Nagaland Board
Class X Science
Sample Paper 2 – Solution

1.

(a) (iii) Coal is a fossil fuel. They are produced when prehistoric organic material is subjected to high temperature and pressure reactions taking place over millions of years. Since, there is a finite amount of fossil fuels, they are considered as exhaustible energy sources.

(b) (iv) The full form of UNEP is United Nations Environment Programme. It is an agency that takes care of the environment.

(c) (iii) When organisms or members of a particular species show certain changes (variations) due to differences caused by geographical isolation, it is known as speciation.

(d) (iii)Some substances that are useful for us such as glucose, amino acids, salts and water are reabsorbed from the initial filtrate as urine flows through the tubular part of the nephron.

(e) (iii)

$V = IR$

Thus, $I = V/R$

V is constant.

Thus, if the resistance is increased, the current would decrease.

(f) (i) Only convex lens forms enlarged and virtual image of an object when object is placed between focal point and optical centre.

(g) (i) Ethanol (alcohol) on reaction with ethanoic acid gives ester as one of the products.

(h) (iii)Aluminium gets coated with a layer of aluminium oxide which prevents further corrosion.

(i) (iii)Sodium hydroxide completely dissociates to produce sodium ions and is a strong base.

(j) (iv) Acids turn blue litmus to red hence dilute hydrochloric acid turns blue litmus paper red.

2. Solar panel

3. The chemical formula of bleaching powder is $CaOCl_2$.

4. Electrolysis of water to form oxygen and hydrogen is an endothermic reaction because electrical energy is absorbed during this reaction.

5. Abscisic acid promotes dormancy of seeds in plants.

6. The fallopian tubes act as a site for the fertilization of egg and sperm.

7. If the blood is deficient in the haemoglobin then less amount of O_2 reaches to tissues due to which less energy will be released as less O_2 bind with the haemoglobin.

8. Principle behind working of electric motor is that any current carrying coil experiences a rotational force or torque in a magnetic field. The direction of rotation depends on flow of current and the magnetic field.

9. Different stages (from egg to an adult) which appear during the course of development of an individual repeats or recapitulates themselves in the form of stages through which its ancestors have passed during their period of evolution.

10. Salts of strong acids and bases are neutral with pH value of 7. Salts of a strong acid and weak base are acidic with pH value less than 7 and those of strong base and weak acid are basic in nature, with pH value more than 7.

11. Fuels such as coal and petroleum have some amount of nitrogen and sulphur in them. Their combustion results in the formation of oxides of sulphur and nitrogen which are major pollutants in the environment.

12. A reflex action is an involuntary, automatic and nearly instantaneous response to a stimulus.

Steps involved in reflex action:

i. The sense organ (skin) is stimulated with a prick, and the stimulus is received by skin receptor cells.
ii. Sensory nerves send this impulse to the spinal cord.
iii. An association neuron transmits this impulse to the motor neuron.
iv. The motor neuron relays the impulse to the muscles of the effector organ (hand).

13. Natural selection is the process whereby organisms better adapted to their environment tend to survive and produce more offspring, whereas other less favourable traits tend to become eliminated. Continuous competition between individuals for environmental resources creates a 'struggle for existence and this struggle makes sure that certain organisms fail to survive or reproduce'.

Examples include

i. Galapagos finches all have different types of beaks. During drought, the finches with the larger beaks survived better than those with the smaller beaks. During rainy times, more small seeds were produced and the finches with smaller beaks fared better.

ii. A habitat has red bugs and green bugs. Birds prefer the taste of red bugs, so soon there are many green bugs and few red bugs. Green bugs reproduce and make more green bugs and eventually there are no more red bugs.

iii. In one ecosystem, lizards which had long legs could climb better to avoid floods and reach the food.

OR

Biodegradable substances: Substances which can be broken down by microorganisms such as bacteria and fungi are called biodegradable substances. Examples: Paper, vegetable and fruit peels, human excreta

Non-biodegradable substances: Substances which cannot be broken down by microorganisms into simpler and harmless substances are called non-biodegradable substance. Examples: Polythene bags, aluminium cans and DDT

Effects of biodegradable substances:

- They produce a foul smell causing air pollution. If thrown in water, they cause water pollution.
- They serve as a breeding ground for flies and mosquitoes which are carriers of malaria.

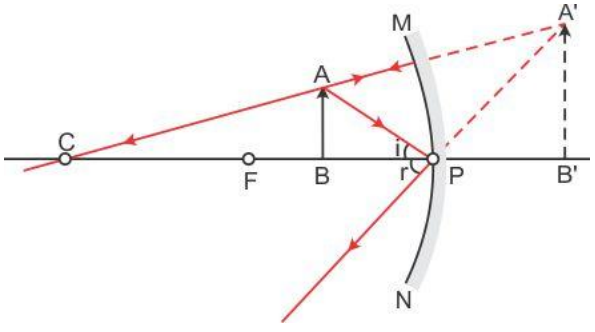
Effects of non-biodegradable substances:

- Non-biodegradable pesticides and fertilisers run off with rainwater into water bodies and cause water pollution and affect the soil making it acidic or alkaline.
- Some non-biodegradable pesticides enter the food chain and badly affect humans and other organisms.

14. Focal length of the concave mirror f is –12 cm.

The student wants to obtain an erect image. A concave mirror produces an erect image when the object is between the pole and the focus. Hence, the range of the object distance should be 0–12 cm from the mirror.

The image so formed would be virtual, erect and magnified.



15.

(a) Elements which belong to the 3rd period of the modern periodic table are Na, Mg and Al.

(b) Elements which belong to Group 1 of the modern periodic table are Li, Na and K.

(c) Al

16. No, it is not true that when a new species emerges, the old species is eliminated. Because when there is a change in any species, the change is only in a part or a few members of the species population. If the newly generated species after genetic change is better in any way, it will get more opportunity to survive; if the genetic change is against the environment, it will die. Thus, unchanged members of other species may also remain and tend to live in the changed environment.

17. Organic evolution occurs because of changes in a species which appear generation after generation and accumulate to form a new species.

The embryology of different vertebrates provides very strong evidence of different vertebrates which show striking similarities. There is an obvious similarity between embryos of fish, amphibians, reptiles, birds and mammals. A comparison of embryos of vertebrates shows that all have gill slits even though they do not remain later in life (except in fish). This indicates a fundamental step which is common to all vertebrates and supports the idea of a common ancestor. Other features which do not exist in the adult form but appear in the embryo include limb buds in dolphins and tail buds in humans.

This shows that species share an ancestor, so their developmental processes occur similarly regardless of other changes which have occurred because of their divergence.

18. $CaCO_3$ + dil. $H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

(A) (B)

$Ca(OH)_2$ + $CO_2 \rightarrow CaCO_3 + H_2O$

(Lime water) (A)

A: $CaCO_3$ (Limestone)

B: CO_2 (g)

OR

(a) Oxidation: Gain of oxygen by a substance.

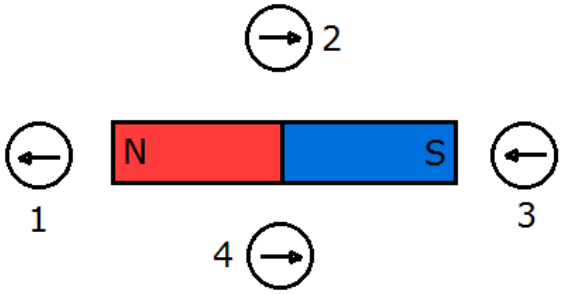
$2Cu + O_2 \xrightarrow{Heat} 2CuO$

Reduction: Loss of oxygen by a substance.

$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$

(b) Sodium (Na) is oxidised to sodium oxide as it gains oxygen, and oxygen reduces.

19. Directions shown by the four needles would be



For a bar magnet, the field lines emanate from the North Pole and end at the South Pole. Hence, the field lines are directed towards the right for compasses 2 and 4 and towards the left for compass 3.

20. Steps to discourage the use of alcohol:

(a) By not getting attracted towards this habit, by stopping my friends as well and asking them to keep it in control if they do consume alcohol

(b) By making posters, banners and writing articles on this issue

(c) By sensitising people about the harmful effects of liquor consumption

21.

(a) Karan showed curiosity in knowing things and has a keen observing power. He showed the ability to judge quickly and was a law-abiding citizen.

Karan's teacher showed awareness and was also a law-abiding citizen.

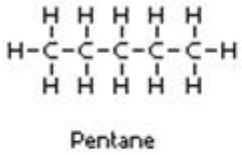
(b) A streak of bright light through the canopy of the dense forest was seen due to the Tyndall effect. According to the Tyndall effect, when a beam of light strikes colloidal solution particles (fine particles), the path of the beam becomes visible.

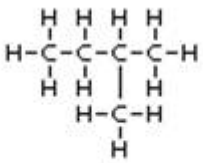
22.

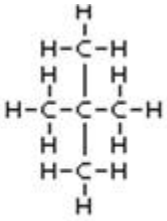
(a) In covalent compounds, electrons are shared between atoms and no charged particles are formed. Hence, they are poor conductors of electricity.

(b) Carbon dioxide is evolved. It turns lime water milky.

(c) Structural isomers of pentane:


Pentane


Isopentane


Neopentane

23.

(a) A conductor offers resistance to the flow of current. Hence, work must be done by the current continuously to keep itself flowing.

When an electric charge Q moves against a potential difference V, the work done is W = QV.

From the definition of current,

$$I = \frac{Q}{t}$$

$$\therefore Q = It$$

From Ohm's law,

$$V = IR$$

$$\therefore W = It \times IR = I^2Rt$$,

assuming that all this work goes in producing heat energy.

Therefore, the heat produced in a conductor of resistance 'R' when current 'I' is flowing for time 't' is

$$H = I^2Rt$$

(b) When resistors are connected in series:

$$R_s = R + R = 2R$$

$$\therefore H_s = \frac{V^2}{R_s} = \frac{V^2}{2R} \quad \text{..... (1)}$$

When resistors are connected in parallel:

$$\frac{1}{R_p} = \frac{1}{R} + \frac{1}{R} = \frac{2}{R}$$

$$\therefore R_p = \frac{R}{2}$$

$$\therefore H_p = \frac{V^2}{R_p} = \frac{2V^2}{R} \quad \text{..... (2)}$$

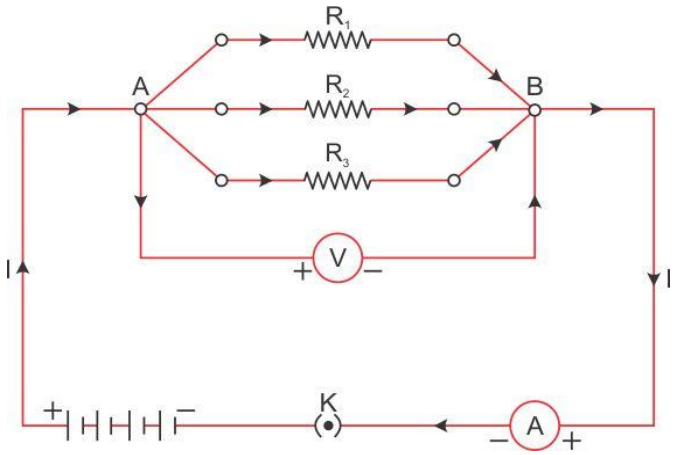
From (1) and (2),

$$\frac{H_s}{H_p} = \frac{V^2}{2R} \times \frac{R}{2V^2} = \frac{1}{4}$$

$$\therefore H_p = 4H_s$$

OR

(a) When two or more resistors are joined to the same end, the resistances are connected in parallel.



Potential difference in a parallel circuit remains the same across all resistors. The current is the sum of the currents across all the individual resistors.

$I = I_1 + I_2 + I_3$ ..... (1)

Let R_p be the resultant resistance of the circuit.

On applying Ohm's law to the entire circuit,

$$I = \frac{V}{R_p} \quad \text{..... (2)}$$

Now, applying Ohm's law to individual resistances,

$$\left.\begin{aligned} I_1 &= \frac{V}{R_1} \\ I_2 &= \frac{V}{R_2} \\ I_3 &= \frac{V}{R_3} \end{aligned}\right\} (3)$$

From equations (1), (2) and (3),

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\therefore \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

(b) For the given circuit,

(i) The resultant resistance is

$$R_{eq} = 7 + 5||10$$

$$\therefore R_{eq} = 7 + \frac{10 \times 5}{10 + 5} = 7 + \frac{50}{15}$$

$$\therefore R_{eq} = \frac{105 + 50}{15} = \frac{155}{15} = 10.33\ \Omega$$

(ii) The total current is

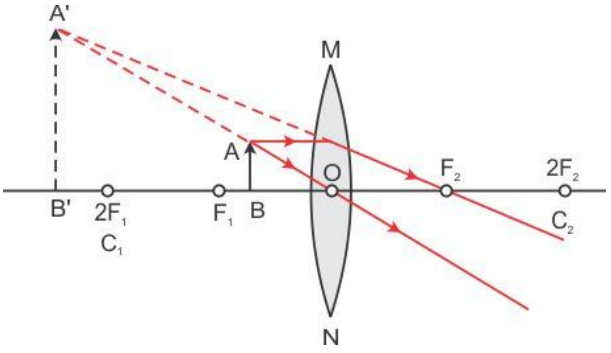
$$I = \frac{V}{R_{eq}}$$

$$\therefore I = \frac{6}{10.33} = 0.58 \text{ A}$$

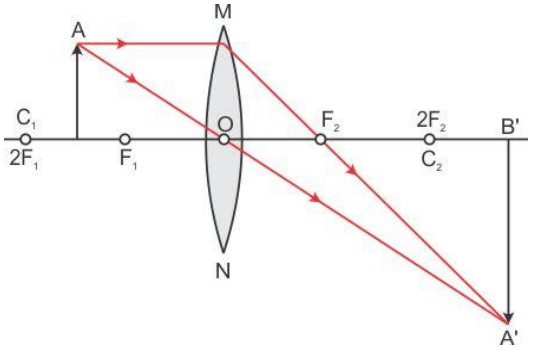
(iii) Voltage across the 7 Ω resistor is

$$V_7 = IR_7 = 0.58 \times 7 = 4.06 \text{ V}$$

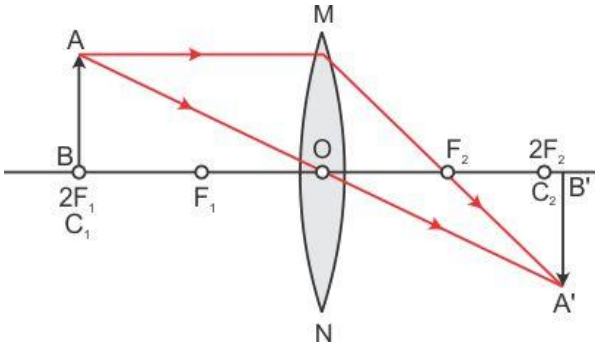
24. Between optical centre and principal focus (F)



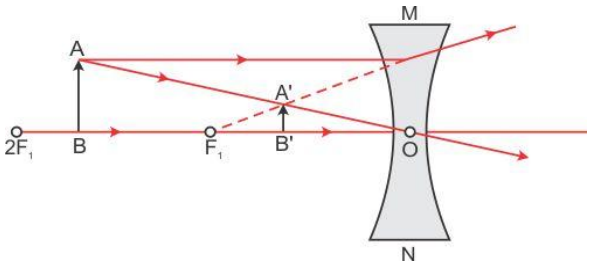
Between F and 2F



At 2F



For a concave lens, the image formed is virtual, erect and diminished for all distances between infinity and the optical centre. Hence, for cases (i) and (ii), the image will be virtual, erect and diminished.



CASE	CONVEX	CONCAVE
(i)	Virtual, erect and magnified	Virtual, erect and diminished
(ii)	Real, inverted and magnified	Virtual, erect and diminished

25. Photosynthesis occurs in two phases—light reaction and dark reaction.

Light Reaction:

This phase occurs in the thylakoids of the chloroplast. Various events occurring in photosynthesis:

- Absorption of light energy
- Splitting of water molecules into hydrogen and oxygen atoms
- Formation of ATP and $NADPH_2$

Dark Reaction:

This phase occurs simultaneously with the light-dependent reaction. In this phase, carbon dioxide is converted to glucose by using ATP and NADPH produced during the light reaction.

Factors which affect the rate of photosynthesis:

Light:

- Rate of photosynthesis increases when light gets brighter.
- Rate of photosynthesis increases linearly with increasing light intensity.

Carbon dioxide concentration:

- Increase in the concentration of carbon dioxide increases the rate of photosynthesis.
- Rate of photosynthesis increases linearly with increasing carbon dioxide concentration.
- Increased carbon dioxide concentration is beneficial for greenhouse crops such as tomatoes.

Temperature

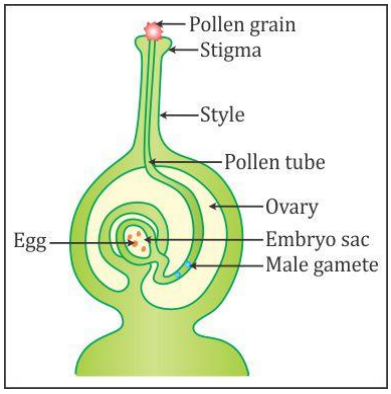
- Higher the temperature, greater is the rate of photosynthesis.
- Rate of photosynthesis slows down when the temperature is more than 40°C because the enzymes involved in the chemical reactions of photosynthesis are temperature sensitive and are destroyed at higher temperatures.

Water

- Water stress causes leaves to wilt, thereby reducing their surface area and metabolic activity.

26.

(a)



(b) The ovule becomes a seed, the ovary thickens to form a fruit and the zygote develops into the embryo of the seed.