

**INSTRUCTIONS:**

- ⇒ All questions are compulsory.
- ⇒ The question paper consists of three subjects. (Physics, Chemistry and Biology)
- ⇒ Each subject consists of 4 sections: A, B, C and D.
- ⇒ Internal choice is given in each section.
- ⇒ All questions in Section A are one-mark questions. These are to be answered in about 10 - 20 words each.
- ⇒ All questions in Section B are two-marks questions. These are to be answered in about 40 - 50 words each.
- ⇒ All questions in Section C are three-marks questions. These are to be answered in about 60 - 80 words each.
- ⇒ All questions in Section D are four-marks questions. These are to be answered in about 90 - 120 words each.
- ⇒ This question paper consists of a total of 39 questions.
- ⇒ New Section should be answered on new page and questions must be answered as per given sequence only.

**PHYSICS**  
**SECTION A**

**(I) Fill in the blanks:**

1. They are joined in parallel. (1)  
 The equivalent resistance =  $R'$   
 $1/R' = 1/(1) + 1/(2) + 1/(3)$   
 $1/R' = 11/6$   
 equivalent resistance ( $R'$ ) =  $6/11$
2. A wire of resistance  $R$  is cut into 10 equal parts. (1)  
 let new resistance =  $r$   
 $r = R/10$   
 They are joined in parallel.  
 The equivalent resistance =  $R'$   
 $1/R' = 1/(R/10) + 1/(R/10) + 1/(R/10) + \dots$  (10 times)  
 $1/R' = 10 * 10/R$   
 $1/R' = 100/R$   
 $R' = R/100$   
 Equivalent resistance ( $R'$ ) =  $R/100 = 0.001 R$

**(II) True/False:**

3. TRUE (As it takes some time for pupil to adjust) (1)
4. The correct answer is c (by running dynamo by kinetic energy), because running water contains kinetic energy. (1)

**SECTION B**

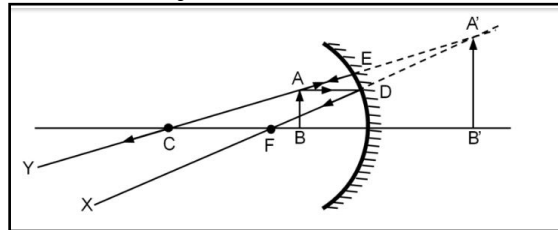
5. Power of accommodation is the ability of the eye lens to focus near and far objects clearly on the retina by adjusting its focal length. Power of accommodation of the eye is limited. It implies the focal length of the eye lens cannot be reduced beyond certain minimum limit. Also for normal eye it is 4 dioptre as near point for a normal eye is 25 cm. (2)
6. (i) As a current flowing in the straight current conductor carrying wire increases its strength of magnetic field also increases. This means current flowing in the conductor is directly proportional to its strength of magnetic field. (1)  
 (ii) If the current strength increases then the magnetic field increase and vice versa, so if the direction of current changes the direction of magnetic field also changes. (1)
7. (i) As we are using more fossil fuels for the energy requirement so we are polluting and damaging the environment in turn. (1)  
 (ii) Use of fuel wood and burning is resulting in increased air pollution. (1)

OR

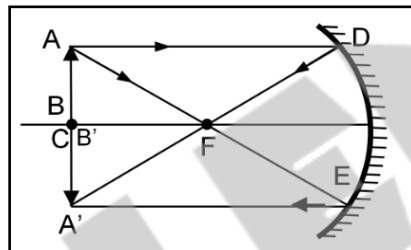
7. There are many reasons for it but some reasons are important which I want to share with you all:-
- As you know, the demand of energy is increasing day by day due to increase population and growing use of machine and industrial in order to improve our living standard. (1)
  - The fossil fuels are the non-renewable source of energy and formed million years ago. And it is the fact that fossil fuels are the limited source and it will finish after some years hence, we have to need to harness of non-conventional source of energy. (1)

**SECTION C**

8. (i) In concave mirror erect is formed only when the object is placed between pole and focus. So object distance should be less than 12 cm. (0.5)
- (ii) The image would be larger than the object. (1.5)



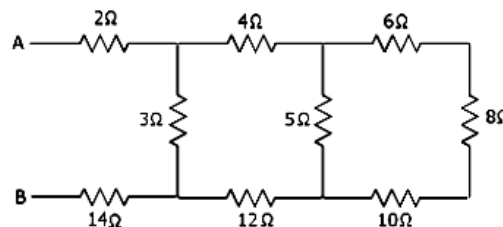
- (iii) If the object distance is 24 cm which is the approx position of centre of curvature, then the image will be formed at the same position. (1)



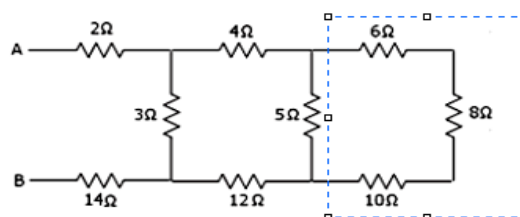
9. (i) Earth wire protects the electrical appliances from getting damaged due to electrical shocks. (1)
- (ii) When live wire touches the neutral wires circuit offers very low resistance to the flow of current so a heavy current flows through the circuit hence electric short circuit occurs. A short circuit is a direct connection between two points in a circuit that should not be connected, such as the two terminals of a power supply. (1)
- (iii) The usual current rating of the fuse wire in the line to feed
- Lights and fans: 5 A (0.5)
  - Appliances of 2kW or more power: 15 A (0.5)

OR

9. (Total 3 marks, and it has to be distributed as per the steps solve)



6 Ω, 8Ω, 10Ω in series so equivalent resistance will be  $R_1 = 6+8+10 = 24\Omega$   
 Now  $R_1$  and 5Ω are in parallel, so equivalent will be  $R_2$  i.e.



$$1/R_2 = 1/(24) + 1/(5)$$

$$1/R_2 = 29/120$$

$$R_2 = 120/29 = 4.13 \Omega$$

Now  $R_2=4.13\Omega$ ,  $4\Omega$  and  $12\Omega$  are in series so equivalent will be  $R_3$  i.e.  $R_3 = 12+4+4.13 = 20.13\Omega$   
 Now  $R_3$  and  $3\Omega$  are in parallel, so equivalent will be  $R_4$  i.e.

$$1/R_4 = 1/(20.13) + 1/(3)$$

$$1/R_4 = 23.13/60.39$$

$$R_4 = 60.39/23.13 = 2.6\Omega$$

Now  $R_4$ ,  $2\Omega$  and  $14\Omega$  are in series so equivalent will be  $R_{AB}$  i.e.  $R_{AB} = 14+2+2.6 = 18.6\Omega$

10. The scattering of light is the phenomenon by which a beam of light is redirected in different directions on interacting with the particles present in the medium. The sky appears blue because the fine particles in the atmosphere scatter blue light the most among all the components of white light. (1)

At sunrise, the sun is located near the horizon, Hence, the light has to travel a long distance through the Earth's atmosphere. At the time of sunrise or sunset, when white sunlight falls on suspended atmospheric particles, the blue colour light scatters out in the atmosphere, while the red colour light scatters less and reaches the eyes of the observer on the surface of the Earth. Hence, when this less scattered red light reaches eyes of the observer, the sun and its surroundings appear reddish. (1)

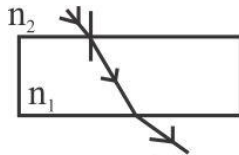
The sky appears dark instead of blue to an astronaut because there is no atmosphere in the outer space that can scatter the sunlight. As the sunlight is not scattered, no scattered light reach the eyes of the astronauts and the sky appears black to them. (1)

### SECTION C

11. (i) Suppose speed of light in Air is  $c = 2x$  (1)

Then the speed of light in the medium will be  $v = x$

refractive index of the medium will be  $n = c/v = 2x/x = 2$  Ans



(ii) (A) When  $n_1 > n_2$  (1)



(B) When  $n_1 = n_2$  (1)



(C) When  $n_1 < n_2$  (1)

12. (i) Resistivity will remain same. As resistivity only depends upon the nature of material of a conductor, temperature and pressure but does not depends upon the length and area of a conductor. (2)

(ii) We know that

$$R = \rho L/A$$

When  $L$  become  $1/4$  th then resistance for each part is  $R'$

$$R' = \rho L'/A$$

$$\text{As, } L' = L/4$$

$$R' = \rho L/4A$$

$$R' = R/4$$

It means that resistance will become one forth of initial resistance

**(A) Parallel connection:**

(1)

We know that equivalent resistance given as

$$\frac{1}{R_{\text{equ}}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

$$R_1 = R_2 = R_3 = R_4 = \frac{R}{4}$$

$$\frac{1}{R_{\text{equ}}} = \frac{4}{R} + \frac{4}{R} + \frac{4}{R} + \frac{4}{R} = \frac{16}{R}$$

$$R_{\text{equ}} = \frac{R}{16}$$

**(B) Series connection:**

(1)

$$R_{\text{equ}} = R_1 + R_2 + R_3 + R_4$$

$$R_1 = R_2 = R_3 = R_4 = \frac{R}{4}$$

$$R_{\text{equ}} = R$$

OR

**12. (i) Case 1: power is given by**

(2)

$$P_1 = I^2 R$$

**Case 2: when current is increased by 100%**

It means that current becomes doubled i.e.  $2I$

Power will be  $P_2 = (2I)^2 R$

i.e. Power =  $4 I^2 R$

Change in dissipated power =  $4 I^2 R - I^2 R = 3 I^2 R$

Increase in percent of power dissipated =  $\frac{3P_1}{P_1} \times 100\% = 300\%$

**(ii) Power=Voltage X current**

(2)

$$P=VI$$

$$V=250 \text{ V}$$

let  $I$  flow through Bulb 1 and  $i$  flow through Bulb 2

Bulb(1)=B1 consumes power 200 W= $P(1)$

B(2) consumes power 100 W= $P(2)$

- for bulb 1
- $P(1)=VI$   
 $200/250=I=0.8 \text{ A}$

- for bulb 2
- $P(2)=Vi$   
 $100/250=i=0.4 \text{ A}$

Now resistances in bulbs will be [ $R(1)$  and  $R(2)$ ]

$$R(1)=V/I \text{ and } R(2)=V/i$$

$$R(1)=250/0.8=312.5 \text{ ohms.}$$

$$R(2)=250/0.4=625 \text{ ohms}$$

As resistances are in series total resistances  $R$

$$R=R(1)+R(2)$$

$$R=937.5 \text{ ohms}$$

$$\text{now } P=V^2/R$$

$$P=(250)^2/937.5=$$

$$P=66.67 \text{ W}$$

**CHEMISTRY**

**SECTION A**

- Fill in the blanks:** [1]  
Basic, acidic, neutral
- (4) Z and Y [1]
- Match column I with II** [1]  
(2) A-S, B-R, C-P, D-Q
- False [1]
- Dobereiner's law of triads states that, the atomic mass of the middle element of a triad is the arithmetic mean of the atomic masses of the other two elements. Example: In the triad of lithium, sodium and potassium. The atomic mass of lithium is 7 and the atomic mass of potassium is 39. [1]

**SECTION B**

- Give reason:**
  - Silver articles turn black because of formation of  $\text{Ag}_2\text{S}$  and copper vessels turn green after sometime because of formation of  $\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$  due to corrosion. [1]
  - Because it forms  $\text{OH}^-$  ions when it is added to water. [1]
- MgO,  $\text{Al}_2\text{O}_3$ , ZnO respectively. [1]  
It forms protective layer and prevents further corrosion of metal. [1]
- (a) But-2-ene or 2-Butene [1]  
(b) Butanoic acid [1]

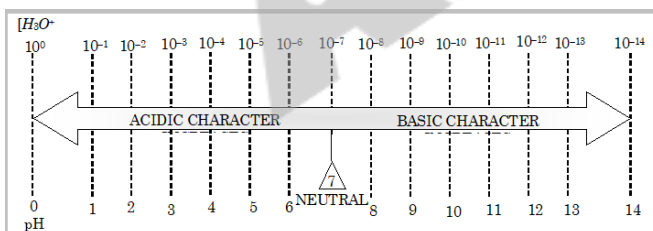
**OR**

The **pH scale** measures how acidic or basic a substance is.

[0.5]

The **pH scale** ranges from 0 to 14. A **pH** of 7 is neutral. A **pH** less than 7 is acidic. A **pH** more than 7 is basic.

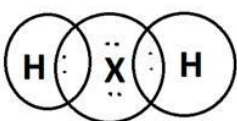
[0.5]



[1]

**SECTION C**

- (a) Valence electrons = 6, Valency -2 [1]  
(b)  $\text{H}_2\text{X}$ , [1]



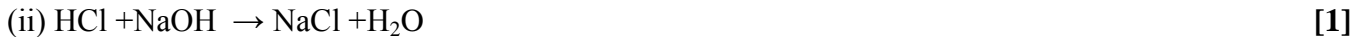
- Oxygen, Non metal [1]



(i) used as disinfectant

(ii) as a bleaching agent for cotton and linen in the textile industry. [1.5]

OR



SECTION D



(b) reducing agent = Al [1]

(c) Rancidity : When the substance containing oils and fats are exposed to air they get oxidised and become rancid due to which their smell, taste and colour change. This process is known as rancidity. [2]

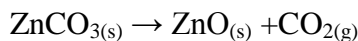
Rancidity can be prevented using the following methods:

(i) Adding antioxidants (substances which prevent oxidation) to food.

(ii) Storing food in airtight containers

(iii) Refrigerating food

12. (a) The carbonate ores are changed into oxides by heating strongly in limited air. This process is called calcination. [2]



The metal oxides are then reduced to the corresponding metals by using suitable reagents such as carbon. For, example, when zinc oxide is heated with carbon, it is reduced to metallic zinc.

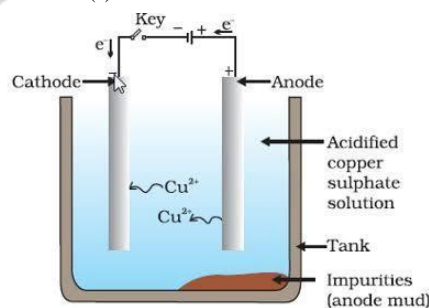
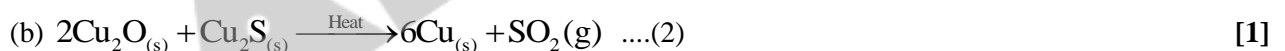
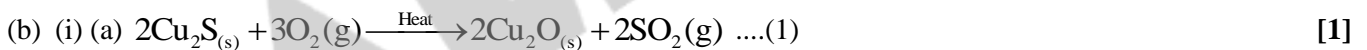
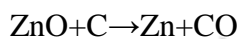
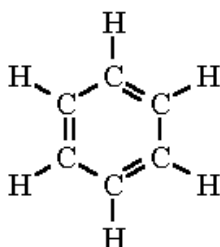


Fig: Electro refining of copper

OR

(i)  $\text{C}_6\text{H}_6$  [1]



S. No.	Covalent Compounds	Ionic Compounds
(i)	They are readily soluble in organic solvent.	They are not soluble in organic solvent.
(ii)	They do not ionize.	They ionize in its solution or in molten solution.

- (i) When 5% alkaline potassium permanganate solution is added drop by drop to warm ethanol in a test tube, an oxidation reaction would be observed by us and purple color of potassium permanganate disappears. [0.5]

Role: oxidising agent [0.5]



### BIOLOGY

#### SECTION A

1. (1) a- Lipase b- Salivary Amylase [1]
2. (3) Contract and flat [1]
3. (4) Both (2) & (3) [1]
4. (1) A natural forest [1]
5. (1) Group of bacteria [1]
6. **a. Heredity:** The transmission of genetic characters from parents to offspring. [1]  
**b. Gene:** A gene is the basic physical and functional unit of heredity. [1]
7. False [1]  
 Adrenaline is hormone which produces from adrenal gland. [1]

#### SECTION B

8. Divergent evolution:  
 Divergent evolution is the process whereby groups from the same common ancestor evolve and accumulate differences, resulting in the formation of new species. Divergent evolution gives rise to new species which may be similar in function but morphologically different from their ancestors.  
 Variations are more successful in sexual mode than in asexual one. The species produced by sexual reproduction survive more than those produced by asexual reproduction. This is because genetic variations help them to adapt to different environments. [2]
9. [2]

Endocrine gland	Location	Hormone
a. Testes	In the scrotum	Testosterone
b. Adrenal	Above the kidney	Adrenaline

OR

- (a) Fallopian Tube: Provides the site for the fertilization process in human.
- (b) Uterus: Life supporting part of female reproductive system where development of baby takes place.
- (c) Ureter: The ureter is a tube that carries urine from the kidney to the urinary bladder.
- (d) Nephron:  
 Nephron is the basic unit of structure in the kidney. A nephron is used separate to water, ions and small molecules from the blood, filter out wastes and toxins, and return needed molecules to the blood.

10. Food chain:

[2]

A food chain represents a series of events and consumption in which food and energy are consumed from one organism in an ecosystem to another.

The number of trophic level in food chain is limited because at each trophic level a large amount of energy is being utilized for the maintenance of organism and lost as heat. The energy keep on decreasing at each trophic level and only 10% of the energy is being passed to the next level.

11.

[2]

Stakeholders are group of people which directly or indirectly effected by depletion of Natural Resource and the people who live in or around forests are dependent on forest produce for various aspects of their life.

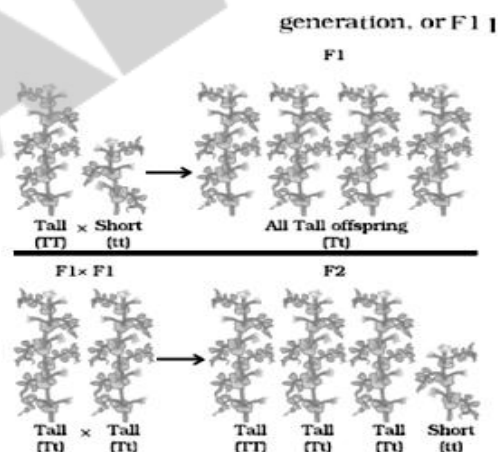
Trees reduce the rate of soil erosion by protecting the soil from the impact of rain, transpiring large amounts of water, which counteracts very wet soil and helps to binding soil to sloping land with their roots.

SECTION C

12.

[3]

- (a) When tall plants were crossed with the dwarf pea plants in the Mendel's experiment, then in the first generation i.e. F1 progeny, only tall plants were obtained and no dwarf plant was obtained as per the Mendel's law of dominance.
- (b) In F2 progeny, there were both tall and dwarf pea plants. The ratio was found to be 3:1 (Tall: Dwarf)
- (c) In F2 progeny, there were both tall and dwarf pea plants. The ratio was found to be 3:1 (Tall: Dwarf) which confirmed that in F2 progeny, both the characteristics were inherited and the tall character of pea plant was found to be dominative and dwarf to be recessive. This was the law of segregation which says that when plants of different traits were crossed, then in the first progeny only the dominant character was observed whereas in F2 progeny both dominant and recessive traits were obtained.



13. Breathing process

[3]

The primary organs of the respiratory system are the lungs, which function to take in oxygen and expel carbon dioxide as we breathe. The gas exchange process is performed by the lungs and respiratory system. Air, a mix of oxygen and other gases, is inhaled. Human respiratory system starts with pair of nostril where filtration of the air takes place. After removing dust particle form air, it passes to trachea. The trachea branches into two bronchi, tubes that lead to the lungs. Once in the lungs, oxygen is moved into the bloodstream. Blood carries the oxygen through the body to where it is needed. A red blood cell collects carbon dioxide from the body's cells and transports it back to the lungs. An exchange of oxygen



and carbon dioxide takes place in the alveoli, small structures within the lungs. The carbon dioxide, a waste gas, is exhaled and the cycle begins again with the next breath. The diaphragm is a dome-shaped muscle below the lungs that controls breathing. The diaphragm flattens out and pulls forward, drawing air into the lungs for inhalation. During exhalation the diaphragm expands to force air out of the lungs.

### Photosynthesis process in plant

Photosynthesis is a process by which plant convert light energy into chemical energy, which is later, is used to fuel cellular activities. The chemical energy is stored in the form of sugars, which are created from water and carbon dioxide. At the cellular level, the photosynthesis process takes place in cell organelles called chloroplasts. These organelles contain a green-colored pigment called chlorophyll, which is responsible for the characteristic green coloration of the leaves. During the process of photosynthesis, carbon dioxide enters through the stomata; water is absorbed by the root hairs from the soil and is carried to the leaves through the xylem vessels. Chlorophyll absorbs the light energy from the sun to split water molecules into hydrogen and oxygen. The hydrogen from water molecules and carbon dioxide absorbed from the air are used in the production of glucose. Furthermore, oxygen is liberated out into the atmosphere through the leaves as a waste product.

14. [3]

There are various methods of contraception used. These include the following:

**(1) Mechanical methods of birth control are:**

- (i) Male Condom
- (ii) Female Condom

Both of these prevent the sperm from meeting the egg.

- (iii) Intrauterine Device (IUD) – a T-shaped device placed inside the uterus (by a doctor) which blocks the sperms from entry into the fallopian tubes
- (iv) Diaphragm, Cervical Cap, and Shield – latex or silicon cap used with spermicides which blocks the entry of sperms into the cervix

**(2) Surgical methods:** These are also called sterilization. Surgical intervention blocks gamete transport and thereby prevents conception. Sterilization procedure in male is called 'vasectomy' and in females it is 'tubectomy'.

**(3) Hormonal methods** - Oral administration of small doses of either progestogens or progestogen-estrogen combinations is a method used by females in the form of pills. They can also be used by females as injections or implants under the skin.

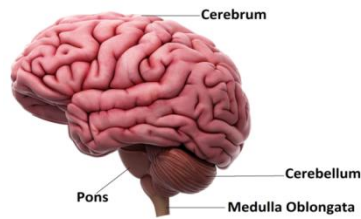
**OR**

After the egg has been fertilized by the sperm, it starts to divide into more cells. When egg reaches the uterus, it attaches itself to the uterus wall which takes the shape of a little ball. The embryo has a head with simple eyes and ears. The placenta serves as an interface between the mother and the developing fetus and has three main jobs: Attach the fetus to the uterine wall. Provide nutrients to the fetus. Allow the fetus to transfer waste products to the mother's blood. The umbilical cord, which connects your baby to the placenta, contains three vessels: two arteries, which carry blood from the baby to the placenta, and one vein, which carries blood back to the baby. Amniotic fluid protects the developing baby by cushioning against blows to the mother's abdomen, allowing for easier fetal movement. The time period from fertilization up to birth of baby is called gestation period (9 month in human).

**SECTION D**

15. (a)

[2]



(b)

[2]

(i) Medulla Oblongata

(ii) Medulla Oblongata

(iii) Cerebellum

(iv) Brain Stem (Medulla- enlarged portion of the upper spinal cord)

ALLEN