

Kerala Board Class 10 Physics 2019

General Instructions to Candidates:

- There is 'cool-off time' of 15 minutes in addition to the writing time. Use this time to get familiar with questions and to plan your answers.
- Questions with different scores are given as distinct parts.
- Read the instructions carefully before answering the questions.
- Keep in mind the score and time while answering the questions.

Q1. What is the relationship between frequency and wavelength of a wave in a medium?

Solution:

Wave velocity = frequency \times wavelength

$$\text{Wavelength} = \frac{\text{Wave velocity}}{\text{Frequency}}$$

Thus in a particular medium since wave velocity is constant, wavelength is inversely proportional to the frequency.

Q2. Name the colour of light emitted when nitrogen is used in a discharge tube.

Solution:

Red light is emitted when nitrogen is used in the discharge tube.

Q3. What is the use of a watt hour meter in a household circuit?

Solution:

The use of a watt-hour meter in a household circuit is to record the electrical power consumed by a circuit in a certain time.

Q4. Write any one reason for global warming.

Solution:

Human activities such as deforestation and the burning of fossil fuels have increased the amount of greenhouse gases like CO_2 , methane etc in the atmosphere which leads to global warming.

Q5. Fill in the blanks.

Magenta + _____ \rightarrow white

Solution:

Green

Q6. Complete the table using the given statements associated with waves.

- (i) Particles vibrate in a direction parallel to the direction of propagation of the wave.
- (ii) Formed on the surface of solids and liquids.
- (iii) Crests and troughs are formed.
- (iv) Compressions and rarefactions are formed.

Longitudinal waves	Transverse waves

Solution:

Longitudinal waves	Transverse waves
Particles vibrate in a direction parallel to the direction of propagation of the wave.	Crests and troughs are formed.
Compressions and rarefactions are formed.	Formed on the surface of solids and liquids.

Q7. Correct the following statements by modifying the underlined words appropriately. If it is wrong.

(a) Heating coils are made up of materials having high resistivity and low melting point.

(b) In the incandescent lamps, vaporisation of filaments can be reduced by using hydrogen or nitrogen at low pressure.

Solution:

(a) Heating coils are made up of materials having high resistivity and high melting point.

(b) In the incandescent lamps, vaporisation of filaments can be reduced by using inert gases or nitrogen at low pressure.

Q8. In household electrical appliances three pin plugs are used to ensure safety.

(a) How is the earth pin different from the other pins?

(b) Which part of the equipment is connected to the earth line?

Solution:

(a) The earth pin is the thickest and longest in plugs. It connects first and disconnects last to ensure grounding before live connections, improving safety.

(b) The metallic frame or part of the equipment is connected to the earth line so that the fault current passes and flows to the earth in equipment fault conditions.

Q9. Explain the following experiences in everyday life on the basis of scientific principles involved.

(a) Propylene glycol is added to water when used as a coolant in the radiators.

(b) The blister caused by steam is said to be more severe than that caused by boiling water at the same temperature.

Solution:

(a) When propylene glycol is added to water, the boiling point increases. This mixture can absorb more heat from the engine, which is used in coolants.

(b) The blister caused by steam is said to be more severe than that caused by

boiling water at the same temperature because steam has more heat energy than water due to its latent heat of vaporization.

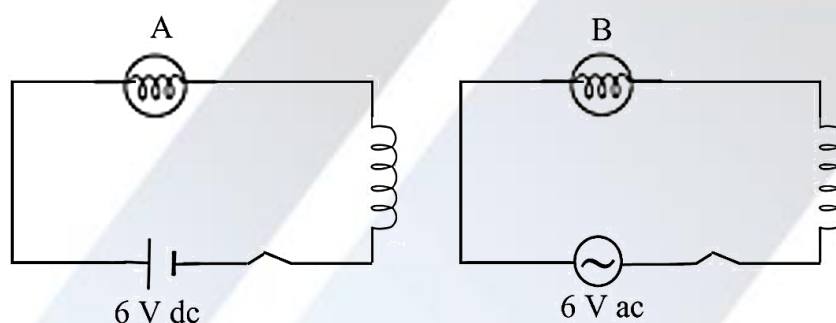
Q10. CNG and LNG are natural gases.

- (a) What are the main component of these gases?
- (b) Write any one merit of LNG over CNG.

Solution:

- (a) Methane is the main component of CNG and LNG.
- (b) LNG exists in liquid form which allows it to take up less storage space as compared to CNG and hence LNG can be transported conveniently.

Q11. Observe the given circuit diagrams and answer the questions. Identical coils and identical bulbs are used.



- (a) If switches are in ON position which bulb will be brighter? Why?
- (b) When a soft iron rod is inserted into the coils, what will be the change observed in the brightness of bulbs A and B?

Solution:

- (a) The bulb in the circuit A will be brighter as compared to the bulb in circuit B because when AC passes through the solenoid, an emf is induced in the solenoid due to changing magnetic field inside it. The induced emf is in direction opposite to the applied emf on the coil. The effective voltage in the circuit decreases and hence the brightness of the bulb decreases.

(b) When a soft iron core is introduced in a solenoid, the magnetic flux density linked with the solenoid increases. Hence, more emf will be induced in the opposite direction of applied emf on the coil. Therefore, the brightness of the bulb will decrease in circuit B. The brightness of the bulb in circuit A remains the same as DC cannot induce emf, and hence, there will be no effect of inserting a soft iron core in the coil.

Q12. (a) The input voltage of a transformer is 240 V AC. There are 80 turns in the secondary coil and 800 turns in the primary. What is the output voltage of the transformer?

(b) In which coil of the transformer thick wires are used?

Solution:

(a) If V_s is the secondary voltage, V_p is the primary voltage, N_s is the number of turns in the secondary coil and N_p is the number of turns in the primary coil then:

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

$$V_p = 240 \text{ V}$$

$$N_s = 80$$

$$N_p = 800$$

therefore,

$$V_s = \left(\frac{N_s}{N_p} \right) \times V_p$$

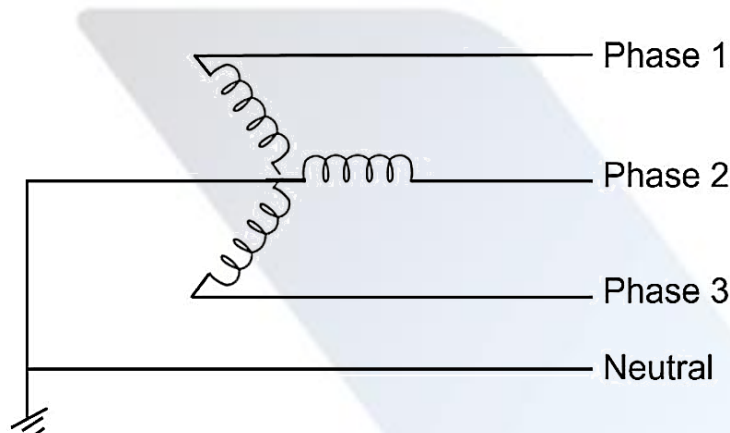
$$= \left(\frac{80}{800} \right) \times 240$$

$$= 24 \text{ V}$$

Therefore, output voltage = 24 V

(b) This transformer is a step-down transformer. For step-down transformers, the secondary coil has a lower voltage but a higher current. Thus, the thicker wire is used in the secondary coil to handle the higher current.

Q13. The following figure represents the configuration of the output lines in a distribution transformer.



- Give the name of this configuration.
- What is the potential difference between 2 phase lines?
- Why a person standing on the earth do not get electrocuted when he comes in contact with the natural line?

Solution:

- The wires are connected in star connection mode, hence this configuration is named as star connection.
- The potential difference between the two phase lines is 400 V.
- A person standing on the earth do not get electrocuted when he comes in contact with the neutral wire because the neutral wire is earthed. Therefore, the body of the person and neutral wire are at the same potential and hence no current flows through the person.

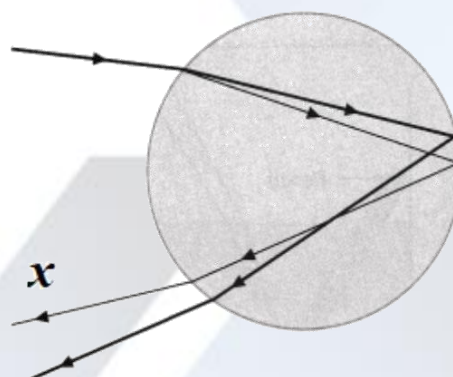
Q14. Describe an experiment to show the scattering of light according to the scheme given below.

- List the materials to be used.
- Write the procedure of the experiment.

Solution:

- (a) Glass vessel filled with water, sodium thiosulphate, hydrochloric acid, Torch, and Screen.
- (b) Water is taken in a beaker. Allow light from a torch to fall on the water from one side of the beaker. The light emerging from the beaker is focused on a white screen. Sodium thiosulphate is dissolved in water in the beaker. Add one or two drops of hydrochloric acid to the water in the beaker. Observe the gradual change in the colour of light in the solution and on the screen.

Q15. A ray diagram of the dispersion of sunlight by a droplet of water is given below.



- (a) What is the colour represented by X?
- (b) How many times does a ray of light undergo refraction when it passes through a water droplet?
- (c) Give an instance in which a rainbow is seen as a circle.

Solution:

- (a) The violet color is represented by X.
- (b) A ray of light undergoes refraction for two times when it passes through a water droplet.
- (c) The rainbow can be seen as a circle when viewed from an aircraft.

- Q16. (a) What is the difference between reverberation and echo?
- (b) Sound signal from a ship floating in water hits at the bottom of the sea and reflects back to the ship after 6 seconds. Speed of sound in water is 1500 m/s. Calculate the depth of the sea.
- (d) What is the minimum distance required to hear an echo in air?

Solution:

(a) Reverberation is the persistence of sound after the sound source has been stopped. It is due to multiple reflections of sound waves that can be perceived by the brain as a continuous sound. On the other hand, an echo occurs when a pulse of sound can be heard multiple times. It is due to single reflection of sound waves that can be perceived by the brain as separate events.

(b) Speed of sound in water (s) = 1500 m/s

Time taken by the sound signal to hit at the bottom of the sea and then reflect back

(t) = 6 seconds

Let ' d ' the Depth of the sea, then

$$S = \frac{2 \times d}{t}$$

Implies,

$$d = \frac{(S \times t)}{2}$$

$$d = \frac{1500 \times 6}{2}$$

$$d = 4500 \text{ m}$$

(c) Time taken to hear an echo (t) = 0.1 s,

Speed of sound in air (s) = 340 m/s

Let the minimum distance required to hear an echo is d , then

$$S = \frac{2 \times d}{t}$$

$$\Rightarrow d = \frac{340 \times 0.1}{2}$$

$$\Rightarrow d = 17 \text{ m}$$

Q17. A heat coil bearing a label 920 W, 230 V is connected to a 230 V supply.

- (a) Find out the current flowing through the heater.
- (b) Calculate the quantity of heat generated in 5 minutes.
- (c) How the power of the heater can be changed without altering its resistance?

Solution:

(a) Power of heater (P) = 920 W

Voltage supplied (V) = 230 V

Let ' I ' be current flowing through heater, then

$$P = V \times I$$

$$920 = 230 \times I$$

$$I = \frac{920}{230} = 4 \text{ A}$$

(b) Heat generated in 5 minutes:

$$\Rightarrow H = V \times I \times t$$

$$\Rightarrow H = 230 \times 4 \times 5 \times 60$$

$$\Rightarrow H = 276000 \text{ J}$$

(c) As the power of the heater = $V \times I$

And Resistance = V/I (ohm's law)

Hence, we can change the power of the heater by changing the working voltage and current flow such that their ratio (resistance) remains the same, and therefore power can be altered without changing resistance.

Q18. In summer season melting of glaciers leads to floods.

- (a) Glaciers do not melt as a whole at the same instant. Why?
- (b) What happens to the potential energy of the molecules of ice when ice melts. Explain why?

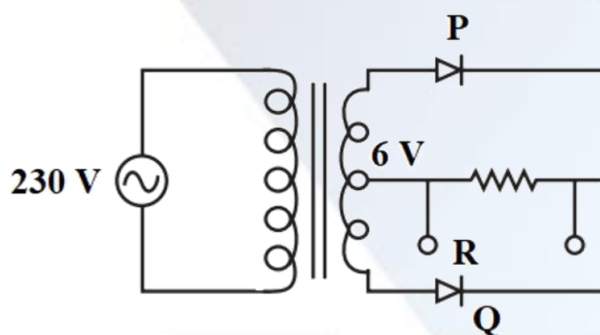
Solution:

(a) Glaciers do not melt as a whole at the same time because when the ice melts it absorbs a lot of heat called latent heat which makes the surrounding ice colder. So,

there is not enough temperature for further melting.

(b) When ice melts the potential energy of the molecules of ice increases. When a solid is changing into a liquid the entire heat energy absorbed is spent to separate the molecules. A change of state occurs because the molecules are moving apart. In other words there is an increase in the potential energy of the molecules.

Q19. Analyse the given circuit diagram of a full wave rectifier and answer the following questions.



- Identify the component labelled as Q.
- Draw the graphical representation of the output voltage-time of this rectifier.
- If the component 'Q' is removed from the circuit. What will be the output voltage-time graph? Why?

Solution:

- Diode
- The given rectifier is full-wave rectifier whose graphical representation of output voltage is as follows:



(c) If the component 'Q' is removed from the circuit, the circuit becomes a half-wave rectifier, which will allow only a positive half-cycle of the input AC voltage to pass and block the negative half-cycle. Hence, its output voltage-time graph is as follows:



- Q20. (a) Hydrogen having the highest calorific value but it is not used as a domestic fuel. Why?
 (b) Give an instance where hydrogen is used as a fuel.
 (c) Write any four properties of a good fuel.

Solution:

- (a) Hydrogen has the highest calorific value but is not used as a domestic fuel. This is because hydrogen is a highly flammable and explosive substance, and hence, it is difficult to store.
 (b) It is used as a fuel in rockets.
 (c) Properties of good fuel:
 (i) readily available
 (ii) low cost
 (iii) minimum atmospheric pollution
 (iv) a liquid fuel must not evaporate quickly at ordinary temperatures