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නව නිර්දේශප්‍රතිපාදන පාඨමාලාව / New Syllabus

**NEW**

**34 E II**

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2016 දෙසැම්බර්  
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2016 டிசெம்பர்  
General Certificate of Education (Ord. Level) Examination, December 2016

විද්‍යාව II  
விஞ்ஞானம் II  
Science II

පැය තුනයි  
மூன்று மணித்தியாலம்  
Three hours

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

Ozone layer depletion, global warming, eutrophication, biomagnification and acid rains are a few direct effects of environmental pollution.

(i) What is meant by biomagnification? accumulation  
Collection of/Concentrate toxic chemical pollutants/substances/wastes along with food chains from one trophic level to the other.

(ii) What is the function of the ozone layer?

Prevent/minimize the entry of (high energy) uv radiation (emitted by the sun) to the earth surface./ acts as a protective shield.

(iii) During the past century, the sea level has risen by about 10-20 cm. Which of the above effects was directly responsible for this?  
global warming

(iv) Consider the figures A and B. (These are rough diagrams.)

(a) State which of the above two effects are shown by A and B.

A: global warming (01)

B: acid rains (01)

(b) State two gases responsible for B and state one method for each that releases each of these gases. (Write the relevant method in front of the name of the gas.)

SO<sub>2</sub>/ Sulphurdioxide, SO<sub>3</sub>/ Sulphurtrioxide; - combustion of vulcanized rubber/ volcanic eruptions/combustion of coal/ burning of fossil fuels/ action of bacterias on dead bodies

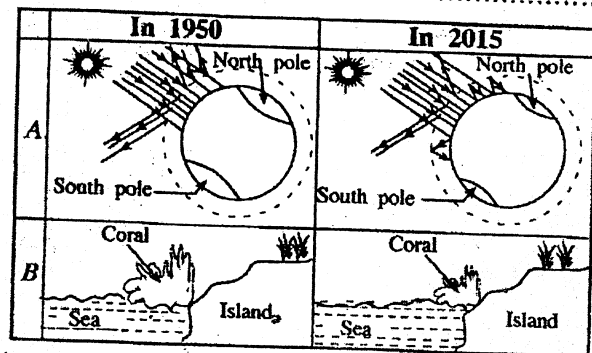
NO/ Nitric oxide NO<sub>2</sub>/ Nitrogen dioxide/ N<sub>2</sub>O/ Nitrusoxide. Lightning/Combustion inside vehicle engines.

(v) Some solid waste material responsible for environmental pollution are as follows.

Florescent lamps, polythene, chemical fertilizers, detergents, animal excretory matters

(a) Of the above, state a material which causes eutrophication.  
Chemical fertilizers/detergents/animal excretory matters

(b) From which of the above materials, mercury could mostly be released to the environment?  
Florescent lamps



- (c) For which of the 4R waste handling techniques can each of the following activities be an example?

I. Use of organic fertilizer instead of chemical fertilizer: .....Replace (01).....

II. Production of biogas using animal excretory matter: .....Recycling/Recycle (01).....

- (vi) Write down two renewable energy resources which are eco-friendly.

(p. 100) • Wind • solar energy • sunlight • Ocean waves • Tidal power (Tidal energy)  
• Geo thermal energy • Water

2. (A) Invertebrates are separated into phyla based on their features.

- (i) In the second column of the table given below, state the phylum which has each of the indicated as *a*, *b*, *c* and *d* in the first column.

| Feature                                                       | Phylum                |
|---------------------------------------------------------------|-----------------------|
| <i>a</i> - Multicellular body build up of two germinal layers | Coelenterata/Cnidaria |
| <i>b</i> - Presence of a muscular foot                        | Mollusca              |
| <i>c</i> - Living only in marine habitats                     | Echinodermata         |
| <i>d</i> - Presence of a chitinous cuticle                    | Arthropoda            |

- (ii) Name an animal that possesses the feature (a) given in the above table. Hydra/sea anemone/Gelatinous animals

- (iii) Write down the kingdom and domain to which the phyla stated in (i) above belong.

Kingdom: Animalia (01) Domain: Eukarya (01)

award 01 mark for domain whether the answer is correct

- (B) Respiration is a process of living organisms.

- (i) (a) State the two types of respiration that can take place in organisms.

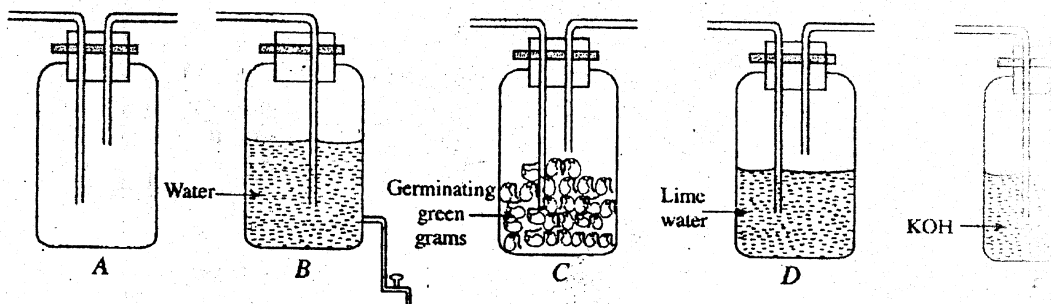
.....Aerobic (respiration)/(respiration) with  $O_2$  (01)

.....Anaerobic (respiration)/(respiration) without  $O_2$  (01)

- (b) Which one of the two types of respirations stated in (a) above produces more energy?

.....Aerobic (respiration)/(respiration) with  $O_2$

- (ii) The apparatus needed to arrange a set-up to show experimentally, that carbon dioxide gas is produced during the respiration are given below without a sequential order.



- (a) What is the solution that should be put into the bottle A? ...lime water/  $Ca(OH)_2$  (solution)

Calcium Hydroxide (solution)

- (b) After putting the relevant solution into the bottle A, write down the correct sequence in which the above bottles (A, B, C, D and E) should be connected. ...E, A, C, D, B, / E, D, C, A, B

BDCAE

- (c) State what should be done after connecting all the bottles correctly.

...Open the tap of bottle B and remove the water in it (slowly) / Open the tap

Award one mark if the answer is correct or wrong

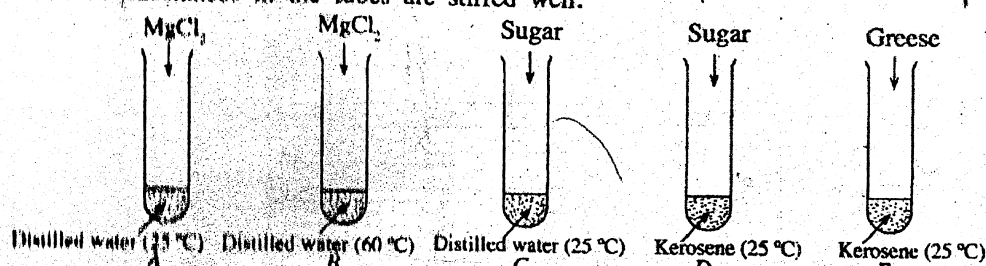
- (d) After the step mentioned in (c) above, state the change that could be observed in the

...lime water in 4<sup>th</sup> bottle turns to milky

- (e) State the change that should be done to the above set-up to arrange a control set-up to the above experiment.

...Keep (the bottle) C empty/Remove green grams in (bottle) C / put some boiled to (bottle) C

3. As shown in the following figures,  $\text{MgCl}_2$ , sugar and grease are added to the test tubes A, B, C, D and E. After that the substances in the tubes are stirred well.



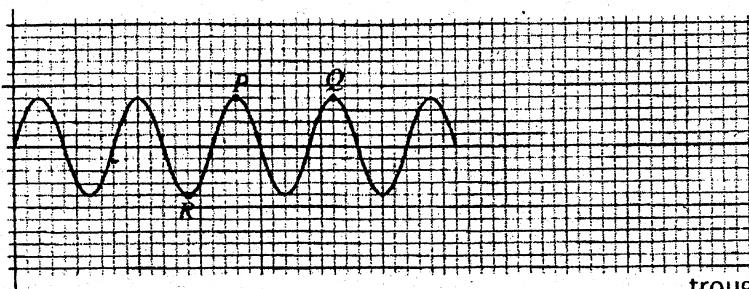
- (i) (a) In which test tube a solid-liquid heterogeneous mixture is formed? D/Tube with sugar and kerosene 01  
 (b) Write respectively, the solute and the solvent in this mixture.  
 Solute - Sugar (01) Solvent - Kerosene (01) 02  
 (no marks for the incorrect sequence)(no marks for grease and kerosene)
- (ii) (a) Define 'solubility of a solute'. 02  
 Maximum mass of solute which dissolves in 100 g of a solvent at a certain temperature  
 (give 01 mark if maximum is not mentioned)
- (b) What factor that affects the solubility can be shown by each of the following pairs of test tubes?  
 I. A and B: temperature. (01)  
 II. C and D: nature of solvent (01)  
 III. D and E: nature of solute (01) 03  
 compulsion
- (iii) In the above experiment, 1.9 g of  $\text{MgCl}_2$  was added to the tube A and the total volume of the solution formed was  $10 \text{ cm}^3$ .  
 (a) Find the number of moles of  $\text{MgCl}_2$  added. ( $\text{Mg} = 24$ ,  $\text{Cl} = 35.5$ )  
 number of moles of  $\text{MgCl}_2 = \frac{1.9 \text{ (g)}}{95 \text{ (g mol}^{-1}\text{)}} = 0.02 \text{ (mol)}$  (01) 02  
 (b) Calculate the concentration of  $\text{MgCl}_2$  in the solution.  
 $\frac{0.02}{10} \times 1000 \text{ (01)} = 2 \text{ mol dm}^{-3}$  (01) 03
- (iv) Water is a good solvent. Write two special properties possessed by water due to the intermolecular forces.  
 • exists as a liquid at room temperature • Having a higher specific heat capacity 02  
 • Having high boiling point • Having a higher density than that of ice  
 (give marks for any two of above) 15  
 15

4. Consider the following types of waves.

- Ultraviolet rays • Infra-red rays • Micro waves • X-rays
- Gamma rays • Visible light • Sound waves • Ultrasound waves

- (i) Of the above waves, mention a wave that propagates with compressions and rarefaction.  
 Sound waves/Ultra sound waves 01
- (ii) Write down a special characteristic of ultrasound waves.  
 Having a frequency higher than 20 000 Hz / Do not enter air after travelling through a solid medium/  
 Frequency exceeds the upper limit of human audible range 01
- (iii) In the field of medicine, which type of the above waves is generally used to observe the conditions of the fetus inside the womb of a pregnant mother? Ultra sound waves 01
- (iv) A part of the electromagnetic spectrum is given below.
- |   |   |         |       |                  |   |            |
|---|---|---------|-------|------------------|---|------------|
| A | B | Visible | Light | Ultraviolet rays | C | Gamma rays |
|---|---|---------|-------|------------------|---|------------|
- (a) Considering the sequence of above waves, write down the types of waves that should be in the places A, B and C.  
 A: Micro waves (01)  
 B: Infra-red waves / IR rays (01)  
 C: X rays (01) 03

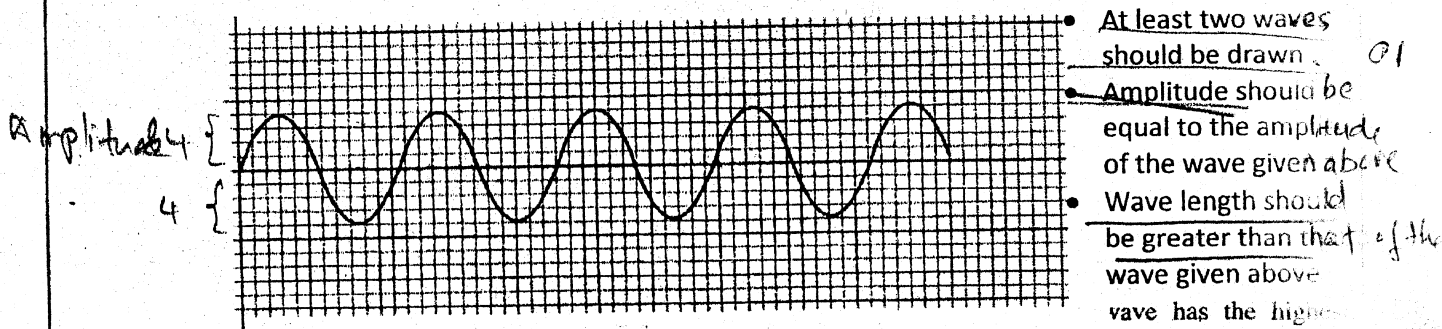
(b) A waveform relevant to Gamma rays is given below.



I. By which name the point R of the wave can be identified? .....trough..... 01

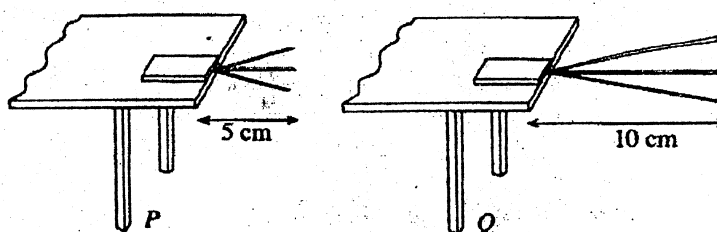
II. Which physical quantity of the wave is equal to the distance between the points P and Q of the wave? .....Wave length..... 01

III. Considering the features of the waveform given above for Gamma rays, draw a typical waveform in the following grid, for the type of waves represented by C in the spectrum above when its amplitudes are equal.



.....Gamma rays /  $\gamma$  rays..... 01

(v) A diagram depicting two instances P and Q of an activity done in the laboratory to study a certain characteristic of sound waves is given below. A hacksaw blade is kept on the table and a heavy metal block is kept on the blade when this activity was done as shown in the figure. Then the blade was vibrated.



(a) Which characteristic of a sound wave can be studied from this activity? .....Pitch..... 01

(b) On which physical quantity does the characteristic you mentioned (a) above depend? .....frequency..... 01

(c) What conclusion can be arrived at through this activity?  
.....when the frequency increases the pitch increases  
/when the frequency decreases the pitch decreases..... 01

(vi) How does the speed of sound in air vary with the temperature?  
.....As the temperature increases the speed of sound increases/..... 02

.....As the temperature decreases the speed of sound decreases  
even 1 answer is there, give marks.

## Part B

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

5. (i) Average masses of macronutrients present in a biscuit of a particular brand are given in the following table.

| Macronutrient | Mass   |
|---------------|--------|
| Proteins      | 0.81 g |
| Carbohydrates | 5.67 g |
| Fat           | 1.55 g |

- (i) What are the elements present in proteins?
- (ii) (a) When a person consumes a biscuit of the above brand, in which part of the digestive system does its digestion start?
- (b) Name the enzyme that is added to food in the part stated in (a) above, and state the nutrient on which that enzyme acts.
- (c) State the two substances that are mainly added to this food in the stomach.
- (d) In which part of the digestive system is the digestion of this food completed?
- (e) State the end products of this digestive process.
- (f) Write one adaptation of the human digestive system for efficient absorption of end products of digestive process.
- (iii) Reproduction is the process of production of a new generation from one generation.
- (i) State respectively, the names given to male and female gametes that contribute to human reproductive process.
- (ii) In a human somatic cell, how many pairs of sex chromosomes are present?
- (iii) Considering the sex chromosomes, show, using a diagram, how sex is determined in humans.
- (iv) (a) What is the sex-linked disorder that occurs only in males?
- (b) What is the genetic reason for this disorder?

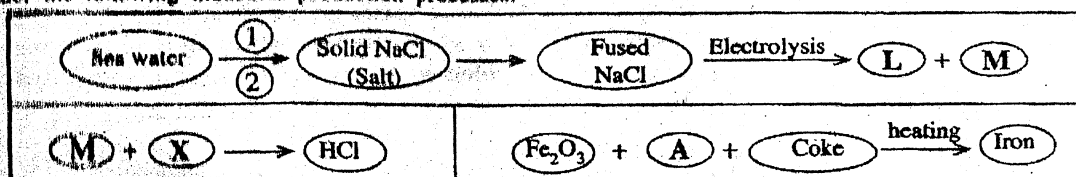
(Total marks 20)

|          |                                                                                                                                                                                                                                                                                                                                                                                                            |    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (i)      | C, H, O, N, S / (5) carbon, hydrogen, Oxygen, Nitrogen, (Sulphur)                                                                                                                                                                                                                                                                                                                                          |    |
| (ii) (i) | (Four elements should be mentioned) one ab. no marks                                                                                                                                                                                                                                                                                                                                                       | 01 |
| (ii) (a) | Mouth/Buccal cavity                                                                                                                                                                                                                                                                                                                                                                                        | 01 |
| (b)      | Ptyalin/Amylase (01)<br>Carbohydrate (01)<br>(No marks for starch)                                                                                                                                                                                                                                                                                                                                         | 02 |
| (c)      | • (Dilute) HCl/Hydrochloric acid (01)<br>• Pepsin (enzyme)                                                                                                                                                                                                                                                                                                                                                 | 02 |
| (d)      | In small intestine                                                                                                                                                                                                                                                                                                                                                                                         | 01 |
| (e)      | • Monosaccharides (glucose/fructose/galactose) (01)<br>• Amino Acids (01)<br>• Fatty acids (01) and Glycerol (01)<br>(Give marks for any kind of monosaccharide) order is not required                                                                                                                                                                                                                     | 04 |
| (f)      | • Small Intestine is being a long tube<br>• Presence of circular folds in the inner wall of small intestine<br>• Presence of finger like projections / villi in the circular folds<br>• Presence of microvilli in the (epithelial cell of) villi<br>• Thin epithelial lining on villi<br>• Highly vascularised villi — presence of more capillaries to supply blood<br>(Give 01 mark for any one of above) | 01 |

|        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|---|---|---|---|---|---|--------|------|---|---|---|---|--------|------|--|
| (B)    | (i)      | Sperm, (01) Ovum / egg (01) <i>ovules / ova</i><br>(Order is essential)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
|        | (ii)     | one (pair)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
|        | (iii)    | <div><div><p>(mother cell) (01)</p><p>(gametes) ovum (01)</p><p>(mother cell) (01)</p><p>(sperm) (01)</p><p>Female male Female male (01)</p></div><div><p>or</p><table><tr><td>XX</td><td>XY</td></tr><tr><td>♀</td><td>♂</td></tr><tr><td>X</td><td>X</td></tr><tr><td>X</td><td>Y</td></tr><tr><td>Female</td><td>male</td></tr><tr><td>X</td><td>X</td></tr><tr><td>X</td><td>Y</td></tr><tr><td>Female</td><td>male</td></tr></table><p>mother cell for gametes represent female and male</p><p>or</p><div><p>(♀) (01)</p><p>(♂) (01)</p><p>(mother cell) (01)</p><p>(gametes) ovum (01)</p><p>(sperm) (01)</p><p>XX XY XX XY (01)</p><p>Female male Female male</p></div></div></div> | XX | XY | ♀ | ♂ | X | X | X | Y | Female | male | X | X | X | Y | Female | male |  |
| XX     | XY       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| ♀      | ♂        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| X      | X        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| X      | Y        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| Female | male     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| X      | X        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| X      | Y        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
| Female | male     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
|        | (iv) (a) | Haemophilia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 01 |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
|        | (b)      | Due to X linked recessive gene                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 01 |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |
|        |          | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 20 |    |   |   |   |   |   |   |        |      |   |   |   |   |        |      |  |



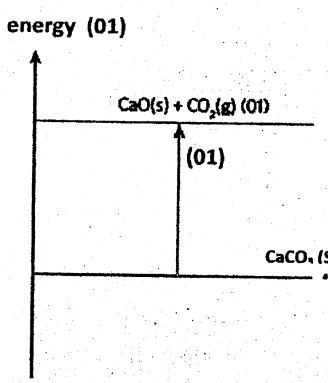
6 Consider the following industrial production processes.



- (i) Name A, L, M and X respectively.
- (ii) Write a physical property of X.
- (iii) Write down the two separating techniques ① and ② relevant to production of salt from sea water.
- (iv) About 40%  $CaCl_2$  is added to NaCl when obtaining fused NaCl from solid NaCl. What is the reason for that?
- (v) What is the strategy used in the cell to prevent the reaction between L and M produced by the electrolysis process?
- (vi) (a) Is the chemical reaction occur in A in the process of iron extraction, exothermic or endothermic?  
(b) Draw the energy level diagram for this reaction and state reactants and products.
- (vii) (a) Write the balanced chemical equation relevant to the production of iron from  $Fe_2O_3$ .  
(b) In this process 1680 kg of pure molten iron was obtained from a 2520 kg of mixture of  $Fe_2O_3$  with impurities. (In this case, assume that all  $Fe_2O_3$  reacted completely.)
  - Find the number of moles of molten iron obtained and calculate the mass of  $Fe_2O_3$  reacted. (Fe = 56, O = 16)
  - What is the mass of impurities presented in the mixture?

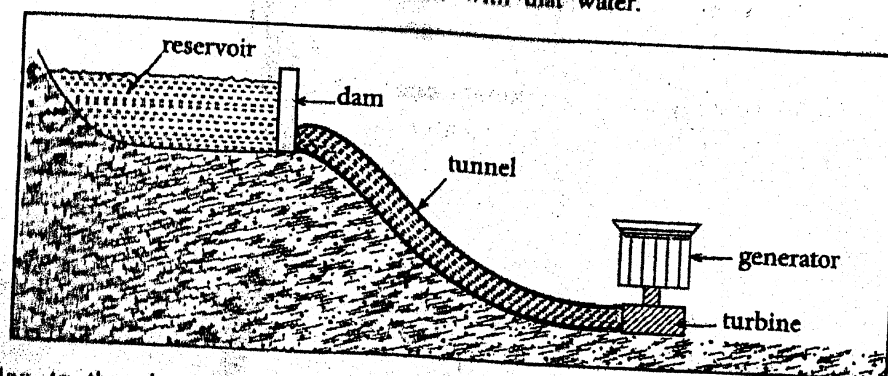
(Total marks 20)

|    |    |    |    |    |          |                                                                                                                                                                                                                                                                                  |    |
|----|----|----|----|----|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 03 | 01 | 01 | 01 | 20 | (i) (i)  | A - Lime stones / $CaCO_3$ / Calcium carbonate (01)<br>L - Sodium / Na (01)<br>M - Chlorine / $Cl_2$ (01)<br>X - Hydrogen / $H_2$ (01)                                                                                                                                           | 04 |
|    |    |    |    |    | (ii)     | <ul style="list-style-type: none"> <li>exists as a gas at room temperature</li> <li>density is lesser than that of air</li> <li>colourless</li> <li>odourless</li> <li>Slightly soluble in water</li> <li>combustible gas</li> </ul> <p>(give one mark for any one of above)</p> | 01 |
|    |    |    |    |    | (iii)    | ① Vapourisation (01)<br>(give marks for evaporation also)<br>② Crystallization (01)<br>(sequential order is not essential)                                                                                                                                                       | 02 |
|    |    |    |    |    | (iv)     | to decrease/reduce the melting point of (solid) NaCl                                                                                                                                                                                                                             | 01 |
|    |    |    |    |    | (v)      | Using a steel mesh diaphragm / separating anode and cathode by a steel mesh                                                                                                                                                                                                      | 01 |
|    |    |    |    |    | (vi) (a) | endothermic                                                                                                                                                                                                                                                                      | 01 |

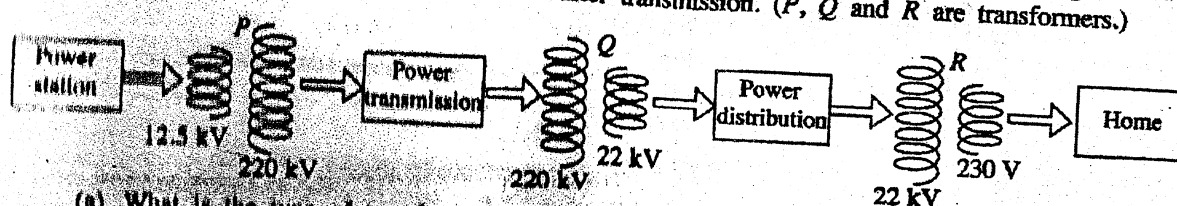
|  |          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |
|--|----------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|  |          | (b) |  <p>Give 01 mark for reactant or products <i>If one is there with (in that case, consider the physical/state) the state give marks</i></p>                                                                                                                                                                                                                                           | 03 |
|  | (vii)(a) |     | $\text{Fe}_2\text{O}_3 + 3\text{CO} \longrightarrow 2\text{Fe} + 3\text{CO}_2$ <p><i>not balanced no marks</i></p>                                                                                                                                                                                                                                                                                                                                                    | 01 |
|  | (b) I    |     | <p>number of moles of (molten) iron = <math>\frac{1680 \times 1000}{56}</math> (01)</p> <p>= 30 000 (moles) (01)</p> <p>Number of moles of <math>\text{Fe}_2\text{O}_3</math> (required to obtain 30,000 moles of molten iron) } = 15,000 (01)</p> <p><math>\therefore</math> Mass of <math>\text{Fe}_2\text{O}_3</math> = <math>15,000 \times 160</math> (01)</p> <p>= 2400000(g)/2400(kg) (01)</p> <p>(Give 01 mark if <math>30,000 \times 160</math> is given)</p> | 05 |
|  | II       |     | <p>Mass of impurities (in the mixture) = <math>2520 \text{ (kg)} - 2400 \text{ (kg)}</math></p> <p>= 120 (kg) or 120 000(g) (01)</p>                                                                                                                                                                                                                                                                                                                                  | 01 |
|  |          |     | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 20 |



7. (A) Consider the following figure pertaining to a hydro-power plant. As shown in the figure, the water is brought from a place in the reservoir to the power plant located below the reservoir through a tunnel. Electric power is generated by rotating a turbine with that water.



- According to the above information, write down the energy transformation that takes place in generating hydroelectric power.
- The following diagram shows the way in which the alternating current electricity is generated in the power station and supplied to homes after transmission. (P, Q and R are transformers.)



- What is the type of transformer shown as P?
  - If the number of turns in the primary coil of R is 8800, find the number of turns in its secondary coil.
- (B) Two similar arrangements, X and Y which have been used in a house to heat water using the voltage of 230 V are given below. However in Y, the immersion coil is immersed to a greater depth.
- 
- When the immersion heaters are connected to the voltage supply, in which arrangement is the water heated upto the required temperature in a lesser time?
  - Briefly explain the reason why the water in one vessel is heated quicker than the other.
- (C) 1.5 kg of water in  $27^\circ\text{C}$  is put into the vessel in the arrangement, which heats up water in a quicker time and the immersion heater is connected to the voltage supply.
- If the water was heated upto  $97^\circ\text{C}$ , find the amount of heat absorbed by water. (Take the specific heat capacity of water as  $4200 \text{ J kg}^{-1} \text{ K}^{-1}$ )
  - The power of the heater is 1 kW. If the time taken to heat the water upto  $97^\circ\text{C}$  was 8 minutes, calculate the energy consumed by the immersion heater during that time.
  - In that house, water is heated 4 times per day as above. Find the number of units of electricity they have consumed in a month of 30 days.
- (C) There is a greater attention at present to generate electricity using solar cells.
- What is the basic electronic component which is used to construct a solar cell?
  - What will happen when the sun light is incident on that component?
  - What type of an arrangement is known as a solar panel?
  - Write down an advantage of using solar cells to generate electricity.

(Total marks 20)

|     |      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----|------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | (A)  | (i) | <p>Potential energy <math>\xrightarrow{(01)}</math> Kinetic energy <math>\xrightarrow{(01)}</math> Electrical energy</p> <p>or</p> <p>Potential energy of water <math>\xrightarrow{(01)}</math> Kinetic energy of water <math>\longrightarrow</math> Kinetic energy of turbine</p> <p style="text-align: right;">(01)<br/>↓<br/>Electrical energy</p> <p>or</p> <p>Potential energy transforms to kinetic energy (01)<br/>Kinetic energy transforms to electric at energy (01)<br/>(Give marks for the energy transformations only)</p>                                                                                                                                                                                                             |
|     | (ii) | (a) | Step up (transformer)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|     | (b)  |     | $\frac{V_P}{V_S} = \frac{N_P}{N_S} \quad \frac{V_S}{V_P} = \frac{N_S}{N_P}$ <p>or</p> $\frac{22\,000(V)}{230(V)} = \frac{8800}{N_S} \quad \text{or} \quad \frac{22\,(kV)}{0.230\,(kV)} = \frac{8800}{N_S} \quad \text{or}$ $N_S = \frac{8800 \times 230}{22\,000} \quad (01)$ <p>Number of turns = 92 (turns) (01)</p>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| (B) | (i)  |     | Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|     | (ii) |     | <ul style="list-style-type: none"> <li>Water in the Y warms up fast due to movements of <u>convictional current</u> from the bottom to the top (01)<br/>In X it doesn't take place in the same way. (01)</li> <li>or</li> <li>Water molecules in the bottom of the container heats by gaining heat from the heater in the vessel Y. Heated <u>water particles become lighter</u> (decreasing density) and <u>move upwards</u> then the <u>water particles in top level comes down to fill that gap and heated</u>. (01)<br/>But the water particles at the bottom of container are not heated in this way (01)</li> <li>Amount of heat loss to the environment from the heater in the vessel X is greater than that of the heater Y (01)</li> </ul> |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (iii)(a) | <p>(Heat absorbed by water) <math>Q = mc\theta</math> or</p> <p><math>= 1.5 \text{ (kg)} \times 4200 \text{ (Jkg}^{-1}\text{K}^{-1}) \times (97 - 27) \text{ (K)} \text{ (01)}</math></p> <p><math>= 1.5 \text{ (kg)} \times 4200 \text{ (Jkg}^{-1}\text{K}^{-1}) \times 70 \text{ (K)} \text{ (01)}</math></p> <p><math>= 441\,000 \text{ (J)} / 441 \text{ (kJ)} \text{ (01)}</math></p> <p>Even though <math>mc\theta</math> is not mentioned give 02 marks for correct substitution</p>                                                                                                                                                     | 03 |
| (ii)     | <p><math>P = \frac{E}{t}</math> or power = <math>\frac{\text{Energy}}{\text{time}}</math> or <math>1 \times 1000 \text{ (W)} = \frac{E}{80 \times 60 \text{ (s)}}</math> or</p> <p><math>E = 1000 \times 8 \times 60 \text{ (01)}</math></p> <p><math>E = 480\,000 \text{ (J)} / 480 \text{ (kJ)} \text{ (01)}</math></p> <p>or</p> <p><math>E = 1 \text{ (kW)} \times \frac{8}{60} \text{ (h)} \text{ (01)}</math></p> <p><math>= \frac{2}{15} \text{ (kWh)} / 0.133 \text{ (kWh)} \text{ (01)}</math></p> <p>unit is not necessary</p>                                                                                                        | 02 |
| (v)      | <p>number of units of electricity = <math>1 \text{ (kW)} \times \frac{8}{60} \text{ (h)} \times 4 \times 30 \text{ (01)}</math></p> <p><math>= 16 \text{ (kWh)} / 16 \text{ (units)} \text{ (01)}</math></p> <p>or</p> <p><math>= \frac{2}{15} \times 4 \times 30 \text{ (01)}</math></p> <p><math>= 16 \text{ (kWh)} / 16 \text{ (units)} \text{ (01)}</math></p> <p>or</p> <p><math>= 0.133 \times 4 \times 30 \text{ (01)}</math></p> <p><math>= 15.9 \text{ (kWh)} \text{ (01)}</math></p> <p>or</p> <p><math>= \frac{480\,000 \times 4 \times 30}{3\,600\,000} \text{ (01)}</math></p> <p><math>= 16 \text{ (kWh)} \text{ (01)}</math></p> | 02 |
| (c)(i)   | p-n Junction / diode / Photo diode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 01 |
| (ii)     | <ul style="list-style-type: none"> <li>• a small electro motive force/voltage is generated across the p-n junction</li> <li>• Light energy is converted to electrical energy / electricity</li> </ul> <p>(give 01 mark for one of above) <i>* No marks for solar energy</i></p>                                                                                                                                                                                                                                                                                                                                                                 | 01 |
| (iii)    | a collection of solar cells connected in series and parallel methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 01 |
| (iv)     | <ul style="list-style-type: none"> <li>• No environment pollution</li> <li>• Functioning with solar energy / no cost for maintenance other than initial cost</li> <li>• having long life time</li> <li>• No wastage substances</li> </ul> <p><i>eco friendly</i></p> <p>(Give one mark for any one of above)</p>                                                                                                                                                                                                                                                                                                                                | 01 |
|          | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 20 |

8. (A) Some main endocrine glands in the human body are given below.

Pituitary, Thyroid, Pancreas, Adrenal glands, Gonads

- (i) Which of the above glands is located below the hypothalamus?
- (ii) Write down, in correct sequence, the glands that secrete calcitonin and oestrogen and state the function of each hormone in correct sequence.
- (iii)
  - (a) What is the gland that secretes the hormone which converts glucose to glycogen?
  - (b) In which organ of body, glycogen is mainly stored?
  - (c) What is the disease condition that occurs due to non-secretion of the hormone stated above?
- (iv) Write two features of the hormones secreted by the glands stated above.

- (B) Following diagrams show some play items in a children park.

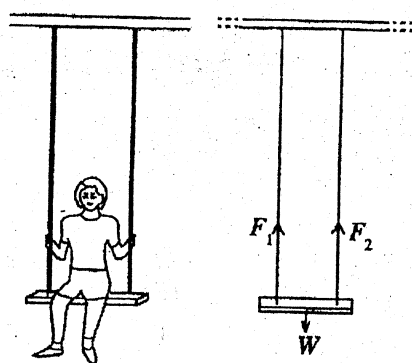


Figure (1) a

Figure (1) b

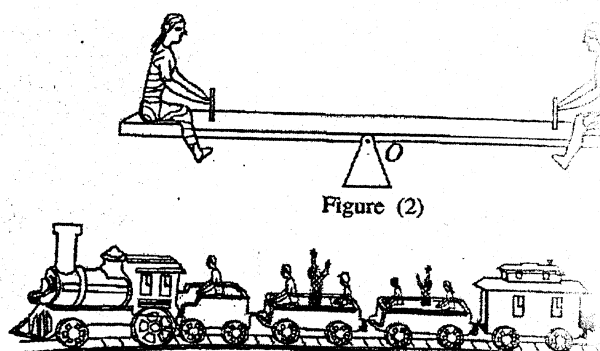
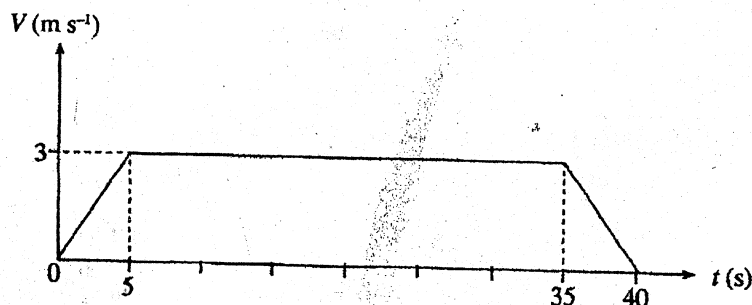


Figure (2)

Figure (3)

- (i) As shown in the figure (1) a, a child is sitting in equilibrium and stationary in a swing. Figure (1) b shows the corresponding force diagram for this situation. Write a relationship among  $F_1$ ,  $F_2$  and  $W$ . Here,  $F_1$  and  $F_2$  are the forces exerted by ropes, and  $W$  is the weight of the child and the seat.
- (ii) In figure (2), the mass of each child who is sitting on the two sides of the see-saw is 25 kg.
  - (a) What can be said about the resultant of the system of forces acting on the see-saw?
  - (b) The distance from the rotating point  $O$  to the place where each child is sitting is 1.5 m. Calculate the moment of the couple of forces acting there.
- (iii) Figure (3) shows a play train in the park that moves in a straight line path. The velocity ( $V - t$ ) graph for its motion from the starting point to the ending point is given below.



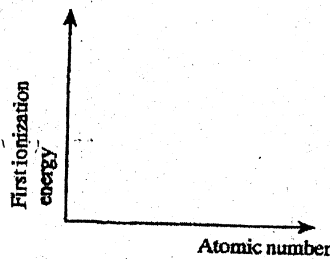
- (a) Briefly explain the nature of the motion of the play-train.
- (b) The total mass of the train with the children is 1500 kg. Find the momentum of the train at the end of the time duration from 5 seconds to 35 seconds.
- (c) If the length of the play-train is 18 m, calculate the length of the railway.

(Total marks)

|       |       | Confidential                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
|-------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (i)   | (i)   | Mitlary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 01 |
|       | (ii)  | Calcitonin - Thyroid (01)<br>reduce calcium level/concentration in blood (01)<br>award one mark for any answer including calcium level in blood                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
|       | (iii) | Oestrogen- gonads (01)<br>development (and maintance) of secondary Sexual characters in females/ To rebuild wall of uterus (during proliferation phase in menstrual cycle) (01) <i>Ovaries</i>                                                                                                                                                                                                                                                                                                                                                                                                                               | 04 |
| (iii) | (a)   | Pancreas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 01 |
|       | (b)   | Liver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 01 |
|       | (c)   | <ul style="list-style-type: none"> <li>Diabetes or</li> <li>Increasing the glucose level/concentration in blood.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 01 |
| (iv)  |       | <ul style="list-style-type: none"> <li>Organic compounds</li> <li>Transport through blood <i>target specified.</i></li> <li>Produce at one site and act on another site</li> <li>Stimulate target organs (only)</li> <li>small concentration is sufficient/required</li> </ul> <p>(Give two mark for any two of above)</p>                                                                                                                                                                                                                                                                                                   | 02 |
| (v)   | (i)   | $W = F_1 + F_2$ /sum of $F_1$ and $F_2$ is <del>W</del> <i>W</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 01 |
| (vi)  | (a)   | Zero / magnitude is 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 01 |
|       | (b)   | <p>Moment of a couple of forces = Force <math>\times</math> perpendicular distance between the lines of action of the two forces</p> <p>or</p> <p><math>= 25 \text{ (kg)} \times 10 \text{ (m s}^{-2}\text{)} \times 3 \text{ (m)} \text{ (01)}</math> <i>1.5</i></p> <p><math>= 375 \text{ (Nm)} \text{ (01)}</math></p> <p><i>* award these 2 marks for obtaining 750 by substituting 3 instead of 1.5</i></p>                                                                                                                                                                                                             | 02 |
| (vii) | (a)   | <p>The play train starting from rest traveled at a <b>uniform acceleration</b> for 5 s and acquired a velocity of <math>3 \text{ m s}^{-1}</math>. Next it moved at a <b>uniform velocity</b> of <math>3 \text{ m s}^{-1}</math> from 5 s to 35 s and then <b>uniformly decelerated</b> from 35 s to 40 s to become rest.</p> <p><b>words in bold letters are essential</b></p>                                                                                                                                                                                                                                              | 01 |
|       | (b)   | <p>Momentum = Mass <math>\times</math> Velocity</p> <p>or</p> <p><math>= 1500 \text{ (kg)} \times 3 \text{ (m s}^{-1}\text{)} \text{ (01)}</math></p> <p><math>= 4500 \text{ (kg m s}^{-1}\text{)} \text{ (01)}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                   | 02 |
|       | (c)   | <p>distance traved/ area of the trapezium/area of the graph</p> <p><math>= \left(\frac{30+40}{2}\right) \times 3</math> or <math>\left(\frac{1}{2} \times 5 \times 3\right) + (30 \times 3) + \left(\frac{1}{2} \times 5 \times 3\right)</math></p> <p><math>= \frac{70}{2} \times 3</math> <i>(7.5 + 90 + 7.5)</i> <span style="float: right;">(01)</span></p> <p><math>= 105 \text{ (m)}</math></p> <p><math>\therefore \text{ length of the railway} = 105 \text{ m} + 18 \text{ m (01)}</math></p> <p><math>= 123 \text{ m (01)}</math></p> <p>If the calculated distance (105) is wrong give one mark for adding 18</p> | 03 |
|       |       | Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 20 |

- 4 5 6 7 8
9. (A) A, E, G, J, L, M, Q and R are 8 consecutive elements in the periodic table. The atomic number of all these elements are less than 20. E naturally occurs in allotropic forms and one of the forms conducts electricity. (Here, the given symbols are **not** the standard symbols of the elements.)

- (i) What is the element E?
- (ii) Of the above elements,
  - (a) which element occurs as a noble gas at room temperature?
  - (b) which element has the highest electro negativity?
  - (c) which element is at the top most level of the activity series?
- (iii) Draw the Lewis dot diagram of a molecule formed by the element G with Hydrogen.
- (iv) Of the above elements, which element is most suitable to produce a sample of  $H_2$  gas in the laboratory?
- (v) Write the balanced chemical equation for the reaction of R with steam.
- (vi) Copy the diagram given below into your answer script and draw a sketch of the variation of the first ionization energy of the above elements. (It is **not** necessary to show the atomic number and values of ionization energy. It is sufficient to mention only the elements.)



- (B) In the following occasions ①, ②, ③ and ④, optical items/instruments were used.

- ① - A dentist examining teeth in a mouth of a patient
- ② - A surgeon observing the internal organs in the body of a patient
- ③ - A student observing cells in a blood sample in the laboratory
- ④ - A cricket lover watching a cricket match from a far end of a pavilion

- (i) (a) In which occasion a concave mirror was used?
- (b) Represent with a ray diagram, the way in which an image is formed in such a situation (take the object as  $\begin{matrix} A \\ \uparrow \\ O \end{matrix}$ ).
- (ii) (a) What was the occasion where an instrument with optical fibres was used?
- (b) What is the name used for the phenomenon that the light rays undergo when light passes through an optical fibre?
- (c) State the conditions that should be fulfilled to occur the phenomenon that is mentioned in (b) above.
- (d) Another instrument where the phenomenon mentioned in (b) above occurs, was also used in another occasion given above. Mention that occasion and write down the name of the instrument that was being used in that occasion.

(Total marks 20)

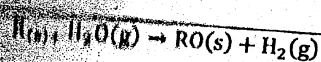
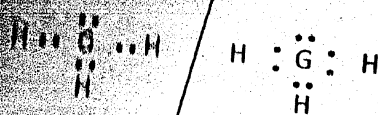


01

01

01

01

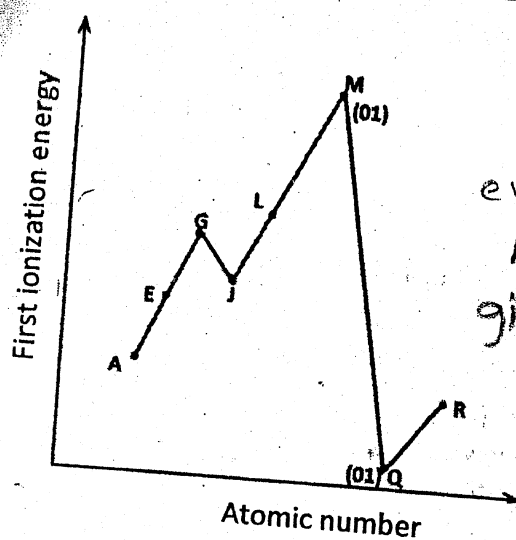


(Physical states are not essential)

01

01

(vi)



for correct shape of the graph - (01)

marking M

- (01)

marking Q

- (01)

even shape wrong  
M marked at top  
give marks.

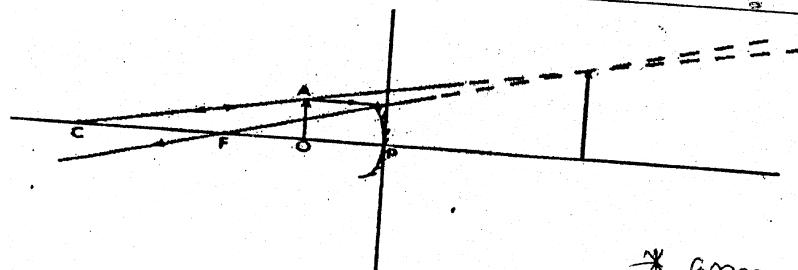
(B) (i) (a)

① / A dentist examining teeth in a mouth of a patient

03

01

(b)



\* arrow heads must  
be these  
rays

for one correct ray or two correct with direction (01)  
keeping the object in between F and mirror (01)

for obtaining the virtual image by extending two rays with dashed lines (01)

03

|  |  |      |     |                                                                                                                                                                                                                                                                            |
|--|--|------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | (ii) | (a) | ② / A surgeon observing the internal organs in the body of a patient                                                                                                                                                                                                       |
|  |  |      | (b) | total internal reflection                                                                                                                                                                                                                                                  |
|  |  |      | (c) | <ul style="list-style-type: none"> <li>• light rays should travel from a denser medium to a rare medium (01)</li> <li>• angle of incidence should be greater than the critical angle / angle of incidence should be greater than <math>c / i &gt; c</math> (01)</li> </ul> |
|  |  |      | (d) | <ul style="list-style-type: none"> <li>• ④ / A cricket lover watching a cricket match from a far end of a pavilion (01)</li> <li>• Prism binocular / binocular (01)</li> </ul>                                                                                             |
|  |  |      |     | no marks for telescope                                                                                                                                                                                                                                                     |
|  |  |      |     | total                                                                                                                                                                                                                                                                      |