

Solved Paper 2014

Science

CLASS-X

Time : 3 Hours

Max. Marks : 100

General Instructions:

- (i) The question paper comprises **two** Sections, A and B. You are to attempt both the sections.
- (ii) **All** questions are compulsory.
- (iii) There is no choice in any of the questions.
- (iv) All questions of Section A and all questions of Section B are to be attempted separately.
- (v) Question numbers **1 to 3** in Section A are one-mark questions. These are to be answered in **one** word or in **one** sentence.
- (vi) Question numbers **4 to 6** in Section A are two-marks questions. These are to be answered in about **30** words each.
- (vii) Question numbers **7 to 18** in Section A are three-marks questions. These are to be answered in about **50** words each.
- (viii) Question numbers **19 to 24** in Section A are five-marks questions. These are to be answered in about **70** words each.
- (ix) Question numbers **25 to 33** in Section B are multiple choice questions based on practical skills. Each question is a **one-mark** question. You are to select one most appropriate response out of the four provided to you.
- (x) Question numbers **34 to 36** in Section B are **two-marks** questions based on practical skills. These are to be answered in brief.

SECTION - A

1. Name the two components of peripheral nervous system. 1

Ans. Cranial nerves arising from the brain and the spinal nerves arising from the spinal cord.

2. A charge of 150 coulomb flows through a wire in one minute. Find the electric current flowing through it. 1

Ans. Charge (Q) = 150 coulomb
Time (t) = 1 minute = 60 sec.
Current (I) = ?

$$I = \frac{Q}{t}$$
$$= \frac{150}{60}$$
$$= 2.5 \text{ A}$$

3. What are hot spots inside earth's crust? 1

Ans. Hotspots are the areas within the Earth's crust where rocks melt to produce magma. These molten rocks are pushed upward and trapped in the regions called hot spots. Underground water when comes in contact with such hot spots, it generates steam.

4. Explain why, an aqueous solution of sodium sulphate is neutral while an aqueous solution of sodium carbonate is basic in nature. 2

Ans. Sodium sulphate is neutral because it is a solution of strong acid and strong base. Hence its aqueous solution is neutral. Sodium carbonate is a salt of strong base and weak acid. Hence its aqueous solution is basic in nature.

5. When hydrogen gas is passed over heated copper (II) oxide, copper and steam are formed.

Write the balanced chemical equation for this reaction and state (i) the substance oxidized and (ii) the substance reduced in the reaction. 2

Ans. Chemical equation for the reaction:



It is a redox reaction in which Copper oxide (CuO) is reduced as it loses oxygen and hydrogen gains oxygen to form water in the form of steam, so it is oxidised.

6. Why do herbivores have longer, small intestine than carnivores? 2

Ans. Herbivores eat plant and grass which are high in cellulose, as digestion of cellulose takes a long time so, they have longer small intestine to allow the digestion of cellulose. On the other hand, carnivores consume meat, as meat is easier to digest, hence they have a shorter small intestine.

7. State reason for the following: 3

(i) Lemon is used for restoring the shine of tarnished copper vessels.

(ii) A metal sulphide is converted into its oxide to extract the metal from the sulphide ore.

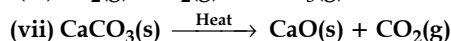
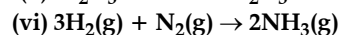
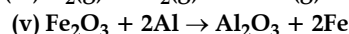
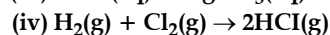
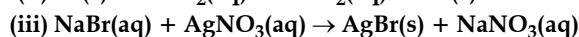
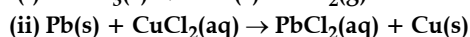
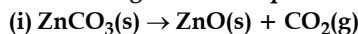
(iii) Copper wires are used in electrical connections.

Ans. (i) When copper vessels are exposed to air, they are tarnished due to the formation of copper oxide and copper carbonate which are basic in nature. Lemon contains citric acid, which combines with copper oxide or copper carbonate and dissolves them to restore the shine of tarnished copper vessel.

(ii) Obtaining metal from its oxides is easier as compared to obtaining it from sulphides and carbonates. Hence, before reduction, metal carbonate and sulphides are converted to metal oxides. A carbonate ore is converted to oxide by calcination while sulphide ore is converted to oxide by roasting.

(iii) Copper is less oxidative as compared to other metals. This property prevents the copper wires from corrosion. Copper has low resistance and higher conductivity. Being a metal, it can be drawn into wires easily due to the property of ductility. Hence copper wires are used in electrical connections.

8. Select (i) combination reaction, (ii) decomposition reaction and (iii) displacement reaction from the following chemical equations: 3



Ans. (i) Decomposition reaction

(ii) Displacement reaction

(iii) Double displacement reaction

(iv) Combination reaction

(v) Displacement reaction

(vi) Combination reaction

(vii) Thermal Decomposition

9. State reason for the following: 3

(i) dry HCl gas does not change the colour of the dry blue litmus paper.

(ii) alcohol and glucose also contain hydrogen, but do not conduct electricity.

(iii) Conc. of H_3O^+ ion is affected when a solution of an acid is diluted.

Ans. (i) Litmus paper changes its colour in the presence of hydrogen or hydronium ions only. HCl can produce these ions when it is in the form of aqueous solution, Dry HCl gas cannot produce these ions, and hence cannot change the colour of the dry blue litmus paper.

(ii) Alcohol and glucose contain hydrogen, but for conduction of electricity, hydrogen ions are required. Alcohol and glucose do not dissociate into ions and that is why cannot conduct electricity.

(iii) The concentration of H_3O^+ (hydronium) ions will go on decreasing with dilution of acid due to the reaction between the hydrogen ions from acid and hydroxyl ions from water, which results in formation of water. This makes the solution less acidic due to decrease in concentration of hydronium ion. Hence the decrease in concentration of hydronium ions due to dilution of acid makes the solution less acidic.

10. State the kind of chemical reactions in the following examples: 3

(i) Digestion of food in stomach

(ii) Combustion of coal in air

(iii) Heating of limestone

Ans. (i) During digestion, food is broken down into simpler form, so it is decomposition reaction.

(ii) During combustion, coal burns with evolution of heat, hence it is exothermic reaction.

(iii) On heating, limestone breaks down into lime and carbon dioxide, hence it is thermal decomposition.

11. The rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms. Give reason. State the pathway of air from nostrils to the lungs in human beings. 3

Ans. A terrestrial organism can obtain oxygen directly from the air and have slow breathing rate but aquatic organisms have to obtain oxygen for respiration which is dissolved in water. Since, the amount of oxygen dissolved in water is fairly low as compared to the amount of oxygen in air, the rate of breathing in aquatic organisms is much faster.

Air enters the body through the nostrils. It then moves down the throat and passes through the pharynx, the larynx and finally reaches the trachea (windpipe). The trachea branches into bronchi which sends air into both the lungs. In the lungs, the bronchi divide into fine tubules called bronchioles. Bronchioles lead air to tiny air sacs called alveoli where exchange of oxygen and carbon dioxide takes place. $1\frac{1}{2} + 1\frac{1}{2}$

12. Mention three characteristic features of hormonal secretions in human beings. 3

Ans. Characteristics of hormones:

(i) Hormones are secreted by endocrine glands which are ductless so, they are poured directly into blood.

(ii) They act on target tissues or organs usually away from their source.

(iii) A very small amount of hormone is produced as their minute amount produce marked effect.

(iv) The timing and amount of hormone released are regulated by feedback mechanism. (Any three) 3

13. (a) State the purpose of formation of urine.

(b) What will happen if there is no tubular reabsorption in the nephrons of kidney. 3

Ans. (a) The purpose of making urine is to filter out waste products from the blood.

(b) As the filtrate moves down the tubular part of the nephron, glucose, amino acids, salts and excess of water gets selectively re-absorbed by the blood vessels surrounding the tubules so, if there will be no tubular re-absorption in the nephron, the useful minerals and salts along with excess water will be eliminated from the body with the urine and urine will be more diluted. 1+2

14. A circuit has a line of 5 A. How many lamps of rating 40 W; 220 V can simultaneously run on this line safely? 3

Ans. $P = 40 \text{ W}, V = 220 \text{ V}$

Current through each lamp,

$$I = \frac{P}{V} = \frac{40}{220} \\ = 0.18 \text{ A}$$

Number of lamps which can be used safely on this line

$$= \frac{\text{Current in line}}{\text{Current of each lamp}}$$

$$= \frac{5}{0.18} = 27$$

Hence, 27 lamps can be run simultaneously on this line safely.

15. The resistance of a wire of 0.01 cm radius is 10 Ω. If the resistivity of the material of the wire is 50×10^{-8} ohm metre, find the length of the wire. 3

Ans. Given: Radius $r = 0.01$ cm = 0.0001 m, Resistance $R = 10$ Ω, resistivity = 50×10^{-8} ohm metre

We know that, $R = \rho \frac{L}{A}$

$$L = \frac{RA}{\rho}$$

$$= \frac{10 \times 3.14 \times (0.0001)^2}{50 \times 10^{-8}}$$

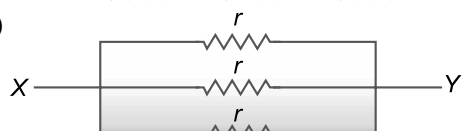
$$= 0.628 \text{ m}$$

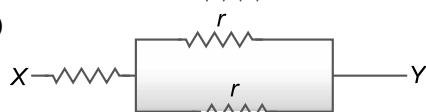
Hence, length of the wire = 0.628 m

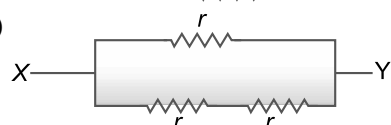
16. Show four different ways in which four resistors of r ohm each may be connected in a circuit. In which case is the equivalent resistance of the combination.

(i) maximum; (ii) minimum? 3

Ans. (a) 

(b) 

(c) 

(d) 

(i) Circuit (a) has maximum resistance

(ii) Circuit (b) has minimum resistance

17. Amit lives in Delhi and is much concerned about the increasing electricity bill of his house. He took some steps to save electricity and succeeded in doing so. 3

(i) Mention any two steps that Amit might have taken to save electricity.

(ii) Amit fulfilled his duty towards the environment by saving electricity. How?

(iii) Which alternative source of energy would you suggest Amit to use?

Ans. (i) Amit might have used solar panels or LED lights to save energy.

(ii) He might have installed solar panels to utilize solar energy on his roof top. He might have started using gadgets such as solar water heater to save energy.

(iii) Amit can make use of solar energy as it is eco-friendly and cheaper.

18. List any three qualities of an ideal source of energy. 3

Ans. An ideal source of energy should be (i) easily available at low cost, (ii) It should not cause pollution (iii) It should have high calorific value.

19. (a) Define corrosion.

(b) What is corrosion of iron called?

(c) How will you recognise the corrosion of silver?

(d) Why corrosion of iron is a serious problem?

(e) How can we prevent corrosion? 5

Ans. (a) Corrosion is a process in which metals are deteriorated by action of air, moisture, chemicals, etc.

(b) Corrosion of iron is called rusting.

(c) Silver turns black as it reacts with H_2S present in air and forms a layer of Ag_2S .

(d) Corrosion of iron is a serious problem because it leads to wastage of tonnes of iron every year and lot of money is spent to repair or replace it.

(e) By Painting, alloying, greasing etc.

20. Write balanced chemical equations for the following statements: 5

(i) NaOH solution is heated with zinc granules.

(ii) Excess of carbon dioxide gas is passed through lime water.

(iii) Dilute sulphuric acid reacts with sodium carbonate.

(iv) Egg shells are dropped in hydrochloric acid.

(v) Copper (II) oxide reacts with dilute hydrochloric acid.

Ans. (i) $2\text{NaOH} + \text{Zn} \xrightarrow{\text{Heat}} \text{Na}_2\text{ZnO}_2 + \text{H}_2$
(Sodium zincate) (Hydrogen)

(ii) $\text{Ca}(\text{OH})_2 + \text{CO}_2 \longrightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

Limewater

$\text{CaCO}_3 + \text{H}_2\text{O} + \text{CO}_2 \longrightarrow \text{Ca}(\text{HCO}_3)_2$

Excess

(iii) $\text{H}_2\text{SO}_4 + \text{Na}_2\text{CO}_3 \longrightarrow \text{Na}_2\text{SO}_4 + \text{CO}_2 + \text{H}_2\text{O}$
Sodium sulphate

(iv) $\text{HCl} + \text{CaCO}_3 \longrightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$

(v) $\text{CuO} + \text{HCl} \longrightarrow \text{CuCl}_2 + \text{H}_2\text{O}$

21. (a) Write three main functions of the nervous system.

(b) In the absence of muscle cells, how do plant cells show movement? 5

Ans. The three main functions of the nervous system are:

(i) Receiving sensory information (stimuli) body and external environment.

(ii) Processing and interpreting the sensory information received.

(iii) Generating response to that information (motor response).

(b) Although plants do not have muscle cells but they can show movement in response to different stimuli with the help of electrical and chemical means.

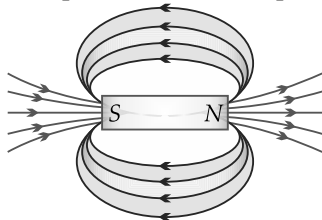
Plant cells show two types of movements:

- (i) Tropic movements are growth movements in response to an environment stimulus. This type of movement may occur in response to gravity (geotropism), light (phototropism), water (hydro tropism), chemical (chemotropism), etc.
- (ii) Nastic movement are independent of the direction of stimulus. This type of movement may occur in response to chemicals, temperature, touch, etc.

22. (a) Draw magnetic field lines of a bar magnet. "Two magnetic field lines never intersect each other." Why?

(b) An electric oven of 1.5 kW is operated in a domestic circuit (220 V) that has a current rating of 5 A. What result do you expect in this case? Explain. 5

Ans. (a)



Magnetic field lines never intersect each other as for two lines to intersect, there must be two directions of magnetic field at a point, which is not possible.

(b) Given: Power $P = 1.5 \text{ kW}$

Voltage $V = 220 \text{ V}$

We know that,

$$\begin{aligned} \text{Current } I &= \frac{P}{V} \\ I &= \frac{1.5}{220} \\ &= \frac{1500}{220} \\ &= 6.8 \text{ A} \quad (1 \text{ kW} = 1000 \text{ W}) \end{aligned}$$

But here the circuit has current rating of 5 A, hence here the amount of current passing is more than the safety limit, hence the fuse will melt and circuit will open.

23. What is meant by resistance of a conductor? Name and define its SI unit. List the factors on which the resistance of a conductor depends. How is the resistance of a wire affected if: 5

(i) its length is doubled, (ii) its radius is doubled?

Ans. (i) Resistance of conductor is the property of conductor to resist the flow of charges. It is defined as the ratio of potential difference across the conductor to the current flowing through it. Its SI unit is Ohm (Ω).

Resistance of the conductor depends on factors such as temperature, length, material and area of cross section of the conductor.

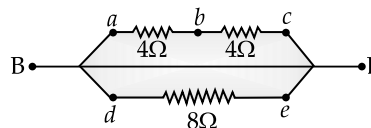
We know that, formula for resistance is, R is resistance and L is length. It means (i) when length L is doubled, resistance R also gets doubled.

$$R = \rho \frac{L}{A}$$

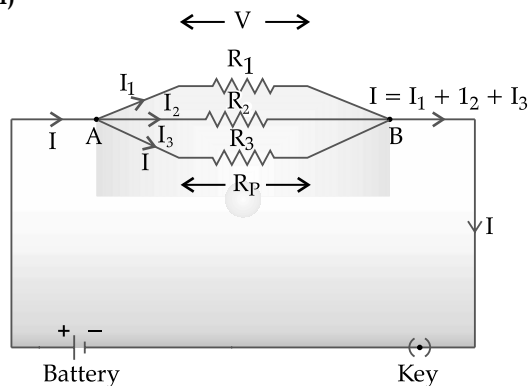
(ii) When radius is doubled, radius becomes one fourth.

24. (i) Establish a relationship to determine the equivalent resistance R of a combination of three resistors having resistances R_1 , R_2 and R_3 connected in parallel.

(ii) Three resistors are connected in a electrical circuit as shown. Calculate the resistance between A and B. 5



Ans. (i)



The given figure shows circuit consisting of three resistors R_1 , R_2 and R_3 connected in parallel.

Suppose the current flowing through the circuit is I , then the current passing through R_1 will be I_1 , through R_2 will be I_2 and through R_3 will be I_3 .

Total current in the circuit will be,

$$I = I_1 + I_2 + I_3 \quad \dots(i)$$

As the potential difference across the circuit is same, By Ohm's law,

$$\rho \frac{L}{A} = R$$

Hence,
$$I = \frac{V}{R}$$

Hence,

$$I_1 = \frac{V}{R_1}, I_2 = \frac{V}{R_2}, I_3 = \frac{V}{R_3}$$

If R_{eqv} is the equivalent or whole resistance in the circuit, By Ohm's law,

$$I = \frac{V}{R_{\text{eqv}}}$$

Putting these values in equation (i)

$$\frac{V}{R_{\text{eqv}}} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

Hence, as V is same throughout the circuit, the formula to find out equivalent resistance in the circuit will be,

$$\frac{1}{eqv} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

where the three resistors are connected in parallel.

(ii) Equivalent resistance between a and c can be found out by the formula

$R = R_1 + R_2$ as they are connected in series.

Equivalent resistance between a and c = $4 + 4 = 8$ Ohm.

Equivalent resistance between A and B will be given by formula

$$\begin{aligned} \frac{1}{R} &= \frac{1}{R_1} + \frac{1}{R_2} \\ &= \frac{1}{8} + \frac{1}{8} \\ &= \frac{2}{8} = \frac{1}{4} \end{aligned}$$

Hence Equivalent resistance between A and B will be 4 Ohm.

SECTION - B

25. Four students studied reactions of zinc and sodium carbonate with dilute hydrochloric acid and dilute sodium hydroxide solutions and presented their results as follows. The (↑) shows evolution of gas and (–) shows no reaction. The right set is: 1

| | Zn | Na ₂ CO ₃ |
|------|----|---------------------------------|
| HCl | ✓ | ✓ |
| NaOH | ✓ | ✓ |

(A)

| | Zn | Na ₂ CO ₃ |
|------|----|---------------------------------|
| HCl | – | ✓ |
| NaOH | ✓ | ✓ |

(B)

| | Zn | Na ₂ CO ₃ |
|------|----|---------------------------------|
| HCl | ✓ | ✓ |
| NaOH | ✓ | – |

(C)

| | Zn | Na ₂ CO ₃ |
|------|----|---------------------------------|
| HCl | ✓ | – |
| NaOH | ✓ | ✓ |

(D)

Ans. Option (C) is correct.

Explanation: Reaction of Zinc with HCl and NaOH involves evolution of gas, while reaction of sodium carbonate with HCl shows evolution of gas, but with NaOH there is no reaction.

26. Dilute NaOH solution and solid sodium carbonate: 1

(A) react only on heating (B) react very slowly

(C) do not react (D) react vigorously

Ans. Option (C) is correct.

Explanation: NaOH and Sodium carbonate, both are bases so they do not react.

27. The colour of Cu metal is: 1

(A) reddish brown (B) blue

(C) green (D) grey

Ans. Option (A) is correct.

28. Shashank was asked to carry out a displacement reaction which would show the following:

(i) Formation of colourless solution

(ii) Black deposits

The reactants he should use are: 1

(A) Fe(s) and Al₂(SO₄)₃(aq)

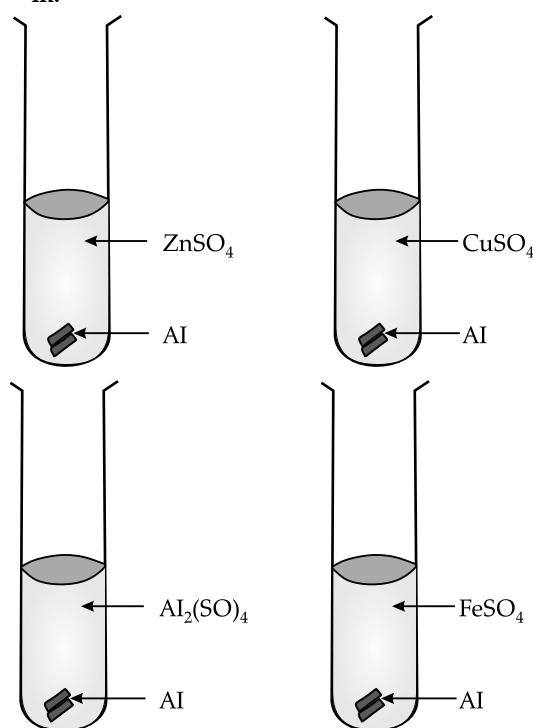
(B) Al(s) and FeSO₄(aq)

(C) Zn(s) and CuSO₄(aq)

(D) Fe(s) and ZnSO₄(aq)

Ans. Option (B) is correct.

29. Mrignayani was doing the experiment of comparing reactivity of metals in the laboratory. She was given aluminium metal and was told to check reactivity by using four solutions as shown below. She would observe that reaction takes place in: 1



(A) A and B

(B) B, C and D

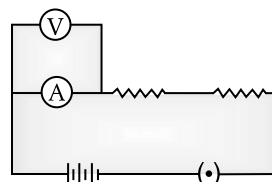
(C) A, C and D

(D) C and D

Ans. Option (B) is correct.

Explanation: Aluminium will not react with Aluminium sulphate. So there will not be any reaction in the test tube which has aluminium and aluminium sulphate, others will show reaction as Al is more reactive among them.

30. In an experiment to find the equivalent resistance of a series combination of two resistance of 3Ω and 4Ω in the circuit diagram given. The circuit will give: 1

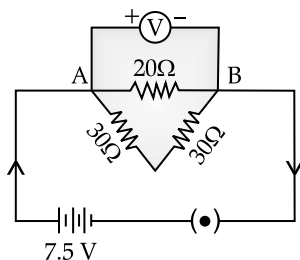


- (A) Incorrect reading for current I and correct reading for voltage V
- (B) Incorrect readings for both current I and voltage V.
- (C) Correct reading for current I and incorrect reading for voltage V
- (D) Correct readings for both voltage V and current I

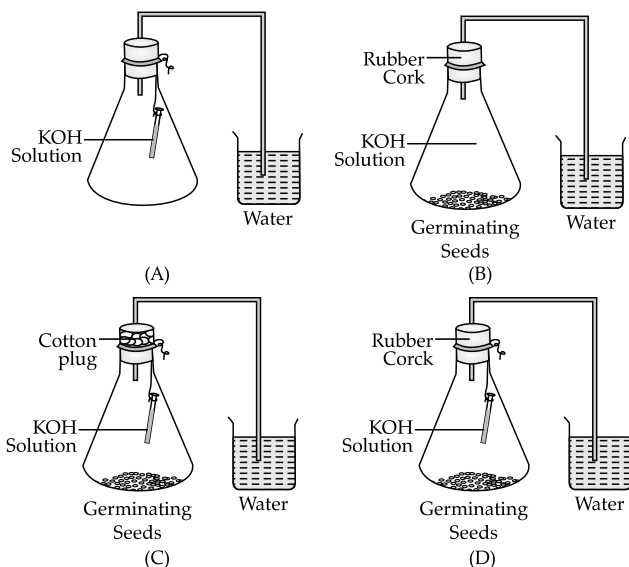
Ans. Option (C) is correct.

Explanation: Voltmeter must be put in parallel with resistances to be measured.

31. A student joined three resistances as shown in the circuit below. The current recorded by ammeter (A) is: 1



33.



Choose the correct set-up to demonstrate that CO₂ is given out during respiration: 1

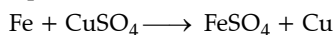
- (A) A (B) B (C) C (D) D

Ans. Option (D) is correct.

Explanation: The set-up in option (D) has all the necessary requirements.

34. An iron nail is dipped in the solution of copper sulphate for about 30 minutes, state the change in colour observed. Give the reason for the change. 2

Ans. When an iron nail is dipped in the solution of copper sulphate which is blue in colour, iron will displace copper from copper sulphate solution as it is more reactive. It results in the formation of ferrous sulphate due to which the colour of solution turns green from blue. It is a displacement reaction. Chemical Equation for the reaction:



- (A) 0.25 A (B) 0.5 A
(C) 0.75 A (D) 1 A

Ans. Option (B) is correct.

Explanation: Resistors of 30 ohm each are connected in series. Their equivalent resistance will be 60 Ω. 20 Ω ohm resistance is in parallel to the two in series, so the total equivalent resistance will be 15 Ω. By Ohm's law,

$$V = IR$$

Hence $I = \frac{V}{R}$

now, $V = 7.5 \text{ V}, R = 15 \Omega$

Hence, $I = \frac{7.5}{15} = \frac{1}{2} = 0.5 \text{ A}$

32. The iodine solution is: 1

- (A) Pure iodine dissolved in water
- (B) Potassium iodide in water
- (C) Iodine dissolved in potassium iodide
- (D) Potassium iodide dissolved in iodide

Ans. Option (D) is correct.

36. Draw a labelled diagram of stomatal apparatus with closed stomatal pore.

2

Ans.

