below are two reactions in connection with the metal M.



(i) Identify M, X, Y and Z and write their names or chemical formulae on the dotted line.

M : .....

X : .....

Y : .....

Z : .....

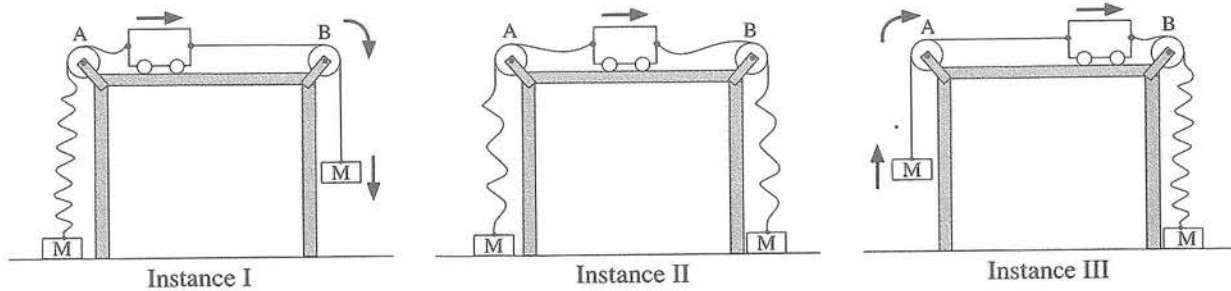
(ii) In compound X, the ionic form in which M exists is  $\text{M}^{2+}$ . Write the chemical symbol of the ionic form in which oxygen exists in that compound. ....

(iii) X is sparingly soluble in water. Which colour litmus papers give a colour change when testing that aqueous solution with litmus papers? .....

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[See page four]

4. (A) In an activity to demonstrate Newton's laws, a trolley connected to two equal masses  $M$  with strings is used. The figures show three instances in the activity. In those instances, the slack strings are represented by wavy lines while the taut strings are represented by straight lines. The strings are made to pass over two smooth pulleys A and B fixed to the two ends of a table. Arrows indicate the direction of motion of the trolley which smoothly moves on the horizontal table and the directions of motion of the masses.



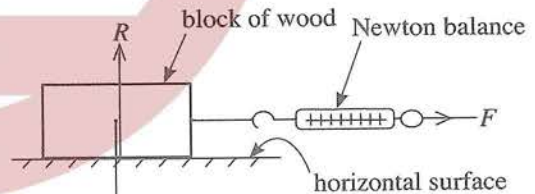
- (i) Inserting appropriately the terms given in the following box, complete the following table which describes the nature of motion of the trolley in the instances I, II and III.

uniform retardation, uniform acceleration, uniform velocity, Newton's first law, Newton's second law		
Instance	Nature of motion of the trolley	Newton's law that describes the nature of motion of the trolley
I	.....	.....
II	.....	.....
III	.....	Newton's second law

- (ii) In one of the above instances, the trolley took 5 s to travel 50 cm on the table with uniform velocity. Find the uniform velocity with which the trolley moved.

.....  
 .....

- (B) The figure shows a cuboidal block of wood used to examine how the frictional force between a horizontal surface and an object placed on it changes. The block of wood is connected to a Newton balance by a string and a horizontal, external force  $F$  is applied. The experiment is conducted by increasing the value of the force  $F$  gradually from zero.



- (i) Name the forces indicated by  $R$  and  $W$ .

$R$  : .....  $W$  : .....

- (ii) The block of wood stays at rest until  $F$  is increased to a certain value from zero. By what name is the frictional force acting on the block of wood known before it starts to move?

- (iii) At the moment the motion starts, the frictional force acting on the block of wood reaches the maximum value.

- (a) What is the name of that maximum frictional force? .....
- (b) Write two factors on which the magnitude of that frictional force depends.

- (c) Suggest a method that can be practically applied to change one factor you stated in (b) above.

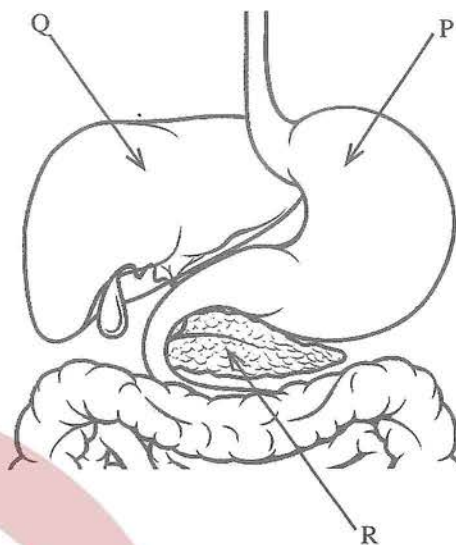


## Part B

- Answer only **three** questions from the questions No. 5, 6, 7, 8 and 9.

5. (A) Given below is a sketch of a part of the human digestive system.

- Name the parts labelled P, Q and R.
- Describe briefly how food is subjected to mechanical digestion in P.
- A secretion essential for the emulsification of lipids contained in food is produced by Q. Name that secretion.
- (a) What is the enzyme which is secreted by R and contributes to digest lipids?  
(b) State the **two** products formed by the action of that enzyme on lipids.
- The pair of hormones insulin and glucagon produced by R contributes to regulate the internal environment of the body.  
(a) What is the factor that is regulated in the internal environment of the body by the action of those hormones?  
(b) Explain briefly how those hormones contribute to regulate the factor you stated in (a) above.



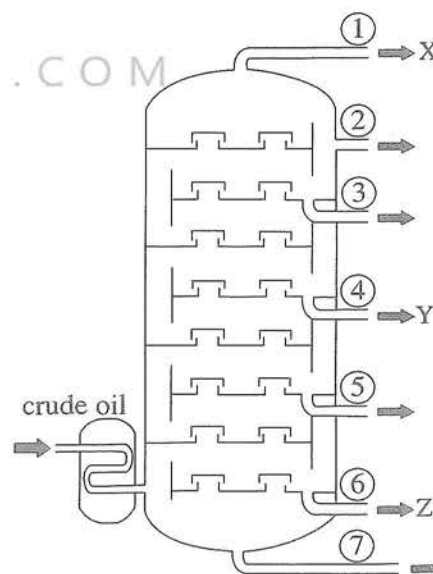
(B) Kidneys are considered the main organs which perform nitrogenous excretion in humans.

- What is excretion?
- Name a nitrogenous excretory product removed by kidneys.
- What is the structural and functional unit of the kidneys?
- One step in the process of forming urine in the structural and functional unit of the kidneys is known as **secretion**.  
(a) Describe briefly how secretion occurs.  
(b) State the other **two** steps in the formation of urine.

(20 marks)


6. (A) A longitudinal section of a fractionating tower used for refining crude oil is given below. Contained in abundance are the compound X in the fraction released from the outlet (1), compound Y in the fraction released from the outlet (4) and the compound Z in the fraction released from the outlet (6).

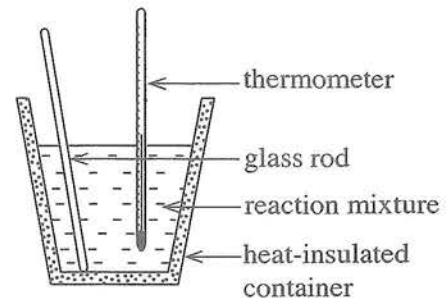
- By what common name is the group of organic compounds contained in abundance in crude oil known?
- Name the crude oil refining technique employed in the tower.
- The boiling points of the compounds X, Y and Z are  $T_X$ ,  $T_Y$  and  $T_Z$  respectively. Write them in the ascending order.
- X is a compound with a single carbon atom and containing carbon and hydrogen only. Draw the dot and cross diagram of a X molecule.
- Write the balanced chemical equation relevant to the complete combustion of one mole of compound X in oxygen gas.
- The substance released from outlet (7) of the tower is used to construct roads. Name that substance.
- State an environmental problem caused by the gaseous components that would be released to the environment during refining of crude oil.

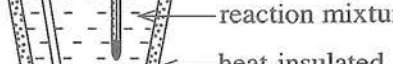


[See page six

- (B) A is a strong acid and B is a strong base. Two products are produced in the reaction between A and B. One of those products is sodium chloride (NaCl).

- (i) Write the chemical formulae of the compounds A and B.
- (ii) Name the compound that is produced as the other product during the reaction between A and B.
- (iii) Describe briefly how the compound you stated in (ii) above is formed during the reaction between A and B.
- (iv) An apparatus set up to determine the heat change associated with the reaction between A and B is shown in the diagram.
- 



- (a) In the apparatus, what measure has been taken to reduce the heat loss?
- (b) Suggest a course of action which can be taken to reduce further the heat loss in this apparatus.
- 
- (v) 50 cm<sup>3</sup> each of A acid solution and B base solution of equal concentration were taken and mixed in the above apparatus. The temperature change occurred here was determined to be 10 °C.
- (a) What are the readings that should be taken to determine the above temperature change?
- (b) Calculate the heat change associated with the above reaction. (The specific heat capacity of the reaction mixture is 5000 J kg<sup>-1</sup> °C<sup>-1</sup> and its density is 1 g cm<sup>-3</sup>.)
- (vi) Sketch an energy level diagram to illustrate the energy change occurring in the chemical reaction between A and B above.

(20 marks)

7. (A) The following activities were done by a student at home using a glass hand lens.

### Activity 1 - Reading a label with very small letters

### Activity 2 - Burning a piece of dry cotton wool by solar rays

### Activity 3 - Obtaining an image of a tree in the compound on a wall in the house

- Name the type of the lens that is used as the hand lens.
- Between which two points related to the lens should the label be placed in Activity 1?
- Indicate by a ray diagram how light rays travel through the lens in Activity 2.
- Instead of the hand lens, what type of a mirror can be used to carry out Activity 2?
- State **two** characteristics of the image formed in Activity 3.
- Name **two** instruments that are made using lenses of the type used for hand lenses.

- (B) When brakes are applied to a normal motor vehicle at run, its kinetic energy is lost due to friction.

- (i) Brakes are applied to a motor vehicle of mass 1000 kg when running at a speed of  $20 \text{ m s}^{-1}$ .
  - (a) Calculate the kinetic energy of the vehicle at the instance just before applying brakes.
  - (b) Name **two** forms of energy to which the kinetic energy lost gets converted when applying brakes.
- (ii) A part of the kinetic energy lost when applying brakes to an electric motor vehicle is converted to electrical energy and its battery is charged.
  - (a) Name the equipment that converts kinetic energy to electrical energy here.
  - (b) Name and describe briefly the phenomenon of converting lost kinetic energy of the vehicle to electrical energy.
  - (c) Name the equipment that converts the electrical energy supplied by the battery to kinetic energy required to run the vehicle.
  - (d) The electromotive force of a battery used in electric motor vehicles is about 400 V. This is composed of a set of cells where the electromotive force of one cell is 4 V. What is the minimum number of cells required to make this battery?

(20 marks)

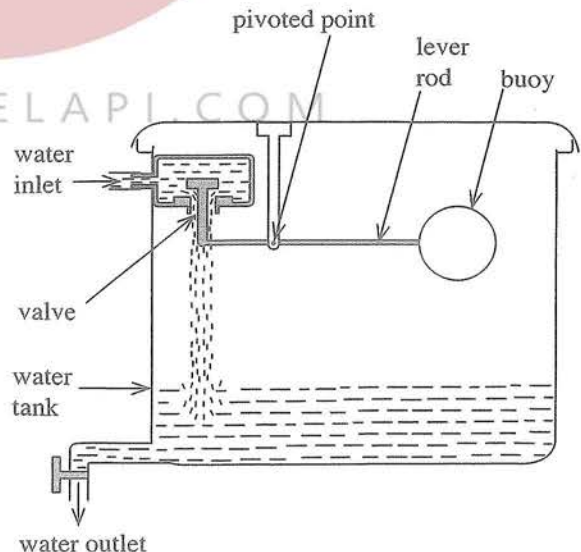
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8. (A) A student recorded as follows three animals and features of two animals indicated as P and Q as their names were unknown to him found in an okra (bandakka/vendi) cultivation.

- snail
- lizard
- greater coucal (etikukula/chenpakam)
- P - Has a thin, long and vermiform body. The body is divided into equal segments.
- Q - Bears jointed legs and wings.

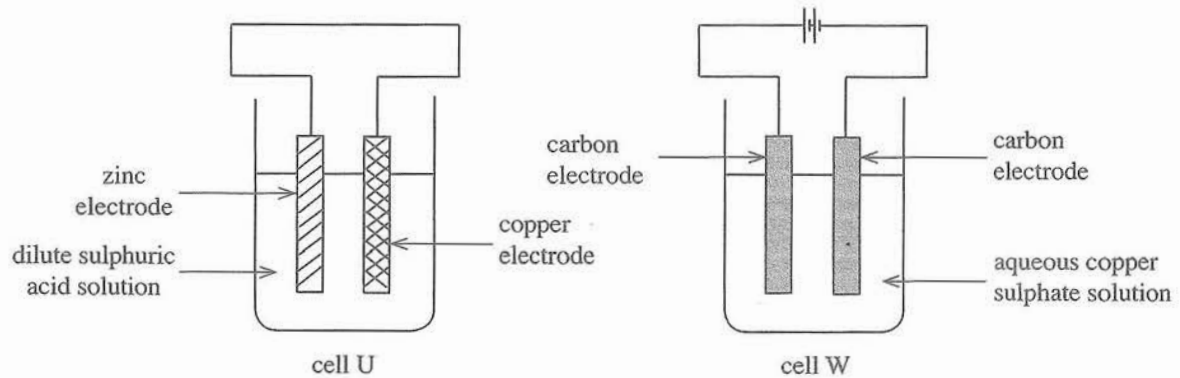
Write answers to the following questions related to the animals observed.

- (i) (a) Name the two vertebrate animals.
  - (b) What is the main characteristic on which the inclusion of those animals in the vertebrate group based?
  - (ii) According to the above observations, what is the animal phylum to which P belongs?
  - (iii) State another common characteristic specific to the animal species of the phylum to which Q belongs.
  - (iv) State a favourable effect and an unfavourable effect which can be expected to have caused by Q on the crop.
  - (v) State a primary consumer and a secondary consumer respectively in a food chain that contains animals observed in the okra cultivation.
  - (vi) A newspaper has printed greater coucal's scientific name as *Centropus Sinensis*. According to the rules of binomial nomenclature, state two errors seen in it.
- (B) A cylindrical water tank is kept on the roof of a two storeyed house.
- (i) Consider an occasion in which two identical water taps in the upper floor and the ground floor of the house are kept fully open at the same time.
    - (a) From the tap in which floor does water flow out with higher speed?
    - (b) Give the reason for your answer.
  - (ii) The inner cross sectional area of the tank is  $1 \text{ m}^2$  and its height is 1 m. (Density of water is  $1000 \text{ kg m}^{-3}$  and acceleration due to gravity is  $10 \text{ m s}^{-2}$ .)
    - (a) What is the mass of water in the tank when it is completely filled with water?
    - (b) What is the pressure exerted by water on the bottom of the tank when it is completely filled with water?
  - (iii) The diagram shows a lever arrangement made to prevent the overflow of water entering the tank. When water gets filled, the buoy lifts closing the valve and the entry of water stops.
 
    - (a) What is the force acting on the buoy at the position shown in the diagram?
    - (b) What is the extra force acting on the buoy from the time at which the water level rises and the buoy starts to submerge in water.
    - (c) State another advantage gained from this lever arrangement in addition to the prevention of overflow of water.

(20 marks)

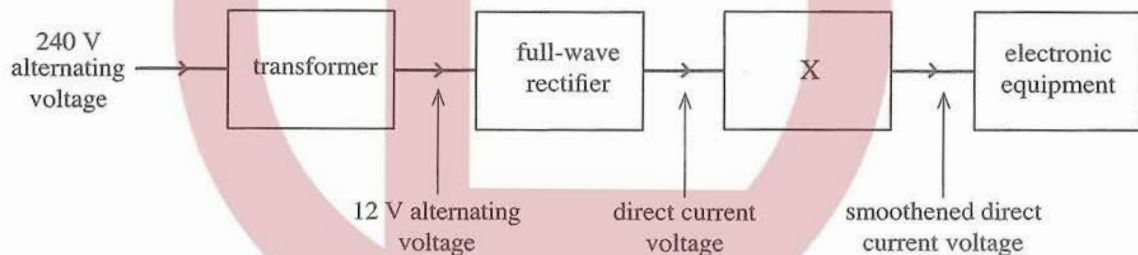
[See page eight]

9. (A) The cell U shown below is an electrochemical cell while the cell W is an electrolytic cell.



- In which cell above is chemical energy converted to electrical energy?
- What is the name by which the anode reactions occurring in the two cells are known in common?
- Indicate the half reaction occurring at the anode of the cell U by a chemical equation.
- State the convention used to identify the anode and cathode in cell W.
- (a) What change in colour occurs in the electrolytic solution when cell W operates?  
(b) Explain the reason for it.
- Which electrode is dissolved when the above cells operate?

(B) In order to operate a certain household electronic equipment, the domestic electricity supply has to be converted to a low voltage, direct current electrical supply. For that, an arrangement consisting of the following parts is used.



- (a) What type of a transformer is connected to the above arrangement?  
(b) In what coil in this transformer should wires of higher diameter be used? State the reason for it.
- The number of turns in the primary coil of the above transformer is 1800. What should be the number of turns in the secondary coil?
- Illustrate graphically how the 12 V alternating voltage supplied by the transformer varies with time.
- Draw using standard symbols, how the four diodes are connected in the full-wave rectifier circuit.
- Name the device indicated by X.

(20 marks)

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