ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව

இலங்கைப் பரீட்சைத் திணைக்களம்

රහස්‍යයි
அந்தரங்கமானது

අ.පො.ස. (සා.පෙළ) විභාගය - 2025 (2026)
க.பொ.த. (சா.தர)ப் பரீட்சை - 2025 (2026)

විෂය අංකය
பாட இலக்கம் 34

විෂයය
பாடம் **Science**

I පත්‍රය - පිළිතුරු
I பத்திரம் - விடைகள்

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

විශේෂ උපදෙස්
விசேட அறிவுறுத்தல்

එක් පිළිතුරකට ලකුණු
ஒரு சரியான விடைக்கு **01**

බැගින්
புள்ளி வீதம்

මුළු ලකුණු / மொத்தப் புள்ளிகள் **01 × 40 = 40**

පහත නිදසුනෙහි දක්වෙන පරිදි බහුවරණ උත්තරපත්‍රයේ අවසාන තීරුවේ ලකුණු ඇතුළත් කරන්න.
கீழ் குறிப்பிடப்பட்டிருக்கும் உதாரணத்திற்கு அமைய பல்தேர்வு வினாக்களுக்குரிய புள்ளிகளை பல்தேர்வு வினாப்பத்திரத்தின் இறுதியில் பதிக.

නිවැරදි පිළිතුරු සංඛ්‍යාව
சரியான விடைகளின் தொகை

25
40

I පත්‍රයේ මුළු ලකුණු
பத்திரம் I இன் மொத்தப்புள்ளி

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සියලු හිමිකම් ඇවිරිණි / முழுப் பதிப்புரிமையுடையது /All Rights Reserved

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

34 | E | II

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2025(2026)
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2025(2026)
General Certificate of Education (Ord. Level) Examination, 2025(2026)

විද්‍යාව II
விஞ்ஞானம் II
Science II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

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

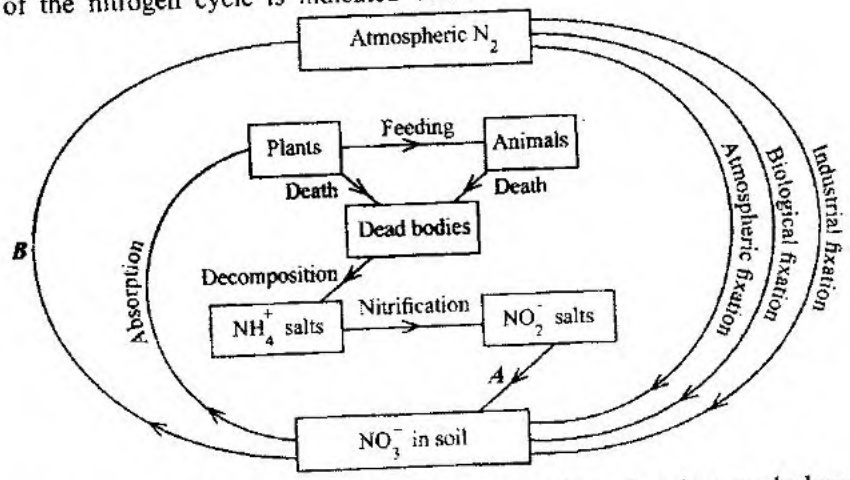
Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

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 handover.***

Part A

1. (*A*) A sketch of the nitrogen cycle is indicated below.



(i) By what name are the cycles such as nitrogen cycle and carbon cycle known in common?
biogeochemical cycles **01 Mark**

(ii) Name the processes *A* and *B* in the above nitrogen cycle.
(a) Process *A*: nitrification **01 Mark**
(b) Process *B*: denitrification **01 Mark**

(iii) (a) Under what environmental condition does the process *B* above occur?
anaerobic conditions/ give marks for swamps/paddy fields/ environmental conditions creating anaerobic nature in soil **01 Mark**

(b) State one special adaptation shown by some plants growing in the environments with the condition you mentioned in (a) above to satisfy their nitrogen requirement.
carnivorous plants or plants showing such adaptation **01 Mark**
Insectivorous plants. Nepenthes, Drosera.

(iv) What is the mode of nitrogen fixation relevant to each of the following instances?

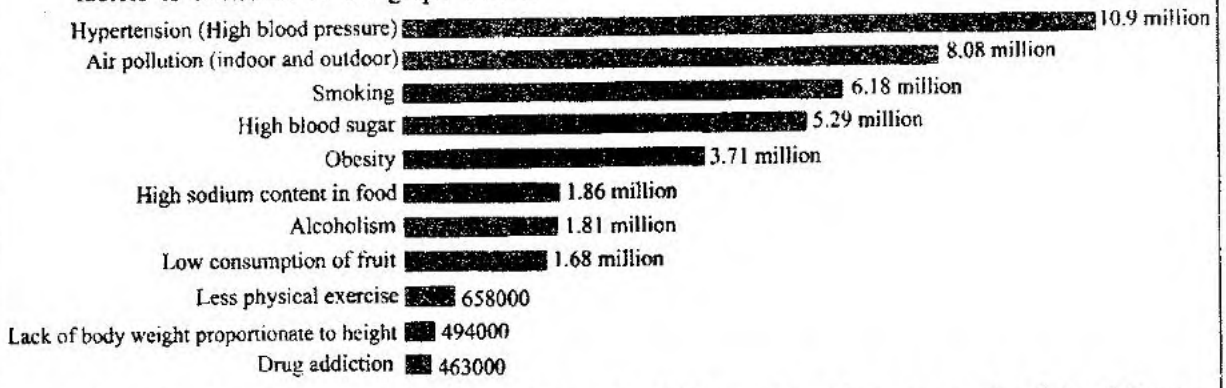
	Instance	Mode of fixation
(a)	Lightning	atmospheric fixation **01 Mark**
(b)	Rhizobium living symbiotically in the root nodules of legumes	biological fixation **01 Mark**

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(v) As what nutrient is the nitrogen contained in the salts absorbed by plants transmitted to animals?

protein **01 Mark**

(B) The number of deaths of people occurred in the year 2021 in the world due to various risk factors is indicated in the graph below.



Complete the following table taking the piece of information relevant to each of the following descriptions from the graph.

	Description	Piece of information
(i)	Risk factor causing the highest number of deaths	hypertension/high blood pressure 01 Mark
(ii)	Number of people died due to indoor and outdoor air pollution	8.08 million **01 Mark**
(iii)	Total number of deaths occurring due to alcoholism and smoking	7.99 million **01 Mark**
(iv)	The risk factor leading to about double the number of deaths caused by excessive sodium in food	obesity **01 Mark**
(v)	The risk factor affecting most a traffic police officer engaged in his duty in the work environment	air pollution **01 Mark**
(vi)	The risk factor directly connected with malnutrition	lack of body weight proportionate to height **01 Mark**
(vii)	The risk factor directly connected with overnutrition	obesity **01 Mark**

2. (A) A sketch of the human urinary system is indicated here.

(i) Write the parts labelled *P*, *Q* and *R* in the diagram in the boxes given opposite to each.

(ii) Of *X* and *Y*, which vessel contains blood with a higher concentration of nitrogenous excretory matter? X **01 Mark** /renal artery

(iii) By what name are the structural and functional units contained in the kidneys known? nephron/ nephridium **01 Mark**

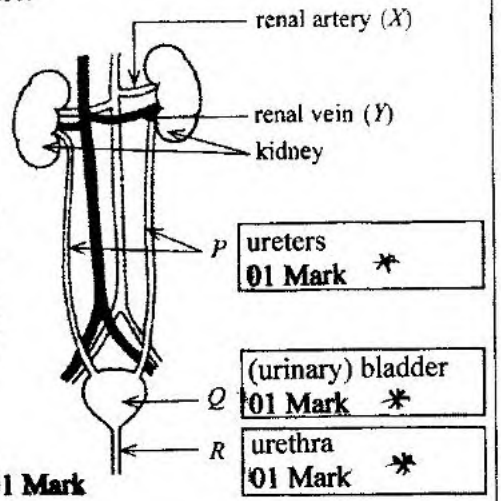
(iv) Name the **three** stages of the process of urine production taking place in the units you stated in part (iii) above.

(a) ultrafiltration **01 Mark**

(b) selective reabsorption/ selective resorption **01 Mark**

(c) secretion **01 Mark** (order is not necessary)

CNO oder



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(B) When a fly was coming towards the eye of a student ironing his clothes, his eyes blinked. On the spur of the moment his hand touched the iron. At that very moment his hand was withdrawn from the iron.

(i) By what name are the instant responses mentioned in the above incident commonly known?
reflex action **01 Mark** / Reflexes

(ii) To what type of instant responses does the blinking of eyes when a fly is coming towards the eye belong? cranial reflex actions/ reflexes **01 Mark**

(iii) Name the receptor and effector relevant to the instant withdrawal of student's hand from the iron.

(a) Receptor : skin (of hand) **01 Mark**

(b) Effector : muscles (of hand) **01 Mark**

(iv) In the following chart, indicate in respective order, the neurones connected with the conduction of the impulse in the event of the hand's withdrawal.

sensory/ afferent neuron **01 Mark**	→	inter/ intermediate/ internuncial neuron **01 Mark**	→	motor/ efferent neuron **01 Mark**

3. This question concerns the elements from sodium to chlorine (Na, Mg, Al, Si, P, S, Cl) belonging to the third period of the periodic table.

(A) Figures (1) and (2) show graphically how the electronegativity and the first ionization energy vary against the atomic number of Na, Mg and Al of the elements stated above.

Electronegativity Labelling unnecessary

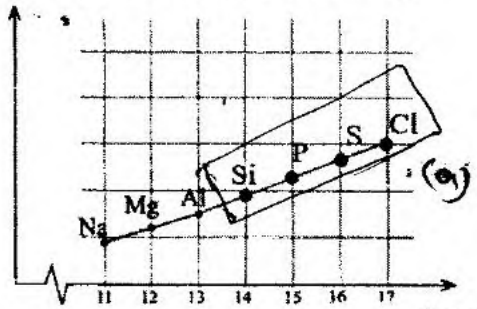


Figure 1

Atomic number

First ionization energy/kJ mol^{-1}

Marking Si and P correctly 01 Mark

Marking S and Cl correctly 01 Mark

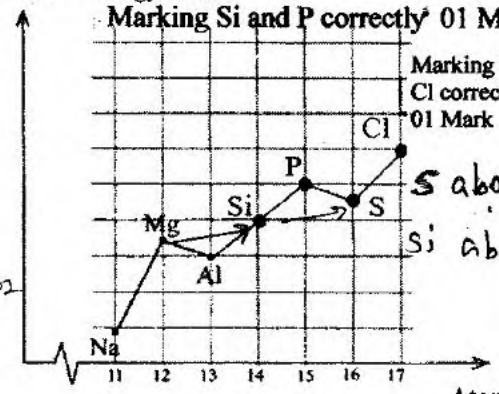


Figure 2

Atomic number

(i) Complete the above **two** graphs indicating approximately the points relevant to the other four elements.

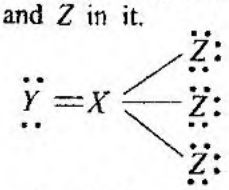
(ii) Of the above seven elements, select the element relevant to each of the following statements and write its symbol.

(a) forms an amphoteric oxide Al **01 Mark**

(b) is a metalloid Si **01 Mark**

(c) reacts fast with cold water liberating hydrogen Na **01 Mark**

(iii) The Lewis structure of the compound $PSCl_3$ formed by the elements P, S and Cl is given below. Write opposite each letter the standard symbols of the elements represented by *X*, *Y* and *Z* in it.



X: P **01 Mark**

Y: S **01 Mark**

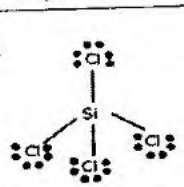
Z: Cl **01 Mark**

(B) (i) Complete the blank boxes in the following table relating to the chlorides formed by the elements Na, Mg, Al and Si.

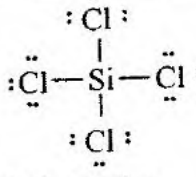
Element	Na	Mg	Al	Si
Formula of the chloride	NaCl	$MgCl_2$	$AlCl_3$ **01 Mark**	$SiCl_4$
Nature of the bond	ionic	ionic **01 Mark**	covalent **01 Mark**	covalent

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(ii) Draw the Lewis structure of $SiCl_4$.



OR



Give marks even if the electrons are denoted by cross. Shape of the molecule is not relevant. 01 Mark

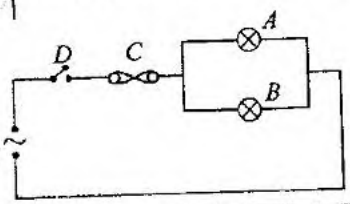
(iii) $SiCl_4$ reacts with water according to the following chemical equation.

$$SiCl_4 + 4H_2O \longrightarrow H_4SiO_4 + 4x$$

(a) Write the chemical formula of the compound indicated by x. HCl 01 Mark

(b) Liberation of gas bubbles can be observed when a magnesium ribbon is put into the above reaction mixture. What could be that gas evolved? hydrogen/ H_2 gas / H_2 01 Mark

4. (*A*) The figure shows a sub-circuit supplying electricity to two electric lamps *A* and *B* from the distribution box in a domestic electrical circuit.



(i) Name the electrical devices *C* and *D* and state the function carried out by each device in the following table.

Device	Name	Function
C	fuse/MCB 01 Mark	to control maximum current/ for the protection (of the bulb) / to prevent flow of an excessive current 01 Mark
D	switch 01 Mark	to close/ open the circuit/ to put on / off the circuit 01 Mark

(ii) What is represented by *E*? alternate current/ alternate current (dynamo) 01 Mark

(iii) When electric lamps *A* and *B* operate in their full power, the current flowing through *C* is 0.42 A. The lamp *A* has been marked 240 V, 60 W.

(a) How much is the current flowing through lamp *A*? $P = VI$ $I = \frac{60}{240}$ (A) $I = 0.25$ (A) 01 Mark

(b) How much is the current flowing through lamp *B*? 0.42 (A) – 0.25 (A) = 0.17 (A) 01 Mark

(c) What is the resistance of lamp *A*? $V = IR$ $R = \frac{240}{0.25}$ (Ω) $R = 960$ (Ω) 01 Mark

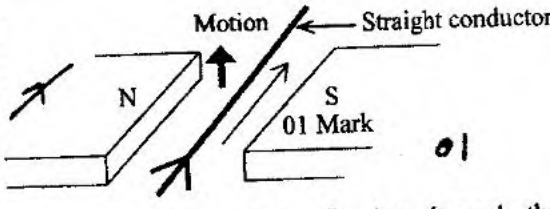
(iv) Though electric lamps should be connected in parallel in a domestic circuit, *A* and *B* were connected in series by a mistake. When that circuit is closed, is the current flowing through *C* is equal to or less than or greater than 0.42 A? less 01 Mark

(v) In a domestic circuit, an electric stove of power 2 kW was connected to a sub-circuit which can supply a maximum current of 5 A from the distribution box.

(a) What can happen in this instance? burning of the fuse/ disconnecting the MCB 01 Mark

(b) Write the cause why it happens ? flow of a greater current 01 Mark

(*B*) (i) A student placed a straight conductor perpendicular to a magnetic field as shown in the diagram and moved it in the direction indicated by the arrow. Mark by an arrow head on the conductor, the direction of the current flowing through the conductor.



01 Mark

(ii) Write the name of the rule used to find the direction of the current flowing through the conductor in part (i) above.

Fleming's right hand rule 01 Mark

(iii) What is the name of the phenomenon generating the above current?

electromagnetic induction * 01 Mark

(iv) Name an instrument which has been produced making use of this phenomenon.

(alternate current / bicycle) dynamo/ transformer/ moving coil microphone 01 Mark

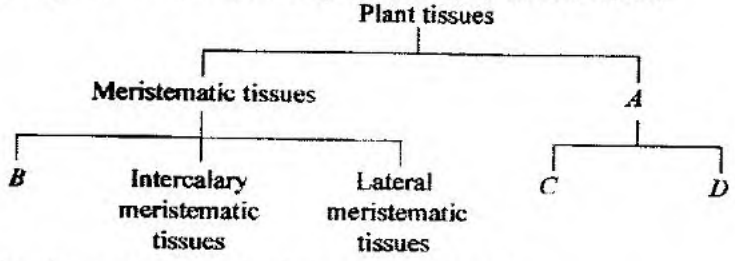
Generators / ATM machine

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Part B

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

5. (A) A chart regarding the classification of plant tissues is shown below.



(i) Name the tissue types indicated as *A*, *B*, *C* and *D*.
(ii) In which locations of a plant is the tissue type *B* found?
(iii) Mention the two tissues affecting the growth of plant stems in height and girth respectively.
(iv) Name the tissue contributing to the grafting of dicotyledonous plants and state to which type of meristematic tissues it belongs.

(B) A group of students engaged in an educational trip to the national zoological gardens, listed a few external features of some animals they observed as follows.

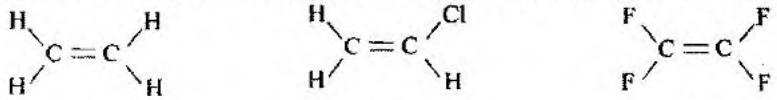
P - streamlined shape of the body
Q - moist and bare skin
R - dry skin with scales all over the body
S - skin covered with hair

(i) Name the common group to which the animals displaying the above features belong.
(ii) Mention the two classes to which the animals possessing feature *P* belong.
(iii) Of the features stated above, write the features displayed by toad and crocodile separately.
(iv) Write two features common to animals belonging to the classes showing feature *Q* and feature *R*.
(v) Mention three other external features common to animals showing feature *S*. (20 marks)

(5)	(A)	(i)	01	A - permanent tissues	01
			01	B - apical meristem	01
			01	C - simple permanent tissues / D	01
			01	D - complex permanent tissues / C apical bud	01
		(ii)	02	stem apex, root apex, axial buds (any two) ~~axillary buds~~, root tip	02
		(iii)	01	growth in height - apical meristem (of the stem)	01
			01	growth in girth - lateral meristem/ cambium tissue	01
		(iv)	01	cambium tissue	01
			01	lateral meristem	01
	(B)	(i)	01	Vertebrates/ Vertebrata	01
		(ii)	01	Pisces (fish)	02
			01	Aves (birds)	
		(iii)	01	toad - Q / moist and bare skin 01	02
			01	crocodile - R/ dry skin with scales 01	
		(iv)		• pentadactyl limbs • cold blooded • bilateral symmetry • laying eggs • presence of lungs • presence of vertebral column (back bone) • Having 4 legs/limbs - any two correct answers	02
		(v)		• external ears/ pinna • testes lying in scrotal sacs outside the body • mammary glands • sweat glands • sebaceous glands • eyes with eyelids • eye lids with eye lashes. - any three of these	03
					20

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6. (*A*) *P*, *Q* and *R* are three organic compounds which are monomers of three polymers.

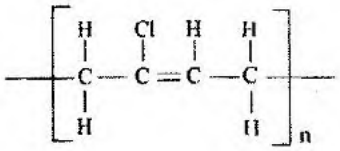


(*P*) (*Q*) (*R*)

(i) A widely used polymer polythene is produced by polymerizing *P*.
(a) To which group of hydrocarbons does *P* belong?
(b) The relative molecular mass of a typical polythene molecule is 1 120 000. How many repeating units does a typical polythene molecule contain? (H = 1; C = 12)

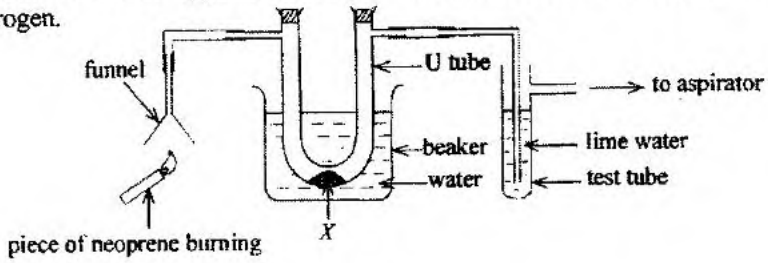
(ii) (a) Why are *Q* and *R* not considered hydrocarbons?
(b) Write the name of the polymer formed by the polymerization of *Q*.
(c) The polymer teflon is formed by the polymerization of *R*. Draw in standard form the structure of teflon.

(*B*) The synthetic rubber neoprene with the structure indicated by the figure is produced by the polymerization of the organic compound chloroprene. It has a carbon chain similar to the carbon chain of isoprene, the monomer of natural rubber.



(i) Draw the structural formula of the monomer chloroprene.

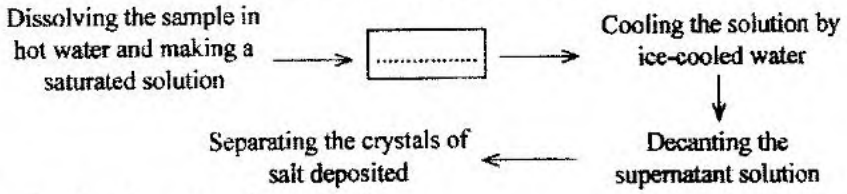
(ii) The figure illustrates a set of apparatus arranged to demonstrate that neoprene contains carbon and hydrogen.



(a) Name *X*.
(b) Mention an error in the set up of apparatus.
(c) What is the function of water in the beaker?
(d) Write **two** observations which you would expect to make when the apparatus is operated after rectifying the error.
(e) Indicate by a balanced chemical equation, the chemical change which causes one of the two observations which you stated in (d) above.

(iii) What is the structural difference at the molecular level resulted in vulcanization of natural rubber?

(*C*) The procedure adopted by a student to obtain purer salt from a sample of unwashed common salt (sodium chloride) bought from the market is as follows.



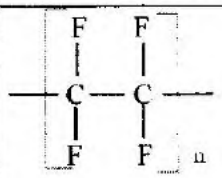
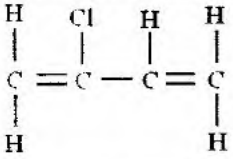
(i) What is the above procedure called?
(ii) Write the step relevant to the blank.
(iii) Water-soluble magnesium chloride which is present as an impurity in salt is not removed by the procedure described above. Reacting the aqueous solution of salt with a sodium hydroxide solution and filtering off the precipitated, insoluble magnesium hydroxide is a method that can be used to remove magnesium chloride. The incomplete chemical equation for this is given below.

$$MgCl_2(aq) + \text{.....} \longrightarrow \text{.....} + 2NaCl(aq)$$

(a) Complete the above equation and write it in the answer script (Physical states should be indicated.).
(b) Of the four types of reactions you have learnt, to which type does the above reaction belong?
(c) If sodium hydroxide essential for the above reaction is not available in the school laboratory, suggest a method to make a sodium hydroxide solution using common salt.

(20 marks)

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(6)	(A)	(i) 01	(a)	alkenes	01
		02	(b)	C_2H_4: $12\times2+1\times4=28$ $\frac{1\,120\,000}{28} = 40\,000$	01 01
		(ii) 01	(a)	because other elements are present in addition to C and H/ because they contain C and F/ because hydrocarbons are compounds containing C and H only.	01
		01	(b)	polychloroethene/ polyvinyl chloride/ PVC The part "poly" may be given within brackets.	01
		01	(c)		01
	(B)	(i) 01			01
		(ii) 01	(a)	anhydrous copper sulphate/ $CuSO_4$ / anhydrous $CuSO_4$/ anhydrous cobalt chloride/ ~~Anhydrous~~ Anhydrous $CoCl_2$	01
		01	(b)	there is no stopper in the test tube (containing lime water.) not sealed / no lid / when the problem is identified.	01
		01	(c)	to condense water vapour (in the "u" tube)/ for cooling	01
		01	(d)	Anhydrous. -) $CuSO_4$ - (white colour) turning blue/ anhydrous cobalt chloride - (blue colour) turning pink - lime water turning milky/ turbid/ turning white milky and becoming colourless again. - liberation of air bubbles at the end of the delivery tube/ deposition of liquid droplets in the 'u' tube form water	01 01
		—	(e)	$CuSO_4(s) + 5H_2O(l) \longrightarrow CuSO_4.5H_2O(s)$ or $CoCl_2 + 6H_2O \longrightarrow CoCl_2.6H_2O(s)$ $Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$ or $CaCO_3(s) + H_2O(l) + CO_2(g) \longrightarrow Ca(HCO_3)_2(aq)$ physical state not requied	01
		(iii)		forming cross bonds (via S) links / diagram is possible	01
	(C)	(i) 01		recrystallisation	01
		(ii) 0		filtering (while hot)	01
		(iii) 0	(a)	$MgCl_2(aq) + 2NaOH(aq) \longrightarrow 2NaCl(aq) + Mg(OH)_2(s)$ writing 2 NaOH (aq) correctly 01 Mark writing $Mg(OH)_2$ (s) correctly 01 Mark * physical state essential.	02
		01	(b)	double displacement/ ~~double decomposition~~	01
		—	(c)	electrolysing (an aqueous) solution of NaCl (using carbon/ graphite electrodes)	01
					20

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7. (*A*) The values of velocity of an object obtained by a student from a displacement - time graph relating to the motion of that object during 4 seconds are indicated in the following table.

time (t) / s	0	1	2	3	4
velocity (v) / m s^{-1}	0	2	4	6	8

(i) Using the data in the table, draw a sketch of the velocity-time graph of the object in your answer script.

(ii) Describe how you estimate the acceleration of the object using the velocity-time graph you have drawn.

(iii) Using the graph, find the displacement of the object at the end of 4 seconds.

(*B*) In order to extinguish a fire broken out in a building, water was gushed into the building very fast with a hose from a water bowser belonging to the urban fire extinguishing unit.

(i) At the time of squirting water from the hose, a fire fighter should put in a great force to hold it in position.

(a) What is the reason for it?

(b) What is the law applicable to explain the above phenomenon?

(*C*) A driver mass 60 kg, drives a motor car on a horizontal road at a constant speed of 36 km h^{-1}.

(i) How much is the energy possessed by the driver by virtue of the motion of the motor car?

(ii) At the foot of a hillock in the road, the driver knocked off the engine and cut off the force provided from it to the car. The car drew forward and stalled after reaching a plateau at the top of the hillock. What is the height of the hillock? (Assume g = 10 m s^{-2})

(*D*) The following table presents various electrical appliances available in a house and information regarding their daily usage.

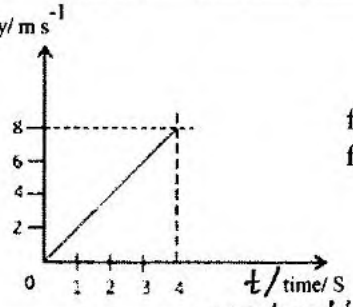
Appliance	Power/kW	Number of appliances	Number of hours used
Electric lamps	0.06	8	6
Electric irons	0.6	1	1
Electric fans	0.4	5	4
Washing machines	1.2	1	1

(i) How much is the electrical energy spent for electric fans per day?

(ii) How much is the number of electrical units spent during a month of 30 days?

(20 marks)

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(I)	(A)	(i)	01	 for naming axes - **01 mark** for drawing the graph correctly - **01 mark**	02
		(ii)	01	The gradient gives the ~~velocity~~ acceleration / change in velocity / time	01
		(iii)	02	$\frac{1}{2} \times 4 \times 8$ (01) area of the triangle or describing it in words $= 16$ (m) (01) Just 16 // give 02 marks.	02
	(B)	(i)	(a)	Because water exerts a force in the opposite direction	01
			(b)	Newton's third law (give marks for writing the law also)	01
		(ii)	02	Power $= \frac{mgh}{t}$ / energy/work / time $= \frac{100 \times 10 \times 10}{25}$ (01) for equation or substitution (01) $= 400$ (W) (01) Just 400 (02) for final answer (01)	02
		(iii)	02	$F = ma$ $F = 20$ kg $\times$ 2 ms^{-1} $F = 40$ (N) Just 40 (02) for equation or substitution (01) for final answer (01)	02
		(iv)	02	*work* = *force* $\times$ *distance* for equation or substitution (01) $= 8$ N $\times$ 3 m $= 24$ (N m) / (J) Just 24 (02) for final answer (01)	02
	(C)	(i)	02	$E = \frac{1}{2} \times 60$ kg $\times 10$ ms$^{-1} \times 10$ ms^{-1} ($E = \frac{1}{2}mv^2$ / $E = mv^2$) $= 3000$ (J) Just 3000 (02) for equation or substitution (01) for final answer (01)	02
		(ii)		$\frac{1}{2} m v^2 = mgh$ / K Energy = potential Energy. for equation or substitution (01) $h = v^2/2g$ $h = \frac{10 \text{ ms}^{-1} \times 10 \text{ ms}^{-1}}{2 \times 10 \text{ ms}^{-2}}$ } Give full marks for substituting 3 000 J for final answer (01) $h = 5$(m) Just 5 (02)	02
	(D)	(i)	01	0.4 kW $\times$ 1000 W $\times$ 5 $\times$ 4 $\times$ 3600 s 28 800 000 (J) / 28 800 (kJ) or 0.4 kW $\times$ 5 $\times$ 4 h = 8 kW h	01
			02	electric lamps - 0.06 kW $\times$ 8 $\times$ 6 h $\times$ 30 = 86.4 kW h electric iron - 0.6 kW $\times$ 1 $\times$ 1 h $\times$ 30 = 18 kW h electric fans - 0.4 kW $\times$ 5 $\times$ 4 h $\times$ 30 = 240 kW h **01** washing machine - 1.2 kW $\times$ 1 $\times$ 1 h $\times$ 30 = 36 kW h total number of electric units = 380.4 (kW h) Give only **01 mark** when the calculation is done only for **electric fans.** Give **01 mark** for multiplying the final total by 30 although the calculation for each device is wrong.	02
					20

(14)

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8. (*A*) (i) What is the hormone which is important in bringing about secondary sexual characteristics of males?

(ii) Why is it important that the pair of testes in the male reproductive system are located in the scrotum outside the body?

(iii) Mention a function carried out by each of the following structures of the male reproductive system.

(a) seminiferous tubules (b) epididymis (c) seminal vesicles

(*B*) (i) Name the locations where the following functions are carried out in the female reproductive system.

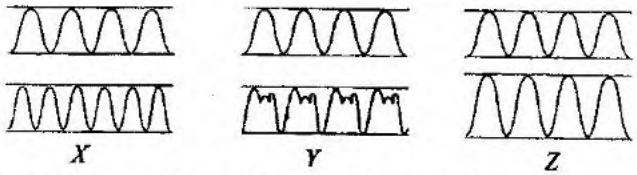
(a) production of ova (b) fertilization (c) implantation

(ii) Mention briefly and separately the changes taking place in the wall of the uterus during the following two main phases of the menstrual cycle.

(a) menstrual phase (b) proliferation phase

(*C*) The characteristics that help distinguish sounds from one another are called characteristics of sound.

(i) Name separately the **three** characteristics of sound illustrated by the pairs of wave patterns labelled *X*, *Y* and *Z*.



(ii) Of *X*, *Y* and *Z* above, select and write the pair of graphs that can be used to explain each of the following differences.

(a) the difference felt when you have a face to face discussion with a friend of yours and his voice is heard from a loudspeaker

(b) the difference felt when a same note is played by the same musical instrument at medium and high pitch

(iii) Write a factor on which the frequency of the sound produced by a violin depends.

(iv) Mention **two** characteristics of ultrasound waves.

(v) Ultrasound waves are used to investigate the location of a tumour (a part with abnormal growth) inside the body. In such a test, the velocity of the wave inside the tumour was 1.7 km s^{-1}. What is the wave length of the wave inside the tumour? The operation frequency of the scanning machine is 4 MHz (1 MHz = 10^6 Hz). (20 marks)

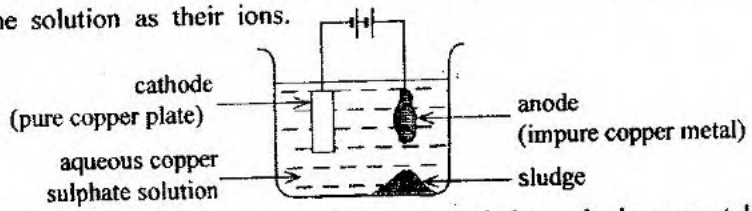
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(9)	(A)	(i)		testosterone	01
		(ii)		because a temperature below the body temperature is essential for the production of healthy sperms/ because the process of sperm production is very sensitive to temperature	01
		(iii)	(a)	production of sperms	01
			(b)	temporary storage of sperms	01
			(c)	production of the fluid for transportation of sperms and provision of nourishment / supply nutrients / transports sperms.	01
	(B)	(i)	(a)	ovary	01
			(b)	fallopian tube	01
			(c)	uterus	01
		(ii)	(a)	breaking down of the uterine wall/ ~~uterine wall becoming vascular~~	01
			(b)	building up of the uterine wall / increase the thickness of uterine wall / uterine wall become vasular	01
	(C)	(i)		X - pitch 01 Y - timbre/ quality of sound 01 Z - loudness 01	03
		(ii)	(a)	Z	01
			(b)	X	01
		(iii)		tension of the string/ length of the vibrating part/ mass of unit length (area of cross section) / thickness of the string	02/00
		(iv)		Frequency is greater than 20 000 Hz/ higher in energy/ cannot be heard by the human ear / do not transfer from solid to gaseous media	02
		(v)		$v = f\lambda$ / $\frac{1.7 \times}{4 \times 10^{9}}$ $\lambda = \frac{17}{4} \times 10^{-4}$ / $\frac{1.7}{4} \times 10^{-3}$ $\lambda = 4.25 \times 10^{-4}$ m / 0.425×10^{-3} / 4.25×10^{-4} $\lambda = 0.000\,425$ (m)	01
					20

11

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9. (*A*) In extraction of copper metal, the impure metal obtained by roasting copper ores is purified by an electrolytic method known as electrorefining. In this process, an electrolytic cell with impure copper as the anode and a pure plate of copper as the cathode is used as shown in the diagram and the copper ions entering into the solution from the anode get deposited on the cathode (as in electroplating of iron with copper). Impurities in the impure metal fall to the bottom of the container as sludge and it contains traces of valuable metals such as gold and silver. Metals such as iron and zinc contained in the impure metal are not deposited but pass into the solution as their ions.



(i) Write half reactions occurring at the anode and the cathode separately in respective order.

(ii) During electrolysis, what can be observed with regard to the intensity of the colour of the copper sulphate solution with the passage of time?

(iii) Based on the position occupied by the respective metals in the activity series, briefly explain the reasons for the following phenomena.
(a) Metals such as iron and zinc enter the solution in the form of ions without being deposited.
(b) Gold and silver exist as native (free) metals in the sludge.

(iv) Name a suitable method to separate gold and silver from other impurities of the sludge. (Gold and silver are high-density metals.)

(v) The purity of copper obtained by the above method is 99.95% by mass. How many copper atoms are there in 100 g of pure copper so obtained? The final answer is **not** required and indicating how the calculation is done is adequate. (Cu = 63.5, Avagardo Constant = 6.022×10^{23} mol^{-1})

(vi) What is the reason why relative atomic mass of copper assumes a fractional value such as 63.5?

(vii) In electrical conductivity, copper comes next to silver only. State one use of copper that exploits this property.

(viii) The following equation indicates a chemical reaction taking place when copper ores are roasted.

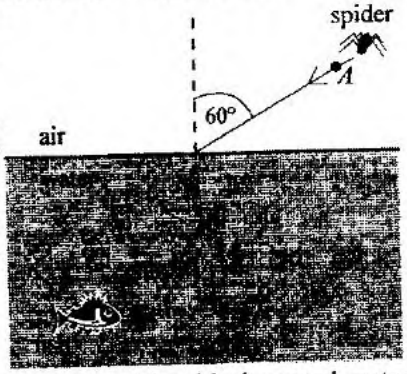
$$2Cu_2S + 3O_2 \longrightarrow 2Cu_2O + 2SO_2$$

Mention an environmental problem caused by the gaseous product of the above reaction.

(*B*) The figure shows a spider at point *A* in the air above the water surface and a fish in a pond at point *B*. The angle of incidence of the rays coming from the spider to the fish is 60° and the angle of refraction is 40°.

(i) Calculate the refractive index of water relative to air. (Assume Sin 60° = 0.8 and Sin 40° = 0.6)

(ii) (a) Indicating the position of the spider and the fish as *A* and *B* respectively, illustrate by a rough ray diagram the path of the ray from *A* to *B*.
(b) On the perpendicular drawn to the water surface passing through point *A*, mark as *D*, the position of the spider's image as seen by the fish.



(iii) If the fish swims in water towards a point *C*, how will the location of the spider's image seen by the fish relative to point *D* change?

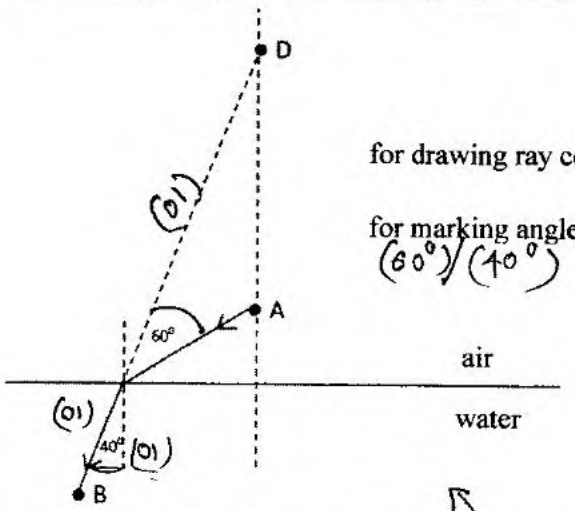
(*C*) A water-filled, open metal container with 1 m^2 area of cross section and a black-coated outer surface is kept outdoor exposed to sunlight. After 4 hours it was observed that its water level has dropped by 5 cm.

(i) Mention the method of heat transfer relevant to each of the following instances.
(a) transfer of heat to the outer surface of the container
(b) transfer of heat from the outer surface to the inner surface of the container

(ii) What is the reason for the drop of the water level in the container?

(iii) If the outer surface of the container is white-coated, how will the drop of the water level differ relative to the drop when it is black-coated after 4 hours? Mention the reason for your answer. (20 marks)

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(9)	(A)	(i)		anodic reaction $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e$ (01) cathodic reaction $Cu^{2+}(aq) + 2e \longrightarrow Cu(s)$ (01)	02
		(ii)		Colour does not change.	01
		(iii)	(a)	activity is higher relative to copper/ lie above Cu in the activity series	01
			(b)	activity is less relative to Cu/ lie below Cu in the activity series	01
		(iv)		panning/ directing to a stream of water	01
		(v)		number of atoms = $\frac{99.95}{63.5} \times 6.022 \times 10^{23}$	01
		(vi)		existence of isotopes	01
		(vii)		making wires/ electrical cables/ electricity conducting parts	01
		(viii)		acid rains	01
	(B)	(i)		refractive index = $\frac{\sin 60}{\sin 40} = \frac{0.8}{0.6} = 1.333$ for equation or substitution	01
		(ii)	(a)	 for drawing ray correctly (01 Mark) for marking angles correctly (01 Mark) (60°)/(40°)	02
			(b)	For marking D as in the above diagram	01
		(iii)		Location of the image does not change/ forms on D.	01
	(C)	(i)	(a)	radiation	01
			(b)	conduction	01
		(ii)		evaporation/ vapourisation	01
		(iii)		• Drop of the water level is less. • Amount of heat reflected by white surfaces is greater/ heat absorbed is less. Therefore, amount of heat absorbed is less. • Black colour absorbs more heat than white	01 01
					20

03

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