

TotalExam Education Services

(Laxmi Nagar, Delhi-92)

Physics Notes

Electricity

Special For: -

- 1. Radio operator CRPF**
- 2. Radio fitter CRPF**
- 3. Cypher (Crypto) CRPF**

1. A 100 watt electric bulb is used for 10 hours. What will be the cost of electricity consumed, if the consumption cost is Rs. 5 per unit?
(a) Rs. 5 (b) Rs. 10
 (c) Rs. 25 (d) Rs. 50
2. If a bulb of 100 watt burns for 10 hours, the expenditure of electricity will be –
 (a) 0-1 unit **(b) 1 unit**
 (c) 10 units (d) 100 units
 Ans. (b)
 See the explanation of above question.
3. Five bulbs each of 100 watt capacity in a tunnel are illuminated continuously for twenty hours. The consumption of electricity will be:
 (a) One unit (b) Two units
(c) Ten units (d) Twenty units
4. The value of 1 kilowatt hour is –
(a) 3.6×10^6 J (b) 3.6×10^3 J
 (c) 103 J (d) 105 J
5. An electric bulb of 100 watt is used for 4 hours. The unit of electric energy used is-
 (a) 400 (b) 25
 (c) 4 **(d) 0.4**
6. Electricity consumption bill is based on the measurement of –
 1. Watt 2. Voltage
 3. Ohm 4. Ampere
 Select your answer of the following codes –
(a) Only 1 (b) 1 and 2
 (c) 2 and 3 (d) 1 and 4
7. How many units of electricity will be consumed if you use a 60-watt electric bulb for 5 hours everyday for 30 days?
 (a) 12 **(b) 9**
 (c) 6 (d) 3
8. An electric bulb is connected to 220 v generator. The current is 0.5 A. The power of the bulb is
(a) 110 w (b) 110 v
 (c) 440 w (d) 220 w
 (e) None of these
9. The total resistance of a circuit having two parallel resistors is 1.403 kilo-ohm. If one of the resistors is 2.0 kilo-ohm, then the other resistor will be
 (a) 1.403 kilo-ohm (b) 2.0 kilo-ohm
 (c) 3.403 kilo-ohm **(d) 4.70 kilo-ohm**
10. Of the two bulbs in a house, one glows brighter than the other. In this context which of the following statements is correct?
 (a) The brightness does not depend on the resistance.
 (b) Both the bulbs have same the resistance.
 (c) The bright bulb has larger resistance.
(d) The dim bulb has larger resistance.
11. Of the two bulbs in a house, one glows brighter than the other. Which of the two has a larger resistance?
(a) The dim bulb
 (b) The brighter bulb
 (c) Both have the same resistance
 (d) The brightness does not depend on the resistance
12. How two identical bulbs should be connected to get maximum light?
 1. Both are connected in series.
 2. Both are connected in parallel.
 Select the correct answer using the code given below :
 Code :
 (a) In case 1 more
(b) In case 2 more
 (c) Same in both 1 and 2
 (d) Nothing can be said
13. A dynamo which is said to generate electricity actually acts as a :
 (a) Source of ions
 (b) Source of electric charge
(c) Converter of energy
 (d) Source of electrons
14. 'Dynamo' is a device, which converts :
 (a) Chemical energy into electrical energy
 (b) Electrical energy into mechanical energy
(c) Mechanical energy into electrical energy
 (d) Electrical energy into chemical energy
15. Dynamo is a machine which is used for –
 (a) Conversion of high voltage to low voltage
 (b) Conversion of electrical energy to mechanical energy
(c) Conversion of mechanical energy to electrical energy
 (d) Conversion of low voltage to high voltage
16. Turbines and Dynamos are used to convert which energy to electrical energy?
 (a) Chemical energy
 (b) Solar energy
(c) Mechanical energy
 (d) Magnetic energy
17. When electrical energy is converted into motion
(a) There is no heat loss
 (b) Heat loss is 50 percent
 (c) Heat loss is 30 percent
 (d) Heat loss is 80 percent
18. A device which converts electrical energy into mechanical energy is –
 (a) Dynamo (b) Transformer
(c) Electric motor (d) Inductor
19. In electrical motor :
 (a) heat is converted into electrical energy
 (b) electrical energy is converted into heat
(c) electrical energy is converted into mechanical energy
 (d) mechanical energy is converted into electrical energy

- (e) None of the above / More than one of the above
20. The device which works on the principle of electromagnetic induction is
(a) Ammeter (b) Voltmeter
(c) Dynamo (d) Electric motor
21. A device which converts chemical energy into electrical energy is called –
(a) Battery (b) Motor
(c) Generator (d) Moving coil meter
22. Electric 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.
23. Faraday constant:
(a) depends on the amount of the electrolyte
(b) depends on the current passed in the electrolyte
(c) depends on the volume of the solvent in which the electrolyte is dissolved
(d) is a universal constant
24. Consider the following statements regarding a motor car battery –
1. The voltage is usually 12 V.
2. Electrolyte used is hydrochloric acid.
3. Electrodes are lead and copper.
4. Capacity is expressed in ampere-hour.
Which of the above statements are correct?
(a) 1 and 2 (b) 2 and 3
(c) 3 and 4 **(d) 1 and 4**
25. Nickel-Cadmium (Ni-Cd) battery is used in :
(a) Calculator
(b) Cordless electronic appliances
(c) Transistors
(d) All of the above
26. Which of the following metals is used as filament in lighting bulbs?
(a) Iron (b) Molybdenum
(c) Silver **(d) Tungsten**
27. The filament of an electric bulb is made of –
(a) Magnesium (b) Iron
(c) Nichrome **(d) Tungsten**
28. Filament of electric bulb is made of:
(a) Tungsten (b) Nichrome
(c) Lead (d) Aluminium
29. Consider the following statements:
An ordinary light bulb has a rather short life because the:
1. Filament wire is not uniform.
2. Bulb cannot be evacuated completely.
3. Wires supporting the filament melt at high temperatures.
- Which of the above statements are correct?
(a) 1 and 3 (b) 2 and 3
(c) 1 and 2 **(d) 1, 2 and 3**
30. The temperature of the filament of lighted electric bulb is generally:
(a) 100°C to 500°C (b) 1000°C to 1500°C
(c) 2000°C to 2500°C (d) 3000°C to 3500°C
31. Lightning can even burn a tree because it contains tremendous amount of
(a) Heat energy **(b) Electric energy**
(c) Chemical energy (d) Nuclear energy
32. Consider the following statements:
Assertion (A): Lightning conductors prevent buildings from damages in the event of lightning strike.
Reason (R): The electric charge conduct to ground through the wire, instead of passing through the structure.
Select the correct answer using the codes given below:
Code :
(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 correct but (R) is wrong.
(d) (A) is correct but (R) is wrong.
33. In a three-pin electrical plug longest pin should be connected to
(a) Ground terminal (b) Live terminal
(c) Neutral terminal (d) Any terminal
34. In electric apparatus 'earth' is used:
(a) To reduce the expenditure
(b) Because the apparatus used 3-phase
(c) For safety
(d) In the form of fuse
35. The electric current does not flow between two properly connected charged bodies if they are having
(a) Same charge (b) Same capacity
(c) Same resistivity **(d) Same potential**
36. A fuse is used in main electric supply as a safety device. Which one of the following statements about the fuse is correct?
(a) It is connected in parallel with the main switch
(b) It is made mainly from silver alloys
(c) It must have a low melting point
(d) It must have a very high resistance
37. Principle of fuse is
(a) Chemical effect of electricity
(b) Mechanical effect of electricity
(c) Heating effect of electricity
(d) Magnetic effect of electricity
38. A fuse wire is characterized by:
(a) Low resistance and high melting point.
(b) Low resistance and low melting point.

- (c) **High resistance and low melting point.**
 (d) High resistance and high melting point.
39. Fuse wire used for safety of household have:
 (a) **Low melting point**
 (b) High melting point
 (c) **High resistance**
 (d) Low resistance.
40. The filament of a halogen lamp is an alloy of –
 (a) Tungsten and iodine
 (b) Tungsten and bromine
 (c) **Tungsten and sodium**
 (d) Molybdenum and sodium
41. **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.
 Code:
 (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
42. Domestic electrical wiring is basically a :
 (a) Series connection
 (b) **Parallel connection**
 (c) Combination of series and parallel connections
 (d) Series connection within each room and parallel connection elsewhere
43. A wire with black insulation during electric supply is –
 (a) Live wire (b) Earth wire
 (c) **Neutral wire** (d) Fuse wire
44. What is the order of magnitude of electric resistance of the human body (dry)?
 (a) 10^2 ohm (b) **10^4 ohm**
 (c) 10^6 ohm (d) 10^8 ohm
45. Full form of C.F.L. is –
 (a) **Compact Fluorescent Lamp**
 (b) Centrally Fixed Lamp
 (c) Chemical Fluorescent Lamp
 (d) Condensed Fluorescent Lamp
46. Light Emitting Diode (LED) work on principle of :
 (a) Laser
 (b) Thermionic emission
 (c) Photoelectric code
 (d) **Electroluminescence**
47. **Assertion (A):** Light Emitting Diode (LED) lamps offer longer service life as compared to Compact Fluorescent Lamps (CFL).
Reason (R): Light Emitting Diodes (LED) lamps are more energy efficient as compared to the Compact Fluorescent Lamps (CFL).
 Select the correct answer using the codes given below:
 (a) **Both (A) and (R) are true, and (R) explains (A).**
- (b) Both (A) and (R) are true, but (R) does not explains (A).
 (c) (A) is true, and (R) is false.
 (d) (A) is false, and (R) is true.
48. What is the difference between a CFL and an LED Lamp?
 1. To produce light, a CFL uses mercury vapour and phosphor while an LED lamp uses semi-conductor material.
 2. The average life span of a CFL is much longer than of an LED lamp.
 3. A CFL is less energy-efficient as compared to an LED lamp.
 Which of the statements given above is/are correct?
 (a) 1 only (b) 2 and 3
 (c) **1 and 3** (d) 1, 2 and 3
49. With reference to street-lighting, how do sodium lamps differ from LED lamps?
 1. Sodium lamps produce light in 360 degrees but it is not so in the case of LED lamps.
 2. As street-lights, sodium lamps have longer life span than LED lamps.
 3. The spectrum of visible light from sodium lamps is almost monochromatic while LED lamps offer significant colour advantages in street-lighting.
 Select the correct answer using the code given below.
 (a) 3 only (b) 2 only
 (c) **1 and 3 only** (d) 1, 2 and 3
50. What gases are filled in fluorescent tube?
 (a) Neon (b) Sodium
 (c) Mercury (d) **Mercury and neon**
51. In comparison to an electric bulb, a fluorescent tube is preferred because –
 (a) It has greater external outer surface to radiate/emit the light.
 (b) There is no effect of voltage fluctuation on it.
 (c) In the tube, electric energy almost converted into light energy.
 (d) **None of these.**
52. How does the white light produce in the tube?
 (a) by heating up the copper wire
 (b) by heating up the filament
 (c) by accelerating the atoms
 (d) **by oscillating the molecules**
53. Which is the gas inside an electric bulb?
 (a) Oxygen (b) Air
 (c) Carbon dioxide (d) **None of the above**
54. Fluorescent tubes are fitted with a choke. The choke coil-
 (a) **Steps up the line voltage**
 (b) Steps down the line voltage
 (c) Reduces current in the circuit
 (d) Chokes low frequency current

55. With reference to the electric potential which of the following statements is/are correct?
1. It is a scalar quantity.
 2. It is a vector quantity.
- Select the correct answer using the codes given below.
- Codes:
- (a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2
56. If potential difference and current flowing through a wire is increased twice each then electric power:
- (a) Will remain unaffected
(b) Will increase four times
(c) Will increase two times
(d) Will decrease half
57. Two wires have their lengths, diameters and resistivities all in the ratio of 1 : 2. If the resistance of the thinner wire is 10 ohm, the resistance of the thicker wire is :
- (a) 5 ohm (b) 10 ohm
(c) 20 ohm (d) 40 ohm
58. Small drops of the same size are charged to V volts each. If n such drops coalesce to form a single large drop, its potential will be :
- (a) $n^{2/3} V$ (b) $n^{1/3} V$
(c) n V (d) $n^{-1} V$
59. Given below are two statements, one labelled as Assertion (A) and the other labelled as Reason (R).
Assertion (A): Transformer is useful for stepping up or stepping down voltages.
Reason (R): Transformer is a device used in D.C. circuits.
In the context of the above two statements, which one of the following is correct?
- (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
60. Transformer is used for-
- (a) Converting AC into DC
(b) Converting DC into AC
(c) To step-up DC voltages
(d) To step-up or step-down AC voltages
61. Which of the following is the purpose for which a transformer is used?
- (a) To convert AC into DC
(b) To convert DC into AC
(c) To step-up or step-down AC voltage
(d) To step-up DC voltage
62. A mobile phone charger is –
- (a) An inverter
(b) A UPS
(c) A step up transformer
(d) A step down transformer
63. Some pairs of devices and associated energy changes are given below:
- (i) Electric generator – Mechanical to electrical
(ii) Electric motor – Electrical to mechanical
(iii) Diesel engine – Light to electrical
(iv) Solar cell – Chemical to mechanical
- Which of the above pair/s is/are correctly matched?
- (a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iv) (d) (iii) and (iv)
64. The basic difference between an AC generator and a DC generator is that –
- (a) AC generator has an electromagnet while a DC generator has permanent magnet
(b) AC generator has slip rings while the DC generator has a commutator
(c) DC generator will generate a higher voltage
(d) AC generator will generate a higher voltage
65. Alternate current is not preferable –
- (a) To charge storage battery
(b) To run/start a electric motor
(c) To transmit electric power
(d) To heat up electric toaster
66. The device used for converting alternating current to direct current is called –
- (a) Inverter (b) Rectifier
(c) Transformer (d) Transmitter
67. Alternating current is converted to direct current –
- (a) By Dynamo (b) By Motor
(c) By Transformer (d) By Rectifier
68. **Assertion (A):** In India, electricity distribution companies calculate the consumption of electricity in kWh.
Reason (R): Electrical system in India works at a frequency of 60 Hz.
Code:
- (a) both (A) and (R) are individually true, and (R) is the correct explanation of (A).
(b) both (A) and (R) are individually 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.
69. Which of the following option represents the consumption of power in ascending order–
- (a) Television, fan, electronic press, electronic kettle
(b) Television, fan, electronic kettle, electronic press
(c) Fan, television, electronic press, electronic kettle
(d) Electronic press, electronic kettle, fan, television
70. The earth's magnetic field is due to
- (a) Currents circulating inside the core
(b) Presence of a huge magnet at its centre
(c) Moving charges in space outside
(d) None of the above

71. What is the source of electrical energy in an artificial satellite?
(a) Solar cells
(b) Mini nuclear reactor
(c) Dynamo
(d) Thermopile
72. Consider the following statements:
Assertion (A): Space-based solar power (SBSP), it is suggested be made a national goal.
Reason (R): Supply of SBSP is 99% uninterrupted throughout the year, besides the enormity of energy availability.
Select the correct answer using the codes given below:
Code:
(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.
73. With reference to technologies for solar power production, consider the following statements:
1. 'Photovoltaics' is a technology that generates electricity by direct conversion of light into electricity, while 'Solar Thermal' is a technology that utilizes the Sun's rays to generate heat which is further used in electricity generation process.
2. Photovoltaics generates Alternating Current (AC), while Solar Thermal generates Direct Current (DC).
3. India has manufacturing base for Solar Thermal Technology, but not for Photovoltaics.
- Which of the statements given above is/are correct?
(a) 1 only
(b) 2 and 3 only
(c) 1, 2 and 3
(d) None
74. With reference to solar water pumps, consider the following statements:
1. Solar power can be used for running surface pumps and not for submersible pumps.
2. Solar power can be used for running centrifugal pumps and not the ones with piston.
Which of the statement given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
75. Which one of the following element is used in solar cells?
(a) Silicon
(b) Cerium
(c) Astatine
(d) Vanadium
76. Photovoltaic cells are:
(a) Solar cells
(b) Thermal cells
(c) Sulphur cells
(d) Molar cells
77. Photovoltaic cells are related to:
(a) Nuclear Energy
(b) Geo Thermal Energy
(c) Solar Energy
(d) Wind Energy

ANSWER KEYS

1	A	11	A	21	A	31	B	41	C
2	B	12	B	22	A	32	A	42	B
3	C	13	C	23	D	33	A	43	C
4	A	14	C	24	D	34	C	44	B
5	D	15	C	25	D	35	D	45	A
6	A	16	C	26	D	36	C	46	D
7	B	17	A	27	D	37	C	47	A
8	A	18	C	28	A	38	C	48	C
9	D	19	C	29	D	39	A & C	49	C
10	D	20	C & D	30	C	40	C	50	D

51	D	61	C	71	A
52	D	62	D	72	A
53	D	63	A	73	A
54	A	64	B	74	D
55	A	65	A	75	A
56	B	66	B	76	A
57	B	67	D	77	C
58	A	68	C		
59	C	69	C		
60	D	70	A		

SOLUTIONS

1. Ans. (a)

Energy Consumption of 100-watt electric bulb which is used for 10 hours = 100×10
 $= 1000\text{-watt hour}$
 $= 1 \text{ kilowatt hour}$
 $= 1 \text{ unit.}$

According to question the cost of 1 unit of electricity = Rs 5.

2. Ans. (b)

See the explanation of above question.

3. Ans. (c)

Consumption of electricity by one bulb

$$\begin{aligned} \text{(No of unites)} &= \frac{\text{watt} \times \text{hours}}{1000} \\ &= \frac{100 \times 20}{1000} \\ &= 2 \text{ unit} \end{aligned}$$

Thus consumption of electricity by 5 bulbs = 2×5
 $= 10 \text{ units}$

4. Ans. (a)

1 Kilowatt hour = 1 (kilowatt) (1 hour)
 $= (1000 \text{ joule/sec.}) (3600 \text{ sec.})$
 $= 36 \times 10^5 \text{ Joule}$
 $= 3.6 \times 10^6 \text{ Joule}$

Thus, option (a) is correct.

5. Ans. (d)

The electric energy consumed = $100 \text{ watt} \times 4 \text{ hour}$
 $= 400\text{-watt hour}$
 $= \frac{400}{1000} \text{ kilowatt hour}$
 $= 0.4 \text{ kilowatt hour}$
 $= 0.4 \text{ unit}$

6. Ans. (a)

Electricity consumption bill is based on the measurement of kilowatt hour. The kilowatt hour is the unit of electricity consumption, equal to 1000 watt in 1 hour (1 unit).

7. Ans. (b)

We know that-

$$\begin{aligned} \text{Number of units} &= \frac{\text{watt} \times \text{hour}}{1000} \\ &= \frac{60 \times 30 \times 5}{1000} = 9 \text{ unit} \end{aligned}$$

8. Ans. (a)

Given,

$$v = 220 \text{ v}$$

$$i = 0.5 \text{ A}$$

we know that,

$$\begin{aligned} P &= \frac{w}{t} = \frac{vit}{t} (\because w = vit) \\ &= vi = 220 \times 0.5 \Rightarrow 110 \text{ watt} \end{aligned}$$

9. Ans. (d)

If total resistance of a parallel circuit is R , then

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

According to the question,

$$\begin{aligned} \frac{1}{1.403} &= \frac{1}{2} + \frac{1}{R_2} \\ \text{or, } \frac{1}{R_2} &= \frac{1}{1.403} - \frac{1}{2} \\ \text{or, } \frac{1}{R_2} &= \frac{2 - 1.403}{2.806} \\ \text{or, } R_2 &= \frac{2.806}{0.597} = 4.70 \text{ kilo-ohm} \end{aligned}$$

10. Ans. (d)

The bulb which decays more energy will generate more brightness.

Power (P) = Voltage (V) $\times$ Current (I)

It is known that $V = I \times \text{Resistance } (R)$

$P = \frac{V^2}{R}$; $P \propto \frac{1}{R}$ Thus, the bulb of high resistance decays low energy and will generate dim light.

11. Ans. (a)

See the explanation of above question.

12. Ans. (b)

Bulbs in parallel are brighter than bulbs in series. In a parallel circuit the voltage for each bulb is the same as the voltage in the circuit while the parallel combination of resistors reduces the effective resistance of the circuit. The power dissipated by a bulb is given by

$$P = \frac{V^2}{R},$$

where V is the voltage of the light bulb and R is the electrical resistance.

The total resistance of the series circuit is

$$R_{\text{series}} = R + R = 2R.$$

The total resistance of the parallel circuit is

$$1/R_{\text{parallel}} = 1/R + 1/R$$

or

$$R_{\text{parallel}} = R/2.$$

Thereby, the power for the light bulbs in series is

$$P_{\text{series}} = \frac{V^2}{2R}$$

and the power for the light bulbs in parallel is

$$P_{\text{parallel}} = \frac{2V^2}{R}$$

Hence, from the above equations it is clear that in parallel circuit the bulbs will shine brightly.

13. Ans. (c)

A dynamo, which is also known as an electrical generator produces direct current through a commutator. It is basically a device which converts mechanical rotation into electric current according to Faraday's law.

14. Ans. (c)

A dynamo is an electrical generator that produces direct current with the use of a commutator. It converts mechanical energy into electrical energy.

15. Ans. (c)

See the explanation of above question.

16. Ans. (c)

See the explanation of above question.

17. Ans. (a)

When electrical energy is converted into motion, there is no heat loss.

18. Ans. (c)

Electric motor is a device which converts electrical energy into mechanical energy. Electric motors involve rotating coils of wire which are driven by the magnetic force exerted by a magnetic field or an electric current.

19. Ans. (c)

See the explanation of above question.

20. Ans. (c) & (d)

Among the above options, both Dynamo and Electric motor are such devices that work on the principle of electromagnetic induction. Dynamo converts mechanical energy into electrical energy and electric motor converts electrical energy into mechanical energy.

21. Ans. (a)

An electrical battery is a device consisting of two or more electrochemical cell that converts stored chemical energy into electrical energy. There are different types of batteries but all have three basic components; a positive electrode, negative electrode, and electrolyte.

22. Ans. (a)

Electric motors operating at low voltages tend to burn out because they draw more current which is inversely proportional to the voltage.

23. Ans. (d)

The Faraday constant represents the magnitude of electric charge per mole of electrons. It is denoted by the symbol ' F ' and is named after English scientist Michael Faraday. It is a universal constant. It has the currently accepted value $F = 96485.332123 \text{ C.mol}^{-1}$.

24. Ans. (d)

A motor car battery usually has six 2V cells connected in series, which gives it a steady voltage of about 12V. The capacity of battery is expressed in ampere-hour. An amperehour is the total amount of electrical charge transferred when a current of one ampere flows for one hour. Therefore the total usable charge stored in a battery can be stated in term of ampere-hour. The electrolyte used is a 35% solution by weight of sulphuric acid H_2SO_4 with 65% of water. The electrodes used in motor car batteries are lead (Pb) and lead dioxide (PbO_2).

25. Ans. (d)

The nickel-cadmium battery is a type of rechargeable battery using nickel oxide hydroxide and metallic cadmium as electrodes, while potassium hydroxide is used as alkaline electrolyte. It is used in calculator, cordless electronic appliances, transistors, portable power tools, photography equipments, flashlight etc.

26. Ans. (d)

Tungsten metal is used as filament in lighting bulbs. In 1781, Carl Wilhelm Scheele and Torbern Bergman suggested that it might be possible to obtain a new metal by reducing tungsten acid. Two years later in 1783, Juan Jose and Fausto Elhuyar were the first to isolate tungsten through the reduction of this acid with charcoal. For this reason, they are credited with the discovery of this element. Its melting point is 3422°C and its boiling point is 5555°C .

27. Ans. (d)

See the explanation of above question.

28. Ans. (a)

See the explanation of above question.

29. Ans. (d)

An ordinary light bulb has a rather short life because the: -

(1) Filament wire is not uniform (2) bulb cannot be evacuated completely and (3) wires supporting the filament melt at high temperature.

30. Ans. (c)

Tungsten metal is used as filament in electric bulb. When electric current flows through it, its temperature goes up to 1500°C to 2500°C . Generally, electric bulbs convert only 5% to 10% of electric energy into light.

31. Ans. (b)

Lightning can even burn a tree because it contains tremendous amount of electrical energy. Lightning is an electrical discharge caused by imbalance between storm clouds and the ground, or within the clouds themselves.

32. Ans. (a)

A lightning conductor is a metal rod mounted on the top of an elevated structure, electrically bonded using a wire or electrical conductor to interface with ground through an electrode, engineered to protect the structure in the event of lightning strike. If lightning hits the structure, it will preferentially strike the rod and would be conducted to ground through wire instead of passing through the structure. Hence the building will be saved by using this lightning conductor.

33. Ans. (a)

In the three-pin plug, there are three ends namely live, neutral and earth. The earth pin on a plug is longer than the line and neutral pins. This means the earth pin is the first to connect and last to disconnect for safety of electrical device. It provides an alternative and easy path for leakage or fault current flow.

34. Ans. (c)

See the explanation of above question.

35. Ans. (d)

According to Ohm's law, if there is a potential difference (V) across a resistor then there is a

current (I) flowing through it. Current flows in a circuit as a result of difference in potential between two points in the circuit.

36. Ans. (c)

An electric fuse is a safety device used to prevent damage to an electrical circuit when excessive current flows through it. The electric fuse works on the principle of the heating effect of electric current. It consists of a piece of wire made of a metal or an alloy of low melting point. As the current increases beyond a limit, the wire in the electric fuse melts and breaks off. The fuse is then said to have blown off. The circuit is broken and current stop flowing through it. Thus, a fuse prevents fires.

37. Ans. (c)

See the explanation of above question.

38. Ans. (c)

Fuse is a piece of wire with high resistance and very low melting point. When a high current flows through the circuit, it gets heated and melts.

39. Ans. (a) & (c)

See the explanation of above question.

40. Ans. (c)

The filament of a halogen lamp is an alloy of tungsten and sodium. Due to the presence of sodium in filament, it produces yellow light.

41. Ans. (c)

When electric current passes through the conducting wire, moving electrons continuously collide with the atoms of the conductor. In this process, they transfer their energy to the atoms of the conductor and therefore, temperature of the conductor increases. Thus, assertion (A) is correct but reason (R) is false.

42. Ans. (b)

Domestic electrical wiring is basically a parallel connection. In parallel circuit, each branch receives equal current. In a parallel connection if one of the bulbs is removed from the circuit i.e. if one of the branches in the circuit is broken, electric current will still flow in other branches and other bulbs will continue to glow.

43. Ans. (c)

The electric power line reaches our house through three wires namely a live wire, neutral wire, and earth wire. To avoid confusion, we follow a colour code for insulating these wires. The red wire is a live wire, and the black wire is neutral. The earth wire is given green plastic insulation.

44. Ans. (b)

The order of magnitude of electric resistance of the human body (dry) is generally in the range of 10^4 (10000) ohms and it may be as high as 10^5 (100000) ohms or more. Wet or broken skin may drop the body's resistance to 1000 ohms or less.

45. Ans. (a)

C.F.L. is short form of Compact Fluorescent Lamp. CFL uses significantly less energy than traditional light bulbs (75% less).

46. Ans. (d)

Light Emitting Diode (LED) work on the Principle of Electroluminescence. Electroluminescence (EL) is an optical and electrical phenomenon in which a material emits light in response to the passage of an electric current or to a strong electric field. It is the result of radiative recombination of electrons and holes in a material, usually a semiconductor. The excited electrons release their energy as photons – light. A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

47. Ans. (a)

In Light Emitting Diode (LED) Lamps, gallium arsenide is used as main light emission component which converts electric energy into light. Its life span is greater than that of CFL because LED lamps consumes less energy than CFL.

48. Ans. (c)

CFL uses mercury vapour and phosphor to produce light. The gases becomes excited by electricity and when combined with mercury particles, produces invisible ultraviolet light. The UV light then hits the white phosphor coating inside the bulb causing it to fluorescence and emit white light. LED lamp uses semi-conductor material to produce light. CFLs have a life of about 6000 to 10,000 hours, while LED has a life span of about 50,000 hours. LED lamps are more energy efficient as compared to CFL.

49. Ans. (c)

Lights from sodium lamps i.e. sodium vapour lights are omnidirectional. Omnidirectional lights produce light in 360 degrees. This is a large system inefficiency because at least half of the light needs to be reflected and redirected to the desired area being illuminated. Whereas LED lamps emit light directionally i.e. over 180 degrees which means there are far fewer losses from the need to redirect or reflect light. Hence, statement 1 is correct. LEDs have an extremely long lifespan relative to every other lighting technology (including sodium lamps). New LEDs can last 50,000 to 100,000 hours or more i.e. more than 3-4 times than sodium lamps. Hence, statement 2 is incorrect. Sodium vapour lights have the worst colour rendering. Low pressure sodium lamps in particular are monochromatic resulting in the colours of illuminated objects being nearly indistinguishable, which means that the objects illuminated by them appear shadowy black rather than the colour you would see during daylight. LEDs

waste much less energy producing waste heat and they also provide an incredibly better variety of high colour rendering index options to the user (thus eliminating the monochromatic black appearance of objects illuminated by sodium lamps). Hence, statement 3 is correct.

50. Ans. (d)

Fluorescent lamps are filled with the low pressure gases specially Mercury and noble gases like Argon, Neon, Xenon and Krypton.

51. Ans. (d)

In comparison to electric bulb, fluorescent tubes transform more electric energy into light energy. A bulb of 100 watt converts only 5 percent of electric energy into light energy but fluorescent tubes convert approximately 22% of electric energy into light energy. Thus, none of the statement is true.

52. Ans. (d)

A tube light or fluorescent lamp is a kind of light that uses a combination of electricity and mercury vapour to create light energy. The electricity causes electrons to travel at high speed between the poles. These electrons hit the mercury gas molecules and oscillate them. The mercury gas is then ionized by the current flowing within, producing ultraviolet radiation. Since the human eye is unable to see this radiation, the glass tube is coated with a fluorescent material which changes it into white light. Thus, among the given options, option (d) is the correct answer.

53. Ans. (d)

The electric bulb was invented by Edison. A coiled filament of tungsten metal with a high melting point fits inside it. To prevent the metal from oxidation, Nitrogen and Argon gases are filled in the bulb instead of vacuum.

54. Ans. (a)

Starter in tube lights increases the current and sends it to the choke. Choke coil steps up the voltage of the transmitted current and send it back to tubelight resulting tubelight to glow. After this work of the starter gets finished and choke is used to step up and step down the voltage thus prevent the tubelight from any damage.

55. Ans. (a)

Electric potential is a scalar quantity. It is the amount of work needed to move a unit charge from a reference point to a specific point against an electric field.

56. Ans. (b)

Power $P = V \times I$

where V = Voltage

I = Current

Since both the voltage and current are increased twice

$$\Rightarrow P' = (2.V)(2I)$$

$$P' = 4V \cdot I = 4P$$

Hence, the electric power will increase four times.

57. Ans. (b)

We know that,

$$R = \rho \frac{l}{a}$$

R = resistance, ρ = resistivity, l = length, a = Area.

Let the ρ_1 , l_1 and r_1 is resistivity, length, and radius of first wire respectively then,

As per the question

Resistivity of second wire $\rho_2 = 2\rho_1$

Length of second wire $l_2 = 2l_1$

Radius of second wire $r_2 = 2r_1$

$$\Rightarrow R_1 = \frac{\rho_1 l_1}{a_1} = \frac{\rho_1 l_1}{\pi r_1^2}$$

$$R_2 = \frac{\rho_2 l_2}{a_2} = \frac{2\rho_1 \times 2l_1}{\pi (2r_1)^2}$$

$$= \frac{4\rho_1 l_1}{4\pi r_1^2} = \frac{\rho_1 l_1}{\pi r_1^2}$$

$$\Rightarrow \frac{R_1}{R_2} = 1$$

Since resistance of thin wire $R_1 = 10\Omega$

Therefore, resistance of thicker wire $R_2 = 10\Omega$

58. Ans. (a)

Let the charge on every small drop = q

Radius of every small drop = r

Charge on large drop (Q) = nq

Radius of large drop = R

$\therefore$ the total volume of n drops = volume of the large drop

$$\therefore n \times \frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$$

$$\Rightarrow R = n^{1/3} \times r$$

$$\text{Now, } \frac{V'}{V} = \frac{Q'C}{qC'} = \frac{Q'}{q} \times \frac{r}{R}$$

$$= \frac{nq}{q} \times \frac{r}{n^{1/3} \times r}$$

$$\Rightarrow V' = n^{2/3} \times V$$

$\Rightarrow$ So, potential of large drop = $n^{2/3} V$

59. Ans. (c)

A transformer transfers electric energy between two or more interconnected circuits through electric induction. It converts the high voltage to low voltage and low voltage to high and transmits it. Transformers can only function with alternating current (AC) not with direct current (DC).

60. Ans. (d)

The transformer is used to step-up and step-down the alternating current. There are two types of coils in transformers (i) Primary coil (2) Secondary coil. Alternating current flows through the primary coil which induces the potential in the secondary coil.

61. Ans. (c)

See the explanation of above question.

62. Ans. (d)

A mobile phone charger works on the simple principle of conversion of AC (alternating current) to DC (direct current). As we connect charger to 220 volt AC switchboard, the first job of the charger is to step down the high 220 v in 9 v or 10v. A step down transformer is used in mobile phone charger.

63. Ans. (a)

An electric generator is a device that converts mechanical energy obtained from an external source into electrical energy as the output. A motor converts electrical energy to mechanical energy. A diesel engine is an internal-combustion engine in which heat produced by the compression of air in the cylinder is used to ignite the fuel. Solar (or photovoltaic) cells convert the sun's energy into electricity.

64. Ans. (b)

The rotating armature of an AC generator is connected to an external circuit by the means of slip rings. In a DC generator, the commutator is used to reverse the directions of the natural alternating voltage every half cycle. So AC generator has slip rings while DC generator has a commutator.

65. Ans. (a)

Direct Current is used for charging the batteries with the help of rectifier which converts AC to DC. Thus alternate current is not preferable for it.

66. Ans. (b)

Rectifier is an electric device that converts alternating current (AC) to direct current (DC).

Inverter is an electronic circuit that changes direct current (DC) to Alternating Current (AC). The transformer supply alternating current or electric power from power grid to those appliances which use different voltages.

Transmitter is an electronic device which, with the aid of antenna produces electromagnetic signals/radio waves. Primarily it is used for radio, television and in other communication tools.

67. Ans. (d)

See the explanation of above question.

68. Ans. (c)

50Hz frequency of power transmission is fixed in our country for normal operation of the power grid. In there an increase or decrease of 0.5 Hz is acceptable. But if it increases or decreases more than that limit, the grid gets failed. In India, electricity distribution companies calculate the consumption of electricity in kWh (units). Thus, (A) is true, but (R) is false.

69. Ans. (c)

Manufacturer of electronic equipment sets a power rating for every equipment which shows the maximum power that can be consumed by the specific device. According to the question, the

ascending or increasing order of the electronic items by their power rating are— fan, television, electronic press, electronic kettle.

70. Ans. (a)

The earth's magnetic field is believed to be generated by electric currents in the conductive material of its core, created by convection currents due to heat escaping from the core.

71. Ans. (a)

In artificial satellites solar (or photovoltaic) cells convert the sun's energy into electrical energy through photovoltaic effect. The photovoltaic effect is the creation of voltage and electric current in a material upon exposure to light.

72. Ans. (a)

Space-based solar power (SBSP) is a system for the collection of solar power in space for use on earth. SBSP would differ from current solar collection methods in such a way that the means used to collect energy would reside on an orbiting satellite instead of the earth surface. The power is then transmitted via electromagnetic waves at 2.45 GHz to dedicated receiver stations on earth. "Rectenna" convert the electromagnetic energy into electricity which is used in the local grid. The supply of SBSP will be 99% uninterrupted throughout the year besides the enormity. Former president Dr. APJ Abdul Kalam suggested that the space-based solar power (SBSP) should be made a national goal.

73. Ans. (a)

Photovoltaics refers to a technology which converts light into electricity using semiconducting materials that exhibit photovoltaic effect. Solar cells produce direct current electricity from sunlight. On the other hand, Solar Thermal Technology works on the principle of converting solar energy into heat energy by absorbing it which can be further used for electricity generation.

In March, 2013 Ministry of New and Renewable Energy, Government of India informed that India has capacity of generating 2000 MW electricity through solar photovoltaic modules. This clarifies that India has infrastructure for photovoltaic technology.

74. Ans. (d)

Solar-powered pumps run on electricity generated by photovoltaic panels or the radiated thermal energy available from collected sunlight as opposed to grid electricity or diesel run water pumps. Solar power can be used for running surface pumps as well as for submersible pumps. Solar-powered submersible pumps support varied applications like field irrigation or supply potable water, while drawing water from underground water sources like bore-wells or sumps. Some solar submersible pumps use the same centrifugal mechanism as a surface pump, while others use a positive displacement mechanism. A solar-powered reciprocating pump is class of positive displacement pump with piston, which is used for various purposes such as, car washing, irrigation, colour spraying, large fountain, garden water pump etc. From the above explanation it is clear that both of the given statements are incorrect.

75. Ans. (a)

Solar cells are the components of solar arrays that convert radiant light from the sun into electricity that is then used to power electrical devices. Solar cells contain materials with semiconducting properties in which their electrons become excited and turned into an electrical current when struck by sunlight. While there are a dozen of variation of solar cells, the two most common types are those made of crystalline silicon (both monocrystalline and polycrystalline) and those made with what is called thin film technology. The majority (90 %) of the solar cells on the market today are made of silicon.

76. Ans. (a)

The conversion of light energy into electrical energy is based on the phenomenon called photovoltaic effect. A photovoltaic cell is the basic unit of the system where the photovoltaic effect is utilized to produce electricity from light energy. Silicon is most widely used semiconductor material for constructing photovoltaic cell.

77. Ans. (c)

See the explanation of above question.