

- An iron needle sinks in water whereas a ship made of iron floats on it because
  - the edge of the needle is pointed
  - the ship is flat
  - the ship is driven by powerful engine
  - specific gravity of the needle is greater than that of water displaced by it.
- The cloudy nights are warmer than clear nights because
  - clouds prevent escape of radiation of heat from the ground and the air.
  - absorb sunlight in the day and radiate the same in night.
  - clouds make the atmosphere damp and generate heat.
  - clouds obstruct the movement of air which creates heat.
- Food gets cooked faster in a pressure cooker because
  - water starts boiling at a lower temperature due to high pressure
  - water starts boiling at a higher temperature due to high pressure
  - water boils only at  $100^\circ\text{C}$  but the heat content is higher at high pressure
  - convection currents are set inside the cooker
- It is more comfortable to wear white cloths in summer because
  - they reflect heat falling on them.
  - they radiate heat transferred from the body.
  - they absorb perspiration.
  - they are soothing to the eye.
- Of the two bulbs in a house, one glows brighter than the other. Which of the following statements is correct?
  - The brightness does not depend on resistance.
  - Both the bulbs have the same resistance.
  - The brighter bulb has larger resistance.
  - The dimmer bulb has larger resistance.
- A fluorescent tube is preferred to an electric bulb because
  - it has a larger light emitting surface.
  - voltage fluctuations do not affect it.
  - in a tube electrical energy is almost converted into light.
  - None of these
- Consider the following statements in respect of a jet engine and a rocket:
  - A jet engine uses the surrounding air for its oxygen supply and so is unsuitable for motion in space.
  - A rocket carries its own supply of oxygen in the gas form as a fuel.
 Which of the above statement(s) is/are correct?
  - 1 only
  - 2 only
  - Both 1 and 2
  - Neither 1 nor 2
- The leaning tower of Pisa does not fall because
  - it is tapered at the top.
  - it covers a large base area.
  - its centre of gravity remains at the lowest position.
  - the vertical line through the centre of gravity of the tower falls within the base.
- Given below are two statements:  
**Assertion (A):** Universe is expanding.  
**Reason (R):** The result is based on red shift of spectra of galaxies.

## E-2 || Physics

## Codes:

- (a) Both A and R are true and R is the correct explanation of A.  
 (b) Both A and R are true, but R is not the correct explanation of A.  
 (c) A is true, but R is false.  
 (d) A is false, but R is true.
10. Electronic motors operating at low voltages tend to burn out because  
 (a) they draw more current which is inversely proportional to the voltage.  
 (b) they draw more current which is inversely proportional to the square root of the voltage.  
 (c) they draw heat proportional to  $V^2$ .  
 (d) low voltage sets in electrical discharge.
11. If the doors of a refrigerator are left open for a few hours, the room temperature will  
 (a) decrease  
 (b) increase  
 (c) remain the same  
 (d) decrease only in the area in the vicinity of the refrigerator
12. If a rock is brought from the surface of the moon to the earth, then  
 (a) its mass will change.  
 (b) its weight will change but not its mass.  
 (c) both mass and weight will change.  
 (d) both mass and weight will remain the same.
13. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	List-II
A. Wavelength	1. Hertz
B. Energy	2. Angstrom
C. Intensity of sound	3. Joule
D. Frequency	4. Decibel

## Codes:

- |     |   |   |   |   |
|-----|---|---|---|---|
|     | A | B | C | D |
| (a) | 2 | 3 | 4 | 1 |
| (b) | 1 | 2 | 3 | 4 |
| (c) | 2 | 3 | 1 | 4 |
| (d) | 2 | 1 | 3 | 4 |
14. Match List-I with List-II and select the correct answer with the help of codes given below:

List-I	List-II
A. Temperature	1. Kelvin
B. Power	2. Watt

- |             |           |
|-------------|-----------|
| C. Pressure | 3. Pascal |
| D. Force    | 4. Newton |

## Codes:

- |     |   |   |   |   |
|-----|---|---|---|---|
|     | A | B | C | D |
| (a) | 2 | 1 | 3 | 4 |
| (b) | 1 | 2 | 4 | 3 |
| (c) | 1 | 2 | 3 | 4 |
| (d) | 2 | 1 | 4 | 3 |
15. Which one of the following statements is not true about cosmic rays?  
 (a) They have very high frequency.  
 (b) They have very high wavelength.  
 (c) They are made of highly energetic charged particles.  
 (d) They originate from the sun.
16. Pendulum clocks become slow in summer because  
 (a) days in summer are large.  
 (b) of the friction in the coil.  
 (c) the length of the pendulum increases.  
 (d) the weight of the pendulum changes.
17. Consider the following statements and select the correct code:  
**Assertion (A):** A piece of ice added to the drink cools it.  
**Reason (R):** Ice takes latent heat from the drink for melting resulting in the cooling of the drink.

## Codes:

- (a) Both A and R are true, and R is the correct explanation of A.  
 (b) Both A and R are true, but R is not the correct explanation of A.  
 (c) A is true, but R is false.  
 (d) A is false, but R is true.
18. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	List-II
A. Revolver	1. Alfred Nobel
B. Dynamite	2. Pascal
C. Law of cooling	3. Colt
D. Law of pressure	4. Newton

## Codes:

	A	B	C	D
(a)	1	3	2	4
(b)	1	3	4	2
(c)	3	1	2	4
(d)	3	1	4	2

19. The atmosphere exerts enormous pressure on us. But, we don't feel it because
- our blood exerts a pressure slightly more than that of the atmosphere.
  - we are used to it.
  - our bones are very strong and can withstand the pressure.
  - the surface area of our head is very small.
20. Which one of the following statements is not true for a person suffering from hypermetropia?
- The person can see far objects distinctly.
  - The focal length of the lens is large.
  - The image of the close object is focussed behind the retina.
  - A concave lens is used to correct this defect.
21. Consider the following statements and select the correct answer using the codes given below:

**Assertion (A):** If ice collects on the freezer, the cooling in the refrigerator is affected adversely.

**Reason (R):** Ice is a poor conductor.

**Codes:**

- Both A and R are true, and R is the correct explanation of A.
  - Both A and R are true, but R is not the correct explanation of A.
  - A is true, but R is false.
  - A is false, but R is true.
22. The minimum height of a plane mirror to see the full size image of a person is equal to
- the height of the person
  - half the height of the person
  - one-fourth the height of the person
  - double the height of the person
23. Match List-I with List-II and select the correct answer from the codes given below the lists:

List-I	List-II
(Energy conversion)	(Device/process)
A. Heat to electrical	1. Car braking
B. Electric to sound	2. Nuclear reactor
C. Mass to heat	3. Loud speaker
D. Chemical to heat and light	4. Solar cell
	5. Fuel burning

**Codes:**

- |     |   |   |   |   |
|-----|---|---|---|---|
|     | A | B | C | D |
| (a) | 1 | 2 | 3 | 4 |
| (b) | 4 | 3 | 2 | 5 |
| (c) | 2 | 1 | 3 | 5 |
| (d) | 3 | 1 | 2 | 4 |
24. Magnetic resonance imaging is based on the phenomenon of
- nuclear magnetic resonance
  - electron spin resonance
  - electron paramagnetic resonance
  - diamagnetism of human tissues
25. A man is standing on a boat in still water. If he walks towards the shore, the boat will
- move towards the shore
  - move away from the shore
  - remain stationary
  - sink
26. An endoscope is used by a physician to view the internal parts of a body organ. It is based on the principle of
- refraction of light
  - reflection of light
  - total internal reflection of light
  - dispersion of light
27. A piece of ice is floating in a beaker containing water. When whole of the ice melts
- the level of water will come down.
  - the level of water will come up.
  - the level of water will first rise and then fall.
  - the level of water will remain the same.
28. A man inside a moving train tosses a coin, the coin falls behind him. The train is moving
- forward with a uniform speed
  - backward with a uniform speed
  - forward with deceleration
  - forward with acceleration
29. A fan produces a feeling of comfort during hot weather because
- fan supplies cool air
  - our body radiates more heat in air
  - conductivity of air increases
  - our perspiration evaporates rapidly
30. Rainbow is formed due to a combination of
- refraction and absorption
  - dispersion and diffraction
  - refraction and scattering
  - dispersion and total internal reflection

## E-4 || Physics

31. Consider the following statements and select the correct code.

**Assertion (A):** A diamond sparkles more than a glass imitation cut to the same shape.

**Reason (R):** The refractive index of diamond is less than that of glass.

**Codes:**

- (a) Both A and R are true, and R is correct explanation of A.
- (b) Both A and R are true, but R is not correct explanation of A.
- (c) A is true, but R is false.
- (d) A is false, but R is true.

32. Consider the following statements:

1. Two persons on the surface of moon cannot talk to each other.
2. Sound waves cannot travel through vacuum.
3. Speed of sound is greater in solid medium than in liquid or gas medium.

- (a) 3 alone is correct
- (b) 1 and 2 are correct
- (c) 1 and 3 are correct
- (d) 1, 2 and 3 are correct

33. Consider the following statements and select the correct code.

**Assertion (A):** The temperature of a metal wire rises when an electric current is passed through it.

**Reason (R):** Collision of metal atoms with each other releases heat energy.

**Codes:**

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true, but R is false.
- (d) A is false, but R is true.

34. Consider the following statements:

1. If a person looks at a coin which is in a bucket of water, the coin will appear to be closer than it really is.
2. If a person under water looks at a coin above, the water surface, the coin will appear to be at a higher level than it really is.

Which of the above statements is/are correct?

- (a) Both 1 and 2
- (b) 1 alone
- (c) 2 alone
- (d) Neither 1 nor 2

35. Consider the following statements and select the correct code.

**Assertion (A):** A stick is dipped in water in a slanting position. If observed sideways, the stick appears short and bent at the surface of water.

**Reason (R):** The light coming from the stick undergoes scattering from water molecules giving the stick a short and bent appearance.

**Codes:**

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true, but R is false.
- (d) A is false, but R is true.

36. Consider the following statements and select the correct code.

**Assertion (A):** A piece of copper and a piece of glass are heated to the same temperature. When touched, thereafter, the copper piece appears hotter than the glass piece.

**Reason (R):** The density of copper is more than that of glass.

**Codes:**

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true, but R is false.
- (d) A is false, but R is true.

37. Consider the following natural phenomena:

1. Terrestrial heating
2. Reflection of light
3. Refraction of light
4. Diffraction of light

Due to which of these phenomena is mirage formed?

- (a) 1 and 2
- (b) 2, 3 and 4
- (c) 1 and 3
- (d) 4 only

38. Consider the following statements:

1. Light of longer wavelength is scattered much more than the light of shorter wavelength.
2. The speed of visible light in water is 0.95 times the speed in vacuum.
3. Radio waves are produced by rapidly oscillating electrical currents.

4. To detect the overspeeding of vehicles, police use the Doppler effect to reflected short radio waves.  
Which of these statements are correct?  
(a) 1 and 2 (b) 1 and 3  
(c) 2 and 4 (d) 3 and 4
39. A hydrogen-inflated polythene balloon is released from the surface of the earth. As the balloon rises to an altitude up in the atmosphere, it will  
(a) decrease in size  
(b) flatten into a disc-like shape  
(c) increase in size  
(d) maintain the same size and shape
40. An oil tanker is partially filled with oil and moves forward on a level road with uniform acceleration. The free surface of oil then  
(a) remains horizontal.  
(b) is inclined to the horizontal with smaller depth at the rear end.  
(c) is inclined to the horizontal with larger depth at the rear end.  
(d) assumes parabolic curves.
41. Which one of the following statements is NOT correct?  
(a) The velocity of sound in air increases with the increase of temperature.  
(b) The velocity of sound in air is independent of pressure.  
(c) The velocity of sound in air decreases as the humidity increases.  
(d) The velocity of sound in air is not affected by the change in amplitude and frequency.
42. Consider the following statements and select the correct code.  
**Assertion (A):** In our houses, the current in A.C. electricity line changes direction 60 times per second.  
**Reason (R):** The frequency of alternating voltage supplied is 50 Hz.
- Codes:**  
(a) Both A and R are correct and R is the correct explanation of A.  
(b) Both A and R are correct, but R is not the correct explanation of A.  
(c) A is true, but R is false.  
(d) A is false, but R is true.
43. Consider the following statements:  
1. If magenta and yellow-coloured circles intersect, the intersected area will have red colour.  
2. If cyan and magenta coloured circles intersect, the intersected area will have blue colour.  
Which of the statement(s) given above is/are correct?  
(a) 1 only (b) 2 only  
(c) Both 1 and 2 (d) Neither 1 nor 2
44. Consider the following statements:  
1. A flute of smaller length produces waves of lower frequency.  
2. Sound travels in rocks in the form of longitudinal elastic waves only.  
Which of the statement(s) given above is/are correct?  
(a) 1 only (b) 2 only  
(c) Both 1 and 2 (d) Neither 1 nor 2
45. Match List-I with List-II and select the correct answer from the codes given below:
- | <b>List-I</b>       |                                 | <b>List-II</b> |  |
|---------------------|---------------------------------|----------------|--|
| A. Acceleration     | 1. Jule                         |                |  |
| B. Electric current | 2. Newton second                |                |  |
| C. Work done        | 3. Newton                       |                |  |
| D. Impulse          | 4. Metre per sec <sup>2</sup> . |                |  |
- Codes:**
- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 2 | 3 | 4 |
| (b) | 2 | 3 | 4 | 1 |
| (c) | 4 | 3 | 1 | 2 |
| (d) | 3 | 4 | 1 | 2 |
46. Match List-I with List-II and select the correct answer using the codes given below:
- | <b>List-I</b> |                          | <b>List-II</b> |  |
|---------------|--------------------------|----------------|--|
| A. Joule      | 1. Henery-ampere/sec     |                |  |
| B. Watt       | 2. Farad-volt            |                |  |
| C. Volt       | 3. Coloumb-volt          |                |  |
| D. Coulomb    | 4. Orested-cm            |                |  |
|               | 5. Amp-gauss             |                |  |
|               | 6. Amp <sup>2</sup> -ohm |                |  |



## E-6 || Physics

## Codes:

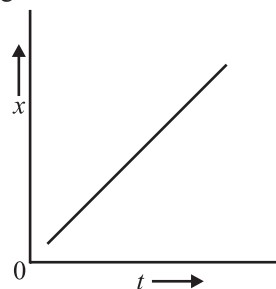
- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 6 | 5 | 4 |
| (b) | 3 | 6 | 1 | 2 |
| (c) | 3 | 6 | 1 | 5 |
| (d) | 2 | 6 | 1 | 3 |
47. Which of the following statements are true regarding heat?
- Heat is a form of energy.
  - Heat can be reflected by mirror.
  - Heat is an electromagnetic radiation.
  - Heat cannot pass through a vacuum.
- Select the correct answer from the codes given:
- (a) 1, 2 and 3                      (b) 2, 3 and 4  
(c) 1, 2 and 4                      (d) 1, 3 and 4
48. Ultrasonic waves are used for stirring liquid solutions because they
- do not produce noise during the operation
  - are easy to produce
  - can produce perfectly homogeneous solution
  - do not produce chemical reactions in the solution
49. According to the modern theory of nature of light, the light has
- wave nature only
  - particle nature only
  - both wave and particle (dual) nature
  - neither particle nature nor wave nature
50. According to Coulomb's law, the electrostatic force between two charges is
- inversely proportional to the product of the charges
  - inversely proportional to the square of the distance between the charges
  - directly proportional to the cube of the distance between charges
  - none of these
51. What is the difference between a CFL and an LED lamp?
- To produce light, a CFL uses mercury vapour and phosphorus while an LED lamp uses semiconductor material.
  - The average lifespan of a CFL is much longer than that of LED lamp.
  - A CFL is less energy - efficient as compared to an LED lamp.

Which of the statement(s) given above is/are correct?

- 1 only
  - 2 and 3
  - 1 and 3
  - 1, 2 and 3
52. Heavy water is used as a moderator in a nuclear reactor. The function of the moderator is
- to control the energy released in the reactor.
  - to absorb neutrons and stop the chain reaction.
  - to cool the reactor.
  - to slow down the neutrons.
53. What does the term Dolby B or Dolby C printed on tape recorders and other sound systems refer to?
- frequency modulated system
  - amplitude modulated system
  - noise reduction circuit
  - both DC and AC power can be used
54. A man inside an artificial satellite feels weightlessness because the force of attraction due to earth is
- zero
  - balanced by the force of attraction due to moon
  - equal to centripetal force
  - non-effective due to particular design of the satellite
55. A liquid drop tends to assume a spherical shape because of
- surface tension
  - viscous force
  - gravitational force
  - centrifugal force
56. The freezer in a refrigerator is located at the top section so that
- the entire chamber of the refrigerator is cooled quickly due to convection.
  - the motor is not heated
  - the heat gained from the environment is high
  - the heat gained from the environment is low
57. Consider the following statements and select the correct code.
- Assertion (A):** The velocity of sound in air increased due to the presence of moisture in it.
- Reason (R):** The presence of moisture in air lowers the density of air.

**Codes:**

- (a) Both A and R are true and R is the correct explanation of A.  
 (b) Both A and R are true, but R is not the correct explanation of A.  
 (c) A is true, but R is false.  
 (d) A is false, but R is true.
58. Which of the following properties is not possible in case of X-rays?  
 (a) Interference  
 (b) Diffraction  
 (c) Polarisation  
 (d) All of the above
59. Which of the following is not correctly matched?  
 (a) Voltmeter — Potential difference  
 (b) Ammeter — Electric current  
 (c) Potentiometer — E.M.F.  
 (d) Galvanometer — Electric resistance
60. If alpha, beta and gamma rays carry same momentum, which has the longest wavelength?  
 (a) Alpha rays  
 (b) Beta rays  
 (c) Gamma rays  
 (d) None, all have same wavelength
61. Consider the following statements :  
 The fraction of a ball floating inside the liquid depends upon  
 1. density of the liquid  
 2. mass of the ball  
 3. density of the ball  
 Which of the statements given above are correct?  
 (a) 1 and 2 only (b) 2 and 3 only  
 (c) 1 and 3 only (d) 1, 2 and 3
62. When a ship floats on water  
 (a) it displaces no water  
 (b) the mass of water displaced is equal to the mass of the ship  
 (c) the mass of water displaced is lesser than the mass of the ship  
 (d) the mass of water displaced is greater than the mass of the ship
63. Consider the following statements. Work is not done, when:  
 1. a man is walking on a horizontal road.  
 2. a man is climbing up a hill.  
 3. a man with a load on his head is walking on a horizontal road.  
 4. moon is revolving round the earth.  
 Which of the statements given above are correct?  
 (a) 1 and 3 only (b) 1 and 4 only  
 (c) 2, 3 and 4 (d) 1, 3 and 4
64. Consider the following statements:  
 A body weighs less at the equator than at the poles because:  
 1. earth rotates about its axis.  
 2. the ice cap at the poles increases gravitational pull.  
 3. equatorial diameter is greater than the polar diameter.  
 4. of some unknown facts.  
 Which of the statements given above is/are incorrect?  
 (a) 1 and 2 (b) 3 only  
 (c) 1 and 3 (d) 4 only
65. What is the correct sequence in which the lengths of the following units increase?  
 1. Angstrom  
 2. Micron  
 3. Nanometer  
 Select the correct answer using the codes given below:  
 (a) 1, 2, 3 (b) 3, 1, 2  
 (c) 1, 3, 2 (d) 2, 3, 1
66. The position– time ( $x - t$ ) graph for motion of a body is given below:



Which one among the following is depicted by the above graph?

- (a) Positive acceleration  
 (b) Negative acceleration  
 (c) Zero acceleration  
 (d) None of the above

## E-8 || Physics

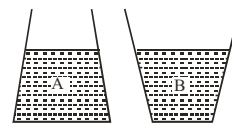
67. Consider the following statement:  
The principle of total internal reflection is applicable to explain the
1. Formation of mirage in desert.
  2. Formation of image in microscope.
  3. Colour of evening sky.
  4. Operation of optical fibres.
- Which of the statement given above are correct?
- (a) 1 and 4                      (b) 3 and 4  
(c) 2 and 3                      (d) 1 and 2
68. Which of the following statements is/are true regarding a light wave travelling from air to glass?
1. Its frequency remains unchanged.
  2. Its speed changes.
- Select the correct answer using the codes given below:
- (a) 1 only                      (b) 2 only  
(c) Both 1 and 2              (d) Neither 1 nor 2
69. Refractive index of an optical medium changes with
1. the nature of the medium.
  2. the change in the angle of incidence of the ray.
  3. colour of the incident ray.
- Select the correct answer using the code given below:
- (a) 1 and 3 only              (b) 2 and 3 only  
(c) 1 and 2 only              (d) 1, 2 and 3
70. Consider the following statements :
- Hypermetropia is a defect of vision in which
1. a person cannot see the distant objects clearly.
  2. a person cannot see the near objects clearly.
  3. the near point of the eye gets shifted away from the normal position.
  4. the far point of the eye gets shifted towards the eye.
- Which of the statements given above are correct?
- (a) 1 and 3                      (b) 2 and 4  
(c) 1 and 4                      (d) 2 and 3
71. Consider the following statements :
1. The magnetic pole in the northern hemisphere is the north magnetic pole.
  2. At all points on a magnet, an iron bar gets attracted.
- Which one of the following statements given above is/are correct ?
- (a) 1 only                      (b) 2 only  
(c) Both 1 and 2              (d) Neither 1 nor 2
72. Consider the following statements:  
Heat produced in a conductor carrying current is independent of
1. Current passing through it.
  2. Thermal conductivity.
  3. Specific resistance.
- Which of the statement given above is/are correct?
- (a) 1 and 3                      (b) 2 only  
(c) 1 and 2                      (d) 2 and 3
73. Match List I with List II and select the correct answer using the code given below:
- | <b>List I<br/>(Magnet)</b> | <b>List II<br/>(Property)</b>      |
|----------------------------|------------------------------------|
| A. Artificial magnet       | 1. Long lived                      |
| B. Permanent magnet        | 2. Last for infinitely long period |
| C. Temporary magnet        | 3. Short lived                     |
| D. Earth as a magnet       | 4. Induced magnet                  |
- Codes:**
- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 1 | 4 | 2 |
| (b) | 3 | 4 | 1 | 2 |
| (c) | 2 | 1 | 4 | 3 |
| (d) | 2 | 4 | 1 | 3 |
74. Consider the following statements :
1. If a piece of bar magnet is broken into two equally long pieces, the pieces will not lose the magnetic properties.
  2. Magnetic properties of a substance lie in the atomic level.
- Which of the statements given above is/are correct ?
- (a) 1 only                      (b) 2 only  
(c) Both 1 and 2              (d) Neither 1 nor 2
75. Consider the following statements:
1. The gravitational force exerted by the sun on the moon is greater than the gravitational force exerted by the earth on the moon.
  2. A heavy body falls at a faster rate than a light body in vacuum.
- Which of the following statements given above is/are correct ?
- (a) 1 only                      (b) 2 only  
(c) Both 1 and 2              (d) Neither 1 nor 2



76. During a thunderstorm, the thunder in the sky is produced by the
1. meeting of cumulonimbus clouds in the sky
  2. lightning that separates the nimbus clouds
  3. violent upward movement of air and water particles

Select the correct answer using the codes given below.

- 1 only
  - 2 and 3
  - 1 and 3
  - None of the above produces the thunder
77. Choose the incorrect option ?
- (a) A bulb in an electric circuits glows due to heating effect of current.
  - (b) Tin cans, used for storing food are made by electroplating tin on to iron
  - (c) When the cells are connected in series, the resultant voltage is equal to sum of the individual voltage of the cells
  - (d) None of these
78. A car is moving on a road and rain is falling vertically. Select the correct answer
- (a) The rain will strike the wind screen only
  - (b) The rain will strike the front screen only
  - (c) The rain will strike both the screens
  - (d) The rain will not strike any of the screens
79. What happens when a heavy object and a light object are allowed to fall from the certain height in the absence of air
- (a) heavy object reaches the ground later than the lighter object
  - (b) lighter object reaches the ground later than the heavier object
  - (c) both heavy and light objects reach the ground simultaneously
  - (d) none of these
80. A ball is dropped from a satellite revolving around the earth at a height of 120 km. The ball will
- (a) continue to move with same speed along a straight line tangentially to the satellite at that time
  - (b) continue to move with the same speed along the original orbit of satellite
  - (c) fall down to earth gradually
  - (d) go far away in space
81. Consider the following statements :
- (1) For a spherically symmetric earth, the acceleration due to gravity should be about the same at the equator and at the poles.
  - (2) If earth suddenly stops rotating about its axis, then the value of  $g$  will be same at all the places.
- Which of these statement(s) is/are correct ?
- (a) (1) only
  - (b) (2) only
  - (c) Both (1) and (2)
  - (d) Neither (1) nor (2)
82. Two vessels A and B of cross-sections as shown in figure contain a liquid up to the same height. As the temperature rises, the liquid pressure at the bottom (neglecting expansion of the vessels) will



- (a) increase in A, decrease in B
  - (b) increase in B, decrease in A
  - (c) increase in both A and B
  - (d) decrease in both A and B
83. A : At high altitude regions the cooking of food becomes difficult.  
B : Water boils at lower temperature when the pressure is low.
- (a) Both A and B are wrong
  - (b) A and B are correct and B is not the correct explanation of A
  - (c) A and B are correct and B is the correct explanation of A
  - (d) A is correct but B is wrong.
84. When a sound wave goes from one medium to another, the quantity that remains unchanged is
- (a) Frequency
  - (b) Amplitude
  - (c) Wavelength
  - (d) Speed
85. Choose the incorrect statement ?
- (a) Light from sun takes nearly eight minutes 20 seconds to come to earth.
  - (b) For a convex lens, if the object is placed between the focus and optical centre then the image formed will be magnified
  - (c) For a convex lens, if the object is placed between the focus and optical centre then the image formed will be diminished
  - (d) Cinematography makes use of persistence of vision.

## E-10 || Physics

86. Consider the following statements :
- (1) A light and a heavy body, having equal momenta, have equal kinetic energies.
  - (2) The total energy of a body in motion is equal to the work it can do in being brought to rest.
  - (3) A body cannot have momentum when its energy is zero.
- Which of these statement(s) is/are correct ?
- (a) (1) and (2)                      (b) (2) and (3)
  - (c) Only (2)                        (d) Only (3)
87. Which of the following are true about speed of sound?
- (i) Sound propagates through a medium at a finite speed.
  - (ii) The speed of sound decreases when we go from solid to gaseous state.
  - (iii) Speed of sound increases with increase in temp.
- (a) only (i)                        (b) (i) & (iii)
  - (c) (i), (ii) & (iii)            (d) (i) & (ii)
88. The sun is seen before the actual sunrise because of .....
- (a) reflection
  - (b) refraction
  - (c) scattering of light
  - (d) rectilinear propagation of light
89. What is the reason to pivot the compass needle on a sharp pin?
- (a) To minimise the magnetic effect on the pin
  - (b) To maximize the magnetic effect on the pin
  - (c) To minimize the friction between the pin and the compass needle
  - (d) To ensure that the compass needle will not drop from the pivoted point
90.                      Column I                      Column II
- |                          |  |
|--------------------------|--|
| (A) Radioactivity        | (p) Emission of electrons from metals  |
| (B) Photoelectric effect | (q) Atom bomb                          |
| (C) Nuclear fusion       | (r) Spontaneous emission of radiations |
| (D) Nuclear fission      | (s) Hydrogen bomb                      |
- (a) A - (p); B - (r); C - (q); D - (s)
  - (b) A - (q); B - (p); C - (r); D - (s)
  - (c) A - (s); B - (r); C - (q); D - (p)
  - (d) A - (r); B - (p); C - (s); D - (q)
91. Two spheres of same size are made of the same metal but one is hollow and the other is solid. They are heated to same temperature, then
- (a) both spheres will expand equally
  - (b) hollow sphere will expand more than the solid one
  - (c) solid sphere will expand more than the hollow one
  - (d) none of the above
92. A car is moving on a circular path and takes a turn. If  $R_1$  and  $R_2$  be the reaction on the inner and outer wheels respectively, then
- (a)  $R_1 = R_2$                       (b)  $R_1 < R_2$
  - (c)  $R_1 > R_2$                       (d)  $R_1 \geq R_2$
93. An astronaut orbiting the earth in a circular orbit 120 km above the surface of earth, gently drops a spoon out of the space ship. The spoon will
- (a) fall vertically down to the earth
  - (b) move towards the moon
  - (c) will move along with the space ship
  - (d) will move in an irregular way and then fall down to earth
94. Which of the following describes the energy changes takes place when a steam engine drives a generator which lights a lamp?
- (a) Heat  $\rightarrow$  Kinetic  $\rightarrow$  Electricity  $\rightarrow$  Heat and light
  - (b) Heat  $\rightarrow$  Sound  $\rightarrow$  Kinetic  $\rightarrow$  Electricity
  - (c) Heat  $\rightarrow$  Light  $\rightarrow$  Sound  $\rightarrow$  Kinetic
  - (d) Kinetic  $\rightarrow$  Light  $\rightarrow$  Heat  $\rightarrow$  Electricity
95. If a liquid is heated in space under no gravity, the transfer of heat will take place by process of
- (a) conduction
  - (b) convection
  - (c) radiation
  - (d) cannot be heated in the absence of gravity
96. A plane mirror is approaching you at a speed of 10 cm/s you can see your image in it. At what speed will your image approach you?
- (a) 10 cm/s                        (b) 5 cm/s
  - (c) 20 cm/s                        (d) 15 cm/s
97. A watch shows time as 3 : 25 when seen through a mirror, time appeared will be
- (a) 8 : 35                        (b) 9 : 35
  - (c) 7 : 35                        (d) 8 : 25

98. Consider the following statements and select the correct code.

**Assertion (A) :** Small glass beads fixed on traffic signals glow brightly when light falls upon them.

**Reason (R) :** Light is totally reflected when the angle of incidence exceeds a certain critical value and light travelling in a denser medium is reflected from a rarer medium.

Codes :

- (a) Both A and R are true and R is the correct explanation of A
  - (b) Both A and R are true but R is not a correct explanation of A
  - (c) A is true but R is false
  - (d) A is false but R is true
99. Suppose a rocketship is receding from the earth at a speed of  $\frac{2}{10}$  th the velocity of light. A light in the rocketship appears blue to the passengers

on the ship. What colour would it appear to an observer on the earth?

- (a) Blue
- (b) Orange
- (c) Yellow
- (d) Yellow-orange

100. Consider the following statements and select the correct code.

**Assertion (A) :** A jet aircraft moving at Mach Number equal to 1 travels faster at an altitude of 15 km than while moving at Mach Number equal to 1 near the sea level.

**Reason (R) :** The velocity of sound depends on the temperature of the surrounding medium.

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not a correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

## ANSWER KEY

1.	(d)	14.	(c)	27.	(d)	40.	(c)	53.	(c)	66.	(c)	79.	(c)	92.	(b)
2.	(a)	15.	(b)	28.	(d)	41.	(c)	54.	(a)	67.	(a)	80.	(b)	93.	(c)
3.	(a)	16.	(c)	29.	(d)	42.	(d)	55.	(a)	68.	(c)	81.	(b)	94.	(a)
4.	(a)	17.	(a)	30.	(b)	43.	(c)	56.	(a)	69.	(d)	82.	(a)	95.	(c)
5.	(d)	18.	(d)	31.	(c)	44.	(b)	57.	(a)	70.	(d)	83.	(c)	96.	(c)
6.	(c)	19.	(a)	32.	(d)	45.	(c)	58.	(d)	71.	(d)	84.	(a)	97.	(a)
7.	(c)	20.	(d)	33.	(a)	46.	(b)	59.	(d)	72.	(d)	85.	(c)	98.	(a)
8.	(d)	21.	(a)	34.	(a)	47.	(c)	60.	(d)	73.	(a)	86.	(d)	99.	(d)
9.	(a)	22.	(b)	35.	(c)	48.	(c)	61.	(c)	74.	(c)	87.	(c)	100.	(d)
10.	(a)	23.	(b)	36.	(b)	49.	(c)	62.	(b)	75.	(a)	88.	(b)		
11.	(b)	24.	(a)	37.	(c)	50.	(b)	63.	(d)	76.	(d)	89.	(c)		
12.	(b)	25.	(b)	38.	(d)	51.	(c)	64.	(d)	77.	(d)	90.	(d)		
13.	(a)	26.	(c)	39.	(d)	52.	(d)	65.	(c)	78.	(b)	91.	(a)		

## Hints &amp; Solutions

- (d) Because the specific gravity of the needle is greater than that of water displaced by it.  
Specific gravity (or relative density)  

$$= \frac{\text{Density of the substance}}{\text{Density of water at } 4^{\circ}\text{C}}$$

The average density of iron needle is greater than water, therefore, it sinks.
- (a) The cloudy nights are warmer because clouds prevent escape of radiation of heat from the ground and the air.
- (a) Because water starts boiling at a lower temperature due to high pressure. According to Gay-Lussac's law  $p \propto T$ .
- (a) The white clothes reflect heat falling on them in summer and they absorb the least from the sun.
- (d) The dimmer bulb has larger resistance than the brighter one.  

$$\text{Power of the bulb} \propto \frac{1}{\text{Resistance}}$$

Resistance is the obstruction offer to the flow of current.
- (c) In a fluorescent tube, electrical energy is almost converted into light. The inner wall of the fluorescent tube is coated with phosphorus which immediately transformed into bright light.
- (c) In respect of a jet engine and a rocket, both the given statements are correct.
- (d) Because the vertical line through the centre of gravity of the tower falls within the base.
- (a) Electronic motors draw more current which is inversely proportional to the voltage, therefore, more heat  

$$H = I^2 R t \text{ is generated.}$$
- (b) If the doors of a refrigerator are left open for a few hours, the room temperature will increase as the system release heat to the surroundings.
- (b) If a rock is brought from the surface of the moon to the earth, its weight will change but not its mass. Mass is a invariant physical quantity whereas weight of a body ( $w = mg$ ) is variable as the value of acceleration due to gravity ( $g$ ) changes.
- (a) Wavelength is the distance between two consecutive crests or troughs and 1 angstrom =  $10^{-10}\text{m}$ , joule is the unit of energy. Intensity of sound is measured in decibel. Frequency is measured in hertz (Hz).
- (c) The unit of temperature is kelvin, power is measured in watt, pressure in pascal and force in newton.
- (b) Cosmic rays have very high frequency  $>10^{23}\text{ Hz}$  and wavelength  $<10^{-24}\text{ m}$ .

16. (c) Pendulum clocks become slow in summer because the length of the pendulum increases.  
Increase in length  $\Delta l = l_0 \alpha \Delta T$   
where  $l_0$  = original length,  $\alpha$  = coefficient of linear expansion and  $\Delta T$  = change in temperature.
17. (a) A piece of ice added to the drink cool it because ice takes latent heat from the drink for melting resulting in the cooling of the drink.
18. (d) Revolver was discovered by Colt. Dynamite was discovered by Alfred Nobel. Law of cooling was discovered by Newton and law of pressure by Pascal.
19. (a) We don't feel the atmospheric pressure because our blood exerts a pressure slightly more than that of the atmosphere.
20. (d) Hypermetropia is corrected by using a concave lens. Myopia is corrected by convex lens.
21. (a) If ice collects on the freezer, the cooling in the refrigerator is affected adversely because ice is a poor conductor of heat.
22. (b) The minimum height of a plane mirror to see the full size image of a person is equal to the half the height of the person.
23. (b) Heat to electrical energy conversion occurs in solar cell. Electric to sound occurs in loud speaker. Mass to heat occurs in nuclear reactor. Chemical to heat and light occurs in fuel burning.
24. (a) Magnetic resonance imaging is based on the phenomenon nuclear magnetic resonance.
25. (b) Aman is standing on a boat in still water. If he walks towards the shore, the boat will move away from the shore. This is according to Newton's third law of motion — to every action there is equal and opposite reaction.
26. (c) An endoscopic process is based on the principle of total internal reflection of light.
27. (d) After the melting of ice, the level of water remains the same because the total volume of the melted ice is equal to the volume of floating ice.
28. (d) When the man tosses a coin, the coin falls behind him because the train is moving forward with acceleration.
29. (d) A fan produces a feeling of comfort during hot weather because our perspiration evaporates rapidly. Evaporation process takes surroundings temperature.
30. (b) Rainbow is a spectrum of seven colours—VIBGYOR. It is formed on account of dispersion and total internal reflection.
31. (c) A diamond sparkles more than a glass imitation cut to the same shape is only the true statement. The refractive index of diamond  $2.42 >$  glass  $1.5$ .
32. (d) Sound waves require material medium to travel. On the surface of the moon, there is no atmosphere. The speed of sound is maximum in solids and minimum in gas medium.
33. (a) The temperature of a metal wire rises when an electric current is passed through it because collision of metal atoms with each other releases heat energy.
34. (a) When the person looks at a coin which is in a bucket of water, the coin will appear closer and at a higher level than it really is.  
$$\mu_2 = \frac{\text{real depth}}{\text{apparent depth}}$$
35. (c) A stick is dipped in water in a slanting position. If observed sideways, the stick appears short and bent because of refraction of light.
36. (b) Because thermal conductivity of copper is greater than glass.
37. (c) The phenomenon of mirage is formed by the terrestrial heating and refraction of light. Due to terrestrial heating, layers of air of different densities (different refractive indices) are formed. The ray of light strikes different layers/refracted and causes mirage—an optical illusion.
38. (d) Radio waves are produced by rapidly oscillating electrical currents. For detecting over speeding of vehicles, police use the Doppler effect to reflected short radio waves.  
$$\text{Scattering} \propto \frac{1}{\lambda^4}$$
39. (d) A hydrogen-inflated polythene balloon rises to an altitude up in the atmosphere, it will maintain the same size and shape.
40. (c) The free surface of oil is inclined to the horizontal with larger depth at the rear end as the oil tanker is moving forward with uniform acceleration.
41. (c) The velocity of sound in air increases as the humidity increases.
42. (d) In our houses, the frequency of alternating voltage supplied is 50 Hz, i.e. 50 times per second. In America, frequency of A.C. line is 60 Hz.
43. (c) The intersected area of magenta and yellow-coloured circles will have red colour. The intersected



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area of cyan and magenta coloured circles will have blue colour.

Magenta = Red + Blue

Cyan = Blue + Green

44. (b) Sound travels in rocks in the form of longitudinal elastic waves only.
45. (c) The unit of acceleration is metre per sec<sup>2</sup>. The unit of electric current is ampere. The unit of work done is joule. The unit of impulse is newton second.
46. (b) Joule denoted by coulomb-volt. Watt denoted by amp<sup>2</sup>-ohm. Volt denoted by henery-amp/sec. Coulomb denoted by farad-volt.
47. (c) Heat is a form of energy. Heat can be reflected by mirror. Heat can't pass through vacuum.
48. (c) Ultrasonic waves can produce perfectly homogeneous solution. It is used in homogenising milk cosmetics, etc.
49. (c) According to the modern theory of nature of light, the light has both wave and particle nature.
50. (b) The electrostatic force between two charges is inversely proportional to the square of the distance between the charges.

$$F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

51. (c) To produce light, a CFL uses mercury vapour and phosphorus while an LED lamp uses semiconductor material.
52. (d) The function of the moderator is to slow down the neutrons.
53. (c) The term Dolby B or Dolby C printed on tape recorders and other sound systems refers to noise reduction circuit.
54. (a) A man inside an artificial satellite feels weightlessness because the force of attraction due to earth i.e.  $g$  (= acceleration due to gravity) is zero.
55. (a) Due to the surface tension, a liquid drop tends to assume a spherical shape to minimise the surface area.
56. (a) Because of the entire chamber of the refrigerator is cooled quickly due to convection.
57. (a) The velocity of sound in air increases as the humidity increases.
58. (d) Due to high penetrating power, the properties of interference, diffraction and polarization are not possible in X-ray.

59. (d) Galvanometers are electrical devices used for the detection or measurement of the electric currents.

60. (d) When alpha, beta and gamma rays carry same momentum, then all have same wavelength as

$$\lambda = \frac{h}{p}$$

where  $\lambda$  = wavelength,  $P$  = momentum and  $h$  = Plank's constant ( $= 6.62 \times 10^{-34}$  Js).

61. (c) The fraction of a ball floating inside the liquid depends only upon density of the liquid and the ball.
62. (b) According to Archimede's principle when a body is immersed fully or partially in a liquid, it experiences an upward force that is equal to the weight of the fluid displaced by it therefore the mass of water displaced is equal to the mass of the ship.
63. (d) Work done is given by,  $w = F s \cos \theta$  where  $\theta$  is the angle between the directions of force applied and displacement.

In cases 1 and 3,  $\theta = 0$

$\therefore$  work done = 0

In case 2,  $w = f s \cos 0 = mgh$ ,  $h$  being height covered.

In case 4, force is always perpendicular to motion i.e.,  $\theta = 90^\circ$ , hence  $w = 0$

64. (d) For a given point on the surface of earth,  $g$  decreases as  $w$  increases. Hence, body weighs less at the equator than at the poles also equatorial diameter is greater than polar diameter,

so according to  $g = \frac{GM}{R^2}$ , value of  $g$  decreases.

65. (c) The multiplier for the given units are as follows:

Angstrom	$10^{-10}$
Micron	$10^{-6}$
Nanometer	$10^{-9}$

Hence, the order in which the lengths of the given units increase is given by

Angstrom, Nanometer, Micron

Therefore, the correct sequence is 1, 3, 2.

66. (c) From the given  $(x - t)$  graph it is clear that velocity is constant. Therefore, acceleration is zero.
67. (a) The principle of total internal reflection is applicable to explain the formation of image in desert and operation of optical fibres. The formation

of image in microscope and colour of evening sky are based on refraction of light.

68. (c) When a light wave passes from one medium to other, its frequency remains constant but its speed and wavelength change.
69. (d) Refractive index of a medium depends on its nature.

Refractive index ( $\mu$ ) is also given by

$$\mu = \frac{\sin i}{\sin r}$$

where  $i$  = angle of incidence

$r$  = angle of refraction

Thus,  $\mu$  depends on the angle of incidence.

Again,  $\mu = \frac{C_0}{c}$  where  $C_0$  is the velocity of light in vacuum and  $c$  is the velocity in a medium. We know that frequency remains constant when light passes from one medium to other, therefore,

$$\mu = \frac{\lambda_0}{\lambda}$$

The colour of light depends on wavelength.

Thus,  $\mu$  depends on the colour of the incident ray.

70. (d) The medical name for long-sightedness is hypermetropia, sometimes called hyperopia. Eyesight problems, such as hypermetropia, are also known as refractive errors. Long sight leads to problems with near vision, and the eyes may commonly become tired. Distance vision (long sight) is, in the beginning, often clear. Long sight can be corrected by glasses or contact lenses, or sometimes 'cured' with laser eye surgery.
73. (a) Properties of different types of magnets are; Artificial magnet- short lived, permanent magnet- long lived, Temporary magnet- induced magnet, earth as a magnet- last for infinitely long period.
74. (c) Broken pieces of magnet never lose their magnetic properties.
75. (a) The gravitational force  $F$  between two bodies is directly proportional to the product of masses of those bodies. Here, since the product  $m_1m_2$  is greater for the sun and the moon than that of the earth and the moon (because mass of the sun is greater than that of earth), therefore  $F$  exerted by the sun on the moon is greater than the  $F$  exerted by the earth on the moon.

76. (d) Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of over 20 km (12.45 miles). The thunderstorms are associated with the cumulonimbus clouds. These clouds normally form on warm sunny days but they can also be found on cold front. But this question is asking about the Thunder i.e. the sound produced. The lightning generates between 100 million and 1 billion volts of electricity and can heat the air to around 50K°F. The rapid expansion causes the shock waves. Thunder happens because the lightning would heat the air at huge temperatures and the air expands so fast that it make a loud clap of thunder.

77. (d) (a) Due to the heating effect of current, the filament of the bulb gets heated to a high temp and it starts glowing.
- (b) Tin being less reactive than iron is used for containerisation of food items.
- (c) When cells are connected in series, the resultant voltage is the sum of the individual voltage of the cells.
81. (b) There is difference in acceleration due to gravity at equator and poles. The gravity is more on the poles due 2 factors:-
- (1) the effect due to the angular rotation of earth is minimum or zero at poles.
- (2) the earth is flatish towards the poles so  $g$  is more at poles.
82. (a) As temperature rises, the density decreases, height increases. In A, the top cross-section is smaller. Therefore  $h_A > h_B$ .
85. (c) (a) Light from sun takes nearly eight minutes 20 seconds to come to earth.
- (b) The image formed by a convex lens when the object is placed between the focus and the optical centre is virtual and magnified.
- (d) Cinematography makes use of persistence of vision. Persistence of vision is the ability of an eye to continue to see the image of an object for a very short duration even after the removal of the object.

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86. (d) Because they have equal momenta, hence equal  $mv$ , the heavy body will move very slowly and the light body will move very quickly. As Kinetic energy is  $\frac{1}{2}mv^2$ . Thus the speed of the light body

will be high giving a higher kinetic energy to it in comparison to the kinetic energy of heavy body.

90. (d) A - (r); B - (p); C - (s); D - (q)  
92. (b) It has been calculated in the theory of the chapter i.e.,

$$R_1 = \frac{mg}{2} \left( 1 - \frac{v^2 h}{rga} \right),$$

$$\text{and } R_2 = \frac{mg}{2} \left( 1 + \frac{v^2 h}{rga} \right), \text{ so } R_1 < R_2.$$

93. (c) When spoon is dropped gently, its tangential speed is equal to the speed of spaceship, and so it revolves like a satellite.  
94. (a) A steam engine converts the heat energy produce by coal into kinetic energy and this produces electricity which further light the lamp and convert electricity into heat and light.  
96. (c) Velocity of object w.r.t mirror = 10 cm/s  
So velocity of image w.r.t you  
 $= 2 \times 10 = 20 \text{ cm/s}.$   
98. (a) Both of the statements are correct and statement 2 is also correct explanation for statement 1. Total internal reflection is an optical phenomenon that happens when a ray of light strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface. If the refractive index is lower on the other side of the

boundary, no light can pass through and all of the light is reflected. Thus because of this phenomena traffic light beads glow when light falls on them.

99. (d) The observer on the earth will detect a wavelength given by

$$v = \pm \frac{\lambda - \lambda_0}{\lambda} c$$

where  $\lambda$  = original wavelength  
 $\lambda_0$  = apparent wavelength  
 $v$  = velocity of source

Here, source is receding, therefore +ve sign will be taken

$$\therefore \frac{2}{10} c = \frac{\lambda - \lambda_0}{\lambda} c$$

$$\Rightarrow \frac{\lambda - \lambda_0}{\lambda} = \frac{2}{10} \Rightarrow 1 - \frac{\lambda_0}{\lambda} = \frac{2}{10}$$

$$\Rightarrow \frac{\lambda_0}{\lambda} = 1 - \frac{2}{10} = \frac{8}{10} \Rightarrow \lambda = \frac{10}{8} \lambda_0 = 1.25 \lambda_0$$

The wavelength of blue light varies from 450 nm to 475 nm. Therefore, the observed light will have wavelength ranging from 562.5 nm to 593.75 nm which will be yellow orange.

100. (d) Mach number, a useful quantity in aerodynamics, is the ratio of air speed to the local speed of sound. The speed of sound varies with temperature. Since temperature and sound velocity normally decrease with increasing altitude, sound is refracted upward. Mach number is a function of temperature at altitude. With decrease in sound velocity Mach number increases.