(c) What is the defect occurring in pelvis or bladder if the process mentioned in (ii)(b) above takes place too much?

6. (A) Acids are used in laboratories and in kitchen for different purposes.

(i) Name a strong acid mostly used in the school laboratory and an acid found in the kitchen.

(ii) Some bottles without labels contain aqueous solutions of copper sulphate, potassium permanganate, hydrochloric acid and sodium hydroxide. A magnesium strip is put into each solution. Some observations made are given in the following table.

Solution	Colour of the solution	Does it react with magnesium?	Does the reaction produce gas?
(a)	Blue	Yes	Yes
Dilute hydrochloric acid	Colourless	Yes	(b)
(c)	(d)	No	No
Sodium hydroxide	Colourless	(e)	No

Using data given in the table, Write the answers to (a), (b), (c), (d), (e)

(a) - (b) - (e) -

(c) - (d) -

(iii) Write the balanced chemical equation for the reaction between magnesium and dilute hydrochloric acid.

(iv) pH values of some solutions are given in the following table.

Solution	*A*	*B*	*C*	*D*	*E*
pH value	7.5	6	1.5	3.5	10

(a) Out of these, what is the strongly acidic solution?

(b) Which colour litmus paper gives a colour change when immersed in that solution?

(B) Atomic numbers of some elements are given in the following table. Use them to answer the questions given below. (*A*, *B*, *C*, *D*, *E*, *F* and *G* are not the standard symbols. Avogadro constant = 6.022×10^{23})

Element	*A*	*B*	*C*	*D*	*E*	*F*	*G*
Atomic number	3	6	8	10	11	12	17

(i) Which elements given in the table belong to the same group of the periodic table?

(ii) Which element belongs to Period 2 and Group IV in the periodic table?

(iii) Which element does **not** take part in any reaction?

(iv) Write the electronic configuration of the element mentioned in (iii) above and explain why it does not take part in any reaction.

(v) Which element reacts vigorously with cold water?

(vi) Draw the Lewis structure of molecule formed by two atoms of *G*?

(vii) Write the molecular formula of the compound formed by combination of *F* and *G*.

(viii) Two atoms of C join and form a C_2 molecule. Relative molecular mass of C_2 is 32. Find the number of molecules in 16 g of C_2.

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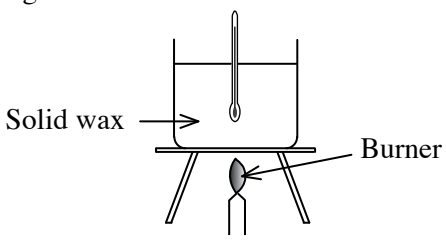
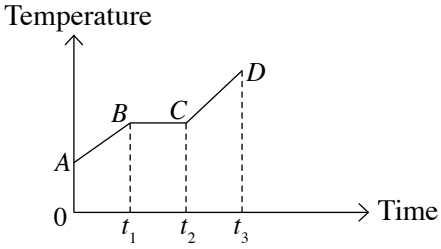
7. (A) The diagram shows heating of solid wax. The graph shows the variation of the temperature when heating solid wax.





(i) State the physical state of wax in following instances in Order.

Between *A* and *B* Between *B* and *C* Between *C* and *D*

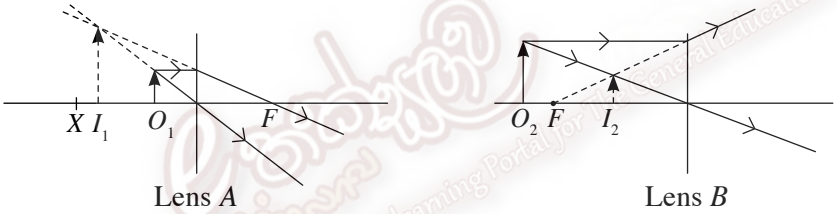
(ii) How do you determine the melting point of wax using the graph?

(iii) Even when continuously heated, no change in temperature is observed between *B* and *C*. What is called the heat supplied during this time interval?

(iv) *D* shows the boiling point of wax. Show in this graph itself how temperature varies if continuously heated by drawing a graph in your answer paper.

(v) If 200 g of wax was used in this experiment, find the amount of heat needed to heat wax from 40 °C to 50 °C. (specific heat capacity of wax is 2800 J kg^{-1} K^{-1}) (50°C < B)

(B) Diagrams show an image of an object formed by a converging lens and diverging lens.



(i) Select the converging lens from *A* and *B*.

(ii) (a) State whether the images I_1 and I_2 are real or virtual.

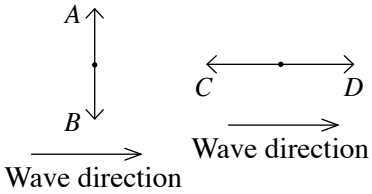
(b) How did you decide whether they are real or virtual?

(iii) Where is the object placed in front of lens *A* to get the image given?

(iv) Name a practical instance where lens *A* forms an image as shown in the diagram

(v) Write **two** properties of the image formed when the object O_1 is placed at *X*.

(C) Two ways in which particles vibrate in mechanical waves are shown in the diagram.



(i) What do you call the mechanical waves in which particles vibrate in the direction of *C* and *D*?

(ii) State an instance where particles vibrate in the direction of *A* and *B*.

(iii) Out of *A-B* and *C-D*, which shows the vibration of particles which propagates sound?

(iv) Write **two** differences between the type of mechanical waves mentioned in (ii) above and electromagnetic waves.

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8. (A) Diagrams show flowers in two pea plants.

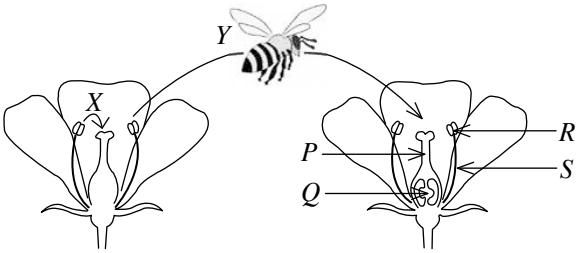


Diagram 1 Diagram 2

(i) Out of *P*, *Q*, *R* and *S*, which belong to the androecium?

(ii) Name the methods of pollination given as *X* and *Y*.

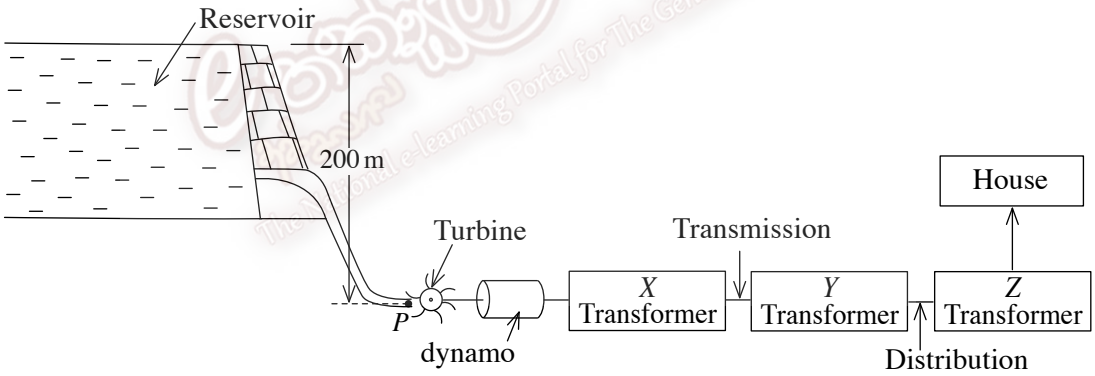
(iii) State whether flowers are more adapted for self-pollination or cross pollination. Write the reason for your answer.

(iv) The flower in Diagram 1 above produces green pods while the flower in Diagram 2 produces yellow pods. Green pods are homozygous dominant while yellow pods are homozygous recessive. Show the inheritance of pod colour in the plant generation produced by the type of pollination shown by Y. (Use "*G*" for green, "*g*" for yellow).

(v) Show in a Punnet Square the inheritance of the pod colour in F_2 produced by $F_1 \times F_1$.

(vi) Write the phenotypic ratio obtained in F_2.

(B) Use the following diagram to answer the questions.



(i) What is the form of energy in water when stored in the reservoir?

(ii) Explain why water in a reservoir at a higher place is used for the operation of the power station.

(iii) Energy transformation taking place in a hydropower station is given in the chart below.

(a)..... energy of water (when stored in the reservoir) → (b)..... energy of water (when water flows) → (c)..... energy of turbine → (d)..... energy of dynamo → electrical energy

Write the energy states denoted by (a), (b), (c) and (e)

(iv) Name the types of transformers given as *Y* and *Z*.

(v) Primary voltage of the transformer *X* is 25 kV while its secondary voltage is 220 kV. Find the turns ratio between primary and secondary coils.

(vi) According to the diagram, calculate the pressure exerted by water on the point "*P*".
(Density of water = $1000\,kg\,m^{-3}$, $g = 10\,m\,s^{-2}$)

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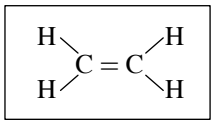
9. (A) Liquid petroleum gas (LPG) mainly contains propane and butane which are alkenes.

(i) Write the common molecular formula for alkenes taking the number of carbon atoms as n.

(ii) Write the molecular formula of propane.

(iii) Draw the structure of butane.

(iv) Polythene is a complex molecule made by polymerization of a large number of ethene molecules. Its molecular formula is C_2H_4. Diagram shows structural formula of ethene.



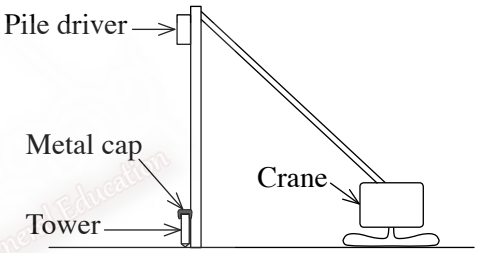
Accordingly, draw the repeating unit and polymer of polythene.

(B) 50 cm^3 of sodium hydroxide and 50 cm^3 of hydrochloric acid of equal concentration were mixed. The reaction released x kJ of heat.

(i) According to the heat change, what type of a reaction is this?

(ii) Represent the above reaction by an energy level diagram.

(C) Pile driver is used in tower foundation constructions.



(i) Mass of the pile driver lifted is 2000 kg. Find its weight. ($g = 10\,m\,s^{-2}$)

(ii) What is the strategy taken to minimize the wastage of energy as the pile driver strikes the tower?

(iii) Crane lifts this pile driver 20 m in 100 seconds.

(a) Find the gravitational potential energy stored in the pile driver when lifted.

(b) What is the power of the crane?

(iv) What energy transformation takes place as the pile driver falls?

(v) If no energy is wasted, find the velocity of the pile driver when it falls on the tower.

(vi) Draw the velocity-time graph for the motion of the pile driver till it falls on the tower from the moment it was dropped.

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