

අධ්‍යාපන පොර සහතික පත්‍ර (සාමාන්‍ය පෙනු) විභාගය, 2023(2024)

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General Certificate of Education (Ord. Level) Examination, 2023(2024)

ඩිජ්‍යාලි

I

විශ්වාසීය

I

Science

I

ඡැස එකුටු

ඉං. මෘත්ත්තිපාලම

One hour

## Instructions :

- \* Answer **all** questions.
- \* In each of the questions 1 to 40, pick one of the alternatives (1), (2), (3), (4) which you consider is correct or most appropriate.
- \* Mark a cross (X) on the number corresponding to your choice in the answer sheet provided.
- \* Further instructions are given on the back of the answer sheet. Follow them carefully.

1. Urea which is an excretory product is produced in  
 (1) kidneys. (2) liver. (3) urinary bladder. (4) nephrons.
2. What is the unit of power?  
 (1)  $W \cdot s$  (2)  $W \cdot s^{-1}$  (3)  $J \cdot s$  (4)  $J \cdot s^{-1}$
3. The formula of an isopropyl alcohol molecule is  $(CH_3)_2CHOH$ . What is the number of atoms in this molecule?  
 (1) 8 (2) 10 (3) 11 (4) 12
4. What is the tissue that transports food produced in plant leaves throughout the plant body?  
 (1) xylem (2) phloem (3) cambium (4) sclerenchyma
5. When two objects are rubbed together and one of them gets positively charged, transferred to the other are  
 (1) electrons. (2) protons. (3) neutrons. (4) electrons and protons.
6. Which of the following includes an acidic oxide, an amphoteric oxide and a basic oxide in respective order?  
 (1)  $SO_3$ ,  $Al_2O_3$ ,  $SiO_2$  (2)  $SO_3$ ,  $Al_2O_3$ ,  $MgO$   
 (3)  $CO_2$ ,  $SiO_2$ ,  $MgO$  (4)  $SiO_2$ ,  $CO_2$ ,  $Al_2O_3$
7. In a plant cell ..... can be called a non-living structure.  
 (1) cell wall (2) plasma membrane (3) ribosomes (4) Golgi body
8. Another morphological feature of a plant bearing the leaves with the venation shown in the diagram is  
 (1) presence of a tap root system.  
 (2) having a branched stem.  
 (3) having one cotyledon in the seed.  
 (4) bearing tetramerous or pentamerous flowers.
9. Which of the following statements on electromagnetic waves is false?  
 (1) They transmit energy.  
 (2) They travel with a speed of  $3 \times 10^8 m \cdot s^{-1}$  in vacuum.  
 (3) Frequency is less in a material medium than in vacuum.  
 (4) Speed is less in a material medium than in vacuum.
10. Which of the following statements is true about ionic compounds?  
 (1) They conduct electricity in the solid state.  
 (2) All dissolve well in water.  
 (3) Boiling points and melting points take high values.  
 (4) They do not conduct electricity in the fused state.



[See page two]

11. Following symptoms are seen in a person suffering from a disease in the respiratory system.

- release of blood with cough
- loss in body weight
- high fatigue

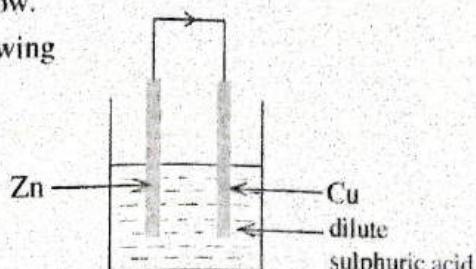
This person would have contracted

- (1) pneumonia. (2) bronchitis. (3) tuberculosis. (4) silicosis.

• Questions 12 and 13 are based on the figure given below.

12. In the direction shown by the arrow, which of the following flow(s) in the external circuit?

- (1) conventional current  
 (2) electrons  
 (3)  $Zn^{2+}$  ions  
 (4)  $Cu^{2+}$  ions



13. What is the cathodic reaction taking place in the above cell?

- (1)  $Zn^{2+}(aq) + 2e \longrightarrow Zn(s)$  (2)  $Cu^{2+}(aq) + 2e \longrightarrow Cu(s)$   
 (3)  $2H^+(aq) + 2e \longrightarrow H_2(g)$  (4)  $4OH^-(aq) + 4e \longrightarrow O_2(g) + 2H_2O(l)$

14. Consider the following statements regarding refraction of light.

- A - Light refracts only when it travels from a rarer medium to a denser medium.  
 B - Reason for the refraction is the difference in the speed of light in the two media.  
 C - Frequency of light changes during refraction.

Of the above, true statement(s) is/are

- (1) only A. (2) only B. (3) only A and C. (4) only B and C.

15. The acceleration due to gravity on the Earth is  $10\text{ m s}^{-2}$ . On the moon its value is  $\frac{1}{6}$  th the value on the Earth. What is the weight of an object on the moon if it weighs 60 N on the Earth?

- (1) 10 N (2) 60 N (3) 100 N (4) 360 N

16. Of the following characteristics, what are the characteristics common only to Aves and Mammalia belonging to the vertebrate animal group?

- |                            |                            |             |             |
|----------------------------|----------------------------|-------------|-------------|
| A - warm bloodedness       | B - skin covered with hair |             |             |
| C - bony internal skeleton | D - four chambered heart   |             |             |
| (1) A and B                | (2) A and D                | (3) B and C | (4) C and D |

17. Which of the following is false about metals?

- (1) Majority of the elements are metals.  
 (2) All metals conduct electricity.  
 (3) Metal atoms lose electrons and form positive ions.  
 (4) All metals react with acids and liberate hydrogen.

18. When a few drops of methyl orange were added to a certain solution, it turned red. Which of the following is most likely to be the pH value of that solution?

- (1) 2 (2) 7 (3) 12 (4) 14

19. It takes four seconds for an ultrasonic wave sent by a ship to the bottom of the sea to be reflected and come back to the ship. If the depth to the bottom of the sea is 2880 m, what is the speed of the ultrasonic wave in sea water?

- (1)  $720\text{ m s}^{-1}$  (2)  $1440\text{ m s}^{-1}$  (3)  $2880\text{ m s}^{-1}$  (4)  $3700\text{ m s}^{-1}$

20. Given below are some properties of a gas.

- can be burnt easily
- density is less than that of air
- slightly soluble in water

This gas is

- (1) hydrogen. (2) nitrogen. (3) oxygen. (4) carbon dioxide.

21. What is the part belonging to the central nervous system which controls the rate of heart beat?

- (1) cerebrum (2) cerebellum (3) spinal cord (4) medulla oblongata

22. Consider the following statements about the resistance of a conductor.

- A - depends on the potential difference between the two ends of the conductor
- B - directly proportional to the length of the conductor
- C - depends on the current flowing through the conductor

Of the above, the true statement(s) is/are,

- (1) only A. (2) only B. (3) only A and B. (4) only A and C.

23. What is the amount of moles of calcium carbonate in 10 g of calcium carbonate? ( $\text{CaCO}_3 = 100$ )

- (1) 0.01 (2) 0.1 (3) 1 (4) 10

24. Select the correct statement about carbohydrates.

- (1) All carbohydrates are water-soluble.
- (2) All carbohydrates are crystalline.
- (3) In carbohydrates, ratio between C and H is 1 : 2.
- (4) Glucose is the structural unit of carbohydrates.

25. The figure on the right shows a bimetal strip made of two metals A and B.

Of these, the metal expanding more is A while the metal expanding less is B.



In which of the following ways does the shape of the bimetal strip change when its temperature is increased?

- (1) (2)   
 (3) (4)

26. If an object made up of a solid substance is to float in a liquid,

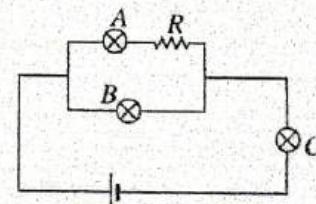
- (1) the density of the solid substance should be less than the density of the liquid.
- (2) the mass of the solid object should be equal to the mass of the liquid displaced.
- (3) weight of the solid object should be equal to the weight of the liquid volume displaced by it.
- (4) weight of the solid object should be less than the upthrust acting on it.

27. Of the offspring produced by the interbreeding of two organisms with the genotype Tt, the numbers of the genotypes and the phenotypes differing from one another respectively are

- (1) 2 and 1. (2) 3 and 2. (3) 4 and 2. (4) 4 and 3.

28. The figure indicates how three identical bulbs A, B and C and a resistor R are connected in a circuit. Which statement correctly indicates the relationship among the brightness of the bulbs A, B and C?

- (1)  $A < B < C$  (2)  $A = B = C$   
 (3)  $A = B < C$  (4)  $A < C < B$



29. Indicated below is the reaction between haematite and carbon monoxide.



What is the mass of Fe that can be produced using one mole of  $\text{Fe}_2\text{O}_3$ ? (Fe = 56)

- (1) 28 g (2) 56 g (3) 112 g (4) 168 g

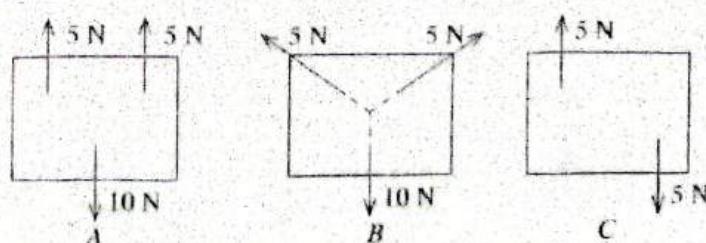
30. The amount of platelets in the blood of a person subjected to a viral infection has decreased below the normal value. As a result of it, in his body,

- (1) transport of oxygen becomes faster. (2) production of antibodies is suppressed.
- (3) clotting of blood does not occur properly. (4) transport of hormones becomes slower.

31. Figures A, B and C show how coplanar forces are applied on three rectangular sheets.

Of the above, the sheet(s) in equilibrium is/are

- (1) only A.  
 (2) only B.  
 (3) only A and C.  
 (4) all A, B and C.



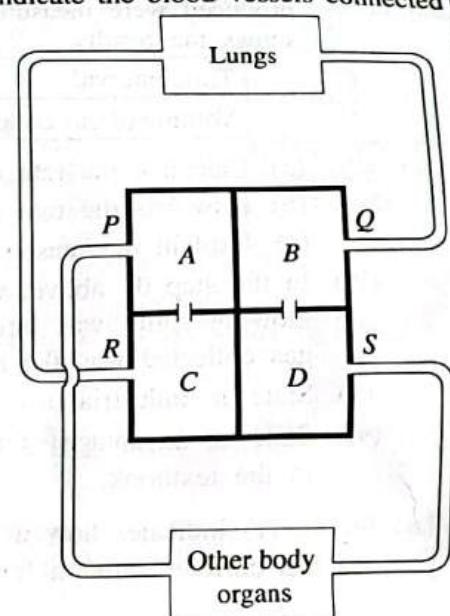
- 32.** A - Catalysts increase the rate of a chemical reaction.  
 B - At the end of the reaction, the chemical composition of the catalyst changes.  
 Of the above,  
 (1) both the statements A and B are true. (2) statement A is true while statement B is false.  
 (3) both the statements A and B are false. (4) statement A is false while statement B is true.
- 33.** The set ups (1), (2), (3) and (4) shown in the figures were prepared by adding equal volumes of water with equal concentration of carbon dioxide to four identical test tubes. In which set up will there be the **lowest** carbon dioxide concentration after exposing these four set ups for three hours to identical conditions of light?
- 
- (1) coconut oil layer  
water  
aquatic plant  
aquatic animal
- (2) black paper
- (3)
- (4)
- 34.** Consider the following statements on polymers.  
 A - have a very high relative molecular mass  
 B - small molecules contributing to make them are known as repeating units  
 C - can be classified as artificial and natural based on origin  
 Of these, the true statement(s) is/are,  
 (1) only A. (2) only B. (3) only A and C. (4) only B and C.
- 35.** The figure illustrates how two insulated copper coils A and B are wound around a soft iron core. Which of the following statement is true about this arrangement?  
 (1) The moment the switch S is closed, a current flows in A while no current flows in B.  
 (2) When the switch S is kept continuously closed, a current flows in A and a current flows in B too.  
 (3) Only the moment the switch S is closed, a current flows in B.  
 (4) Only the moment the switch S is opened and is closed, a current flows in B.
- 
- A
- B
- S
- G
- 36.** Of the following statements on the velocity-time graphs, which one is **false**?  
 (1) The area covered by the graph gives the displacement of the object.  
 (2) The graph starts from the origin for the objects starting their motion from the state of rest.  
 (3) The gradient of the graph is zero in a motion where the velocity varies with time.  
 (4) The gradient of the graph gives the acceleration / deceleration.
- 37.** What is the pollutant that contributes to the abnormal growth of algae population in oceanic ecosystems?  
 (1) heavy metals (2) sulphate (3) nuclear waste (4) phosphate
- 38.** During the discussions held with a few adults living in coastal areas, they stated that at present, they witness an increase in the number of outbreaks of storms occurring per year and their severity while coastal erosion occurs largely. Which of the following environmental phenomenon contributes most to this condition?  
 (1) global warming (2) greenhouse effect  
 (3) ozone layer depletion (4) eutrophication
- 39.** The environmental pyramids always indicated in an upright way are,  
 (1) biomass pyramids. (2) number pyramids.  
 (3) energy pyramids. (4) energy pyramids and biomass pyramids.
- 40.** Which of the following practices is an example for the principle of recycling?  
 (1) making door mats from ~~the~~ denim trousers in use  
 (2) younger brother wearing the clothes used by his elder brother  
 (3) using the same cloth bag to carry foodstuffs bought day-to-day  
 (4) restitching and wearing a clothe whose stitches have gone undone

## Part B

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

5. (A) Indicated below is a diagram drawn to depict double circulation of blood in humans. A, B, C and D indicate chambers of the heart while P, Q, R and S indicate the blood vessels connected to those chambers.

- Why is the human blood circulation known as double blood circulation?
- P represents two vessels. Of them, name the vessel bringing blood from the inferior parts of the body.
- Name the following blood vessels.
  - blood vessel R starting from chamber C
  - blood vessel S starting from chamber D
- Indicate a difference in the composition of blood contained in vessels R and S.
- Name the valve located between the chambers B and D.
- (a) By what name is the pressure exerted when D contracts and pushes blood into S known?  
 (b) What is the value of that pressure of a healthy adult?  
 (c) Even in a healthy adult, that value can change from time to time. State a factor affecting it.

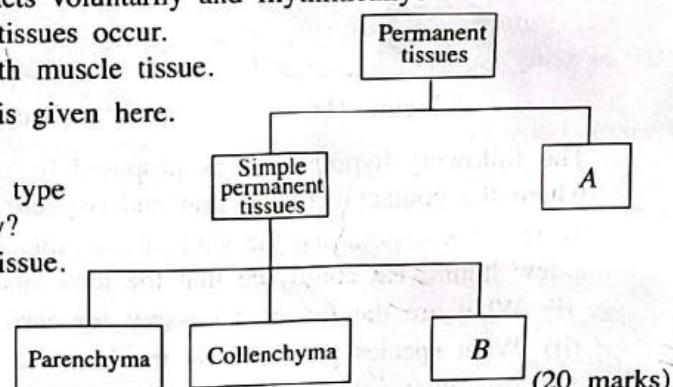


- (B) Muscle tissue can be identified as a main tissue type contributing to build up the human body. There are three main types of muscle tissues. One of them is the smooth muscle tissue.

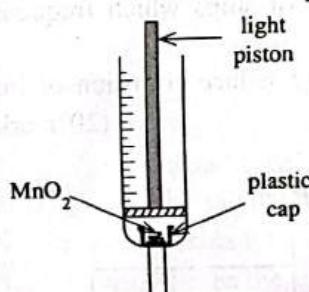
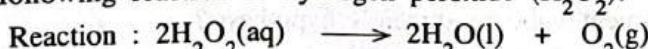
- Name the other two main types of muscle tissues found in the human body.
- What is the muscle tissue type having multinucleate cells?
- What is the muscle tissue type that acts voluntarily and rhythmically?
- Name a place where smooth muscle tissues occur.
- Draw a sketch of a cell of the smooth muscle tissue.

- (C) A figure on classification of plant tissues is given here.

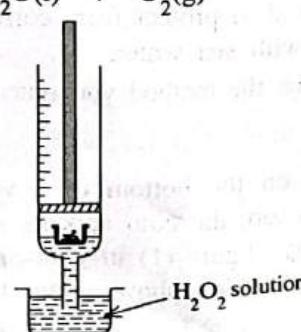
- Name A and B.
- What is the simple permanent tissue type most abundantly seen in a plant body?
- State a function of the collenchyma tissue.



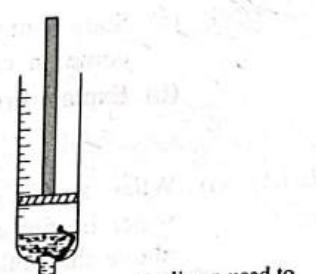
6. (A) The figures illustrate the steps of an experiment conducted by a group of students who studied the following reaction of hydrogen peroxide ( $H_2O_2$ ).



step 01  
placing the plastic cap  
with some  $MnO_2$  inside the syringe



step 02  
sucking in about 5 ml of  $H_2O_2$   
solution into the syringe



step 03  
mixing  $H_2O_2$  and  $MnO_2$  and allowing the  
gas liberated to collect inside the syringe

[See page six]

- (i) According to the classification of reactions you learned, what type of a reaction is the above reaction?
- (ii) What is the function of manganese dioxide ( $MnO_2$ ) in the above reaction?
- (iii) From the moment the gas started collecting inside the syringe, the volumes of the gas produced were measured in six successive 10 second time intervals. The following table shows the results.

Time interval	1	2	3	4	5	6
Volume of gas collected /ml	14	9	5	3	1	0

- (a) Calculate the rate of production of gas during the first time interval.
- (b) How has the rate of production of the gas changed with passage of time?
- (c) Explain the reason for the variation you stated in (b) above.
- (iv) In the step 03 above, when the piston was removed after the collection of the gas and a glowing splint was introduced into the syringe, it lighted brightly. What property of the gas collected was the reason for this observation?
- (v) State an industrial use of the gas collected in the syringe.
- (vi) State an advantage of adopting the above method instead of preparing gases as indicated in the textbook.
- (B) Figure (1) indicates how a straight cylindrical iron pillar planted on the bottom of a shallow sea has corroded after a few years.

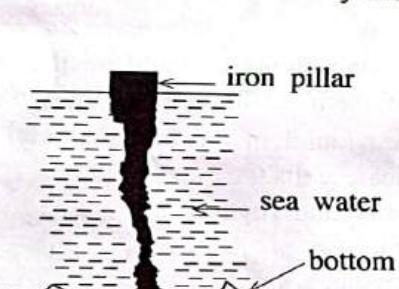


Figure (1)

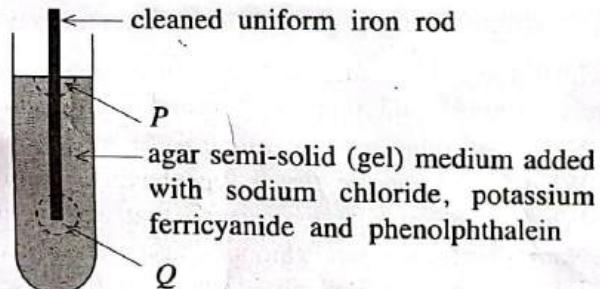


Figure (2)

The following hypothesis was proposed by a student who observed the iron pillar. 'In places where the contact between iron and oxygen is less, the rate of corrosion of iron is high.'

To test this hypothesis, the student assembled the set up shown in figure (2) and observed after a few hours. He could see that the area labelled *Q* has become blue in colour.

- (i) What are the factors necessary for corrosion of iron?
- (ii) What species produced by the iron rod caused the blue colour in area *Q*?
- (iii) (a) What colour could be observed in area *P* in this experiment?  
(b) Write the ion-electron half reaction causing the colour you stated above.
- (iv) What is the use of adding sodium chloride to the jelly medium?
- (v) Does the result of the experiment validate student's hypothesis?
- (vi) (a) State a method used to protect from corrosion, the iron hulls of ships which frequently come in contact with sea water.  
(b) Explain briefly, how the method you stated above contributes to reduce corrosion of iron.

(20 marks)

7. (A) (i) When a coin placed on the bottom of a vessel containing water is viewed from top, the coin appears as if it is raised above the bottom. Copy figure (1) in your answer script and draw the ray diagram which shows how the coin appears raised like that.

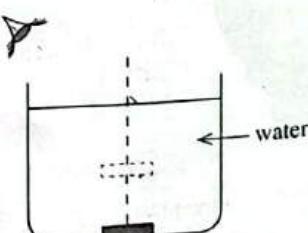
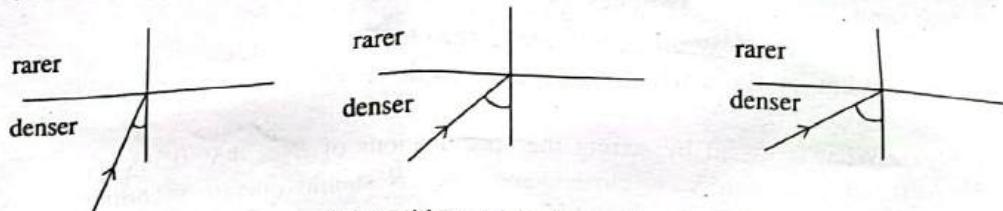


Figure (1)

[See page seven]

- (ii) Figure (2) below illustrates three instances of the incident angle in the denser medium of a light ray travelling from a denser medium to a rarer medium.



(Y) incident angle is equal to the critical angle

(Z) incident angle is greater than the critical angle

Figure (2)

- (a) What is meant by the critical angle?  
 (b) Copy figure (2) in your answer script and complete the ray diagrams in instances (X), (Y) and (Z) indicating the continued path of the ray.  
 (c) Name the phenomenon occurring in the instance (Z) in figure (2).  
 (d) Give examples for two occasions in which the phenomenon stated in (c) above is made use of.

(B) The time spent for boiling a quantity of water required to prepare four cups of tea using an electric kettle which indicates that its power is 1000 W is three minutes.

- (i) Calculate the amount of electric energy spent here.  
 (ii) How much is that amount of electrical energy in kWh? ( $1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$ )  
 (iii) How much is the amount of electrical energy wasted in kWh, if an amount of water required to prepare eight cups of tea was boiled to prepare four cups of tea?

(C) When a motor car runs with a uniform speed of  $10 \text{ m s}^{-1}$  ( $36 \text{ km h}^{-1}$ ) on a rectilinear road, the driver of the car sees a barrier placed at a distance of 4 m. In this instance, he applies brakes to avoid an accident. The time that elapses from the moment of deciding that brakes be applied to putting the application of brakes into effect, that is his reaction time is 0.2 s.

- (i) Find the distance travelled by the car during the time of 0.2 s.  
 (ii) The retardation applied by the brakes was  $40 \text{ m s}^{-2}$  and the distance travelled under that retardation till the car stopped was 1.25 m.  
 (a) Could the driver avoid the accident?  
 (b) If the mass of the car was 1000 kg, what was the force applied by the brakes?  
 (c) Explain by a calculation, whether the accident could have been avoided by applying the above force in an instance where the reaction time was 0.3 s of a driver who was sleepy or under the influence of liquor.

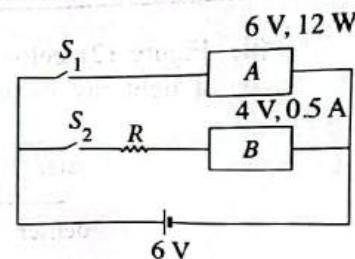
(20 marks)

8. (A) Proteins, lipids and nucleic acids are three basic types of organic compounds contained in living matter.

- (i) Why are proteins, lipids and nucleic acids called organic compounds?  
 (ii) State two elements that may be contained in proteins but not contained in lipids.  
 (iii) Name the structural unit of proteins.  
 (iv) State a common function of the compounds proteins and lipids.  
 (v) There are two major types of nucleic acids. One of them is called DNA. What is the other type?  
 (vi) In a living cell, name the organelle that contains DNA.  
 (vii) Explain how the genotype of an organism is changed in gene technology.  
 (viii) Name the species of micro-organisms used to produce insulin by means of gene technology.  
 (ix) It is required to verify that a crime was committed by the suspect of that crime using a sample of hair collected from the site of that crime. State how gene technology is used for it.

[See page eight]

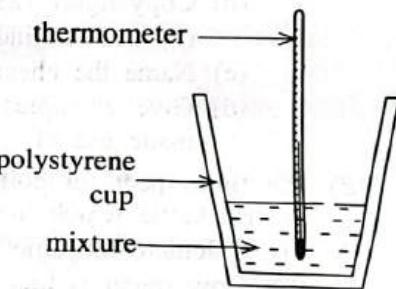
(B) The figure shows how two electrical appliances *A* and *B* are connected to a 6 V battery. It is indicated that the specifications of *A* are 6 V, 12 W and the specifications of *B* are 4 V, 0.5 A.  $S_1$  and  $S_2$  are two switches.



- Name the way *A* and *B* are connected to the circuit.
- What is the current flowing through *A* when switch  $S_1$  is closed?
- What is meant by stating the specifications of *B* as 4 V, 0.5 A?
- When switch  $S_2$  is closed, appliance *B* should operate according to specifications.
  - For this, what should be the potential difference across *R*?
  - What is the current flowing through *R* in this instance?
  - Calculate the due value for *R*.
- How much is the current drawn from the battery when both the appliances operate?

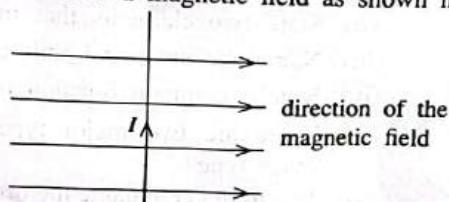
(20 marks)

9. (A) A student added  $50\text{ cm}^3$  of hydrochloric acid (HCl) solution, concentration  $0.1\text{ mol dm}^{-3}$  at  $30^\circ\text{C}$  to a polystyrene cup and introduced a thermometer into it. Afterwards,  $50\text{ cm}^3$  of sodium hydroxide (NaOH) solution, concentration  $0.1\text{ mol dm}^{-3}$  at  $30^\circ\text{C}$  were added to the same cup.



- The maximum temperature, the mixture reached after mixing the two solutions was  $38^\circ\text{C}$ . Explain the reason for the rise in temperature of the mixture.
- State,
  - a change in the above set up
  - a change in the concentration of reactants that should have been done to bring the maximum temperature reached by the mixture to a value above  $38^\circ\text{C}$ .
- It is expected to repeat the experiment using an amount of solid NaOH which contains the same amount of moles of NaOH that was present in the volume of NaOH solution used in the above experiment. A student states that the maximum temperature the mixture reaches will be  $38^\circ\text{C}$  in this case also.
  - Do you agree with this statement?
  - Explain the reasons for your answer.
- (a) Write the balanced chemical equation for the reaction taking place in this experiment.  
(b) Explain the reason why this reaction is called a neutralization reaction.
- Why hydrochloric acid is considered a strong acid?
- State an industrial use of sodium hydroxide.

- (B) (i) A magnetic field is created around a straight conductor carrying an electric current.
- Using a diagram, illustrate the direction of the current flowing through such a conductor and also the shape and direction of the magnetic lines of force created by it.
  - Present examples for two instances where electromagnets are made by modifying the conductor as a coil and sending a current.
- (ii) When a conductor carrying a current is placed perpendicular to a magnetic field as shown in the figure, a force acts on it.
- State two factors affecting the magnitude of the force acting on the above conductor.
  - Name the rule used to find the direction of the force acting on the conductor.
  - Present examples for two instances in which the force generated as above is made use of.



- (C) The production of electricity in a hydroelectricity power plant is based on the principle of electromagnetic induction.
- Explain briefly what is electromagnetic induction.
  - Illustrate separately and graphically, how the electric current produced by a hydroelectricity power plant and the electric current produced by a solar panel varies against time.

(20 marks)

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රහස්‍යය

අ.පො.ස. (සා.පෙළ) විභාගය - 2023(2024)  
ක.පො.ත. (සා.තර)ප් පරීක්ෂා - 2023(2024)

විෂය අංකය  
පාට නිලක්කම

34

විෂය අංකය  
පාටම

Science

I පත්‍රය - පිළිතුරු  
I පත්‍රිරුම් - බිජෝක්කල්

ප්‍රශ්න අංකය විනා තිල.	පිළිතුරු අංකය විජෝ තිල.	ප්‍රශ්න අංකය විනා තිල.	පිළිතුරු අංකය විජෝ තිල.	ප්‍රශ්න අංකය විනා තිල.	පිළිතුරු අංකය විජෝ තිල.	ප්‍රශ්න අංකය විනා තිල.	පිළිතුරු අංකය විජෝ තිල.
01. ....2.....	11. ....3.....	21. ....4.....	31. ....1.....				
02. ....4.....	12. ....2.....	22. ....2.....	32. ....2.....				
03. ....4.....	13. ....3.....	23. ....2.....	33. ....3.....				
04. ....2.....	14. ....2.....	24. ....4 All	34. ....3.....				
05. ....1.....	15. ....1.....	25. ....4.....	35. ....4.....				
06. ....2.....	16. ....2.....	26. ....3,2.....	36. ....3.....				
07. ....1.....	17. ....4.....	27. ....2.....	37. ....4.....				
08. ....3.....	18. ....1.....	28. ....1.....	38. ....1.....				
09. ....(3) All	19. ....2.....	29. ....3.....	39. ....(3) All				
10. ....3.....	20. ....1.....	30.. ....3.....	40. ....1.....				

විශේෂ උග්‍රදේශ } එක පිළිතුරු තුළ ලක්ෂණ  
විසේට අර්ථවුත්තල } ඉරු සරියාන බිජෝක්කා

01

බැඩින්  
ප්‍රශ්න බ්‍රේස්

මුළු ලක්ෂණ / මොත්තප් ප්‍රශ්නිකාන්

01

 $01 \times 40 = 40$ 

ඡාන තිදුළුනෙහි දැක්වන පරිදි බුදුවරන උත්තරපූඨයේ අවසාන තිරුවේ ලක්ෂණ ඇතුළත් හරන්න.  
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නිවැරදි පිළිතුරු සංඛ්‍යාව  
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40

I පත්‍රයේ මුළු ලක්ෂණ  
පත්‍රිරුම් I මොත්තප් ප්‍රශ්නි

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40

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[මිලද නේ ප්‍රතිඵල මුද්‍රය ප්‍රතිප්‍රකාශනය කළු/All Rights Reserved]

සිංහල සාහැනුවෙන් උග්‍ර මූල්‍ය තොරතුරුව නිවැරදිව නිවැරදිව නිවැරදිව  
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Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka  
සිංහල සාහැනුවෙන් උග්‍ර මූල්‍ය තොරතුරුව නිවැරදිව නිවැරදිව නිවැරදිව  
Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka

34 E II

අධ්‍යාපන පොදු යහැන පත්‍ර (යාමාන්‍ය පෙල) විභාගය, 2023(2024)

කළුවිප් පොතුත් තරාතුරු පත්තිර (සාහැනු තරාප් පරිශෑස, 2023(2024))

General Certificate of Education (Ord. Level) Examination, 2023(2024)

විද්‍යාව	II
විෂ්ණුවාසම	II
<b>Science</b>	<b>II</b>

තුළ තැන්  
මුත්‍ර මැවින්ත්‍යාලම  
*Three hours*

දානුව කියවීම කාලය - මිනින්ද 10 දි  
මෙවතික බාහිත් නිෂ්චිත නිෂ්චිත නිෂ්චිත නිෂ්චිත  
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) Indoor air pollution is caused by the harmful pollutants released inside homes. Indoor air pollution is several times more harmful than the outdoor air pollution. The following figure indicates various places of a house subject to indoor air pollution and pollutants that may be present in one of those places.

Bedroom:  
dust mites in bedsheets, hairs  
of pets, volatile substances  
issued from cosmetics etc.



From the above figure, identify a place which is an example for each of the following statements and write it in the box opposite to it.

	Statement	Place
(i)	Poisonous gases contributing to acid rains and global warming and volatile hydrocarbons may accumulate.	garage (1 mark)
(ii)	Subjected to pollution more by volatile organic pollutants released during the use of perfumes, nail polish, etc.	bedroom (1 mark)
(iii)	Contributes to indoor air pollution frequently releasing pathogenic micro-organisms, mould, fungi and foul smell.	bathroom/ kitchen (1 mark)
(iv)	Volatile organic pollutants released from furniture and wall paints and solid particulate pollutants issued from carpets may occur in abundance.	living room (1 mark)

(v) State a personal addiction that pollutes indoor air and makes the dwellers victims of diseases such as lung cancer, heart attacks and strokes.  
**smoking** (1 mark)

(vi) State an eco-friendly practice adopted in this house to control indoor air pollution naturally.  
**Keeping a plant in the living room (indoor plant)** (1 mark)

(vii) Suggest a measure that could be taken during architectural design to minimize indoor air pollution. **Installing large windows / Constructing a chimney /Fixing exhaust fans** (1 mark)

*For lights*

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- 2 -

(B) Microplastics mean pieces of any type of plastics that are less than 5 mm in length and have different shapes. Microplastic particles made of the polymer types polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), polyester and rayon have been found from a cultivated land.

Figure A indicates the percentage composition of microplastics by polymer type in the cultivated land while figure B indicates the percentage composition of polymer types contained in different forms of microplastics.

Figure A

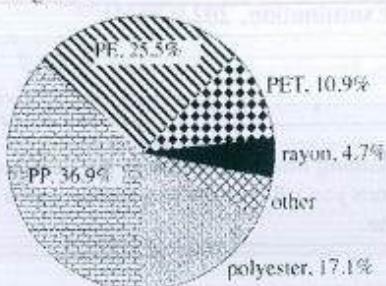
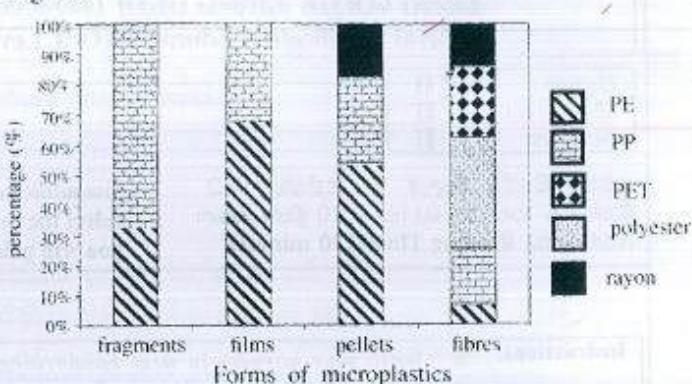


Figure B



Using the information given in the figures, fill in the blanks of the following statements.

(i) According to figure A, the most abundant polymer type in the cultivated land is **polypropylene / PP** ..... (1 mark)

(ii) According to figure A, the sum of the percentage compositions of polymer **polyethylene / PE** and polymer **terephthalate (PET)** is approximately equal to the percentage composition of PP. (1 mark)

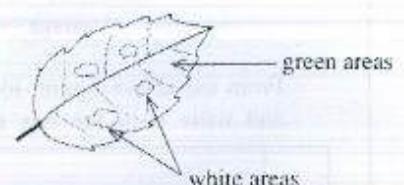
(iii) According to figure B, the polymers existing in the cultivated land as microplastics in the form of films are **polyethylene / PE** and **polypropylene / PP** ..... (1 mark)

(iv) Microplastics in the form of ..... **fibre** ..... (1 mark) are composed of the highest number of various polymers. (1 mark)

(v) State a way by which microplastics are added to the cultivated land. **runoff water/ covers/agrochemicals packages/ fertilizers/ wind/ water added to the cultivation from planting bags**

(vi) Suggest a method to separate microplastics contained in a sample of urea fertilizer. **Dissolving in water and filtering** ..... (1 mark)

2. (A) A group of students preparing for a practical experiment sketched on a paper the diagram of a leaf with white and green areas of a shoe flower plant growing in a place well exposed to sunlight. The diagram is shown on the right. Later, that leaf was subjected to the starch test following the relevant steps.



(i) Name the chemical substance used to identify starch. **iodine solution / iodine / I<sub>2</sub>** ..... (1 mark)

(ii) Indicate in the following table the observations made after applying the chemical substance you mentioned in (i) above.

Area of the leaf subjected to the test	Observation	(1 mark)
(a) Green areas	brown colour turning blue/ purple / purplish blue	
(b) White areas	yellow/ brown/ no colour change / pale yellow colour doesn't change	(1 mark)

(iii) What conclusion can be drawn as per the observations made in relation to the green and white areas of the leaf in the above experiment? **chlorophyll / chloroplast** (1 mark) is essential for photosynthesis.

(B) Several species of animals that could be seen either in home or in home garden are given below. cockroach, gecko, spider, snail, leech, centipede

From the above list, select the animal species with each of the following characteristic and write on the dotted line opposite each.

(i) bears a vertebral column **gecko** ..... (1 mark)

(ii) has a muscular foot ..... **snail** ..... (1 mark)

15

15

02

02

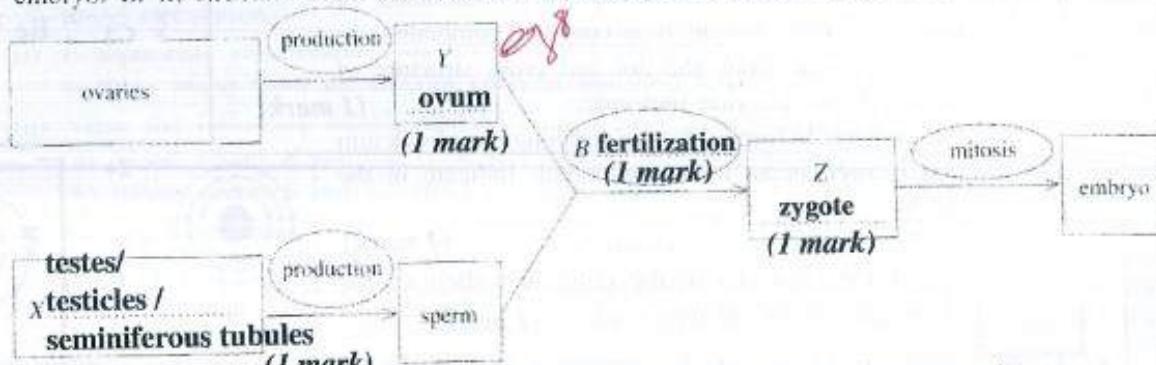
| See page three

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- (iii) body is divided into equal segments ..... **leech (1 mark)**  
 (iv) bears four pairs of legs ..... **spider (1 mark)**  
 (v) has a body consisting of three tagmas, head, thorax and abdomen ..... **cockroach (1 mark)**

(C) The following flow chart shows the steps of human reproduction up to the formation of the embryo. In it, structures/cells are shown in rectangles and processes are shown in ellipses.

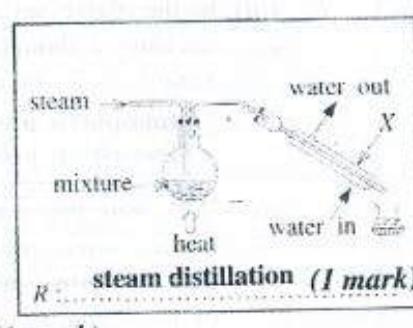
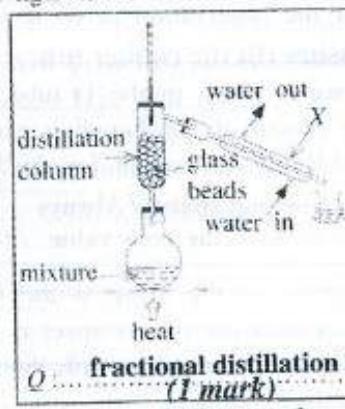
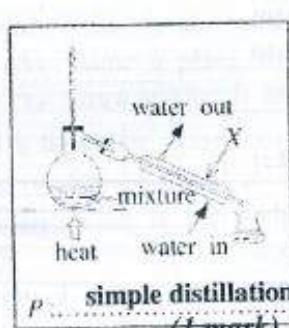


- (i) Write the structures/cells indicated as X, Y and Z in the respective rectangles.  
 (ii) Write the process indicated as B in the respective ellipse.  
 (iii) In which site does the process B occur? ..... **fallopian tube (1 mark)**

15

3. (A) Steam distillation, simple distillation and fractional distillation are three distillation methods that can be used to separate the components of mixtures. Three sets of apparatus P, Q and R, assembled to effect distillation by each of those methods are illustrated below (not in respective order).

- (i) Write below the relevant figures, the methods of distillation employing the set ups P, Q and R.



- (ii) Name the equipment labelled X. ..... **Liebig condenser (1 mark)**  
 (iii) Of the above methods, write the most suitable distillation method for each of the following separations on the dotted line opposite each.  
 (a) separation of the components of a liquid hydrocarbon mixture : ..... **fractional distillation / Q (1 mark)**  
 (b) extraction of cinnamon oil from cinnamon leaves : ..... **steam distillation / R (1 mark)**  
 (c) obtaining salt-free pure water from sea water : ..... **simple distillation / P (1 mark)**

(B) The figure indicates the positions occupied by the elements beryllium, oxygen, chlorine, potassium and calcium in the periodic table.

Be		O	
K	Ca		Cl

- (i) From the elements given, write the symbol of the element that shows each of the following properties in the box opposite each.

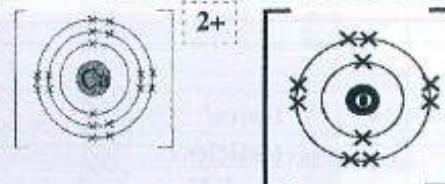
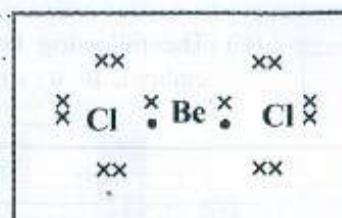
Property of the element	Example
(a) a coloured gas existing as diatomic molecules	Cl (1 mark)
(b) highest in electronegativity	O (1 mark)
(c) has the lowest first ionisation energy	K (1 mark)

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- (ii) State whether the compounds formed by the combination of following elements are ionic or covalent.  
 (a) calcium and chlorine : **Ionic (1 mark)**  
 (b) chlorine and oxygen : **Covalent (1 mark)**
- (iii) Beryllium chloride formed by the combination of beryllium and chlorine is a covalent compound. In the box given, draw the dot and cross structure of the beryllium chloride molecule. **(1 mark)**
- (iv) Calcium oxide formed by the combination of calcium and oxygen is an ionic compound. Indicate in the figure.  
 (a) the charge of the calcium ion **(1 mark)**  
 (b) all the electrons in the outermost shell of the oxide ion in calcium oxide. **(1 mark)**



4. (A) The mouth of the funnel shown in figure 1 is fully closed by a tightly stretched sheet of rubber. The other end of the funnel is connected to one arm of a U tube partly filled with coloured water by a rubber tube.

- (i) In the situation shown in the figure 1, how will the water level in the arms of the U tube change when a finger is placed on the top of the rubber sheet and pressed slightly?

- (a) arm X goes down **(1 mark)** (b) arm Y goes up **(1 mark)**

- (ii) Explain the reason for the observation in (i) above.

**increase in the pressure (In the rubber tube) ... (1 mark)** *Exert a pressure*

- (iii) In the above set up, water levels in the U tube remain unchanged though the mouth of the funnel is turned to various sides in air. What is the reason for this?

**Atmospheric pressure does not change/ Always**

**Atmospheric pressure assumes the same value (2 marks)**

- (iv) How will the water levels in the arms of the U tube change when the funnel with the rubber sheet is dipped in water shown in figure 2 and moved towards the bottom of the container gradually?

- (a) arm X goes down **(1 mark)** (b) arm Y goes up **(1 mark)**

- (v) State the conclusion that can be drawn according to the observation in (iv) above.

**The pressure increases with the increasing depth in water. (2 marks)**

- (vi) In place of water, an equal volume of coconut oil is added to the container with the funnel in figure 2. When the funnel is held close to the bottom of the container, in the presence of which liquid can a greater difference between the liquid levels of the U tube be observed?

**water (1 mark)**

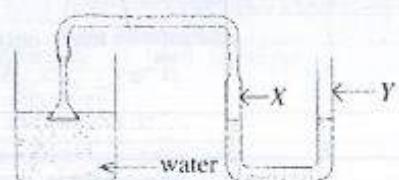
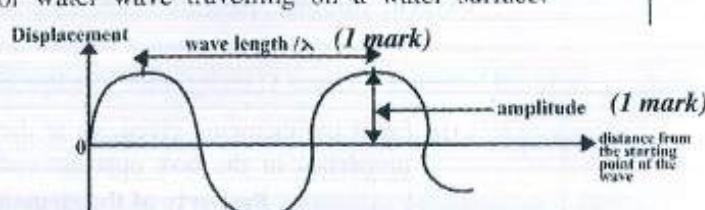


Figure 2

- (B) The figure is the graphical representation of water wave travelling on a water surface.

- (i) As regards the direction in which the water particles vibrate, name the type of waves to which this wave belongs.

**Transverse waves (1 mark)**



- (ii) Mark and label in the above figure, the wave length and amplitude of the wave represented by the graph. **(02)**

- (iii) When a light piece of styrofoam (regifoam) was placed on the water surface along which the wave travels, it was observed that it moves up and down. What is the reason for this observation?

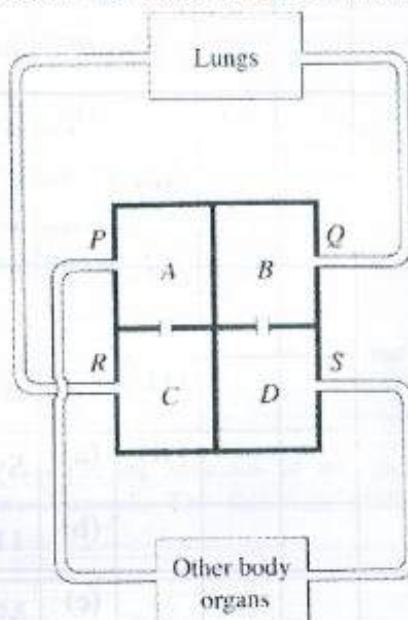
**Particles oscillate perpendicular to the direction of propagation of the wave. (2 marks)**

**Part B**

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

5. (A) Indicated below is a diagram drawn to depict double circulation of blood in humans. A, B, C and D indicate chambers of the heart while P, Q, R and S indicate the blood vessels connected to those chambers.

- Why is the human blood circulation known as double blood circulation?
- P represents two vessels. Of them, name the vessel bringing blood from the inferior parts of the body.
- Name the following blood vessels.
  - blood vessel R starting from chamber C
  - blood vessel S starting from chamber D
- Indicate a difference in the composition of blood contained in vessels R and S.
- Name the valve located between the chambers B and D.
- (a) By what name is the pressure exerted when D contracts and pushes blood into S known?  
 (b) What is the value of that pressure of a healthy adult?  
 (c) Even in a healthy adult, that value can change from time to time. State a factor affecting it.

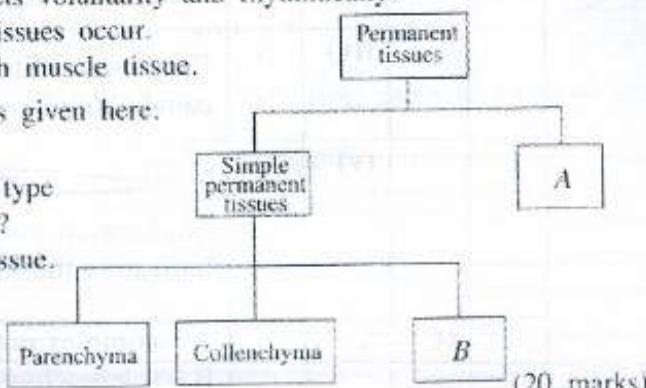


(B) Muscle tissue can be identified as a main tissue type contributing to build up the human body. There are three main types of muscle tissues. One of them is the smooth muscle tissue.

- Name the other two main types of muscle tissues found in the human body.
- What is the muscle tissue type having multinucleate cells?
- What is the muscle tissue type that acts voluntarily and rhythmically?
- Name a place where smooth muscle tissues occur.
- Draw a sketch of a cell of the smooth muscle tissue.

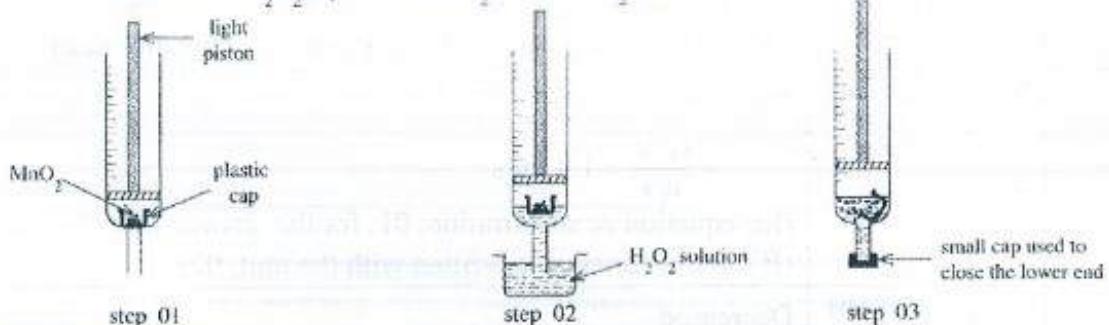
(C) A figure on classification of plant tissues is given here.

- Name A and B.
- What is the simple permanent tissue type most abundantly seen in a plant body?
- State a function of the collenchyma tissue.



<b>(5)</b>	<b>(A)</b>	<b>(i)</b>	Blood flows twice through the heart while flowing once through the body	<b>01</b>
		<b>(ii)</b>	Inferior vena cava	<b>01</b>
		<b>(iii) (a)</b>	Pulmonary artery <i>OR</i>	<b>01</b>
		<b>(b)</b>	Systemic aorta/ artery	<b>01</b>
		<b>(iv)</b>	<ul style="list-style-type: none"> <li>• Oxygen (<math>O_2</math>) concentration in <math>S</math> is higher than that in <math>R</math></li> <li>• Carbon dioxide (<math>CO_2</math>) concentration in <math>S</math> is lower than that in <math>R</math></li> <li>• <math>R</math> contains deoxygenated blood while <math>S</math> contains oxygenated blood.</li> </ul> <i>(any one)</i>	<b>01</b>
		<b>(v)</b>	Bicuspid valve/ mitral valve	<b>01</b>
		<b>(vi) (a)</b>	Systolic blood pressure	<b>01</b>
		<b>(b)</b>	110-120 mm Hg / 110 mm Hg / 120 mm Hg	<b>01</b>
		<b>(c)</b>	Mental stress / Tiring heavily / exercising / <i>Being afraid / Anxious</i>	<b>01</b>
<b>(B)</b>	<b>(i)</b>		Skeletal muscles, Cardiac muscles	<b>02</b>
	<b>(ii)</b>		Skeletal muscles	<b>01</b>
	<b>(iii)</b>		A free mark for any <i>free mark</i>	<b>01</b>
	<b>(iv)</b>		Esophagus/ Stomach/ small intestine/ large intestine/ alimentary canal / blood vessels / urinary bladder / uterus / <i>(any one)</i>	<b>01</b>
	<b>(v)</b>		 Marking the nucleus (01) Indicating the shape correctly (01)	<b>02</b>
<b>(C)</b>	<b>(i)</b>		A – complex permanent tissues B – sclerenchyma tissue	<b>02</b>
	<b>(ii)</b>		Parenchyma	<b>01</b>
	<b>(iii)</b>		Mechanical support / photosynthesis	<b>01</b>
			<b>Total Marks</b>	<b>20</b>

6. (A) The figures illustrate the steps of an experiment conducted by a group of students who studied the following reaction of hydrogen peroxide ( $H_2O_2$ ).



placing the plastic cap with some  $MnO_2$  inside the syringe sucking in about 5 ml of  $H_2O_2$  solution into the syringe mixing  $H_2O_2$  and  $MnO_2$  and allowing the gas liberated to collect inside the syringe

- According to the classification of reactions you learned, what type of a reaction is the above reaction?
  - What is the function of manganese dioxide ( $MnO_2$ ) in the above reaction?
  - From the moment the gas started collecting inside the syringe, the volumes of the gas produced were measured in six successive 10 second time intervals. The following table shows the results.
- | Time interval               | 1  | 2 | 3 | 4 | 5 | 6 |
|-----------------------------|----|---|---|---|---|---|
| Volume of gas collected /ml | 14 | 9 | 5 | 3 | 1 | 0 |
- Calculate the rate of production of gas during the first time interval.
  - How has the rate of production of the gas changed with passage of time?
  - Explain the reason for the variation you stated in (b) above.
  - In the step 03 above, when the piston was removed after the collection of the gas and a glowing splint was introduced into the syringe, it lighted brightly. What property of the gas collected was the reason for this observation?
  - State an industrial use of the gas collected in the syringe.
  - State an advantage of adopting the above method instead of preparing gases as indicated in the textbook.

- (B) Figure (1) indicates how a straight cylindrical iron pillar planted on the bottom of a shallow sea has corroded after a few years.

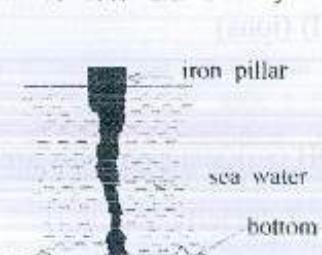


Figure (1)

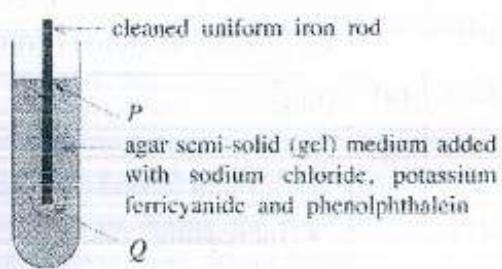


Figure (2)

The following hypothesis was proposed by a student who observed the iron pillar. 'In places where the contact between iron and oxygen is less, the rate of corrosion of iron is high.'

To test this hypothesis, the student assembled the set up shown in figure (2) and observed after a few hours. He could see that the area labelled Q has become blue in colour.

- What are the factors necessary for corrosion of iron?
- What species produced by the iron rod caused the blue colour in area Q?
- (a) What colour could be observed in area P in this experiment?  
(b) Write the ion-electron half reaction causing the colour you stated above.
- What is the use of adding sodium chloride to the jelly medium?
- Does the result of the experiment validate student's hypothesis?
- (a) State a method used to protect from corrosion, the iron hulls of ships which frequently come in contact with sea water.  
(b) Explain briefly, how the method you stated above contributes to reduce corrosion of iron.

(20 marks)

(6)	(A)	(i)	(Chemical) decomposition reaction	01	01
		(ii)	<ul style="list-style-type: none"> <li>Acting as a catalyst</li> <li>Increasing the rate of the reaction (for any one)</li> </ul>	01	01
		(iii) (a)	$\text{Rate} = \frac{\text{volume of gas collected}}{\text{time}}$ $= \frac{14 \text{ ml}}{10 \text{ s}} = 1.4 \text{ ml s}^{-1}$ <p>(for equation or substitution, 01; for the answer with the unit, 01) (If the final answer is written with the unit, 02)</p>	02	02
		(b)	Decreased	01	01
		(c)	<ul style="list-style-type: none"> <li>decrease in the concentration of reactants</li> <li>Decrease in the amount of reactants</li> <li>Spending of reactant/H<sub>2</sub>O<sub>2</sub> (for any one)</li> </ul>	01	01
		(iv)	A supporter of combustion	01	01
		(v)	<ul style="list-style-type: none"> <li>Welding metals/ Oxy-acetylene flame /Artificial respiration</li> <li>Production of nitric acid / HNO<sub>3</sub></li> <li>Production of sulphuric acid / H<sub>2</sub>SO<sub>4</sub> (for any one)</li> </ul>	01	01
		(vi)	<ul style="list-style-type: none"> <li>Only a minimum amount of chemical substances is spent/disposed to the environment</li> <li>Less equipment is needed</li> <li>Mixing with ordinary air is minimized/ Purer sample of gas can be collected           <ul style="list-style-type: none"> <li>Can be collected all the gases liberated.</li> </ul> </li> <li>Less chances for accidents           <ul style="list-style-type: none"> <li>minimizing to the Exposing to chemicals</li> </ul> </li> <li>Less costly</li> <li>Can carry out individually (for any one)</li> </ul>	01 01 01 01 02	01
(B)	(i)		<ul style="list-style-type: none"> <li>Water / water vapour / H<sub>2</sub>O/ moisture</li> <li>Oxygen / O<sub>2</sub> / air /O</li> </ul>	02	
	(ii)		Fe <sup>2+</sup> / Ferrous (ions) / Iron(II) (ions)	01	
	(iii) (a)		Pink	01	
		(b)	2H <sub>2</sub> O(l) + O <sub>2</sub> (g) + 4e → 4OH <sup>-</sup> (aq)(state symbols are not compulsory)	01	
		(iv)	<ul style="list-style-type: none"> <li>Increasing conductivity (of the jelly medium)</li> <li>Increasing the rate of corrosion/rusting/reaction</li> <li>Creating a condition similar to that of sea water (for any two)</li> </ul>	02	
		(v)	Yes	01	
	(vi) (a)		<ul style="list-style-type: none"> <li>Applying paint Corrosive protection</li> <li>Welding/sticking blocks of magnesium (Mg) or zinc (Zn) on the hull/ using Mg or Zn as sacrificial metals (for any one)</li> </ul>	01	
		(b)	<ul style="list-style-type: none"> <li>Reason (Applying paint) - Prevents iron from coming into contact with water and oxygen</li> <li>Reason (Sacrificial metal Mg/Zn) -Iron acts as the cathode (for any one)</li> </ul>	02	
				Total Marks	20

7. (A) (i) When a coin placed on the bottom of a vessel containing water is viewed from top, the coin appears as if it is raised above the bottom. Copy figure (1) in your answer script and draw the ray diagram which shows how the coin appears raised like that.

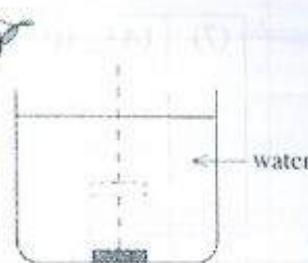
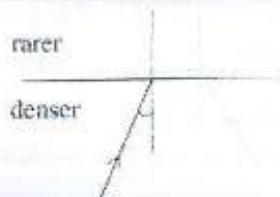
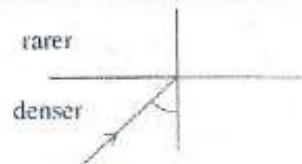


Figure (1)

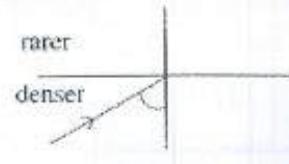
- (ii) Figure (2) below illustrates three instances of the incident angle in the denser medium of a light ray travelling from a denser medium to a rarer medium.



(X) incident angle is smaller than the critical angle



(Y) incident angle is equal to the critical angle

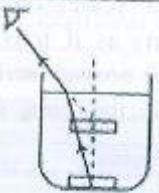
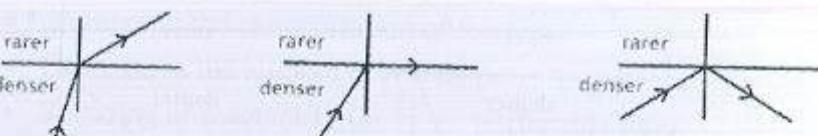


(Z) incident angle is greater than the critical angle

Figure (2)

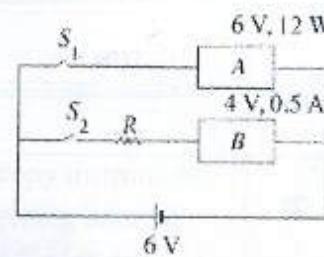
- (a) What is meant by the critical angle?  
 (b) Copy figure (2) in your answer script and complete the ray diagrams in instances (X), (Y) and (Z) indicating the continued path of the ray.  
 (c) Name the phenomenon occurring in the instance (Z) in figure (2).  
 (d) Give examples for two occasions in which the phenomenon stated in (c) above is made use of.
- (B) The time spent for boiling a quantity of water required to prepare four cups of tea using an electric kettle which indicates that its power is 1000 W is three minutes.  
 (i) Calculate the amount of electric energy spent here.  
 (ii) How much is that amount of electrical energy in kWh? ( $1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$ )  
 (iii) How much is the amount of electrical energy wasted in kWh, if an amount of water required to prepare eight cups of tea was boiled to prepare four cups of tea?
- (C) When a motor car runs with a uniform speed of  $10 \text{ m s}^{-1}$  ( $36 \text{ km h}^{-1}$ ) on a rectilinear road, the driver of the car sees a barrier placed at a distance of 4 m. In this instance, he applies brakes to avoid an accident. The time that elapses from the moment of deciding that brakes be applied to putting the application of brakes into effect, that is his reaction time is 0.2 s.  
 (i) Find the distance travelled by the car during the time of 0.2 s.  
 (ii) The retardation applied by the brakes was  $40 \text{ m s}^{-2}$  and the distance travelled under that retardation till the car stopped was 1.25 m.  
 (a) Could the driver avoid the accident?  
 (b) If the mass of the car was 1000 kg, what was the force applied by the brakes?  
 (c) Explain by a calculation, whether the accident could have been avoided by applying the above force in an instance where the reaction time was 0.3 s of a driver who was sleepy or under the influence of liquor.

(20 marks)

(7)	(A)	(i)		for refracted ray (01) for producing the ray	02
		(ii) (a)	It is the angle of incidence in the denser medium at the instance when the angle of refraction in the rarer medium is $90^\circ$ /the refracted ray travels along the interface between the two media when a ray of light travels from a denser medium to a rarer medium.		
		(b)		(01) (01) (01)	03
		(c)	Total internal reflection		
		(d)	cutting and polishing gems/ prism binocular/ endoscopy instrument/ optical fibers/ decorations/ telecommunication/ observing internal parts of the body (for any two) periscope / reflectors		
	(B)	(i)	$E = Pt$ $= 1000 (\text{W}) \times 3 \times 60 (\text{s})$ $= 180,000 (\text{J})$	(01) (for equation or substitution) (01)	02
		(ii)	$= 180,000 (\text{J})$ $3.6 \times 10^{-6} (\text{J kW h}^{-1})$ $= 0.05 (\text{kW h})$ Or $= \frac{\text{watt value} \times \text{hours}}{1000}$ $= \frac{1000 \times 3}{1000 \times 60} = 0.05 (\text{kW h})$	(01) (01) (01) (01)	02
		(iii)	Amount of electrical energy for eight cups of tea $= 0.05 \text{ kW h} \times 2$ $= 0.10 \text{ kW h}$ The amount of electrical energy wasted $= 0.10 \text{ kW h} - 0.05 \text{ kW h}$ $= 0.05 (\text{kW h})$		
	(C)	(i)	speed $= \frac{\text{distance}}{\text{time}}$ distance $= \text{speed} \times \text{time}$ $= 10 (\text{m s}^{-1}) \times 0.2 (\text{s})$ $= 2 (\text{m})$	$s = \frac{d}{t}$ (01)	01
		(ii) (a)	Yes / can		
		(b)	$F = ma$ $= 1000 (\text{kg}) \times 40 (\text{m s}^{-2})$ $= 40,000 (\text{N})$	(01) (01)	02

			(c) $\text{speed} = \frac{\text{distance}}{\text{time}}$ distance = speed x time = $10 (\text{m s}^{-1}) \times 0.3 (\text{s})$ = 3 (m)  Distance travelled during reaction time = 3 m Distance travelled with retardation = 1.25 m  $\therefore$ Total distance travelled is 4.25 m (01)  (As the barrier is 4 m away) vehicle couldn't be stopped (01)	02
				<b>Total Marks</b> <b>20</b>

8. (A) Proteins, lipids and nucleic acids are three basic types of organic compounds contained in living matter.
- Why are proteins, lipids and nucleic acids called organic compounds?
  - State **two** elements that may be contained in proteins but **not** contained in lipids.
  - Name the structural unit of proteins.
  - State a common function of the compounds proteins and lipids.
  - There are two major types of nucleic acids. One of them is called DNA. What is the other type?
  - In a living cell, name the organelle that contains DNA.
  - Explain how the genotype of an organism is changed in gene technology.
  - Name the species of micro-organisms used to produce insulin by means of gene technology.
  - It is required to verify that a crime was committed by the suspect of that crime using a sample of hair collected from the site of that crime. State how gene technology is used for it.
- (B) The figure shows how two electrical appliances *A* and *B* are connected to a 6 V battery. It is indicated that the specifications of *A* are 6 V, 12 W and the specifications of *B* are 4 V, 0.5 A.  $S_1$  and  $S_2$  are two switches.
- Name the way *A* and *B* are connected to the circuit.
  - What is the current flowing through *A* when switch  $S_1$  is closed?
  - What is meant by stating the specifications of *B* as 4 V, 0.5 A?
  - When switch  $S_1$  is closed, appliance *B* should operate according to specifications.
    - For this, what should be the potential difference across *R*?
    - What is the current flowing through *R* in this instance?
    - Calculate the due value for *R*.
  - How much is the current drawn from the battery when both the appliances operate?

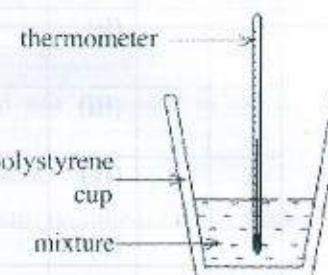


(20 marks)

(8)	(A)	(i)	(because those compounds) contain carbon (C) (as a component)	01
		(ii)	Nitrogen /N , Sulphur /S	02
		(iii)	Amino acids	01
		(iv)	<i>As Storage functions / Production of hormones</i> Acting as sources of energy / As components of structures	01
		(v)	RNA / (Ribonucleic Acid)	01
		(vi)	Nucleus / mitochondria	01
		(vii)	Removing some parts of DNA from genes <i>or</i> introducing parts of DNA to genes <i>/ making changes in genes</i>	01
		(viii)	<i>E.coli</i> or bacteria	01
		(ix)	Comparing the DNA of those hairs with the DNA of the suspect	01
	(B)	(i)	In parallel	01
		(ii)	$P = VI$ $12 \text{ (W)} = 6 \text{ V} \times I \quad (\text{for equation or substitution 01})$ $I = 2 \text{ (A)} \quad (01)$	02
		(iii)	When a potential difference of 4 V <i>(01)</i> is applied across B, the current flowing through it is 0.5 A <i>(01)</i>	02 <i>100</i>
		(iv) (a)	2(V)	01
		(b)	0.5(A)	01
		(c)	$V = IR$ $R = V/I$ $= 2 \text{ (V)} / 0.5 \text{ (A)}$ $= 4 \text{ (\Omega)}$ <i>(for equation or substitution 01; for answer 01)</i>	02
		(v)	$2 \text{ A} + 0.5 \text{ A} = 2.5 \text{ A} \quad (\text{for the answer 01})$	01
			Total Marks	20

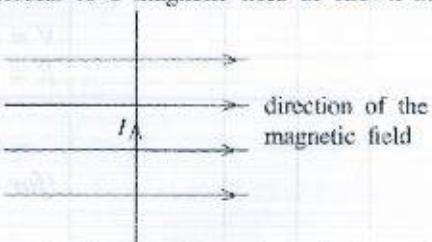
9. (A) A student added  $50 \text{ cm}^3$  of hydrochloric acid (HCl) solution, concentration  $0.1 \text{ mol dm}^{-3}$  at  $30^\circ\text{C}$  to a polystyrene cup and introduced a thermometer into it. Afterwards,  $50 \text{ cm}^3$  of sodium hydroxide (NaOH) solution, concentration  $0.1 \text{ mol dm}^{-3}$  at  $30^\circ\text{C}$  were added to the same cup.

- (i) The maximum temperature, the mixture reached after mixing the two solutions was  $38^\circ\text{C}$ . Explain the reason for the rise in temperature of the mixture.
- (ii) State,
- a change in the above set up
  - a change in the concentration of reactants that should have been done to bring the maximum temperature reached by the mixture to a value above  $38^\circ\text{C}$ .
- (iii) It is expected to repeat the experiment using an amount of solid NaOH which contains the same amount of moles of NaOH that was present in the volume of NaOH solution used in the above experiment. A student states that the maximum temperature the mixture reaches will be  $38^\circ\text{C}$  in this case also.
- Do you agree with this statement?
  - Explain the reasons for your answer.
- (iv) (a) Write the balanced chemical equation for the reaction taking place in this experiment.  
(b) Explain the reason why this reaction is called a neutralization reaction.
- (v) Why hydrochloric acid is considered a strong acid?  
(vi) State an industrial use of sodium hydroxide.



- (B) (i) A magnetic field is created around a straight conductor carrying an electric current.
- Using a diagram, illustrate the direction of the current flowing through such a conductor and also the shape and direction of the magnetic lines of force created by it.
  - Present examples for two instances where electromagnets are made by modifying the conductor as a coil and sending a current.

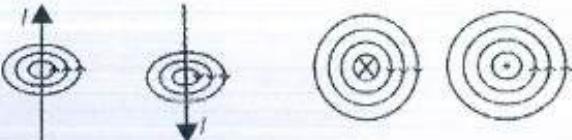
- (ii) When a conductor carrying a current is placed perpendicular to a magnetic field as shown in the figure, a force acts on it.
- State two factors affecting the magnitude of the force acting on the above conductor.
  - Name the rule used to find the direction of the force acting on the conductor.
  - Present examples for two instances in which the force generated as above is made use of.

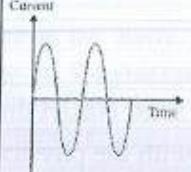
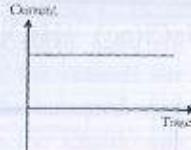


- (C) The production of electricity in a hydroelectricity power plant is based on the principle of electromagnetic induction.

- Explain briefly what is electromagnetic induction.
- Illustrate separately and graphically, how the electric current produced by a hydroelectricity power plant and the electric current produced by a solar panel varies against time.

(20 marks)

(9)	(A)	(i)		(Acid-base neutralization) reaction is exothermic. / When the reaction takes place, energy is released to the environment.	01
		(ii)	(a)	Closing the mouth of the cup with the heat insulating / polystyrene lid / Placing the cup in another cup	01
			(b)	Increasing the concentration of the reactants	01
		(iii)	(a)	No	01
			(b)	<ul style="list-style-type: none"> <li>Evolution of heat when solid NaOH dissolves</li> <li>Change of heat change with the physical states</li> <li>Decrease in the total volume of the mixture <i>(for any one)</i></li> </ul>	01
		(iv)	(a)	$\text{NaOH(aq)} + \text{HCl(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(aq)}$ <i>(Disregard physical states)</i>	01
			(b)	<ul style="list-style-type: none"> <li><math>\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}</math> / <i>acid and base react and form water and salt</i></li> <li>Because <math>\text{H}^+</math> ions and <math>\text{OH}^-</math> ions combine to form water <i>(for any one)</i></li> </ul>	01
		(v)		Because it completely ionises in aqueous solution releasing $\text{H}^+$ ions <i><math>\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-</math></i>	01
		(vi)		<ul style="list-style-type: none"> <li>Production of soap</li> <li>Production of paper</li> <li>Production of artificial silk and dyes</li> <li>Refining petroleum products <i>(for any one correct answer)</i></li> </ul>	01
	(B)	(i)	(a)	 <i>(for drawing any diagram correctly)</i>	01
			(b)	Electric bell, electric crane, relay switch, door lock, galvanometer, ammeter — <i>MRI</i> <i>(for any two correct answers 1 x 2)</i>	02
		(ii)	(a)	<ul style="list-style-type: none"> <li>Strength of the magnetic field</li> <li>Length of the conductor</li> <li>Current flowing / magnitude of the current <i>(for any two correct answers 1 x 2)</i></li> </ul>	02
			(b)	Fleming's left hand rule <i>(give marks for stating the rule also)</i>	01
			(c)	<ul style="list-style-type: none"> <li>Electric motor / <i>Giovanni Galvani</i> / ammeter / voltmeter</li> <li>Speaker</li> </ul> <i>(1 x 2)</i>	02

	(C)	(i)	<p>Induction of an electromotive force across a conductor when the magnetic field affecting it changes OR generation of an electromotive force across a conductor when it is kept still in a changing magnetic field or when it moves in a steady magnetic field</p>	01
		(ii)	<p>Electric current produced by a hydroelectricity plants</p>  <p style="text-align: center;">(01)</p> <p>Electric current produced by a solar panel</p>  <p style="text-align: center;">(01)</p>	02
			<b>Total Marks</b>	
			<b>20</b>	

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