ICSE Board
Physics
Sample Paper – 4

Time: 2 hrs **Total Marks: 75**

General Instructions:

1. ***All*** *questions are* ***compulsory****.*
2. *Questions 1 to 15 carry one mark each.*
3. *Questions in 2A and 2B carry one mark each.*
4. *Questions in 3A and 3B carry one mark each.*
5. *Question 4A and 4B carry five marks each.*
6. *Question 5A and 5B carry five marks each.*
7. *Question 6A and 6B carry five marks each.*
8. *Question 7A and 7B carry five marks each.*

Question 1

Choose the correct answer out of the four available choices given under each question. [15]

1. Which of the following is not a property of magnetic lines of force?
(a) Each line is a closed and continuous curve
(b) They originate at the North Pole
(c) They never intersect each other
(d) They are crowded near the centre of the magnet

2. A lightning streak is a type of
(a) Electric discharge
(b) Electrostatic repulsion
(c) Electrostatic attraction
(d) None of the above

3. If the density of an object is greater than the density of the liquid in which the body is kept, then the object will
(a) Float on liquid
(b) Sink in liquid
(c) Partially sink in liquid
(d) Can't predict on the basis of the density alone

4. The force of attraction between molecules of similar kind is called
(a) Force of adhesion
(b) Intramolecular force of repulsion
(c) Force of cohesion
(d) Intermolecular force of adhesion

5. The distance of the lens from the film of a camera can be changed by turning the
(a) Focusing ring
(b) Diaphragm
(c) Shutter
(d) View finder

6. The angle between the incident ray and the emergent ray of a prism is called
(a) Angle of emergence
(b) Angle of incidence
(c) Angle of deviation
(d) Angle of refraction

7. Which of the following feature does not hold true for a fuse?
(a) It has a low melting point
(b) It has high resistance
(c) It is used to break circuits when a large current flows
(d) It is used at the end of any household circuit

8. Which among these is not a type of coal?
(a) Bituminous
(b) Anthracite
(c) Asphalt
(d) Lignite

9. Which among these is not a non-renewable source of energy?
(a) Natural gas
(b) Biogas
(c) Forests
(d) Coal

10. The heat required to change the state of a substance without any change in temperature is
(a) Specific latent heat
(b) Specific heat capacity
(c) Thermal heat capacity
(d) State heat capacity

11. The image formed by a convex lens is observed to be virtual, erect and larger than the object. Hence, the position of the object should be
(a) Between the focus and the centre of curvature
(b) At the centre of curvature
(c) Beyond the centre of curvature
(d) Between the optical centre and the focus

12. Which among the following is not a natural satellite of any planet?

(a) Ceres
(b) Phobos
(c) Deimos
(d) Moon

13. Which among the following is not true for a transformer?

(a) A step-up transformer has more number of turns in the secondary coil
(b) A step-down transformer increases the input voltage
(c) A step-down transformer has more number of turns in the primary coil
(d) A step-up transformer increases the input voltage

14. The pressure inside a liquid

(a) Increases with a decrease in the depth
(b) Increases with an increase in the depth
(c) Decreases with an increase in the depth
(d) Remains the same

15. Halley's Comet was last seen in the year

(a) 1984
(b) 1996
(c) 1986
(d) 1990

Question 2

(A) Match the columns and rewrite them correctly. [5]

	Column A		**Column B**
1	Refraction through glass slab	1	Positive charge
2	Convex lens	2	Gaseous state to solid state
3	Sublimation	3	Angle of incidence = Angle of emergence
4	Glass rod	4	Natural magnet
5	Lodestone	5	Angle of incidence = Angle of refraction
		6	Magnifying glass
		7	Solid state to gaseous state
		8	Negative charge

(B) Fill up the blanks and rewrite the sentences: [5]

1. A _____ image is formed by a convex lens only if the object is placed between the focus and the optical centre of the lens.
2. We measure liquid pressure using a _____.
3. The direction of current can be detected using a _____.
4. The curvy shape of a liquid near the point of contact is called the _____ of the liquid.
5. The splitting of heavy nuclei into small nuclei is called _____.

Question 3

(A) State whether the following statements are True or False. Correct the false statement and rewrite it. [5]

1. A conductor will not experience any force if the direction of the magnetic field is perpendicular to the direction of current.
2. The first satellite launched by the U.S.A. was the Explorer.
3. The permanent image on the film of a camera is called a photograph.
4. If the relative density of substance A is 0.85 and that of B is 1.15, then substance A is denser than water and B is lighter than water.
5. Thicker the wire, greater is its resistance.

(B) Give reasons for the following. [5]

1. Meteors are also known as shooting stars.
2. Cold drinks are efficiently cooled by ice pieces at 0°C.
3. All bodies immersed in a given fluid do not experience the same buoyant force.
4. An ebonite rod rubbed with fur becomes negatively charged.
5. A normal eye cannot clearly see an object kept closer than 25 cm.

Question 4

(A)

1. Why is Pluto not a classical planet? [3]
2. How many calories are there in 2520 joules? [2]

(B)

1. Write the form of energy possessed by the body in the following situations: [2]
   (a) A coconut falling from a tree
   (b) An object raised to a certain height
   (c) Wind blowing in an area
   (d) A child driving a bicycle on a road

2. Answer the following: [3]
   (a) Mention the factors on which the direction of force experienced by a current carrying conductor, placed in a magnetic field, depends.
   (b) Under what condition is the force experienced by a current carrying conductor placed in a magnetic field maximum?
   (c) A proton beam is moving along the direction of a magnetic field. What force is acting on the proton beam?

Question 5

(A)

1. Can we recombine the seven spectral colors to obtain white light? Justify your answer. [2]
2. Explain how surface tension plays a role in the following examples: [3]
   (a) Insects walking on water
   (b) Working of a tent
   (c) Soaps and detergents

(B)

1. Draw a labeled diagram of a gold leaf electroscope. Explain any one of its functions. [3]

2. A fan of power 300 W is used for 510 minutes. Calculate the electrical energy consumed in joules. [2]

Question 6

(A)

1. Define the following: [2]
   (a) Focus of a concave lens
   (b) Radius of curvature of a lens

2. State the relation between the pressure and the depth h in a liquid of density d. What is the pressure at the bottom of a flask of height 40 cm containing water with density 1000 kgm^{-3}? [g = 9.8 ms^{-2}] [3]

(B)

1. Find the odd one out giving reasons. [2]
   (a) 1 light year, 1 year, 1 parsec, 1 kilometre
   (b) Corona, Photosphere, Umbra, Core

2. What is Joule's law of heating? An electric iron having resistance 100 Ω works for 30 minutes when a current of 2 A flows through it. What is the heat produced by the iron? [3]

Question 7

(A)

1. Write a short note on the human eye. [3]
2. State the properties of magnetic lines of force. [2]

(B)

1. A body of mass 200 g possesses 40 J of energy when placed at the top of a tower. How high is the tower? [g = 10 m/s^2] [2]
2. What is the principle of floatation? How is it utilised in submarines? [3]

Solution

Question 1

1. **(d)** They are crowded near the centre of the magnet
   The magnetic lines of force are crowded near the poles of a magnet as the field is strongest at the poles.

2. **(a)** Electric discharge
   When a charged cloud passes over a tall building or a tree, it induces an opposite charge on them. If the charge built up is large, it leads to an electric discharge in the form of a lightning streak.

3. **(b)** Sink in liquid
   Objects sink in a liquid if their density is greater than the density of the liquid in which they are kept.

4. **(c)** Force of cohesion
   The force of attraction between similar molecules is called the force of cohesion.

5. **(a)** Focusing ring
   The distance of the lens from the film of a camera can be changed by turning the focusing ring.

6. **(c)** Angle of deviation
   The angle between the incident ray and the emergent ray is called the angle of deviation.

7. **(d)** It is used at the end of any household circuit
   A fuse wire is always used at the beginning of a circuit so that if a large current flows the circuit, the fuse wire will melt and prevent any damage to an appliance. If it is connected at the end, the appliance will not be protected.

8. **(c)** Asphalt
   Coal is of mainly three types, viz. anthracite, bituminous and lignite. Asphalt is a product obtained after the refining of petroleum.

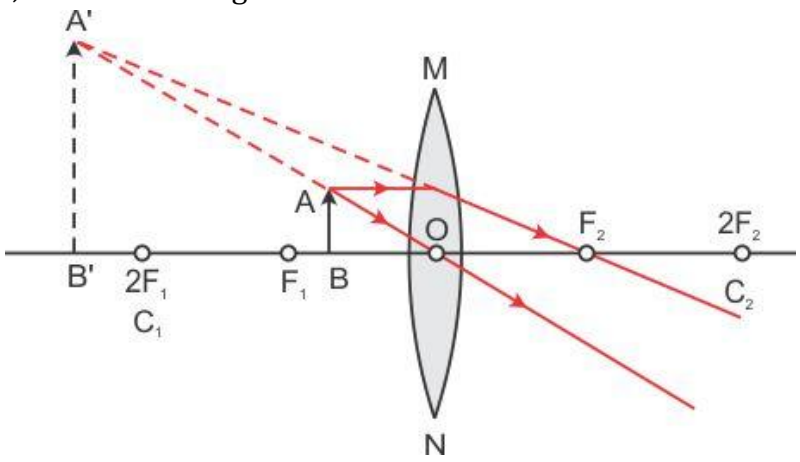
9. **(b)** Biogas
   Biogas is a renewable source of energy while the others are non-renewable sources of energy.

10. (a) Specific latent heat

The heat required by a unit mass of a substance to change its state without any rise in its temperature is known as specific latent heat.

11. (d) Between the optical centre and the focus

If the object is placed between the optical centre and the focus, then the image formed will be virtual, erect and enlarged.



12. (a) Ceres

Ceres is an asteroid in the asteroid belt. The Moon is the satellite of the Earth while Phobos and Deimos are satellites of Mars.

13. (b) A step-down transformer increases the input voltage

A step-down transformer is used to decrease the input voltage.

14. (b) Increases with an increase in the depth

The pressure inside a liquid increases with an increase in the depth, i.e. as one goes deeper inside a liquid, the pressure exerted by the liquid increases.

15. (c) 1986

Halley's Comet was last seen in the year 1986 and will reappear after 76 years.

Question 2

(A)

	Column A		**Column B**
1	Refraction through glass slab	1	Angle of incidence = Angle of emergence
2	Convex lens	2	Magnifying glass
3	Sublimation	3	Solid state to gaseous state
4	Glass rod	4	Positive charge
5	Lodestone	5	Natural magnet

(B)

1. A virtual image is formed by a convex lens only if the object is placed between the focus and the optical centre of the lens.
2. We measure liquid pressure using a manometer.
3. The direction of current can be detected using a galvanometer.
4. The curvy shape of a liquid near the point of contact is called the meniscus of the liquid.
5. The splitting of heavy nuclei into small nuclei is called nuclear fission.

Question 3

(A)

1. False. A conductor will not experience any force if the direction of the magnetic field is parallel to the direction of the current.
2. True.
3. False. The permanent image on the film of a camera is called a negative.
4. False. The relative density of substance A is less than water, and hence, it is lighter than water and substance B having a higher relative density is denser than water.
5. False. Thicker the wire, lesser is its resistance.

(B)

1. When meteors enter the Earth's atmosphere, they burn and evaporate due to the heat produced by friction. This makes the meteors luminous giving them the appearance of a star. Hence, meteors are also known as shooting stars.

2. Drinks are cooled more efficiently by ice pieces at 0°C and not by water at 0°C because 1 g of ice takes away 336 J of heat from the drink to melt into water at 0°C.

3. According to Archimedes' principle, bodies with different weight will displace different weight of the fluid. Hence, the buoyant force on different objects will be different in a given fluid.

4. When an ebonite rod is rubbed with fur, the fur loses its electrons to the ebonite rod because the electrons in the outermost orbit of the fur are loosely bound as compared to those in the ebonite rod. This causes an excess of electrons in the ebonite rod and it becomes negatively charged.

5. The maximum accommodation of a normal human eye is reached when the object is at a distance of 25 cm from the eye. The focal length of the eye cannot be decreased below this minimum limit. Thus, the eye is not able to see an object placed closer than 25 cm.

Question 4

(A)

1. A classical planet is a celestial body which:
   (a) Orbits around the Sun.
   (b) Has sufficient mass for its self quantity to pull it into a nearly spherical shape.
   (c) Has a clear neighbourhood around its orbit.
   Pluto fails to meet the third criterion as its oblong orbit overlaps the orbit of Neptune. Hence, it is no longer a classical planet and is now categorised as a dwarf planet.

2. We know that 1 calorie is equal to 4.2 joules.
   Hence, 1 joule will be equal to $1\text{ J} = \frac{1}{4.2}$ calories
   Therefore, 2520 joules will be equal to
   $2520\text{ J} = \frac{2520}{4.2} = 600$ calories

(B)

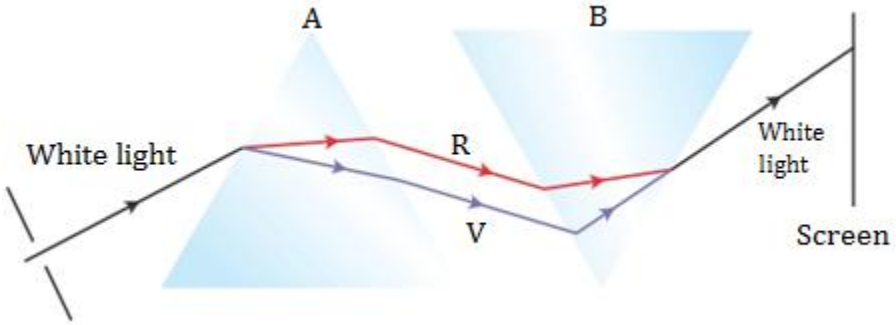
1. The form of energy possessed by the body is:
   (a) Kinetic as well as potential energy
   (b) Potential energy
   (c) Kinetic energy
   (d) Kinetic energy

2.
   (a) Factors on which the direction of force experienced by a current carrying conductor placed in a magnetic field depends are:
      (i) the direction of current, and
      (ii) the direction of the magnetic field
   (b) The force acting on a current carrying conductor placed in a magnetic field is maximum when the direction of the current is at right angles to the direction of the magnetic field.
   (c) As the proton beam moves parallel to the direction of the magnetic field, no force acts on it.

Question 5

(A)

1. Yes we can recombine the seven colors. A prism splits the white light into its seven constituent colours. When these colours fall on another prism placed in an inverted position with respect to the first, then the colours recombine and form white light.



2.

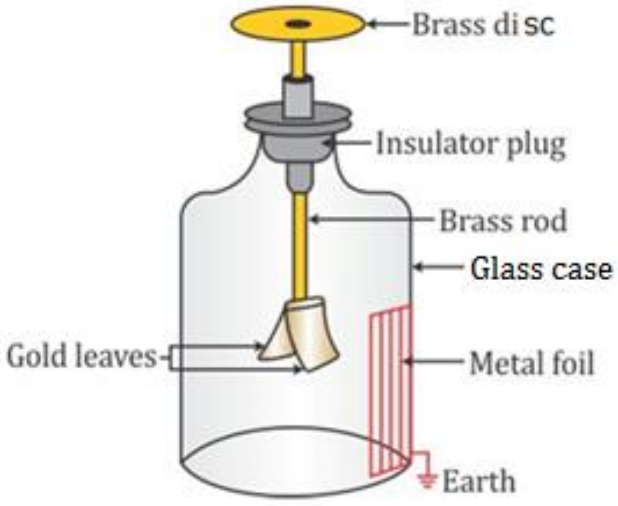
(a) Insects walking on water: Small insects such as the water strider are able to walk on water because their weight is not enough to break the surface tension of the water and penetrate the surface.

(b) Working of tent: The material of a tent is waterproof as the surface tension of water, bridges the pores in the finely woven material. However, when we touch the tent the surface tension breaks and water seeps through the material.

(c) Soaps and detergents: Cleaning clothes become easier with the help of soaps and detergents because they lower the surface tension of water enabling it to soak into pores and soiled areas of the clothes.

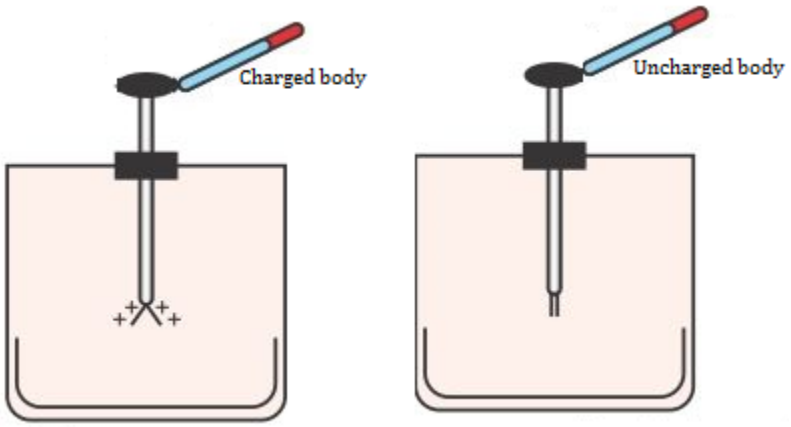
(B)

1. The labelled diagram of a gold leaf electroscope is shown below:



Function of a gold leaf electroscope:

Detection of a charge: The conductor is touched with the brass cap of the gold leaf electroscope. If the conductor is charged, then we observe that the gold leaves diverge. However, if the body is uncharged, then the leaves do not show any effect.



2. Given: Power of the fan is P = 300 W = 0.3 kW
   Time for which the fan is used is t = 510 minutes = 8.5 hours
   We know that energy consumed is given as
   $E = Pt$
   $\therefore E = 0.3 \times 8.5 = 2.55 \text{ kWh}$
   Now, we know that 1 kWh = 3.6×10^6 J
   So, we get
   $E = 2.55 \times 3.6 \times 10^6$
   $\therefore E = 9.18 \times 10^6 \text{ J}$

Question 6

(A)

1.

(a) Focus of a concave lens: For a concave lens, the rays of light incident parallel to the principal axis appear to diverge after refraction, from a point on the same side of the lens on the principal axis. This point is called the focus of the concave lens.

(b) Radius of curvature of a lens: It is the radius of the sphere of which, the surface of the lens is a part.

2. The pressure at a depth h in a liquid of density d is given as

   $P = hdg$ …… (1)

   Here, g is the acceleration due to gravity.

   Given: h = 40 cm = 0.4 m

   $d = 1000 \text{ kg m}^{-3}$

   $g = 9.8 \text{ m s}^{-2}$

   Therefore, the pressure at the bottom of the flask is given from equation (1) as

   $$P = hdg$$
   $$= 0.4 \times 1000 \times 9.8$$
   $$= 3920 \text{ Nm}^{-2}$$

(B)

1.

   (a) 1 year: 1 year is the unit of time and the others are various units of distance.

   (b) Umbra: Umbra is the dark shadow formed while the others are layers of the Sun.

2. According to Joule's law of heating, the amount of heat produced in a conductor is:

   (a) directly proportional to the square of the current I

   (b) directly proportional to the resistance of the conductor, and

   (c) directly proportional to the time during which the current flows.

   Therefore, according to Joule's law $H = I^2Rt$

   Given: R = 100 Ω; I = 2 A; t = 30 minutes = 30 × 60 = 1800 s

   According to Joule's law of heating, we get,

   $$H = I^2Rt$$
   $$= 2^2 \times 100 \times 1800$$
   $$= 7.2 \times 10^5 \text{ J}$$

Question 7

(A)

1. The human eye is like a camera. Its lens system forms an image on the light-sensitive screen called the retina.

   Light enters the eye through a thin membrane called the cornea. The cornea forms a transparent bulge on the front surface of the eyeball. The other important parts of the human eye are the iris, pupil, ciliary muscles, etc.

   The ability of the eye-lens to change the power of the lens to accommodate the near and far off distances is called the power of accommodation of the eye.

   For a normal human eye an object situated at a distance less than 25 cm is not visible clearly and this distance is called the least distance of distinct vision.

   There are two defects of the human eye: Myopia or short-sightedness and Hypermetropia or long-sightedness.

2. The magnetic lines of force has the following properties: (Any 4)
   (1) Each line is a closed and continuous curve.
   (2) They originate from the North Pole and terminate at the South Pole.
   (3) The magnetic lines never intersect each other.
   (4) They are crowded near the poles where the magnetic field is strong.
   (5) They affect the magnetic compass needle.

(B)

1. Given: PE = 40 J; m = 200 g = 0.2 kg; g = 10 m/s^2
   The potential energy possessed by a body of mass m at a height h is
   $$PE = mgh$$
   $$h = \frac{PE}{mg}$$
   $$= \frac{40}{0.2 \times 10}$$
   $$= 20 \text{ m}$$
   Hence, the height of the tower is 20 m.

2. According to the principle of floatation, a body floats in a liquid if the weight of the body is equal to the weight of the liquid displaced by it.

   A submarine is a ship which can float or submerge in water. It has ballast tanks in its basement. When the submarine is to be submerged, these tanks are filled with sea water. As a result the weight of the submarine becomes more than the weight of the water displaced by it, and hence, it gets submerged.

   When the submarine has to come up, the tanks are emptied out so that its weight becomes less than the weight of the water displaced by it. In this way the principle of floatation is utilised in the functioning of a submarine.