

සියලු ම හිමිකම් ඇවිරිණි / முழுப் பதிப்புரிமையுடையது / All Rights Reserved]

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 Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka  
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 கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2014 டிசம்பர்  
 General Certificate of Education (Ord. Level) Examination, December 2014

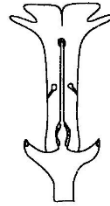
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 Science I

පැය එකයි  
 ஒரு மணித்தியாலம்  
 One hour

Note :

- Answer all questions.
- In each of the questions 1 to 40, pick one of the alternatives (1), (2), (3), (4) which you consider as 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.

- Which of the following is a non-flowering plant without seeds?  
 (1) *Marchantia* (2) *Pinus* (3) *Cycas* (4) *Bamboo*
- According to the classification of organisms, to which of the following groups of organisms do *Penicillium notatum* and *Gallus lafayetti* belong respectively?  
 (1) Protozoa, Reptiles (2) Fungi, Fish  
 (3) Algae, Mammals (4) Fungi, Birds
- In which of the following are sclerids mostly present?  
 (1) Root tubers (2) Cortex of dicotyledonous stems  
 (3) Dates seeds (4) Papaw fruits
- Select the answer which contains the substances that are present in blood plasma but not in tissue fluid.  
 (1) Glucose, Oxygen (2) Amino acids, Enzymes  
 (3) Water, Lipids (4) Fibrinogen, Serum albumin
- Consider the diagram of the flower given here. Which of the following is an adaptation of this flower to prevent from self pollination?  
 (1) Presence of gynoecium only  
 (2) Stigma is located above the stamens  
 (3) Stigma and stamens are located close to each other  
 (4) Having turned stamens
- Which of the following actions is a spinal reflex?  
 (1) Immediate blinking of the eye when a small amount of water is thrown towards the eye  
 (2) Salivation when the aroma of a food is felt  
 (3) Pulling away the hand immediately on contact with a hot object  
 (4) Enlargement of the pupil of the eye in darkness
- Which of the following organs does **not** contribute to maintain homeostasis of the human body?  
 (1) Skin (2) Kidneys (3) Pancreas (4) Ear
- Nuwan, Ravi and Shifan had undergone a blood test to identify their blood groups. According to the blood test, Nuwan can donate his blood to Ravi, but not to Shifan. Shifan is able to donate his blood to Nuwan and Ravi.  
 The blood groups of Nuwan, Ravi and Shifan would be respectively,  
 (1) A, AB and O. (2) O, AB and O.  
 (3) O, O and AB. (4) A, B and O.
- "The colour blind persons should refrain from driving vehicles." Which of the following is a reason for this statement?  
 (1) They cannot see objects located in the distance.  
 (2) They cannot see at night.  
 (3) They cannot identify traffic signal lights correctly.  
 (4) They cannot identify the head lights of vehicles at night.



10. Which of the following is a natural vegetative reproductive method?  
 (1) Producing a bud from leaves (2) Producing a plant by germination of a seed  
 (3) Tissue culture (4) layering

11. Following are three statements on biopesticides.

A – Biopesticides are ecofriendly.

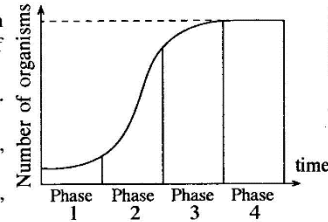
B – Poisons produced by the bacterium *Bacillus thuringiensis* is used as a biopesticide.

C – Poisons of biopesticides do not accumulate along the food chains.

The true statement/s from the above is/are

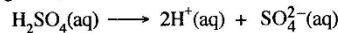
- (1) A only. (2) C only. (3) A and C only. (4) all A, B and C.

12. Pattern of change in the number of organisms of a natural population with time is shown in the graph. According to the graph, which of the following statements is **false**?



- (1) Although food is abundant, the growth rate is slow in phase 1.  
 (2) Although there are predators, the growth rate is rapid in phase 2.  
 (3) Although the organisms are not well adapted to the environment, the growth rate is increased in phase 3.  
 (4) Although there is a competition among organisms for resources, an equilibrium is reached in phase 4.
13. When an ion forms from a neutral atom in a chemical reaction,  
 (1) number of protons in the atom changes. (2) number of electrons in the atom changes.  
 (3) number of neutrons in the atom changes. (4) numbers of protons and electrons in the atom change.
14. The molecular formula of the sulphate of metal M is  $MSO_4$ . The molecular formula of the chloride of M is  
 (1)  $MCl$  (2)  $MCl_2$  (3)  $M_2Cl$  (4)  $MCl_3$

15. Sulphuric acid which is a strong acid, ionizes in water as shown below.

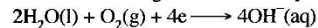


What is the total number of ions in one litre of  $0.5 \text{ mol dm}^{-3}$   $H_2SO_4$  solution?

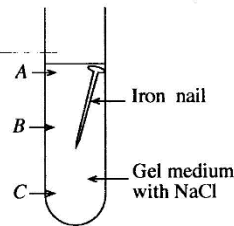
- (1)  $0.5 \times 6.022 \times 10^{23}$  (2)  $1.0 \times 6.022 \times 10^{23}$  (3)  $1.5 \times 6.022 \times 10^{23}$  (4)  $3.5 \times 6.022 \times 10^{23}$
16. "When pressure decreases, the solubility of a gas in water decreases." Which of the following incidents confirms that this statement is true?  
 (1) Evolution of gas bubbles when water is heated.  
 (2) Evolution of gas bubbles when a drinking soda bottle is opened.  
 (3) Storing of LP gas in liquid state in gas cylinders.  
 (4) Dissolving of a gas more in normal water than in salt water.

17. A setup prepared in the laboratory to demonstrate rusting of iron is shown in the figure.

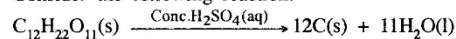
In the setup, which region from the regions A, B and C of the test tube does the following reaction mainly occur?



- (1) In region A  
 (2) In region B  
 (3) In region C  
 (4) In three regions A, B and C



18. When diluting a glucose solution by adding water, the number of solute particles in the solution  
 (1) increases. (2) decreases.  
 (3) increases and then decreases. (4) will not change.
19. Select the group which only contains elements with allotropes.  
 (1) Carbon, Oxygen, Nitrogen (2) Carbon, Oxygen, Sulphur  
 (3) Sodium, Silicon, Chlorine (4) Magnesium, Carbon, Sulphur
20. Which of the following minerals is in its elemental state?  
 (1) Graphite (2) Calcite (3) Silica (4) Apatite
21. Which of the following gases does **not** influence the depletion of the ozone layer?  
 (1)  $O_2$  gas (2)  $CO_2$  gas (3) CFC gases (4) NO gas
22. Consider the following reaction.

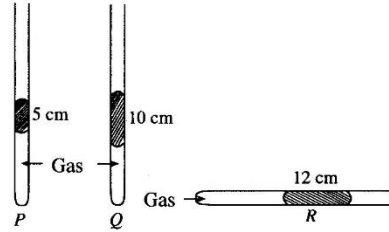


In this reaction, concentrated  $H_2SO_4$  acts as

- (1) a reactant. (2) a catalyst. (3) a dehydrator. (4) an acid.

- Use the information given below to answer questions No. 23 and 24.

*P*, *Q* and *R* are three identical glass tubes with one end closed. Equal masses of a certain gas are trapped by introducing mercury columns of lengths 5 cm, 10 cm and 12 cm in the tubes as shown in the figure. The tubes *P* and *Q* are kept vertically and the tube *R* is kept horizontally.

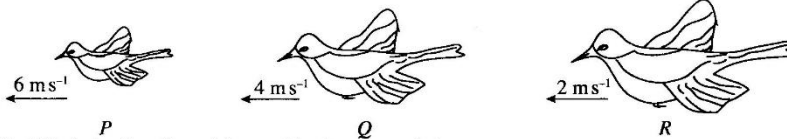


- Which tubes/tube contain/s the gas column with a pressure equal to the atmospheric pressure?  
 (1) *P* (2) *Q* (3) *R* (4) *P* and *Q*
- Calculate the volume of the gas column in tube *Q*, if the volume of the gas column in the tube *R* is  $4.3 \text{ cm}^3$ . Consider that the gases in tubes are at room temperature. (Atmospheric pressure is 76 Hg cm)  
 (1)  $2.8 \text{ cm}^3$  (2)  $3.0 \text{ cm}^3$  (3)  $3.8 \text{ cm}^3$  (4)  $4.9 \text{ cm}^3$
- What is the unit that is used to measure the capacitance of a capacitor?  
 (1) farad (2) ohm (3) coulomb (4) joule
- When an object is kept in front of a concave lens, the image produced by the lens is always  
 (1) real, erect, diminished. (2) virtual, erect, diminished.  
 (3) real, inverted, magnified. (4) virtual, inverted, diminished.
- Consider the following table regarding situations where optical components are used in optical instruments.

Situation	Optical component	Optical instrument
X	plane mirror	overhead projector
Y	concave mirror	slide projector
Z	convex lens	simple microscope

The situations which correctly indicate the optical instrument that uses the optical component given against it are  
 (1) X and Y only. (2) Y and Z only. (3) X and Z only. (4) all X, Y and Z.

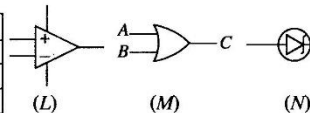
- The three birds *P*, *Q* and *R* fly in the same horizontal direction with the velocities given in the figures. The mass of *Q* is twice that of *P*. The mass of *R* is thrice that of *P*.



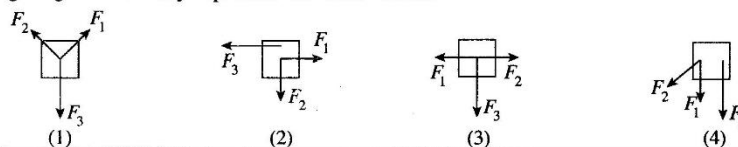
- The bird/birds having the minimum kinetic energy is/are  
 (1) *P*. (2) *Q*. (3) *R*. (4) *P* and *R*.
- Select the correct statement from the following statements.  
 (1) Heat capacity of a substance does not depend on its mass.  
 (2) The international unit of temperature is Fahrenheit.  
 (3) All non metals are non conductors of heat.  
 (4) Blackened pipes at the back of certain refrigerators remove heat by radiation.
  - A glass sheet having 4.5 mm of thickness is kept on a table. A picture which is kept under the glass sheet and in contact with surface of the table is viewed from above the glass, the apparent depth of a mark on the picture is (Refractive index of glass = 1.5)  
 (1) 1.5 mm. (2) 3.0 mm. (3) 3.5 mm. (4) 4.0 mm.

- Select the correct answer according to the given symbols.

	(L)	(M)	(N)
(1)	Operational amplifier	AND gate	Zener diode
(2)	NOT gate	OR gate	Zener diode
(3)	NOT gate	OR gate	Operational amplifier
(4)	Operational amplifier	OR gate	Zener diode

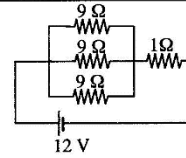


- An object is in equilibrium under three coplanar forces of  $F_1$ ,  $F_2$  and  $F_3$ . If  $F_1 = F_2$ , which of the following diagrams correctly represents the three forces?



[See page four]

33. In the given circuit, what is the current flowing through a  $9\ \Omega$  resistor?  
 (1)  $0.4\ \text{A}$  (2)  $1\ \text{A}$   
 (3)  $2\ \text{A}$  (4)  $3\ \text{A}$

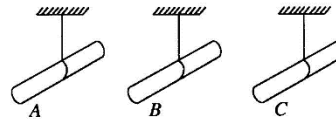


34. The displacement–time data relevant to the motion of a child along a straight path is given below.

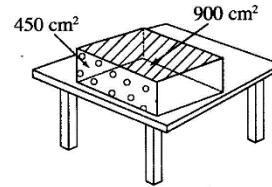
Time (s)	1	10	20	30	40
Displacement (m)	0	50	0	50	0

During the entire period of time,

- (1) he has moved in the same direction. (2) his velocity is  $5\ \text{ms}^{-1}$ .  
 (3) total distance he moved is  $200\ \text{m}$ . (4) his displacement is  $100\ \text{m}$ .
35. The rods  $A$ ,  $B$  and  $C$  given in the figure are charged by rubbing them with three pieces of dry silk cloths  $a$ ,  $b$  and  $c$  respectively. After that the pieces of cloths  $a$ ,  $b$  and  $c$  are brought closer to rods  $A$ ,  $B$  and  $C$ , it was observed that
- \* the cloth  $a$  repels rod  $B$ ,
  - \* the cloth  $b$  repels rod  $C$ ,
  - \* the cloth  $c$  attracts rod  $A$ .
- According to the observations, which of the following is correct?
- (1) rods  $A$  and  $B$  have like charges. (2) rods  $B$  and  $C$  have like charges.  
 (3) rods  $A$  and  $C$  have like charges. (4) all  $A$ ,  $B$  and  $C$  have like charges.



36. A box of mass  $2\ \text{kg}$  is kept on a table as shown in the figure. The box is moved along the table by applying an unbalanced force of  $X$  Newtons parallel to the surface of the table. The frictional force acting on the box by the surface of the table is  $Y$  Newtons.



Consider the following statements.

$A$  – Magnitude of the external force applied in the direction of motion is equal to the sum of  $X$  and  $Y$ .

$B$  – The magnitude of the acceleration of the box is half of  $X$ .

$C$  – When the surface of area  $450\ \text{cm}^2$  is kept in contact with the table, and applied the same unbalanced force  $X$  in the same direction, the frictional force will be half of  $Y$ .

of the above statements

- (1) only  $A$  and  $B$  are true. (2) only  $B$  and  $C$  are true.  
 (3) only  $A$  and  $C$  are true. (4) all  $A$ ,  $B$  and  $C$  are true.
37. Which disease was **not** transmitted within Sri Lanka, from one person to another by mosquitoes, during the past two years, (after October 2012)?  
 (1) Malaria (2) Dengue (3) Filaria (4) Chikungunya
38. Due to the high demand for organic food by people, organic farming has been started again in some areas of Sri Lanka. Which of the following is a problem faced by the farmers who are involved in organic farming?  
 (1) More expenditure is involved in farming  
 (2) Difficult to control pests  
 (3) More chemical fertilizer has to be used  
 (4) The harvest cannot be kept for a long time
39. The technology of manufacturing cloths that do **not** retain dirt and that resist hot and cold conditions is a revolution of which of the following?  
 (1) Computer technology (2) Nanotechnology  
 (3) Molecular biotechnology (4) Engineering technology
40. Consider the following facts.  
 $P$  – Population growth  
 $Q$  – Rapid advancement of technology  
 $R$  – Occurrence of climatic changes  
 To reach the expected targets, a developing country has to find new power sources due to the facts  
 (1)  $P$  and  $Q$  only. (2)  $Q$  and  $R$  only. (3)  $P$  and  $R$  only. (4) all  $P$ ,  $Q$  and  $R$ .



## Part B - Essay Questions

- Answer **three** questions, selecting **one question** each from the sections Biology, Chemistry and Physics.

## Biology

5. (A) Waste substances produced due to metabolic activities of the human body are excreted by kidneys, lungs and the skin.
- Which one of the above organs, does **not** excrete nitrogenous waste?
  - Name **two** nitrogenous wastes that are excreted by kidneys.
  - Waste substances removed from blood are excreted as urine due to some processes that occur in the nephron, which is the functional unit of the kidney.
    - Write a process that occurs
      - in the glomerulus in the nephron,
      - in the capillaries formed by dividing the excurrent arteriole in the nephron in the formation of urine.
    - If there is plasma protein in the urine of an individual, which of the functions that you mentioned in (a) has been affected?
    - What is the name given for the disorder condition relevant to (b) above?
- (B) A person who saw a wild elephant coming towards him, got frightened and immediately started running fast. He had never run so fast in his life. The energy required for running fast was provided by some processes that occurred in his body.
- Name the sub system of the autonomous nervous system that conducts impulses when frightened.
  - In situations like above, one ductless gland secretes many hormones to carry out the processes required for generating energy. Name that gland.
  - 'Increasing the glucose level in blood' is a body process that helps to generate energy in the above situation. State **two** other processes of the body that occur in such a situation.
  - The basic unit of the body that generates energy is the cell.
    - What is the organelle in the cell that produces energy?
    - From which metabolic activity is energy generated in the cell?
  - Explain how the processes of body that you mentioned in (iii) above contributed to immediately generate energy fast required for running fast
- (C) Pollution of the environment results in the loss of biodiversity.
- State the **two** main methods that are followed in the conservation of biodiversity.
  - Give **one** example each for the instances where the methods stated above are used in Sri Lanka.

6. (A) Germination of seeds occurs in two ways.

- Name the **two** ways of germination of seeds shown in figures A and B respectively.
- In which germination type does the seed leaves, that produce food by photosynthesis, develop?
- According to which type stated above does germination of bean seeds occur?

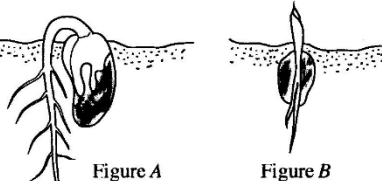


Figure A

Figure B

- Non germination of seeds in fruits, even in the presence of all factors required for germination, is called seed dormancy. State a reason for this condition.

- (B) (i) The results of a mono hybrid cross carried out in Gregor Mendel's experiments on heredity for the character of colour of the flower of Pea plant are given in the following table.

Character	Hybrid	F <sub>1</sub> Generation	F <sub>2</sub> Generation
Colour of flower	purple × white	all flowers are purple	purple : white 705 : 224 3 : 1

- According to the given information, state the dominant character and recessive character for colour of the flower.
- Explain how the dominant and recessive characters stated in (a) above, were identified.
- As given in the above table, draw a diagram to show the pattern of inheritance of purple and white colours of flowers in F<sub>2</sub> generation using English letters 'R' and 'r' appropriately.
- During the inheritance of characters from generation to generation, state **two** instances where there are deviations from the Mendelian patterns.

[See page six

- (ii) Three types of birds' beaks could be seen with in the *Pyronestes ostrinus* bird population which feeds on grains. Those types are as follows.

▲ Large beaks      ▲ Small beaks      ▲ Intermediate beaks

After several generations, the number of birds with large and small beaks increased and number of birds with intermediate beaks decreased. Available grains for them were in two types, namely large seeds and small seeds.

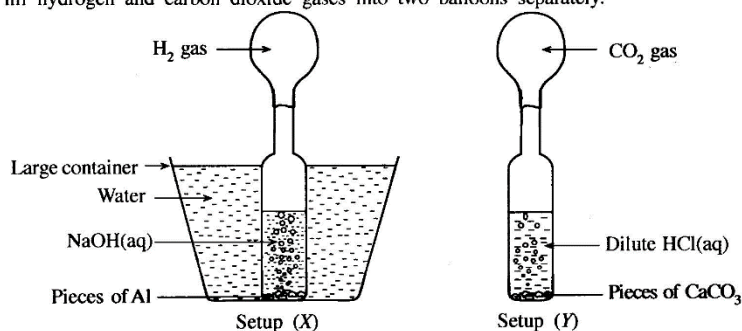
Explain the reasons for the increase in the number of birds with large beaks and small beaks and decrease in the number of birds with intermediate beaks in this bird population in terms of Charles Darwin's theory of natural selection.

- (C) According to natural classification, mammals are considered as the evolutionary most advanced animal group among vertebrates.

- (i) State **two** main features of mammals.  
 (ii) Human is also a mammal. State a specific feature of human that can not be seen in other mammals.

### Chemistry

7. (A) In the following diagrams, it is shown separately the setups prepared by a group of grade 10 students to fill hydrogen and carbon dioxide gases into two balloons separately.



- (i) After collecting approximately equal volumes of  $H_2$  gas and  $CO_2$  gas into the balloons, in the two setups, the mouths of the two balloons were tied well and they were released to the atmosphere.
- (a) State the expected observations upon the release of the balloons.  
 (b) Among the physical properties of gases  $H_2$  and  $CO_2$ , state respectively the physical property of each gas that lead to the above observations.
- (ii) (a) The chemical reactions relevant to the above two setups are exothermic. The experiment in setup X is done in a large water bath but not so in setup Y. Give reasons for this.  
 (b) Draw a labelled energy diagram for an exothermic reaction.
- (iii) Name a combustible material which causes a fire that should not to be put off by water, but can be extinguished by a foam fire extinguisher.
- (B) Saline treatment is given to many patients treated in hospitals. A normal saline solution is prepared by completely dissolving 9 g of sodium chloride in  $1 \text{ dm}^3$  of distilled water.
- (i) (a) According to the 'nature of the resulting saline solution', to what type of solutions is it an example for?  
 (b) What is the reason for your answer?
- (ii) State the composition of a normal saline solution with respect to its mass and volume (w/v).
- (iii) When preparing standard solutions in the laboratory, the compositions of the solutions are expressed as concentrations.
- (a) Define the term 'concentration'.  
 (b) What is the amount of NaCl moles in the above saline solution, if its concentration is  $0.15 \text{ mol dm}^{-3}$ ?  
 (c) State one main purpose of using each instrument stated below, when preparing standard solutions in the laboratory.
- I. Triple beam balance / Chemical balance    II. Volumetric flask  
 III. Glass funnel    IV. Wash bottle

[See page seven

- (iii) In the evening, with the rain, hailstones fell to the peak for a short period.
- If the volume and the density of a hailstone that fell freely from a cloud are  $V$  and  $d$  respectively, write an expression for the gravitational acceleration force acted on the hailstone in terms of  $V$ ,  $d$  and  $g$ . ( $g$  is the acceleration due to gravity.)
  - A hailstone that fell from the cloud, struck the top of a tower at the peak, and was broken into two pieces. One piece (say  $X$ ) was thrown up 0.5 m from the top of the tower and, from that point starting from rest, moved down vertically under gravity and struck the foot of the tower. The time taken by  $X$  to reach the foot of the tower was 2 seconds. Explorers calculated the height of the tower using a velocity–time graph relevant to the motion of  $X$ .
    - Draw the velocity–time graph for the motion of  $X$  from rest.
    - Find the velocity of  $X$ , when it struck the foot of the tower (Take the value of ' $g$ ' as  $10 \text{ m s}^{-2}$ ).
    - Calculate the height of the tower.
- (iv) The explorers who came to the base of the mountain at night, heard thunder a short time after they had seen the lightning. What is the reason for hearing thunder after a short time from seeing the lightning?

10. In Sri Lanka, the basic electric power supplied to houses from the national electric grid system is 230 V. This is an alternating current supply. One wire which provides electricity to a house is called live wire ( $L$ ) and the other wire is called neutral wire ( $N$ ).

- To which wire is the service fuse connected ( $L/N$ )?
- The two wires ( $L$ ) and ( $N$ ) are first connected to the electric meter. Write down the order in which the **three** basic components of the domestic electric circuit are connected after the electric meter.
- Are the lamp circuits in a domestic electric circuit connected to one another in series or parallel?
- Ten filament bulbs, a fan, a television, a radio, a refrigerator, an immersion heater and an electric iron are the electric appliances used in a certain house.

- According to the domestic electric circuit of this house, one electric bulb fixed at the stairs can be operated from the top and bottom of the stairs. Draw the relevant switching circuit for this.
- A transformer used to obtain 9V from the 230 V alternating current for the rectifying circuit used in the radio in this house is given in the figure 1.

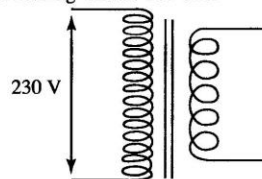


Figure 1

- Which category does this transformer belong to?
  - The number of turns in the primary coil of the transformer is 230. Find the number of turns in the secondary coil.
- Every morning water is heated using the immersion heater.
    - Calculate the heat gained by water, when 2 kg of water at temperature  $29^\circ\text{C}$  was kept in a container and raised to the temperature of  $99^\circ\text{C}$  using the immersion heater. (Take the specific heat capacity of water as  $4200 \text{ J kg}^{-1} \text{ K}^{-1}$ .)
    - Taking the heat gained by the container and the heat loss to the surroundings as 7000 J in the (I) above, calculate the electrical energy that has been converted to heat energy by the heater.

- A circuit which is used in this house to light up an electric bulb  $B$  automatically when there is a power failure at night is given in the figure 2.
  - Explain how the bulb  $B$  lights up as soon as power failure occurs.
  - Explain how the bulb  $B$  is put off as soon as the power returns.

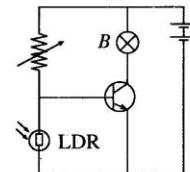


Figure 2

(e) The data obtained monthly by the people in this house who followed a procedure to reduce the cost of electricity is given in the table.

Date	Reading of the electric meter (kWh)
2014.07.26	25786
2014.08.26	25872
2014.09.26	25940

- Comparing with the first month, calculate the electrical energy that they were able to save from 26.08.2014 to 26.09.2014.
- Write **two** strategies you think, they would have followed to reduce the cost of electricity fulfilling all their requirements at the same time.

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