GRADE:-7 PHYSICS
CHAPTER-4 HEAT

Answer in short:

1) State any three effects of heat.

i) Change in temperature ii) Change in size of the body iii) Change in state.

2) State the factors that affect linear expansion of solids.

i) Original length of the solid ii) Increase in temperature iii) Nature of the solid.

3) Name the different modes of transfer of heat. Which is the fastest mode of transfer of heat?

Modes: i) Conduction ii) Convection iii) Radiation

Fastest mode: Radiation

4) Give reason for blackening the bottom of a cooking utensil while its upper part is kept shinning.

The base is made black to increase the intake of heat from the flame. The inside is kept shiny to minimize the loss of heat by radiation.

5) What is a liquid thermometer? Name the two most common used thermometric liquids.

Thermometers in which a liquid is used as the thermometric fluid.

Commonly used: i) Mercury ii) Alcohol

6) Write the reason for using alcohol in thermometers.

a) It expands and contracts more than mercury for the same rise or fall in temperature, thus making it more accurate than mercury thermometer.

b) It is transparent, but can be coloured brightly by adding a dye, so as to make it easily visible through the glass of the thermometer.

c) Its freezing point is - 100℃, so used to measure low temperature below - 39℃.

7) Write difference between conduction and convection.

Conduction	Convection
a) The process of transfer of heat energy in solids, from one particle to another, without the actual movement of the particles.	a) The mode of transfer of heat in fluids, wherein the molecules actually move from one part of the fluid to other.
b) The molecules in a solid are tightly packed but are free to vibrate.	b) Moles in solids are tightly packed, actual movement of molecules is not possible in solids. Hence, convection does not take place in solids.

Answer in detail:

1) Explain the anomalous expansion of water.

Most substances expand on heating and contract on cooling. However, water behaves slightly differently when cooled below 4℃. When hot water in cooled, it contracts till 4℃. But when cooled further, it starts expanding and hence, its density starts decreasing. Thus, the density of water is maximum at 4℃. This behaviour of water is known as anomalous expansion of water.

2) Explain that black bodies are better absorbers of heat than polished surfaces.

The amount of heat that an object absorbs by radiation depends on the colour of the object. Dark coloured objects absorb more heat radiation than light – coloured objects.

3) Write 2 applications of black and white surfaces.

a) Base of cooking utensils is made of black to increase the intake of heat from the flame. The inside is generally kept shiny to minimize the loss of heat by radiation.

b) People prefer wearing white or light coloured clothes during summer in order to stay cool. Wearing dark coloured clothes is preferred during winter to stay warm.

4) Describe the conduction of a thermos flask. Also draw the diagram of a thermos flask and label it.

Construction: It consists of a double walled glass or metal bottle. The narrow region between the inner and the outer walls is evacuated and sealed together at their necks or at the bottom. Walls are silvered. The vessel is put in metallic or plastic case and is separated from it by a cork or a

plastic piece to prevent it from breaking. The mouth of the vessel is closed by a stopper made from an insulating material. (Diagram from T.B)

Numerical:

1) Convert:

a) 65 ℉ ***into*** ℃

C= 5/9 (F – 32)
= 5/9 (65 – 32)
= 5/9 × 33
= 18.33 ℃

b) 37 ℃ ***into*** ℉

F = 9/5 × c + 32
= 9/5 × 37 + 32
= 66.6 + 32
= 98.6 ℉

c) 273 K into ℃

C = K – 273
= 273 – 273
= 0 ℃

4) 96 ℉ **into K**

C= 5/9 (F – 32)
= 5/9 (96 – 32)
= 5/9 (64)
= 35.55 ℃
K = C +273
= 35.55 + 273
= 308.55 K

2) The temperature of milk in a glass is 50℃**. Express this temperature in Fahrenheit and Kelvin scales.**

C = 50 ℃, F= ? , K =?

i) F = 9/5 × C + 32
= 9/5 × 50 + 32
= 90 + 32
= 122 ℉

ii) K = C + 273
= 50 +273 = 323 K

3) The temperature of water in a bucket is 40℃ **. Find its value in the SI unit.**

SI unit is Kelvin.

C = 40℃ , K = ?

K = C + 273 = 40 + 273 = 313 K

4) The average body temperature of a normal human body is 98.6℉**. A patient checks his body temperature, which reads 38**℃ **. Helps this patient to convert his body temperature in** ℉ **. Does he have fever?**

Average body temperature = 98.6 ℉

Temperature of patients body = 38 ℃

F = 9/5 × C + 32
= 9/5 × 38 + 32
= 68.4 + 32
= 100.4℉ ∴ Patient have fever.

5) At what temperature will the reading on the Fahrenheit scale be double of that on the Celsius scale?

Let C = x and F = 2x

C = 5/9 (F – 32)
X = 5 / 9 (2x – 32)
X = 10x/9 – 5 ×32 / 9
X – 10x / 9 = - 5 × 32 / 9
9x – 10x / 9 = - 5 × 32 / 9
-X = - 160
X = 160

The common temperature is 160 degree. i.e. 160 ℃ = 160 ℉

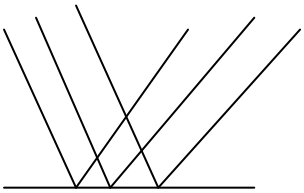
CHAPTER – 6 REFLECTION OF LIGHT – PLANE MIRRORS

Answer in detail:

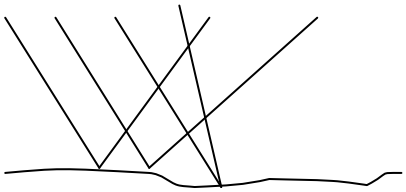
1) State the difference between regular reflection and diffused reflection.

Regular reflection	Diffused reflection

a) A parallel beam of light strikes a smooth & polished surface & all the light rays are reflected as a parallel beam of light in a definite direction.
b) Ex: Mirrors, still water surfaces, oiled surfaces and highly polished surfaces.
c) Formation of image is clear.
d)



a) A parallel beam of a light strikes a rough surface & the rays of light are reflected in different directions or the light rays get Scattered.
b) Wavy water surface, old chipped – off mirrors.
C) Formation of image is blurred.
d)



2) State any 3 uses of a plane mirror.

a) Looking glasses, b) Periscopes and kaleidoscopes, c) Optical instruments and devices, d) Box- type solar cookers, e) Display jewellery & wrist watches, f) Army personnel and scouts use for signalling, g) False dimensions to a small room.

3) State the characteristics of the image formed by a plane mirror.

a) Erect, b) Laterally inverted, c) Image is of same size as the object, d) Virtual, e) Image is as far behind the mirror as the object in front of it.

4) What is meant by lateral inversion of an image by a plane mirror?

The right of the object becomes the left of the image and vice versa. This behaviour of mirrors due to which sides of an object gets inverted is called lateral inversion.

5) Prove geometrically that the image formed in a plane mirror is at the same distance behind the mirror as the object in front of the mirror.

(Diagram from T.B)

a) Point object O placed in front of plane mirror strip MM'.
b) Let 2 rays of light OP & OQ travelling from point object & incident on the mirror at P and Q resp. & are reflected along PA & QB.
c) PN & QN' are the normals at P & Q resp.
d) As per law of reflection, angle of incidence i_1= angle of reflection r_1, & angle of incidence i_2= angle of reflection r_2.
e) If reflected rays PA and QB are produced backwards, they meet at a point I, behind the mirror.
f) This is the point where these rays seem to be coming from, or the point where image is formed.
g) As the reflected rays PA & QB do not actually meet at I but only appear to do so, image formed is virtual.
h) Draw a perpendicular from I to MM' at S & extend it to meet O.
i) Length of IS = Length of OS.
j) Image is formed as far behind the mirror as the object is in front of it.

6) Draw a well labelled diagram to show the working of periscope.

(Diagram from T.B)

Working:

a) It is used to see objects at a level below or above the observer's eye. It works on the principle of reflection from 2 parallel plane mirrors. The mirror facing the object receives the rays of light & reflects them to the second mirror. The ray of light gets reflected again by the second mirror & are directed towards the opening at the other end & reach the eyes of the observer. As the rays from the object are reflected twice from the two mirrors, image produced is without lateral inversion & virtual in nature.

7) Describe an experiment to show that the angle of incidence is equal to the angle of reflection.

(Diagram from T.B)

a) Place a plane mirror strip along AB & mark its mid–point as O. Draw a perpendicular ON at O.
b) Draw angle XON = 60 °.
c) Fix 2 pins P & Q on line XO, & it should be atleast 5 cm apart & in an upright position.
d) Looking into the mirror from the side of ON, fix 2 more pins R & S ,in such a way that pin R & S & the respective images of P & Q appear in the same straight line.
e) Remove mirror & pins. Join RS & produce line YO to meet AB at O.
f) Measure the angle YON & angle XON = angle YON.

CHAPTER - 8 ELECTRICITY

Answer in one or two words or a sentence.

1) What is the charge on an atom under ordinary circumstances?

The charge on an atom under ordinary circumstances is zero.

2) Define one ampere.

If one coulomb of charge flows past it in one second is called one ampere.

3) An atom gains some electrons from another. What will be the nature of charge on the gainer atom?

The nature of charge on the gainer atom will be negative.

4) Why free electrons called so?

Atoms of most metals contain very loosely bound negatively charged electrons in their outermost orbits. These electrons can be knocked out easily & are then called free electrons.

5) State an application of the magnetic effect of current.

Electric bells, telephones & electric cranes.

6) Name 2 applications that work on the principle of electromagnetism.

Microwave ovens, electric mixers, grinders, bread toasters, fans, blowers, TV, radio, motors, generators.

Answer in short:

1) Why are dry cells called so?

Dry cells are called so because the chemical stored in them are not in liquid form, but in the form of thick paste.

2) What do you understand by primary cells?

Cells that can be used only once are called primary cells.

3) What is meant by earthing of a electrical device?

Earthing is a safety technique used to prevent electric shocks due to leakage of current.

4) How is a short circuit caused?

Due to defective or loose connections or damaged wiring, the live & neutral wires may touch each other. As a result of which large current starts flowing in the circuit.

5) What is overloading of an electric circuit?

If too many devices connected to the same circuit are operated at the same time, the wires draw a much larger current from the mains that they can handle. This is called overloading.

6) Why are electromagnet also called temporary magnets?

Electromagnets are also called temporary magnets because the magnetic effect disappears as soon as the supply of electric current is removed.

Answer in detail:

1) Describe the construction of a dry cell.

(Diagram from T.B)

Constuction:

a) It consists of a zinc container that behaves as negative terminal of cell.
b) Carbon rod having brass cap is placed at the centres & behaves as the positive terminal of cell.
c) The space around the rod is filled with a mixture of manganese dioxide & powdered carbon in a muslin bag.
d) A moist paste of ammonium chloride & plaster of paris is used as the electrolyte.

e) The outer body of the zinc container, except the base in covered with a thick cardboard or plastic insulation.
f) Base is kept free for connections to be made with negative terminal of the cell.

2) Explain how we can get electricity from wind.

Wind possesses kinetic energy, which rotates the blades of windmills. As the blades rotate, kinetic energy is converted to electrical energy through a turbine.

3) What are the advantages of a parallel circuit over a series circuit?

The advantages of a parallel circuit over a series circuit are
a) Various devices connected can function independently.
b) If any of the devices is out of order, other devices continue to work.
c) Each appliance gets enough electrical energy & so works to its full capacity.

4) Compare the behaviour of appliances connected in a parallel circuit & a series circuit.

Parallel circuit	Series circuit
a) All devices work independently.	a) All devices work simultaneously.
b) If any one of the device is out of order, all other stops working.	b) If any one of the device is out of order, all other continue working.
c) All devices work to its full capacity	c) All devices do not work to its full capacity

5) Write 4 ways in which we can conserve electricity.

a) Switch off appliances when they are not in use.
b) Keep A.C. at 25℃ . Use timers to switch them off & turn the fan on to circulate the cold air.
c) Use solar panels to operate room coolers, water heaters etc.
d) Use CFL & LEDS.

6) What is electroplating? Why are articles electroplated?

a) The process of covering the surface of a metal object with a thin layer of another metal is called electroplating.
b) Articles are electroplated to prevent the articles from rusting or to make them look attractive.

7) How is a fuse connected in an electric circuit? What is its role?

a) A fuse is connected in series with a live wire.
b) Fuse protects an electric circuit or electrical appliances during
i) Overloading, ii) short circuit, iii) Fluctuation in current.

8) Describe the working of an electric fuse.

As soon as there is a overheating caused due to overloading, short circuit or fluctuation in electric current, the fuse wire melts & breaks the circuit.

9) Why is it possible to recharge a car battery?

It is possible to recharge a car battery because it is a secondary cell in which reverse chemical reactions take place when the electric current is passed & the original chemicals are restored.

Numerical:

1) A fan of 60 W runs for 75 hours in a month. How much electrical energy is consumed in a month?

Electrical energy consumed = P * t = 60 W * 75 hour = 4500 Wh = 4.5 kWh

2) An electric kettle rated at 2.2 kW works for 4 hours a day. Calculate the no. of units consumed by it in 20 days.

Energy consumed in 1 day = P * t = 2200 W * 4 hr = 8800 Wh = 8.8 kWh
Energy consumed in 20 days = 8800 Wh * 20 = 176000 Wh = 176 kWh

3) A heater is rated at 5 kW. Calculate the cost of energy consumed by it in 30 days. If it run for 2 hr daily. The cost of 1 kWh is Rs. 4.20.

Energy consumed in a day = P * t = 5 kW * 2 hr = 10 kWh
Energy consumed in 30 days = 10 kWh * 30 = 300 kWh
Cost of energy consumed = 300 * 4. 20 Rs. = 1260 Rs.

4) 5 bulbs of 80 W each, 2 fans of 100 W each, an electric motor of 3 kW & a geyser of 5 kW are used for 8 hours per day by a family. Calculate the total energy consumed in 30 days & the cost of electricity used in 30 days at the rate of Rs.5 per unit.

Total power = 5* 80 W + 2 * 100 W + 3000 W + 5000 W
= 400 W + 200 W + 3000W + 5000 W = 8600 W
Energy consumed in a day = 8600 W * 8 hour = 68800 Wh
Energy consumed in 30 days = 68800 Wh * 30 = 2064000 Wh
Cost of energy consumed = 2064 kwh * Rs.5 = 10320 Rs.

CHAPTER 7 REFLECTION OF LIGHT – SPHERICAL MIRRORS

1) Define focus of (a) a concave mirror (b) a convex mirror

a) Concave mirror – All rays of light parallel to the principal axis converge after reflection & meet at the principal focus. Due to this property concave mirrors are also known as converging mirrors.
b) Convex mirror - All rays of light parallel to the principal axis diverge after reflection & appear to come from the principal focus. Due to this property convex mirrors are also known as diverging mirrors.

2) The radius of curvature of a concave mirror is 16 cm. What is its focal length?

f = r/ 2 = 16 / 2 = 8 cm.

3) The focal length of a spherical mirror is 8 cm. What is its radius of curvature?

r = 2f = 2 * 8 = 16 cm.

4) The distance between the pole and the principal focus of a spherical mirror is 10 cm. What is the focal length of the mirror?

The distance between the pole & the principal focus is called focal length. Therefore, f = 10 cm.

5) State any 3 uses of concave mirrors.

a) Solar heater, b) As reflectors in headlights of automobiles, in searchlights, in floodlights & in torches, c) Dentists and doctors uses to see enlarged image of internal parts of body, d) Shaving mirror, e) Reflector- type telescopes.

6) Can a convex mirror form an image larger than the object?

No, a convex mirror cannot form an image larger than the object.

Answer in detail:

1) What do you mean by spherical mirror? Distinguish between a concave mirror and a convex mirror.

A mirror in which the reflecting surface is curved or spherical is called spherical mirror.

Concave mirror	Convex mirror
a) Inner surface is the reflecting surface.	a) Outer surface is the reflecting surface.
b) Outer surface is polished.	b) Inner surface is polished.
c) Image formed is real.	c) Image formed is virtual.
d) Image formed is inverted usually.	d) Image formed is erect.
e) Diagram from T.B	e) Diagram from T.B

2) Define:

a) Centre of curvature: The geometrical centre of the hollow sphere of which the spherical mirror is a part.
b) Pole: The geometrical centre of the spherical mirror**.**
c) Aperture: The area of the mirror from which reflection takes place.
d) Principal axis: The straight line passing through the pole & the centre of curvature of the spherical mirror.
e) Focal length: The distance between the pole & the principal focus.

3) State the rules for drawing ray diagrams for spherical mirror. Support them with ray diagrams.

(Diagram from T.B)

Rules:
a) Reflecting surface should always face towards the left side.
b) The object should always be kept perpendicular to the principal axis such that its foot touches the principal axis.

4) (a) Name the type of spherical mirror which always forms a virtual, erect & diminished image.

Convex mirror.

(b) What is the position of such type of images with respect to the mirror?

Behind the mirror i.e. between pole (P) & focal point (F).

c) Draw a ray diagram for the same.

(Diagram from T.B.)