SSC-II Physics: Chapter-wise MCQs

Federal Board (FBISE) | National Book Foundation textbook | 886 MCQs in 12 units plus Federal Board past papers. The correct option in every question is shown in bold.

Unit 10: Heat Capacity and Modes of Heat Transfer (70 MCQs)
Unit 11: Thermal Expansion and Change of State (67 MCQs)
Unit 12: Waves (50 MCQs)
Unit 13: Sound (59 MCQs)
Unit 14: Optics (80 MCQs)
Unit 15: Electrostatics (65 MCQs)
Unit 16: Current Electricity (63 MCQs)
Unit 17: Electric Circuits (60 MCQs)
Unit 18: Electronics (82 MCQs)
Unit 19: Electromagnetism (60 MCQs)
Unit 20: Electromagnetic Waves (64 MCQs)
Unit 21: Nuclear Physics (107 MCQs)
Federal Board Past Paper MCQs (59 MCQs)

Unit 10: Heat Capacity and Modes of Heat Transfer

70 MCQs

1. The specific heat capacity of a material is the heat absorbed or lost to change the temperature of
A. 1 m^3 of the substance by 1 K
B. 1 kg of the substance by 100 K
C. any mass of the substance by 1 K
D. 1 kg of the substance by 1 K

2. The formula for specific heat capacity is
A. $c = Q / (m\Delta T)$
B. $c = m\Delta T / Q$
C. $c = Q + m\Delta T$
D. $c = Qm\Delta T$

3. The SI unit of specific heat capacity is
A. J kg K
B. $J\ K^{-1}$
C. $J\ kg^{-1}\ K^{-1}$
D. $J\ kg^{-1}$

4. The SI unit of heat capacity of an object is
A. J kg
B. $J\ K^{-1}$
C. $J\ kg^{-1}\ K^{-1}$
D. $J\ kg\ K^{-1}$

5. The specific heat of aluminium is 900 $J\ kg^{-1}\ K^{-1}$. In $J\ g^{-1}\ °C^{-1}$ this is
A. 0.9 B. 90 C. 0.09 D. 9

6. The specific heat of water 4180 $J\ kg^{-1}\ K^{-1}$ expressed in $J\ g^{-1}\ °C^{-1}$ is
A. 4180 B. 41.8 **C. 4.18** D. 0.418

7. Materials of low specific heat are used in heat sinks because they
A. absorb a large amount of heat for a small temperature change
B. heat up and cool down quickly
C. retain heat for a long time
D. never conduct heat

8. Water is used as a coolant in the radiators of automobiles because
A. it has oxygen
B. it has a low cost only
C. it is easily available only
D. it has a large specific heat

9. Coastal areas like Karachi have small temperature variation because
A. the Sun is weaker there
B. oceans have low specific heat
C. oceans store heat in summer and release it in winter
D. land has a high specific heat

10. If equal heat is supplied to equal masses of water and copper, the temperature of copper rises faster because
A. water is a poor conductor of heat
B. radiation from water is stronger
C. convection in water dissipates heat
D. copper has a lower specific heat capacity

11. Two common methods to measure specific heat of solids and liquids are
A. method of mixtures and electrical heating method
B. calorimetry and conduction methods only
C. electrical method and radiation method
D. method of mixtures and Leslie cube method

12. In the method of mixtures, heat lost by the hot body is
A. less than heat gained by the cold bodies
B. equal to heat gained by the cold bodies
C. greater than heat gained by the cold bodies
D. zero

13. In the electrical heating method, the heat energy supplied by the heater is calculated by
A. current / voltage × time
B. voltage / current × time
C. voltage × current × time
D. voltage + current + time

14. A 200 g metal is heated from 25 °C to 75 °C using 3500 J. Its specific heat is
A. 35 $J\ kg^{-1}\ K^{-1}$
B. 700 $J\ kg^{-1}\ K^{-1}$
C. 3500 $J\ kg^{-1}\ K^{-1}$
D. 350 $J\ kg^{-1}\ K^{-1}$

15. The heat absorbed by 0.5 kg of aluminium (c = 900 $J\ kg^{-1}\ K^{-1}$) heated from 25 °C to 100 °C is
A. 33.75 kJ B. 3.375 kJ C. 45 kJ D. 337.5 kJ

16. The heat given to 25 kg of water to raise its temperature by 50 °C is (c = 4200 $J\ kg^{-1}\ K^{-1}$)
A. 52.5 MJ **B. 5.25 MJ** C. 0.525 MJ D. 5.25 kJ

17. The temperature change of 5 litres of water absorbing 8.4 MJ of heat is (c = 4200 $J\ kg^{-1}\ K^{-1}$)
A. 400 °C B. 4 °C C. 1680 °C D. 40 °C

18. A 0.5 kg metal block needs 19 kJ to be heated from 30 °C to 80 °C. Its specific heat is
A. 1520 $J\ kg^{-1}\ K^{-1}$
B. 190 $J\ kg^{-1}\ K^{-1}$
C. 380 $J\ kg^{-1}\ K^{-1}$
D. 760 $J\ kg^{-1}\ K^{-1}$

19. 100 g of water at 80 °C is mixed with 200 g of water at 20 °C. The final temperature is
A. 30 °C B. 60 °C **C. 40 °C** D. 50 °C

20. A 3 kg steel rod (c = 460 $J\ kg^{-1}\ K^{-1}$) cools from 450 °C to 50 °C. The heat lost is
A. 62 kJ **B. 552 kJ** C. 620 kJ D. 55.2 kJ

21. The three methods of heat transfer are
A. conduction, convection and radiation
B. conduction, convection and refraction
C. conduction, evaporation and radiation
D. convection, reflection and radiation

22. Thermal conduction takes place mainly in
A. gases only
B. liquids only
C. solids
D. vacuum

23. Metals are good conductors of heat because they have
A. large gaps between atoms
B. a large number of free electrons
C. no atoms
D. high density only

24. In a metal rod, heat is transferred quickly by
A. radiation only
B. convection currents
C. bulk movement of atoms
D. free electrons

25. Handles of cooking pans are made of plastic or wood because these are
A. heavy
B. good conductors of heat
C. poor conductors of heat
D. good radiators

26. The transfer of heat due to bulk movement of molecules in fluids is called
A. conduction
B. convection
C. radiation
D. insulation

27. The transfer of heat due to density difference in fluids is
A. radiation
B. conduction
C. insulation
D. convection

28. When water is heated from the bottom, the hot water rises because it becomes
A. less dense
B. heavier
C. more dense
D. more viscous

29. Upward movement of sea water is called
A. evaporation
B. tide
C. downwelling
D. upwelling

30. Upwelling brings to the surface water that is
A. warmer and poor in nutrients
B. warmer and rich in nutrients
C. colder and rich in nutrients
D. colder and poor in nutrients

31. A sea breeze blows during the
A. day B. winter nights only
C. night D. early morning only

32. A land breeze blows during the
A. noon **B. night**
C. afternoon D. summer day only

33. During the day, the land becomes hotter than the sea because the land has
A. high density only B. no heat absorption
C. low specific heat D. high specific heat

34. Birds like eagles, hawks and vultures glide without flapping by riding on
A. sea breezes **B. thermals (rising warm air)**
C. cold air currents D. land breezes

35. Hurricanes form over
A. cold land B. deserts
C. polar ice **D. warm ocean waters**

36. The transfer of heat by electromagnetic waves is called
A. radiation B. conduction
C. insulation D. convection

37. Radiation does not require
A. a hot body **B. a material medium**
C. heat energy D. infrared waves

38. Radiation is the fastest method of heat transfer because it moves at the
A. speed of free electrons B. speed of sound
C. speed of air currents **D. speed of light**

39. Which combination of heat transfer is dominant when your hand is near, but not touching, a fire?
A. Conduction and radiation B. Convection and conduction
C. Radiation and convection D. Conduction and insulation

40. The best absorber of radiation is a
A. dull black surface B. shiny silver surface
C. white surface D. smooth mirror

41. A good absorber of heat radiation is also a good
A. conductor **B. emitter** C. reflector D. insulator

42. Laptop chargers are made with black surfaces because black surfaces are good
A. reflectors B. conductors
C. emitters D. insulators

43. Before painting house walls they are made smooth and painted white so that they become
A. good absorbers B. good emitters
C. poor reflectors **D. good reflectors and poor absorbers**

44. At the same temperature, a hot body with a larger surface area emits
A. more radiation B. the same radiation as a smaller body
C. no radiation D. less radiation

45. An object remains at the same temperature when it absorbs and radiates heat at
A. an increasing rate B. zero rate
C. equal rates D. different rates

46. The Leslie cube is used to demonstrate how
A. specific heat is measured
B. conduction occurs in metals
C. convection currents form
D. surface textures affect emission of thermal radiation

47. In a thermos flask, the vacuum between the walls prevents heat transfer by
A. radiation only **B. conduction and convection**
C. emission only D. evaporation only

48. The inner walls of a thermos flask are silvered to reduce heat loss by
A. radiation B. convection
C. diffusion D. conduction

49. An infrared thermometer detects
A. sound waves B. X-rays
C. ultraviolet radiation **D. infrared radiation emitted by objects**

50. The greenhouse effect is the process in which heat is trapped near the Earth's surface by
A. ozone only B. clouds only
C. greenhouse gases D. oxygen

51. Without the atmosphere, the Earth's night temperature would fall to about
A. -180 °C B. -50 °C C. -20 °C D. 0 °C

52. Which of the following is a greenhouse gas?
A. Argon **B. Methane** C. Helium D. Neon

53. The enhanced greenhouse effect contributes to global warming by
A. trapping more heat in the atmosphere B. increasing reflection of solar radiation
C. increasing Earth's rotation speed D. blocking ultraviolet rays

54. The gradual increase in temperature of the Earth's atmosphere and oceans is called
A. convection **B. global warming**
C. greenhouse effect D. thermal equilibrium

55. Burning of fossil fuels increases
A. oxygen B. ozone
C. nitrogen only **D. greenhouse gases in the atmosphere**

56. Deforestation increases carbon dioxide because trees
A. absorb oxygen B. absorb methane only
C. absorb carbon dioxide D. produce carbon dioxide

57. Rising sea levels increase the risk of
A. freezing B. earthquakes only
C. droughts only **D. flooding of coastal areas**

58. Increased evaporation due to global warming leads to
A. droughts in dry areas and heavier rainfall in wet areas
B. more rain everywhere
C. no change in rainfall
D. less rain everywhere

59. A heat wave is a period of abnormally hot weather lasting generally more than
A. one hour B. one year **C. two days** D. one month

60. A prolonged dry period with deficiency of precipitation is called
A. flood **B. drought** C. hurricane D. cyclone

61. The temperature of the Earth's core is about
A. 60000 °C B. 600 °C C. 60 °C **D. 6000 °C**

62. The Earth's core is mainly composed of
A. aluminium and copper **B. iron and nickel**
C. carbon and hydrogen D. silicon and oxygen

63. The layer between the core and the crust is the
A. mantle B. troposphere
C. lithosphere D. outer core

64. Molten or partially molten rock beneath the Earth's crust is called
A. lava B. lithosphere
C. magma D. ash

65. The layer of the Earth composed of partially molten rock that can flow slowly is the
A. outer core B. lithosphere
C. mesosphere **D. asthenosphere**

66. In the mantle, heat is transferred mainly by
A. radiation **B. convection**
C. conduction D. diffusion

67. The primary driving force behind the movement of tectonic plates is
A. the Moon's gravity B. solar radiation
C. mantle convection currents D. the Earth's magnetic field

68. Tectonic plates move at a rate of
A. a few centimetres per year B. a few metres per day
C. a few kilometres per hour D. a few metres per second

69. A factor that keeps the Earth's core hot is
A. ocean currents
B. the Sun's heat
C. radioactive decay of uranium, thorium and potassium
D. the Moon

70. Gravitational compression keeps the core hot because it
A. increases pressure and temperature B. decreases pressure
C. cools the core D. removes radioactive elements

Unit 11: Thermal Expansion and Change of State

67 MCQs

1. In solids, the particles can only
A. escape from the surface B. flow freely
C. move randomly in all directions **D. vibrate about their mean positions**

2. When a solid absorbs heat, the amplitude of vibration of its particles
A. increases B. remains the same
C. becomes zero D. decreases

3. Liquid particles
A. have the largest gaps
B. keep changing their positions and can flow
C. are fixed in position
D. have no attractive force

4. Gas particles exert pressure by
A. vibrating about fixed positions
B. sticking to the walls
C. colliding with the walls of the container
D. attracting each other

5. Melting is the change of a
A. gas into a solid **B. solid into a liquid**
C. liquid into a solid D. liquid into a gas

6. The boiling point of water at standard atmospheric pressure is
A. 100 °C B. 373 °C C. 0 °C D. 212 °C

7. Condensation is the change of a
A. liquid into a gas B. gas into a solid
C. solid into a gas **D. gas into a liquid**

8. Water droplets forming on the outside of a cold bottle are an example of
A. sublimation B. evaporation
C. condensation D. melting

9. Sublimation is the change of a
A. solid directly into a gas B. solid into a liquid
C. gas directly into a solid D. liquid into a solid

10. A common example of sublimation is
A. ice melting **B. dry ice changing into carbon dioxide gas**
C. water boiling D. dew formation

11. Deposition is the change of a
A. liquid into a gas B. solid into a liquid
C. gas directly into a solid D. solid directly into a gas

12. Formation of frost on leaves is an example of
A. melting B. evaporation
C. sublimation **D. deposition**

13. Which process involves a change from gas to solid without passing through the liquid phase?
A. Freezing **B. Deposition**
C. Sublimation D. Melting

14. Thermal expansion means
A. change in colour on heating B. increase in mass on heating
C. decrease in size on heating **D. increase in size of matter on heating**

15. For the same increase in temperature, the expansion is least in
A. solids B. liquids C. plasma D. gases

16. For the same increase in temperature, the expansion is most in
A. solids B. all equal **C. gases** D. liquids

17. The change in length of a solid on heating is called
A. linear thermal expansion B. real expansion
C. surface expansion only D. volumetric thermal expansion

18. The formula for linear thermal expansion is
A. $\Delta L = \alpha L_0/\Delta T$ **B. $\Delta L = \alpha L_0 \Delta T$**
C. $\Delta L = L_0 \Delta T/\alpha$ D. $\Delta L = \alpha/(L_0 \Delta T)$

19. The coefficient of linear thermal expansion is the
A. fractional change in volume per kelvin
B. change in length per metre
C. fractional change in length per kelvin change in temperature
D. change in temperature per metre

20. The SI unit of the coefficient of linear expansion is
A. $m\ K^{-1}$ B. K C. m **D. K^{-1}**

21. The change in volume of a solid on heating is called
A. apparent expansion **B. volumetric thermal expansion**
C. linear thermal expansion D. real expansion

22. The formula for volumetric thermal expansion is
A. $\Delta V = \beta V_0 \Delta T$ B. $\Delta V = \beta/(V_0 \Delta T)$
C. $\Delta V = V_0 \Delta T/\beta$ D. $\Delta V = \beta \Delta T/V_0$

23. The relation between the coefficients of linear and volume expansion of solids is
A. $\beta = \alpha^2$ B. $\beta = \alpha/3$ **C. $\beta = 3\alpha$** D. $\beta = 1.5\alpha$

24. A steel bridge 1500 m long ($\alpha = 1.2\times10^{-5}\ K^{-1}$) undergoes a temperature change of 15 °C. Its change in length is
A. 0.027 m B. 2.7 m C. 27 m **D. 0.27 m**

25. A steel bar of length 1.5 m is heated from 10 °C to 100 °C ($\alpha = 1.2\times10^{-5}\ K^{-1}$). The increase in length is
A. 16.2 mm **B. 1.62 mm** C. 0.162 mm D. 162 mm

26. A solid cube of side 10 cm with $\alpha = 9\times10^{-6}\ K^{-1}$ is heated by 100 °C. The increase in its volume is
A. 9 cm^3 B. 0.9 cm^3 C. 27 cm^3 **D. 2.7 cm^3**

27. A hot air balloon fabric of volume 500 m^3 with $\beta = 3.5\times10^{-5}\ K^{-1}$ is heated by 60 °C. The volume increases by
A. 1.05 m^3 B. 0.105 m^3 C. 105 m^3 D. 10.5 m^3

28. When heat is applied directly to a liquid, the increase in its volume is called
A. apparent volume expansion B. surface expansion
C. real volume expansion D. linear expansion

29. Expansion of a liquid observed without considering the expansion of its container is called
A. apparent expansion B. anomalous expansion
C. real expansion D. linear expansion

30. When a liquid in a flask is heated, its level first
A. only falls **B. falls and then rises**
C. rises and then falls D. only rises

31. Real expansion of a liquid equals
A. apparent expansion − expansion of container
B. apparent expansion only
C. apparent expansion + expansion of the container
D. apparent expansion × expansion of container

32. The relation between the coefficients of real and apparent expansion of a liquid is
A. $\gamma r = \gamma a\ \gamma g$ B. $\gamma r = \gamma a / \gamma g$
C. $\gamma r = \gamma a - \gamma g$ **D. $\gamma r = \gamma a + \gamma g$**

33. A flask contains 250 ml of glycerine at 20 °C ($\gamma = 500\times10^{-6}\ K^{-1}$). When heated to 70 °C, the volume increases by
A. 12.5 ml B. 0.625 ml **C. 6.25 ml** D. 62.5 ml

34. All liquids expand on heating except water, which between 4 °C and 0 °C
A. evaporates **B. expands on cooling**
C. does not change D. contracts on cooling

35. Water has its highest density at
A. 4 °C B. 100 °C C. -4 °C D. 0 °C

36. The anomalous expansion of water allows ice to
A. sink in water B. become denser than water
C. melt faster **D. float on water**

37. A bimetallic strip consists of
A. two thin strips of different metals joined together
B. two glass strips
C. two strips of the same metal
D. a metal and a plastic strip

38. A bimetallic strip bends on heating because
A. it becomes magnetic B. both metals contract
C. one metal expands more than the other D. both metals expand equally

39. In an electric iron, a bimetallic thermostat controls the temperature of the
A. handle **B. heating coil**
C. fuse D. cord

40. Expansion joints are used in bridges to
A. reduce weight B. reduce cost only
C. increase strength only **D. accommodate expansion and contraction**

41. Evaporation is the change of a liquid into vapours at
A. only the freezing point **B. any temperature**
C. only 100 °C D. only the boiling point

42. Evaporation causes cooling because the molecules left behind have
A. lower average kinetic energy B. lower mass
C. higher average kinetic energy D. higher mass

43. Sweating cools the body because of
A. condensation of sweat B. freezing of sweat
C. radiation of sweat **D. evaporation of sweat**

44. Which factor decreases the rate of evaporation?
A. Increase in surface area B. Increase in wind speed
C. Increase in humidity D. Increase in temperature

45. Which factor increases the rate of evaporation?
A. Decrease in temperature B. Increase in humidity
C. Decrease in surface area **D. Increase in wind speed**

46. Boiling occurs
A. only at the surface at any temperature
B. without any heat
C. throughout the liquid at the boiling point
D. only below the boiling point

47. In a refrigerator, cooling is produced by the evaporation of
A. air **B. the refrigerant**
C. water D. oil

48. CFCs were banned as refrigerants because they
A. deplete the ozone layer B. freeze easily
C. are expensive D. are heavy

49. Latent heat is the heat absorbed or released during a change of state without a change in
A. mass B. volume
C. temperature D. pressure

50. The heat required to change a solid into a liquid at its melting point is called latent heat of
A. vaporisation B. condensation
C. sublimation **D. fusion**

51. The heat required to change a liquid into a gas at its boiling point is called latent heat of
A. freezing **B. vaporisation**
C. melting D. fusion

52. The formula for heat required for a change of state (melting) is
A. $\Delta Q = mLf$ B. $\Delta Q = Lf/m$ C. $\Delta Q = mc\Delta T$ D. $\Delta Q = m/Lf$

53. The latent heat of fusion of ice is
A. 3.33×10^{3} J kg^{-1} B. 4200 J kg^{-1}
C. 3.33×10^{5} J kg^{-1} D. 2.26×10^{6} J kg^{-1}

54. The latent heat of vaporisation of water is
A. 2.26×10^{6} J kg^{-1} B. 4200 J kg^{-1}
C. 2.26×10^{4} J kg^{-1} D. 3.33×10^{5} J kg^{-1}

55. During melting of ice at 0 °C, the heat absorbed is used to
A. increase the kinetic energy of particles
B. increase the temperature
C. increase the mass
D. weaken the attractive forces between particles

56. On the temperature-heat graph of ice, the flat portion at 0 °C represents
A. latent heat of vaporisation **B. latent heat of fusion**
C. heating of steam D. specific heat of water

57. On the temperature-heat graph of water, the flat portion at 100 °C represents
A. latent heat of fusion B. specific heat of ice
C. latent heat of vaporisation D. heating of ice

58. How much heat is required to change 15 kg of ice into water at its melting point (Lf = 3.3×10^{5} J kg^{-1})?
A. 4.95×10^{6} J B. 4.95×10^{5} J
C. 4.95×10^{7} J D. 4.95×10^{4} J

59. How much heat is required to change 7 kg of water into steam at its boiling point (Lv = 2.26×10^{6} J kg^{-1})?
A. 1.58×10^{8} J B. 1.58×10^{5} J
C. 1.58×10^{6} J **D. 1.58×10^{7} J**

60. If the latent heat of fusion of a material is 336 J/g, the heat required to melt 10 g of it at its melting point is
A. 336 J **B. 3360 J**
C. 33600 J D. 3.36×10^{5} J

61. When the temperature of a gas in a fixed volume increases, its pressure
A. decreases B. becomes zero
C. remains the same **D. increases**

62. When the volume of a gas is decreased at constant temperature, its pressure
A. increases B. decreases
C. becomes zero D. stays the same

63. The pressure of a gas is inversely proportional to its volume at constant temperature according to
A. Snell's law **B. Boyle's law**
C. Ohm's law D. Newton's law

64. Superconductors are materials through which current flows
A. only at high temperature B. with very high resistance
C. without resistance D. only in one direction

65. The temperature at and below which resistivity becomes zero is called the
A. melting point B. boiling point
C. room temperature **D. critical temperature**

66. Superconductivity was discovered in 1911 by
A. Isaac Newton **B. Heike Kamerlingh Onnes**
C. Michael Faraday D. Albert Einstein

67. The critical temperature of aluminium is
A. 4.2 K B. 7.2 K **C. 1.18 K** D. 108 K

Unit 12: Waves

50 MCQs

1. Waves are carriers of
A. heat only **B. energy and information**
C. matter only D. mass only

2. Waves transfer
A. both matter and energy B. neither matter nor energy
C. matter without transferring energy **D. energy without transferring matter**

3. A wave in a rope is an example of a
A. transverse wave B. sound wave
C. seismic P-wave D. longitudinal wave

4. The shortest distance between points where the wave pattern repeats itself is the
A. amplitude B. time period
C. wavelength D. frequency

5. The maximum value of upward displacement within a cycle is called a
A. trough **B. crest**
C. rarefaction D. node

6. The lowest point in a cycle of a transverse wave is called a
A. compression B. crest
C. trough D. wavefront

7. The maximum displacement from the mean position on either side is called
A. amplitude B. wave speed
C. wavelength D. frequency

8. The number of cycles completed by an oscillating body in one second is called
A. amplitude B. time period
C. wavelength **D. frequency**

9. The SI unit of frequency is
A. hertz B. metre C. second D. joule

10. The time required for one wave cycle to pass a point is called
A. wavelength B. wave speed
C. frequency **D. time period**

11. Time period and frequency are
A. directly proportional **B. reciprocals of each other**
C. equal to each other D. unrelated

12. The relation between time period T and frequency f is
A. $T = f^2$ B. $T = 2f$ **C. $T = 1/f$** D. $T = f$

13. A body performing simple harmonic motion completes one vibration in 2 seconds. Its frequency is
A. 2 Hz B. 10 Hz C. 1 Hz **D. 0.5 Hz**

14. 360 waves pass through a point in a river in one hour. The time period of the wave is
A. 10 s B. 100 s C. 1 s D. 0.1 s

15. The time period of the vibrator of a ripple tank is 0.5 s. The frequency of the water waves is
A. 0.5 Hz B. 200 Hz **C. 2 Hz** D. 50 Hz

16. The universal wave equation is
A. $v = \lambda/f$ **B. $v = f\lambda$** C. $v = f/\lambda$ D. $v = f + \lambda$

17. The wave equation for electromagnetic waves is
A. $c = f/\lambda$ B. $c = \lambda/f$ **C. $c = f\lambda$** D. $c = f - \lambda$

18. A rope wave has speed 2.5 m/s and wavelength 0.5 m. Its frequency is
A. 5 Hz B. 0.2 Hz C. 3 Hz D. 1.25 Hz

19. A wave in a ripple tank has frequency 12 Hz and wavelength 3 cm. Its speed is
A. 36 m/s **B. 0.36 m/s** C. 4 m/s D. 0.25 m/s

20. The frequency of red light of wavelength 700 nm in vacuum is about
A. 2.1×10^{15} Hz B. 4.29×10^{8} Hz
C. 2.1×10^{2} Hz **D. 4.29×10^{14} Hz**

21. The wavelength of radio waves from an FM station at 90 MHz is about
A. 33.3 m B. 0.33 m **C. 3.33 m** D. 300 m

22. Which of the following characteristics of a wave is independent of the others?
A. amplitude B. speed
C. wavelength D. frequency

23. Waves that require a material medium for propagation are called
A. radio waves **B. mechanical waves**
C. light waves D. electromagnetic waves

24. Waves that do not require a material medium are called
A. seismic waves B. mechanical waves
C. sound waves **D. electromagnetic waves**

25. Which of the following is a mechanical wave?
A. Ultraviolet wave **B. Sound wave**
C. Light wave D. X-ray

26. In an electromagnetic wave, the electric and magnetic fields oscillate
A. perpendicular to each other and to the direction of propagation
B. along the direction of propagation
C. parallel to each other
D. only in the direction of the electric field

27. In a transverse wave, the vibrations are
A. parallel to the direction of wave motion
B. in the form of compressions
C. at right angles to the direction of wave motion
D. in circles

28. Which of the following is a transverse wave?
A. Sound B. Seismic P-wave
C. Wave in a Slinky pushed along its length **D. Light**

29. Waves on the surface of water are an example of
A. transverse waves B. sound waves
C. longitudinal waves D. seismic P-waves

30. Seismic S-waves are
A. longitudinal waves B. sound waves
C. transverse waves D. light waves

31. In a longitudinal wave, the vibrations are
A. absent
B. parallel to the direction of wave travel
C. circular
D. perpendicular to the direction of wave travel

32. Parts of a longitudinal wave having higher density and pressure are called
A. crests B. troughs
C. rarefactions **D. compressions**

33. Parts of a longitudinal wave having smaller density and pressure are called
A. compressions B. troughs
C. rarefactions D. crests

34. Which of the following is a longitudinal wave?
A. String waves B. X-rays
C. Light **D. Sound**

35. The fastest type of seismic wave is the
A. P-wave B. light wave
C. surface wave D. S-wave

36. Longitudinal waves move fastest through
A. gases **B. solids** C. vacuum D. liquids

37. A ripple tank is used to study
A. properties of water waves B. properties of sound only
C. heat transfer D. electric current

38. The change in direction of a wavefront at a barrier so that it returns to the original medium is
A. refraction B. diffraction
C. reflection D. interference

39. The change in speed (and sometimes direction) of a wave when it enters another medium is
A. reflection B. absorption
C. diffraction **D. refraction**

40. When a water wave enters a medium in which it moves more slowly, its wavelength
A. increases **B. decreases**
C. becomes infinite D. remains the same

41. When water waves pass from deep to shallow water, their speed
A. increases B. remains the same
C. becomes zero **D. decreases**

42. When water waves pass from deep to shallow water, their frequency
A. decreases B. increases
C. remains the same D. becomes zero

43. The bending of waves around the corners of an obstacle is called
A. diffraction B. reflection
C. refraction D. interference

44. Diffraction is greatest when the size of the opening is
A. ten times the wavelength **B. less than or equal to the wavelength**
C. a hundred times the wavelength D. much greater than the wavelength

45. Wavelength or speed of a wave is _____ by diffraction.
A. decreased B. increased
C. not affected D. doubled

46. Waves with longer wavelengths diffract
A. not at all B. equally with all wavelengths
C. less **D. more**

47. Listening to radio transmission in the deep valleys of mountain areas is due to
A. reflection of waves **B. diffraction of waves**
C. refraction of waves D. interference of waves

48. Tsunamis are most often generated by
A. earthquakes B. floods
C. bomb blasts D. storms

49. In the deep sea, tsunami waves
A. are very high and fast **B. travel fast but are not very high**
C. travel slowly and are very high D. do not exist

50. When a tsunami approaches the coast, its speed
A. increases and its height increases
B. decreases and its height decreases
C. decreases while its height increases
D. increases while its height decreases

Unit 13: Sound

59 MCQs

1. Sound waves are
A. transverse waves
B. surface waves only
C. longitudinal waves
D. electromagnetic waves

2. Sound waves cannot travel through
A. vacuum B. air C. steel D. water

3. The speed of sound at 0 °C deduced by the French Academy was about
A. 3×10^8 m/s
B. 332 m/s
C. 5000 m/s
D. 1500 m/s

4. In a compression, the pressure is
A. negative B. low C. zero **D. high**

5. In a rarefaction, the pressure is
A. high B. zero **C. low** D. infinite

6. The amplitude of a sound wave tells about the
A. speed of the wave
B. pitch of the wave
C. colour of the sound
D. energy carried by the wave

7. The human audible range of frequencies is
A. 2 Hz to 2000 Hz
B. 20 Hz to 20,000 Hz
C. 0 Hz to 20 Hz
D. 200 Hz to 200,000 Hz

8. Sound waves with frequency less than 20 Hz are called
A. infrasonic waves
B. supersonic waves
C. audible waves
D. ultrasonic waves

9. Sound waves with frequency greater than 20,000 Hz are called
A. audible waves
B. subsonic waves
C. ultrasonic waves
D. infrasonic waves

10. A silent whistle used to train a dog has a frequency
A. less than 20 Hz
B. greater than 20,000 Hz
C. of 20 Hz
D. less than 20,000 Hz and greater than 20 Hz

11. Ultrasound is used in
A. prenatal scanning
B. heating water
C. communication by elephants
D. making X-rays

12. In ultrasonic cleaning, high-frequency sound waves create
A. magnetic fields
B. heat that dissolves dirt
C. bright light
D. tiny bubbles that implode and clean the surface

13. In medical scanning, the device that sends and receives high-frequency sound is a
A. oscilloscope
B. transducer
C. transformer
D. thermometer

14. SONAR stands for
A. Sound Noise and Radar
B. Signal Navigation and Ranging
C. Sound Navigation and Ranging
D. Sound Network and Rating

15. A ship's sound wave returns after 14.7 s in the sea (speed 1500 m/s). The depth is
A. 11,025 m B. 5,512 m C. 22,050 m D. 110 m

16. Sonar signal with speed 1550 m/s returns after 5.3 s. The depth of the sea is
A. 2053.7 m B. 8215 m C. 292 m **D. 4107.5 m**

17. Infrasound is produced by
A. dog whistles
B. earthquakes, volcanic eruptions and explosions
C. ultrasound scanners
D. bats

18. The three main characteristics of sound are
A. speed, amplitude and colour
B. pitch, speed and wavelength
C. pitch, loudness and quality
D. loudness, colour and shape

19. A high pitched sound has
A. a high frequency
B. a large amplitude
C. a low frequency
D. a low amplitude only

20. Loudness is measured on the basis of the
A. frequency of the sound wave
B. wavelength of the sound wave
C. speed of the sound wave
D. amplitude of the sound wave

21. Loudness level is measured in
A. metres
B. decibels
C. hertz
D. watts only

22. Pitch is independent of the
A. shrillness
B. frequency
C. vibrations per second
D. energy received by the ear per unit time

23. The quality or timbre of sound helps to distinguish between two sounds having the same
A. loudness and pitch
B. medium
C. speed
D. amplitude only

24. Quality of sound depends on the
A. speed only
B. frequency only
C. waveform
D. amplitude only

25. Sounds from a piano or violin produce on the oscilloscope
A. simple sine waves
B. straight lines
C. no waveform
D. complex waveforms

26. The speed of sound in air is approximately
A. 330 to 350 m/s
B. 3300 to 3500 m/s
C. 3 to 5 m/s
D. 33 to 35 m/s

27. In air, the speed of sound increases with
A. increase in amplitude
B. increase in temperature
C. decrease in temperature
D. increase in loudness

28. The speed of sound is fastest in
A. liquids B. gases **C. solids** D. vacuum

29. The speed of sound is slowest in
A. gases B. solids C. liquids D. steel

30. The speed of sound in steel is over
A. 50 m/s B. 1500 m/s **C. 5000 m/s** D. 340 m/s

31. The speed of sound in water is approximately
A. 340 m/s **B. 1500 m/s** C. 150 m/s D. 5000 m/s

32. If the frequency of sound is doubled, the speed of sound will
A. become half
B. become double
C. become four times
D. remain the same

33. Which is NOT true for sound?
A. Sound is a compressional and longitudinal wave
B. Sound is produced by a vibrating body
C. Sound transfers energy along with matter of the medium
D. Sound travels due to variation of pressure in air

34. Sound travels fastest in
A. steel B. water C. rubber D. air

35. Sound travels from water to an iron rod, then into air and back into water. The speed will successively
A. decrease, increase, decrease
B. increase, decrease, increase
C. increase, increase, increase
D. decrease, decrease, decrease

36. We see lightning before we hear thunder because
A. light travels slower
B. sound travels faster than light
C. thunder is produced later
D. light travels much faster than sound

37. A boy hears thunder 3.0 s after seeing lightning (speed of sound 343 m/s). The distance to lightning is about
A. 343 m B. 3 km **C. 1 km** D. 114 m

38. Noise is a sound that is
A. always ultrasonic
B. non-rhythmic and unpleasant
C. always infrasonic
D. rhythmic and pleasant

39. Reflection of sound occurs when sound
A. bounces back from a surface
B. bends around a corner
C. is absorbed
D. changes speed in a medium

40. Sound waves change direction as they pass through layers of air with varying temperature. This is
A. diffraction B. reflection
C. absorption **D. refraction**

41. When sound bends around obstacles or spreads out through small openings, it is called
A. reflection B. refraction
C. diffraction D. echo

42. An echo is a reflected sound that
A. is louder than the original
B. can be distinguished from the original sound
C. cannot be distinguished from the original sound
D. has a higher pitch

43. Human ear can perceive two separate sounds if the time gap between them is at least
A. 0.1 s B. 1 s C. 0.01 s D. 10 s

44. The minimum distance of a person from an obstacle to hear an echo (speed 340 m/s) is
A. 34 m B. 0.1 m C. 50 m **D. 17 m**

45. A boy hears an echo after 1.2 s (speed of sound 346 m/s). The distance of the cliff is
A. 288 m B. 415.2 m **C. 207.6 m** D. 103.8 m

46. A tourist hears an echo after 5 s (speed of sound 344 m/s). The cliff is at a distance of
A. 1720 m B. 430 m C. 68.8 m **D. 860 m**

47. Reverberation is the
A. overlapping of sound caused by multiple reflections
B. bending of sound
C. change in the speed of sound
D. absorption of sound

48. Acoustic protection means using _____ to absorb unwanted sounds.
A. metal sheets only **B. soft and porous materials**
C. glass panels D. hard smooth surfaces

49. Soft materials on classroom walls are used to
A. stop all sound B. increase reverberation
C. increase echo **D. reduce echo**

50. In acoustics, bass traps are used to control
A. low-frequency sounds B. high-frequency sounds
C. ultrasound D. light

51. The three main parts of the human ear are
A. outer ear, auditory nerve and cochlea **B. outer ear, middle ear and inner ear**
C. middle ear, eardrum and auditory nerve D. inner ear, cochlea and eardrum

52. The three tiny bones in the middle ear are called
A. cochleae B. nerves **C. ossicles** D. membranes

53. The sound entered in the ear is amplified by the
A. eardrum B. cochlea C. brain **D. ossicles**

54. In the cochlea, vibrations are converted into electrical signals by
A. ossicles B. skin
C. hair cells D. eardrum

55. Electrical signals from the cochlea go to the brain through the
A. vocal cords **B. auditory nerve**
C. spinal cord D. optic nerve

56. Excessive use of earphones at high volume can lead to
A. noise-induced hearing loss B. improved balance
C. infrasound D. better hearing

57. A physician counts 69 heartbeats in 1 minute. The frequency of the heartbeat is
A. 4140 Hz B. 69 Hz **C. 1.15 Hz** D. 0.87 Hz

58. The wavelength of a 20 kHz sound wave at 343 m/s is
A. 0.01715 m B. 0.1715 m C. 6.86 m D. 17.15 m

59. A sound wave in seawater has speed 1500 m/s and wavelength 45 cm. Its frequency is
A. 675 Hz **B. 3333.3 Hz** C. 6.75 Hz D. 33.3 Hz

Unit 14: Optics

80 MCQs

1. When a ray of light approaches a smooth polished surface and bounces back, it is called
A. dispersion B. refraction
C. reflection D. diffraction

2. The line perpendicular to the reflecting surface at the point of incidence is called the
A. radius **B. normal**
C. tangent D. principal axis

3. The first law of reflection states that the incident ray, the reflected ray and the normal
A. are parallel B. lie in different planes
C. are perpendicular to each other **D. all lie in the same plane**

4. The second law of reflection states that the angle of incidence
A. is equal to the angle of reflection B. is always 90°
C. is less than the angle of reflection D. is greater than the angle of reflection

5. An incident ray makes an angle of 45° with a plane mirror. The angle of reflection is
A. 90° B. 60° C. 30° **D. 45°**

6. A ray of light strikes a plane mirror at an angle of 47° with the surface. The angle between the incident and reflected rays is
A. 43° B. 47° **C. 86°** D. 94°

7. The image formed by a plane mirror is always
A. real and erect **B. virtual and erect**
C. real and inverted D. virtual and inverted

8. The image formed by a plane mirror is
A. the same size as the object B. half the size
C. smaller than the object D. larger than the object

9. In a plane mirror, the distance of the image from the mirror is
A. half the object distance
B. twice the object distance
C. equal to the distance of the object from the mirror
D. zero

10. A virtual image
A. is always inverted B. can be projected on a screen
C. is formed by actual meeting of rays **D. cannot be projected on a screen**

11. Refraction of light is the change in
A. colour of light
B. direction of light as it passes from one medium to another
C. frequency of light only
D. intensity of light only

12. The speed of light in vacuum is
A. 3×10^{8} m/s B. 3×10^{5} m/s
C. 3×10^{10} m/s D. 3×10^{6} m/s

13. The speed of light in matter is
A. equal to that in vacuum **B. less than that in vacuum**
C. infinite D. greater than that in vacuum

14. Light bends towards the normal when it
A. travels along the normal only B. enters a medium of equal density
C. speeds up on entering a rarer medium **D. slows down on entering a denser medium**

15. Light bends away from the normal when it
A. reflects from a mirror B. enters at 0° incidence
C. speeds up on entering a rarer medium D. slows down on entering a denser medium

16. Refractive index of a medium is defined as
A. speed of light in vacuum divided by speed of light in the medium
B. difference of the two speeds
C. product of the two speeds
D. speed of light in the medium divided by speed in vacuum

17. The formula for refractive index is
A. $n = v/c$ **B. $n = c/v$** C. $n = c - v$ D. $n = cv$

18. The refractive index of any medium cannot be
A. equal to 1.5 B. equal to 2
C. less than 1 D. greater than 1

19. The speed of light in diamond (n = 2.419) is about
A. 1.24×10^8 m/s B. 3×10^8 m/s
C. 2.4×10^8 m/s D. 7.3×10^8 m/s

20. The speed of light in a medium of refractive index 1.7 is about
A. 3×10^8 m/s B. 1.7×10^8 m/s
C. 5.1×10^8 m/s **D. 1.76×10^8 m/s**

21. The speed of light in diamond if its refractive index is 2.5 is
A. 1.2×10^8 m/s B. 5.2×10^8 m/s
C. 2.5×10^8 m/s D. 7.5×10^8 m/s

22. Snell's law is expressed as
A. $n_1 \tan\theta_1 = n_2 \tan\theta_2$ B. $n_1 \cos\theta_1 = n_2 \cos\theta_2$
C. $n_1 \sin\theta_1 = n_2 \sin\theta_2$ D. $n_1\,\theta_1 = n_2\,\theta_2$

23. The refractive index of a medium into which light enters from air at 37° and is refracted at 21° is about
A. 2.2 **B. 1.68** C. 1.2 D. 0.6

24. If light enters a medium at right angles to the boundary, the angle of refraction is
A. 90° B. equal to the critical angle
C. 45° **D. 0°**

25. A glass slab dipped in a liquid of the same refractive index shows no boundary because refraction is
A. zero B. infinite
C. maximum D. minimum but not zero

26. The apparent flattening of the Sun at dawn and dusk is due to
A. polarization B. reflection
C. refraction D. dispersion

27. A ray travelling in a medium of index 1.6 enters at 21° into a medium of index 1.7. The angle of refraction is about
A. 24° **B. 19.7°** C. 21° D. 22.3°

28. The angle of incidence in the denser medium for which the angle of refraction is 90° is called the
A. angle of reflection B. Brewster angle
C. angle of deviation **D. critical angle**

29. Total internal reflection occurs when light travels from a
A. denser medium to a rarer medium at an angle greater than the critical angle
B. denser to rarer medium at an angle less than the critical angle
C. rarer medium to a denser medium
D. rarer to denser medium at any angle

30. Total internal reflection can occur only when light travels from
A. a rarer to a denser medium **B. a denser to a rarer medium**
C. air to glass D. air to water

31. The formula for the critical angle is
A. $\tan\theta c = n$ B. $\sin\theta c = n$
C. $\cos\theta c = 1/n$ **D. $\sin\theta c = 1/n$**

32. The critical angle of polystyrene (n = 1.49) surrounded by air is
A. 90° B. 60° **C. 42.2°** D. 32.2°

33. The critical angle for light travelling from a medium of index 1.63 into a medium of index 1.35 is about
A. 35° B. 42° C. 90° **D. 55.9°**

34. When the angle of incidence equals the critical angle, the refracted ray
A. bends towards the normal B. is totally reflected
C. moves along the boundary D. goes into the second medium at 45°

35. The working principle of optical fibres is
A. total internal reflection B. refraction
C. diffraction D. dispersion

36. The mirage on a road in summer is explained by
A. diffraction **B. total internal reflection**
C. polarization D. dispersion

37. An advantage of optical fibres over copper cables is
A. more power consumption B. greater electrical interference
C. lower bandwidth **D. higher bandwidth and faster speed**

38. A converging lens is also called a
A. plane lens B. concave lens
C. convex lens D. diverging lens

39. A converging lens is
A. flat
B. thicker at the centre and thinner at the edges
C. equally thick everywhere
D. thinner at the centre and thicker at the edges

40. The focal length of a converging lens is
A. positive B. infinite C. negative D. zero

41. The focal point of a concave lens is
A. at the optical centre B. at infinity
C. virtual D. real

42. The image formed by a convex lens for an object at infinity is
A. real and enlarged at 2F **B. real, at the focus and highly diminished**
C. virtual and enlarged D. virtual and diminished

43. An object placed beyond 2F of a convex lens forms an image that is
A. virtual and enlarged
B. real and enlarged beyond 2F
C. real and same size
D. real, inverted and smaller, between F and 2F

44. An object placed at 2F of a convex lens forms an image that is
A. real, inverted and the same size at 2F B. formed at infinity
C. virtual and enlarged D. real and smaller

45. An object placed between F and 2F of a convex lens forms an image that is
A. real and smaller B. at infinity
C. real, inverted and larger, beyond 2F D. virtual and enlarged

46. An object placed inside F of a convex lens forms an image that is
A. virtual and diminished **B. virtual, erect and enlarged**
C. real and inverted D. real and diminished

47. The image formed by a diverging lens for an object at infinity is
A. virtual and enlarged B. real and inverted
C. real and enlarged **D. virtual, upright and diminished**

48. Linear magnification is also equal to
A. q/p B. $p \times q$ C. p/q D. $p - q$

49. An object of height 2 cm is placed 6 cm from a lens with magnification 3. The image height is
A. 12 cm B. 18 cm C. 2 cm **D. 6 cm**

50. An object of height 2 cm is placed 6 cm from a lens with magnification 3. The image distance is
A. 18 cm B. 6 cm C. 9 cm D. 2 cm

51. An object of height 3 cm at a distance of 5 cm is placed from a lens with magnification 3. The image height and distance are
A. 9 cm and 1.7 cm B. 1 cm and 1.7 cm
C. 9 cm and 15 cm D. 15 cm and 9 cm

52. An object is placed at 10 cm from a convex lens of focal length 5 cm. The linear magnification is
A. 2 **B. 1** C. 0.5 D. 3

53. A real image
A. can be caught on a screen
B. is formed by imaginary intersection of rays
C. cannot be caught on a screen
D. is always erect

54. A real image is always
A. virtual B. erect **C. inverted** D. smaller

55. A magnifying glass uses a
A. prism B. concave lens
C. plane mirror **D. convex lens**

56. To use a magnifying glass, the object must be placed
A. at infinity **B. closer than the focal point**
C. beyond 2F D. at 2F

57. A magnifying glass forms an image that is
A. enlarged, inverted and real B. diminished and virtual
C. diminished and real **D. enlarged, erect and virtual**

58. The splitting of white light into seven colours by a prism is called
A. dispersion B. total internal reflection
C. diffraction D. reflection

59. In a prism, the colour that bends the most is
A. red B. yellow **C. violet** D. green

60. A camera forms on the film or CCD an image that is
A. virtual and erect **B. real and inverted**
C. virtual and inverted D. real and erect

61. The number of colours in the visible spectrum is
A. eight B. five **C. seven** D. six

62. The seven colours of the visible spectrum in order from red are
A. red, yellow, orange, green, blue, violet, indigo
B. red, orange, yellow, green, blue, indigo, violet
C. red, orange, yellow, blue, green, indigo, violet
D. violet, indigo, blue, green, yellow, orange, red

63. Ibn al-Haytham is known as the
A. father of chemistry B. father of algebra
C. father of astronomy **D. father of optics**

64. Red light has the
A. longest wavelength and lowest frequency
B. longest wavelength and highest frequency
C. shortest wavelength and lowest frequency
D. shortest wavelength and highest frequency

65. Violet light has the
A. longest wavelength and highest frequency
B. longest wavelength and lowest frequency
C. shortest wavelength and highest frequency
D. shortest wavelength and lowest frequency

66. The visible spectrum lies in the wavelength range of about
A. 500 to 700 nm **B. 400 to 750 nm**
C. 700 to 900 nm D. 400 to 850 nm

67. In the human eye, the image is formed on the
A. retina B. iris C. cornea D. pupil

68. In the human eye, the image formed on the retina is
A. virtual and erect B. virtual and inverted
C. real and erect **D. real and inverted**

69. The near point of the eye is at
A. 250 cm B. 2.5 cm **C. 25 cm** D. 2.5 m

70. Rods are used for
A. colour vision B. sharpness only
C. focusing **D. night vision**

71. Cones are used for
A. colour vision B. night vision
C. hearing D. balance

72. Short-sightedness (myopia) is the condition in which a person sees
A. no colours
B. near objects clearly but distant objects blurry
C. distant objects clearly but near objects blurry
D. all objects clearly

73. In myopia, the image forms
A. on the cornea B. behind the retina
C. on the retina **D. in front of the retina**

74. Myopia is corrected using a
A. concave lens B. plane glass
C. prism D. convex lens

75. Long-sightedness (hypermetropia) is the condition in which a person sees
A. near objects clearly but distant objects blurry
B. everything blurry
C. distant objects clearly but near objects blurry
D. no colours

76. In hypermetropia, the image forms
A. on the lens **B. behind the retina**
C. in front of the retina D. on the retina

77. Hypermetropia is corrected using a
A. concave lens B. plane glass
C. prism **D. convex lens**

78. Gravitational lensing occurs because massive objects
A. scatter sound **B. curve space-time and bend light**
C. reflect light D. absorb all light

79. Einstein rings are seen due to
A. gravitational lensing B. acoustic lensing
C. diffraction D. refraction in glass

80. Acoustic lenses are used to
A. reflect heat B. focus light
C. focus or diverge sound waves D. produce electricity

Unit 15: Electrostatics

65 MCQs

1. The SI unit of charge is the
A. farad B. volt C. ampere **D. coulomb**

2. Electrons carry a
A. positive charge B. variable charge
C. negative charge D. no charge

3. The charge on an electron is
A. $+1.6\times10^{-19}$ C **B. -1.6×10^{-19} C**
C. -1.6×10^{19} C D. 0 C

4. Like charges
A. repel each other B. combine
C. have no force D. attract each other

5. Unlike charges
A. have no force B. repel each other
C. attract each other D. combine permanently

6. Charge cannot be created or destroyed, only
A. doubled **B. transferred**
C. reduced D. melted

7. In charging by friction, the charge that is transferred is
A. neutrons B. atoms C. protons **D. electrons**

8. When a glass rod is rubbed with silk, electrons move from
A. the glass rod to the silk B. neither
C. the rod to the air D. the silk to the glass rod

9. When a rubber rod is rubbed with animal fur, the rubber rod becomes
A. neutral B. positively charged
C. magnetic **D. negatively charged**

10. A rubber rod is rubbed with fur. The fur is brought near the bulb of an uncharged electroscope. The sign of charge on the leaves is
A. positive B. negative C. neutral D. zero

11. If you remove electrons from an object, it will have a
A. variable charge **B. positive charge**
C. negative charge D. zero charge

12. A positive ion is formed when a
A. negative atom gains an electron B. neutral atom gains a proton
C. neutral atom loses an electron D. neutral atom gains an electron

13. Materials that conduct electric charge efficiently are called
A. dielectrics only B. magnets
C. insulators **D. conductors**

14. Which of the following is an insulator?
A. Copper B. Silver **C. Rubber** D. Aluminium

15. In conductors, the valence electrons are
A. inside the nucleus **B. loosely bound to their atoms**
C. absent D. firmly attached to their atoms

16. In insulators, even the least tightly bound electrons are
A. firmly attached to their atoms B. absent
C. free to move D. moving randomly

17. The mobile electrons in a conductor are called
A. protons **B. free electrons**
C. ions D. bound electrons

18. On a non-spherical conductor, charges tend to move towards the
A. centre B. flat areas
C. more pointed areas D. hollow parts

19. The three main ways to charge objects are
A. friction, heating and cooling
B. contact, magnetism and induction
C. induction, radiation and conduction of heat
D. friction, contact and induction

20. Charging by contact is also called
A. conduction B. induction
C. polarisation D. friction

21. In charging by induction, the charge acquired by the object is
A. random B. zero
C. the same as the inducing charge **D. opposite to the inducing charge**

22. A change in the distribution of charge in an object due to nearby charges is called electrostatic
A. induction B. friction
C. radiation D. conduction

23. Earthing or grounding means
A. storing the charge
B. producing charge
C. giving the charge a path to escape into the ground
D. heating the body

24. A negatively charged object is brought close to a conductor and the opposite side is grounded. The conductor is left with
A. a negative charge **B. a positive charge**
C. a changing charge D. no charge

25. A small metal ball hangs by an insulating thread and is attracted to a positively charged rod. The ball must be
A. positive B. negative only
C. positive or neutral **D. negative or neutral**

26. A charged rod is brought near a suspended object which is repelled. The suspended object is
A. charged with the same sign B. charged with the opposite sign
C. uncharged D. neutral

27. A negatively charged sphere touches a neutral identical sphere. Afterwards the spheres will
A. attract each other B. neutralise each other
C. repel each other D. exert no force

28. An insulator can be discharged by
A. rubbing it more **B. heating it above a flame**
C. charging it more D. cooling it

29. An insulator can also be discharged by
A. exposing it to humid conditions B. exposing it to dry air
C. placing it in a dry box D. keeping it in vacuum

30. Static electricity is more noticeable on dry days because
A. humid air is hot B. dry air is a good conductor
C. dry air does not conduct charge away D. dry air has more electrons

31. Pieces of paper are attracted to a charged comb because of
A. diffraction B. radiation
C. friction **D. polarisation**

32. An electroscope is used to
A. store charge **B. detect charge on an object**
C. measure current D. produce light

33. An electroscope works on the principle that
A. heat flows to cold B. like charges attract
C. light is refracted **D. like charges repel**

34. The leaves of a charged electroscope diverge because of
A. air pressure B. attraction of unlike charges
C. repulsion of like charges D. neutral leaves

35. A negatively charged electroscope has its leaves diverge more when a _____ rod is brought near.
A. neutral **B. negatively charged**
C. positively charged D. magnetic

36. A positively charged rod brought near a negatively charged electroscope causes the leaf to
A. collapse B. diverge more
C. remain unchanged D. vibrate

37. An electroscope can be positively charged by induction using a negatively charged rod by
A. touching the disk with the rod
B. grounding the electroscope with a finger and then removing it
C. wetting it
D. heating it

38. An electric field is the region around a charge where it
A. produces heat B. emits light
C. emits sound **D. exerts a force on other charges**

39. Electric field intensity is the
A. force per unit area
B. work per unit time
C. electrostatic force per unit positive test charge
D. charge per unit force

40. The formula for electric field intensity is
A. E = F/q B. E = Fq C. E = q/F D. E = F + q

41. The SI unit of electric field intensity is
A. C N^{-1} B. N C C. J C **D. N C^{-1}**

42. The direction of the electric field at a point is the direction of force on a
A. positive test charge B. neutral charge
C. negative test charge D. moving magnet

43. Electric field lines for a positive charge are directed
A. in circles **B. away from the charge**
C. towards the charge D. parallel to the charge

44. Electric field lines for a negative charge are directed
A. in circles B. away from the charge
C. towards the charge D. perpendicular to the charge

45. The density of electric field lines indicates the
A. colour of the field **B. strength of the field**
C. charge only D. direction only

46. Inside a charged conducting sphere, the electric field is
A. maximum B. infinite
C. zero D. uniform and non-zero

47. A positive test charge of 30 μC experiences a force of 0.600 N. The electric field is
A. 2.00×10^{4} N/C B. 2.00×10^{-5} N/C
C. 0.05 N/C D. 18 N/C

48. A positive test charge experiences a force of 0.5 N in a field of 2.0 N/C. The charge is
A. 1 C B. 2.5 C C. 4 C **D. 0.25 C**

49. A charge of 3.0 μC is in a uniform field of 1.5 N/C. The force on it is
A. 0.5 μN **B. 4.5 μN** C. 2 μN D. 4.5 N

50. An electron experiences a force of 0.01 N. The electric field strength is ($e = 1.6\times10^{-19}$ C)
A. 1.6×10^{17} N/C B. 1.6×10^{-21} N/C
C. 6.25×10^{16} N/C D. 6.25×10^{-17} N/C

51. The force on an electron in a uniform field of 20 N/C is
A. 3.2×10^{-17} N B. 3.2×10^{-19} N
C. 8×10^{-21} N **D. 3.2×10^{-18} N**

52. A charge of -1.0×10^{-4} C is in a field of 1.7×10^{4} N/C directed right. The force is
A. 1.7 N to the left B. 0.17 N to the left
C. 17 N to the left D. 1.7 N to the right

53. An electrostatic precipitator is used to
A. detect charge B. make photocopies
C. remove dust from smoke in chimneys D. produce electricity

54. Most photocopy machines use an electrostatic process called
A. xerography B. radiography
C. photography D. lithography

55. Selenium acts as a photoconductor, meaning it is an insulator in the dark and a _____ in light.
A. insulator **B. conductor**
C. magnet D. semiconductor only in dark

56. A faint glow around sharp points of conductors at high voltage is called
A. Lichtenberg figure B. static charge
C. lightning **D. corona discharge**

57. Corona discharge is most likely to occur at
A. smooth spheres **B. sharp points**
C. flat surfaces D. insulated areas

58. Branching tree-like patterns formed on insulators by high-voltage discharges are called
A. corona discharge B. step leaders
C. Lichtenberg figures D. streamers

59. Lightning occurs when charges separate in clouds, with positive charges rising to the
A. ground B. bottom of the cloud
C. middle only **D. top of the cloud**

60. The zigzag path of excess electrons travelling from the cloud base to the ground is called a
A. step leader B. streamer
C. corona D. sprite

61. In lightning, negative charge may move to the ground at speeds up to about
A. 100 km/s B. 1000 km/s
C. 100,000 km/s D. 10 km/s

62. A lightning rod was invented by
A. Michael Faraday B. Robert Van de Graaff
C. Charles Coulomb **D. Benjamin Franklin**

63. A lightning rod protects a building by providing
A. a safe path for current to the ground B. a source of lightning
C. heat D. a store for charge

64. To be safe during a lightning storm, it is best to be
A. in the middle of a grassy meadow **B. inside a metal car**
C. next to a tall tree D. on a metal observation tower

65. The hair of a person touching a Van de Graaff generator lifts because the strands
A. are magnetised
B. are attracted to the dome
C. have the same charge and repel each other
D. are heated

Unit 16: Current Electricity

63 MCQs

1. The formula for electric current is
A. I = Q/Δt B. I = Δt/Q
C. I = Q + Δt D. I = QΔt

2. The SI unit of electric current is the
A. coulomb **B. ampere** C. ohm D. volt

3. One ampere is the current when _____ of charge flows through a cross-section in one second.
A. one volt B. one ohm
C. one joule **D. one coulomb**

4. The assumed direction of flow of positive charges from the positive to the negative terminal of a battery is called
A. actual current B. induced current
C. conventional current D. alternating current

5. The directions of actual current and conventional current are
A. the same **B. opposite to each other**
C. unrelated D. perpendicular to each other

6. A battery charged at 10 A for 2 hours receives a charge of
A. 72,000 C B. 1,200 C C. 20 C D. 7,200 C

7. 1 Ah is equal to
A. 1 C B. 1000 C C. 60 C **D. 3600 C**

8. A 200 Ah battery is charged with a current of 25 A. The time required is
A. 0.125 hours B. 5000 hours
C. 8 hours D. 225 hours

9. If 3 A of current flows for 2 minutes, the charge crossing a cross-section is
A. 6 C B. 1.5 C C. 180 C **D. 360 C**

10. A current of 1 mA passes through a wire. The number of electrons passing a point in 10 s is
A. 6.25×10^{-16} B. 6.25×10^{13}
C. 6.25×10^{16} D. 6.25×10^{19}

11. Direct current (DC) flows
A. in circles **B. in one fixed direction**
C. only in AC mains D. in alternating directions

12. Alternating current (AC) changes its direction
A. continuously B. only when the battery is replaced
C. never D. once

13. The difference of electric potential between two points is called
A. resistance B. current
C. electromotive force **D. potential difference**

14. The formula for potential difference is
A. V = q/W B. V = Wq **C. V = W/q** D. V = W + q

15. The SI unit of potential difference is the
A. ampere **B. volt** C. watt D. ohm

16. One volt is equal to
A. one joule per coulomb B. one ampere per ohm
C. one coulomb per joule D. one watt per second

17. The energy supplied by a battery per unit positive charge is called
A. potential difference **B. electromotive force (emf)**
C. current D. resistance

18. The SI unit of emf is the
A. volt B. ampere C. joule D. ohm

19. An emf source is a device which converts
A. heat into light
B. electrical energy into heat
C. non-electrical energy into electrical energy
D. light into sound

20. The mathematical form of Ohm's law is
A. V = R/I B. V = I/R C. I = VR **D. V = IR**

21. Devices that obey Ohm's law are called
A. insulators **B. ohmic devices**
C. semiconductors D. non-ohmic devices

22. Which of the following is a non-ohmic device?
A. Carbon resistor B. Copper wire
C. Diode D. Silver wire

23. Which of the following is an ohmic device?
A. Copper wire B. Filament bulb
C. Thermistor D. Semiconductor diode

24. A torch bulb uses two 1.5 V cells in series and has a resistance of 20 Ω. The current is
A. 1.5 A B. 30 A C. 6.7 A **D. 0.15 A**

25. A device connected to a 12 V battery allows a current of 200 mA. Its resistance is
A. 60 Ω B. 0.6 Ω C. 6 Ω D. 2400 Ω

26. A 12.0 V emf source is connected to a bulb through which 2.0 A flows. The resistance of the bulb is
A. 24 Ω B. 0.17 Ω C. 10 Ω **D. 6 Ω**

27. A voltage of 5000 V is needed to pass 50 A through a resistance of
A. 0.01 Ω **B. 100 Ω** C. 10 Ω D. 250 Ω

28. The current through a resistor is 0.5 A at 6.0 V. At 9.0 V, the current is
A. 0.33 A B. 1.5 A **C. 0.75 A** D. 0.25 A

29. Resistance is the
A. opposition to the flow of charges B. force on charges
C. energy of charges D. flow of charges

30. The SI unit of resistance is the
A. volt B. siemens C. ampere **D. ohm**

31. The resistance of a wire is directly proportional to its
A. cross-sectional area **B. length**
C. voltage D. current

32. The resistance of a wire is inversely proportional to its
A. resistivity B. length
C. cross-sectional area D. temperature

33. If a wire's length is doubled (same area), its resistance becomes
A. four times B. half
C. one fourth **D. double**

34. The resistance of a conductor as the temperature rises
A. increases B. becomes zero
C. stays constant D. decreases

35. The resistance of semiconductors as the temperature rises
A. increases **B. decreases**
C. becomes infinite D. stays constant

36. A tungsten bulb burns out the moment it is switched on mainly because
A. the filament is thick
B. the filament has high resistance when cold
C. the cold filament has low resistance so a large current flows
D. the voltage drops

37. The resistance of a material always decreases when
A. temperature increases B. area decreases
C. length increases **D. the number of free electrons increases**

38. Conductance is the reciprocal of
A. resistance B. resistivity
C. voltage D. current

39. The resistance offered by a wire of length 1 m and cross-sectional area 1 m^2 is called
A. conductivity **B. resistivity**
C. capacitance D. conductance

40. The formula for resistance in terms of resistivity is
A. R = L/ρA B. R = A/ρL **C. R = ρL/A** D. R = ρA/L

41. The formula for resistivity is
A. ρ = L/RA **B. ρ = RA/L** C. ρ = RL/A D. ρ = R/AL

42. The SI unit of resistivity is
A. ohm B. ohm per metre squared
C. ohm-metre D. ohm per metre

43. Good electrical conductors have
A. very low resistivities B. resistivity equal to insulators
C. very high resistivities D. zero conductivity

44. The resistivity of semiconductors lies
A. below conductors
B. equal to metals
C. above insulators
D. between those of conductors and insulators

45. Which of these metals has the lowest resistivity in the book's table?
A. Silver B. Gold C. Copper D. Aluminium

46. The resistivity of copper is about
A. 1.72×10^{8} Ω m B. 1.72×10^{-4} Ω m
C. 1.72×10^{-8} Ω m D. 1.72×10^{-2} Ω m

47. A 1 m silver wire ($\rho = 1.6\times10^{-8}$ Ω m) with area 0.4 cm^2 has resistance
A. 40 mΩ B. 0.4 Ω C. 4 Ω **D. 0.4 mΩ**

48. A wire of length 2 m and area 0.4 mm^2 has resistance 0.085 Ω. Its resistivity is
A. 1.7×10^{-3} Ω m **B. 1.7×10^{-8} Ω m**
C. 1.7×10^{-6} Ω m D. 1.7×10^{-10} Ω m

49. The resistivity of a metal _____ with rising temperature.
A. becomes zero B. remains constant
C. decreases **D. increases**

50. The temperature coefficient of resistivity is positive for
A. metals B. glass
C. semiconductors D. insulators

51. The temperature coefficient of resistivity is negative for
A. silver **B. semiconductors**
C. metals D. copper

52. The relation between final and initial resistivity is
A. $\rho_t = \rho_0 \alpha\Delta T$ B. $\rho_t = \rho_0/(\alpha\Delta T)$
C. $\rho_t = \rho_0(1 + \alpha\Delta T)$ D. $\rho_t = \rho_0(1 - \alpha\Delta T)$

53. The resistivity of a metal is 1.7×10^{-8} Ω m. After a rise of 50 K with $\alpha = 0.004\ K^{-1}$, the new resistivity is
A. 2.04×10^{-8} Ω m B. 1.36×10^{-8} Ω m
C. 3.4×10^{-8} Ω m D. 1.7×10^{-8} Ω m

54. An ammeter is used to measure
A. resistance B. potential difference
C. power **D. current**

55. An ammeter must be connected in
A. parallel **B. series**
C. series-parallel D. any manner

56. An ammeter is designed to have
A. very high resistance B. no wires
C. very low resistance D. infinite resistance

57. The resistance of an ammeter is usually of the order of
A. 10 MΩ **B. 1 Ω** C. 1 MΩ D. 1000 Ω

58. A voltmeter is used to measure
A. power B. current
C. potential difference D. resistance

59. A voltmeter must be connected in
A. parallel B. series-parallel
C. any manner D. series

60. A voltmeter is designed to have
A. zero resistance B. very low resistance
C. no resistance **D. very high resistance**

61. The resistance of a voltmeter is usually of the order of
A. 10 Ω **B. 10 MΩ** C. 1 Ω D. 1 kΩ

62. Ammeters and voltmeters are modified forms of the
A. galvanometer B. diode
C. capacitor D. transformer

63. In the resistance experiment, the resistance is calculated using
A. R = I/V B. R = VI **C. R = V/I** D. R = V + I

Unit 17: Electric Circuits

60 MCQs

1. Active elements in a circuit
A. can supply or generate energy B. do nothing
C. only absorb energy D. only store energy

2. A component whose function is to provide a specified value of resistance is a
A. inductor **B. resistor** C. capacitor D. diode

3. Resistors dissipate electrical energy as
A. sound B. light **C. heat** D. magnetism

4. The resistance of a carbon resistor is indicated by
A. a magnetic strip B. a numeric screen
C. a hologram **D. colour bands**

5. The first two bands of a resistor represent
A. the multiplier B. the power rating
C. the significant figures D. the tolerance

6. The fourth band, silver or gold, indicates the
A. multiplier B. first digit
C. second digit **D. tolerance**

7. A resistor with bands green, blue, orange and gold has a resistance of
A. 56 kΩ ± 5 % B. 56 Ω ± 5 %
C. 560 kΩ ± 10 % D. 5.6 kΩ ± 5 %

8. A resistor has first three bands brown, black and red. Its value is
A. 10 kΩ **B. 1 kΩ** C. 2 kΩ D. 100 Ω

9. A variable resistor used to regulate current in a circuit is called a
A. capacitor B. thermistor
C. potentiometer **D. rheostat**

10. A circuit that produces an output voltage that is a fraction of its input voltage is called a
A. rectifier **B. potential divider**
C. relay D. transformer

11. In a potential divider, the output voltage across R_2 is
A. $V R_2/(R_1 + R_2)$ B. $V R_1/(R_1 + R_2)$
C. $V (R_1 + R_2)$ D. $V R_1R_2$

12. If $R_1 = R_2$ in a potential divider, the output voltage is
A. zero B. double the input voltage
C. half the input voltage D. equal to the input voltage

13. A thermistor is a resistor whose resistance varies significantly with
A. voltage only B. light
C. length **D. temperature**

14. The resistance of an NTC thermistor _____ with increasing temperature.
A. remains constant **B. decreases**
C. becomes infinite D. increases

15. The best metal for resistance thermometers (RTDs) is
A. platinum B. aluminium C. gold D. lead

16. The resistance of an LDR as light intensity increases
A. increases B. becomes infinite
C. decreases D. stays constant

17. An LDR is used in
A. automatic lighting control B. fuses
C. heating elements D. generators

18. For resistors in series, the _____ is the same through each resistor.
A. voltage **B. current**
C. power D. resistance

19. The equivalent resistance in series is
A. $R_1 - R_2 - R_3$ B. $R_1R_2R_3$
C. $R_1 + R_2 + R_3$ D. $1/R_1 + 1/R_2 + 1/R_3$

20. Resistors of 10 Ω, 20 Ω and 30 Ω in series have equivalent resistance
A. 5.45 Ω B. 6000 Ω C. 20 Ω **D. 60 Ω**

21. Resistors of 10 Ω, 20 Ω and 30 Ω in series across 20 V carry a current of
A. 0.333 A B. 0.67 A C. 3 A D. 1 A

22. In that series circuit (10 Ω, 20 Ω, 30 Ω, 20 V), the voltage across the 30 Ω resistor is about
A. 6.7 V **B. 10 V** C. 20 V D. 3.3 V

23. The equivalent resistance in parallel is given by
A. $Req = R_1R_2R_3$ B. $Req = R_1 + R_2 + R_3$
C. $1/Req = 1/R_1 + 1/R_2 + 1/R_3$ D. $Req = R_1 - R_2$

24. Resistors of 5 Ω, 10 Ω and 15 Ω in parallel have equivalent resistance about
A. 0.37 Ω B. 30 Ω C. 10 Ω **D. 2.73 Ω**

25. Resistors of 8 Ω, 12 Ω and 18 Ω in parallel have equivalent resistance about
A. 3.789 Ω B. 38 Ω C. 0.26 Ω D. 12.7 Ω

26. Resistors of 5 Ω, 10 Ω and 15 Ω in parallel across 12 V: the current through the 5 Ω resistor is
A. 1.2 A **B. 2.4 A** C. 4.4 A D. 0.8 A

27. The total current in that parallel circuit (5 Ω, 10 Ω, 15 Ω across 12 V) is
A. 2.4 A B. 1.2 A C. 0.8 A **D. 4.4 A**

28. Two 4 Ω resistors are in parallel and in series with a 6 Ω resistor. The equivalent resistance is
A. 4 Ω B. 14 Ω **C. 8 Ω** D. 10 Ω

29. A wire of resistance R is divided into 10 equal parts connected in parallel. The equivalent resistance is
A. 10 R B. 0.1 R C. R **D. 0.01 R**

30. In a parallel connection of two bulbs, if bulb A glows brighter than B, then the resistance
A. RA = 0 **B. RA < RB** C. RA > RB D. RA = RB

31. Series combination of emf sources is used to obtain
A. a higher voltage B. lower current only
C. lower voltage D. a higher ampere-hour value

32. Four 1.5 V, 2.5 Ah batteries in series give
A. 6.0 V, 10 Ah B. 1.5 V, 10 Ah
C. 6.0 V, 2.5 Ah D. 1.5 V, 2.5 Ah

33. In a parallel connection of identical emf sources, the equivalent emf is
A. equal to the emf of one source B. the product of emfs
C. zero D. the sum of the emfs

34. Parallel combination of emf sources is used when we need
A. a lower ampere-hour B. a higher voltage
C. a higher ampere-hour value D. less current

35. Three 12 V, 2 Ah batteries in parallel give
A. 36 V, 2 Ah **B. 12 V, 6 Ah**
C. 36 V, 6 Ah D. 12 V, 2 Ah

36. When four cells each of 0.5 V are connected in parallel, the net emf is
A. 0.75 V B. 4.5 V C. 2.0 V **D. 0.5 V**

37. The number of 0.4 V cells in series needed to get 12 V is
A. 30 B. 12 C. 48 D. 3

38. The electrical energy consumed in a device is given by
A. E = I/Vt B. E = V/It **C. E = VIt** D. E = VI/t

39. The electrical energy can also be written as
A. $E = IRt^2$ **B. $E = I^2Rt$** C. $E = R/I^2t$ D. E = IR/t

40. An iron working at 200 V draws 7 A for 1 hour. The energy it consumes is
A. 50.4 MJ B. 504 kJ C. 1400 J **D. 5.04 MJ**

41. The formula for electric power is
A. P = I + V B. P = I/V **C. P = IV** D. P = V/I

42. The SI unit of power is the
A. watt B. volt C. joule D. ampere

43. The power consumption of a toaster of 19 Ω resistance at 200 V is about
A. 3800 W B. 10.5 W C. 380 W **D. 2100 W**

44. A device of 10 Ω connected to 120 V consumes
A. 14.4 W **B. 1440 W** C. 1200 W D. 12 W

45. A 100 Ω resistor of power rating 0.5 W connected to 10 V will dissipate
A. 10 W, and be safe B. 0.5 W, and be safe
C. 0.1 W, and be safe **D. 1 W, and will be damaged**

46. A 60 W bulb switched on for 5 hours consumes
A. 300 Wh B. 3 Wh C. 65 Wh D. 12 Wh

47. 1 kilowatt-hour equals
A. 3600 J B. 3.6×10^3 J
C. 3.6×10^6 J D. 1000 J

48. A device rated 500 W operating for 2 hours consumes
A. 250 kWh **B. 1 kWh** C. 0.25 kWh D. 1000 kWh

49. An air conditioner of 2200 W used 24 hours daily for 30 days consumes
A. 1584 kWh B. 52.8 kWh C. 158.4 kWh D. 15840 kWh

50. The monthly cost of that air conditioner at Rs 25 per kWh is
A. Rs 396,000 B. Rs 3,960
C. Rs 39,600 D. Rs 1,584

51. In household wiring, a mains circuit consists of
A. only an earth wire
B. only live and neutral wires
C. four live wires
D. a live wire, a neutral wire and an earth wire

52. The wire that carries the current from the power source to the appliance is the
A. earth wire **B. live wire**
C. ground rod D. neutral wire

53. The earth wire is a safety measure providing a
A. path to the supply
B. high-resistance path
C. low-resistance path for current to the ground
D. path for the neutral current

54. A fuse contains a metal strip that
A. melts when the current is larger than the rated value
B. never melts
C. increases current
D. stores charge

55. A circuit breaker
A. increases electrical resistance
B. interrupts the flow of electricity in case of a fault
C. stores energy
D. regulates voltage

56. The purpose of grounding electrical systems is to
A. reduce resistance B. increase voltage
C. increase energy efficiency **D. protect against electric shocks**

57. If a live wire touches a metal case that is earthed, a large current flows and the
A. current stops by itself **B. fuse blows or circuit breaker trips**
C. bulb glows D. case becomes safe without any effect

58. An RCD or GFCI detects a difference in current between the
A. two live wires only
B. earth and ground
C. live and neutral wires
D. bulb and switch

59. A GFCI interrupts the circuit when it detects a current difference of about
A. 5 milliamperes
B. 0.5 amperes
C. 500 amperes
D. 5 amperes

60. A current of 20 to 30 mA through the body can make a person
A. immune to shock
B. feel nothing
C. feel a slight tingle
D. unable to let go of the circuit

Unit 18: Electronics

82 MCQs

1. Materials whose conductivity lies between conductors and insulators are
A. semiconductors
B. insulators
C. alloys
D. superconductors

2. Pure semiconductors are called
A. extrinsic semiconductors
B. intrinsic semiconductors
C. n-type semiconductors
D. p-type semiconductors

3. Semiconductors doped with specific impurities are called
A. superconductors
B. insulators
C. extrinsic semiconductors
D. intrinsic semiconductors

4. When a pentavalent impurity is added to silicon, the result is
A. p-type semiconductor
B. an insulator
C. a conductor
D. n-type semiconductor

5. When a trivalent impurity is added to silicon, the result is
A. an insulator
B. p-type semiconductor
C. a conductor
D. n-type semiconductor

6. A pentavalent impurity has _____ valence electrons.
A. three
B. four
C. six
D. five

7. A vacant spot in a covalent bond is called a
A. electron
B. neutron
C. hole
D. proton

8. The majority charge carriers in an n-type semiconductor are
A. electrons
B. neutrons
C. holes
D. protons

9. The majority charge carriers in a p-type semiconductor are
A. protons
B. holes
C. electrons
D. neutrons

10. Pentavalent impurities are called donors because they
A. donate protons
B. accept electrons
C. donate holes
D. donate free electrons

11. Trivalent impurities are called acceptors because they
A. accept electrons creating holes
B. accept protons
C. donate holes
D. donate electrons

12. The region near the junction that is free of mobile charges is the
A. conduction region
B. valence region
C. depletion region
D. doped region

13. The potential barrier for a germanium crystal is about
A. 7 V
B. 0.3 V
C. 3 V
D. 0.7 V

14. The potential barrier for a silicon crystal is about
A. 0.3 V
B. 7 V
C. 0.7 V
D. 3 V

15. A PN junction diode allows current to pass in
A. one direction only
B. no direction
C. both directions equally
D. only when heated

16. A PN junction diode is used as a
A. transformer
B. resistor
C. amplifier
D. rectifier

17. The biasing in which the diode allows current to flow is called
A. no bias
B. forward bias
C. reverse bias
D. zero bias

18. A diode is forward biased when the positive terminal of the DC source is connected to the
A. p-type
B. n-type
C. ground
D. neutral

19. In forward bias, the depletion region
A. disappears permanently
B. increases in width
C. decreases in width
D. remains unchanged

20. In forward bias, the barrier potential
A. is increased
B. becomes infinite
C. does not change
D. is reduced

21. When the potential at the anode (p-type) is smaller than at the cathode (n-type), the diode is
A. reverse biased
B. unbiased
C. conducting
D. forward biased

22. In reverse bias, the depletion region
A. becomes narrower
B. remains the same
C. disappears
D. becomes wider

23. In reverse bias, only a small current flows due to
A. majority charge carriers
B. neutrons
C. minority charge carriers
D. protons

24. The small current in reverse bias is of the order of a few
A. milliamperes
B. microamperes
C. amperes
D. kiloamperes

25. The small current in a reverse-biased diode is called
A. base current
B. forward current
C. emitter current
D. reverse or leakage current

26. A light-emitting diode (LED) emits light when it is
A. reverse biased
B. forward biased
C. heated
D. not connected

27. In an LED, when electrons fall into holes, they
A. absorb energy
B. stay at the same level
C. radiate energy as light
D. lose charge

28. A transistor is a _____ terminal device.
A. three
B. two
C. four
D. five

29. The three terminals of a transistor are
A. source and sink only
B. drain, source and gate only
C. anode, cathode and gate
D. emitter, base and collector

30. A transistor is a _____ device because both holes and electrons participate in conduction.
A. unipolar
B. diode only
C. bipolar
D. passive

31. The two types of transistors are
A. PN and NP only
B. PNP and NPN
C. NPP and PPN
D. PPP and NNN

32. An NPN transistor is made by joining
A. one p-type between two n-types
B. one n-type between two p-types
C. three p-types
D. three n-types

33. A PNP transistor is made by sandwiching
A. three n-types
B. an n-type between two p-types
C. three p-types
D. a p-type between two n-types

34. The heavily doped region of a transistor is the
A. base
B. collector
C. all of these
D. emitter

35. The base of a transistor is
A. thin and lightly doped
B. thick and heavily doped
C. large and moderately doped
D. absent

36. The function of a transistor is to
A. block light
B. store charge
C. amplify current
D. reduce current

37. In normal operation of an NPN transistor, the emitter-base junction is
A. unbiased
B. open
C. reverse biased
D. forward biased

38. In normal operation of an NPN transistor, the collector-base junction is
A. open
B. forward biased
C. reverse biased
D. unbiased

39. The relation between emitter, collector and base currents is
A. $IB = IC + IE$
B. $IE = IC + IB$
C. $IC = IE + IB$
D. $IE = IC - IB$

40. The current gain β of a transistor is given by
A. IC/IB
B. IC/IE
C. IE/IB
D. IB/IC

41. The current gain α of a transistor is given by
A. IB/IC
B. IE/IC
C. IC/IE
D. IC/IB

42. The majority charge carriers in the emitter of an NPN transistor are
A. holes **B. electrons**
C. pentavalent atoms D. trivalent atoms

43. In a junction transistor, IC = 99.9 mA and IB = 0.1 mA. The emitter current is
A. 99.9 mA B. 0.1 mA C. 99.8 mA **D. 100 mA**

44. If IE = 1 mA and IC = 0.25 mA, the base current IB is
A. 0.75 mA B. 1.25 mA C. 0.95 mA D. 0.25 mA

45. In a junction transistor, IE = 5.82 mA and IB = 120 μA. The collector current is
A. 120 mA B. 5.94 mA **C. 5.7 mA** D. 6.0 mA

46. For IB = 600 μA and IC = 30 mA, the current gain β is
A. 500 B. 5 C. 0.02 **D. 50**

47. For IC = 150 mA and β = 190, the base current required is about
A. 190 mA **B. 0.8 mA** C. 0.15 mA D. 28.5 mA

48. When the emitter current changes by 4 mA and the collector current by 3.5 mA, β is
A. 7 B. 0.875 C. 14 D. 1.14

49. The transistor was developed in 1948 at
A. NASA B. MIT
C. Bell Laboratories D. CERN

50. The transistor invention was awarded the Nobel Prize in Physics in
A. 1948 B. 1966 C. 1936 **D. 1956**

51. A relay is an
A. type of diode **B. electrically operated switch**
C. electronic amplifier D. source of emf

52. Relays are used to control a high power circuit with a
A. low power circuit B. high power circuit
C. magnet only D. gas

53. A solid state relay (SSR) has
A. springs B. many moving parts
C. no moving parts D. mechanical contacts

54. A transistor can be used as a switch if it is biased in the
A. forward region only B. saturation region only
C. cut-off region only **D. saturation and cut-off regions**

55. When there is no base current, the transistor is in
A. cutoff B. breakdown
C. amplification D. saturation

56. When a large enough base current flows, the transistor is in
A. breakdown **B. saturation**
C. reverse bias D. cutoff

57. In the saturation state, the collector-emitter path behaves like a
A. open switch B. diode
C. capacitor **D. closed switch**

58. Digital electronic circuits deal with signals having
A. three states only B. no states
C. only two states D. infinite states

59. Boolean algebra is based on the three basic operators
A. AND, OR and NOT B. AND, NAND and NOR
C. NOT, NAND and XOR D. OR, NOR and XOR

60. Each digit in binary (0 or 1) is called a
A. gate **B. bit** C. byte D. qubit

61. An analogue-to-digital converter (ADC)
A. converts digital into analogue
B. amplifies voltage
C. converts continuous analogue signals into discrete digital signals
D. converts AC to DC

62. A digital-to-analogue converter (DAC)
A. amplifies current
B. converts analogue into digital
C. stores bits
D. converts digital signals into analogue signals

63. Analogue signals
A. vary continuously B. are always zero
C. have only one value D. have only two values

64. A table of inputs and outputs of a logic system in binary form is called a
A. logic table **B. truth table**
C. circuit table D. periodic table

65. The three fundamental logic gates are
A. OR, NOR and NAND B. NOT, NAND and NOR
C. AND, NAND and NOR **D. AND, OR and NOT**

66. The output of an AND gate is 1 only when
A. any input is 1 B. any input is 0
C. all inputs are 1 D. all inputs are 0

67. The Boolean expression of an AND gate is
A. X = A.B B. X = NOT A
C. X = NOT(A.B) D. X = A + B

68. The output of an OR gate is 0 only when
A. all inputs are 1 **B. all inputs are 0**
C. any input is 0 D. any input is 1

69. The Boolean expression of an OR gate is
A. X = A + B B. X = NOT A
C. X = A.B D. X = NOT(A + B)

70. A NOT gate has
A. two inputs and one output B. two inputs and two outputs
C. no input **D. one input and one output**

71. If the input of a NOT gate is 1, its output is
A. 2 B. 1 **C. 0** D. undefined

72. NAND and NOR gates are called universal gates because
A. they are the fastest
B. they can be used to make all the other gates
C. they have the most inputs
D. they are the cheapest

73. The output of a NAND gate is 0 when
A. any input is 0 B. both inputs are 0
C. both inputs are 1 D. A is 0 and B is 1

74. The Boolean expression for a NAND gate is
A. X = NOT(A.B) B. X = NOT(A + B)
C. X = A + B D. X = A.B

75. The output of a NOR gate is 1 only when
A. any input is 0 B. any input is 1
C. all inputs are 1 **D. all inputs are 0**

76. The Boolean expression for a NOR gate is
A. X = A + B **B. X = NOT(A + B)**
C. X = A.B D. X = NOT(A.B)

77. A simple burglar alarm circuit can be made using an
A. NOT gate only B. NOR gate only
C. OR gate **D. AND gate**

78. In a burglar alarm using an AND gate, the alarm is activated when
A. any one is ON
B. both are OFF
C. both the sensor and the alarm switch are ON
D. one is OFF

79. In the fire alarm circuit, when the thermistor is warmed by fire, its resistance
A. falls B. rises
C. stays constant D. becomes infinite

80. Quantum computers use
A. bits only **B. qubits**
C. vacuum tubes D. bytes only

81. A qubit can exist in
A. a superposition of multiple states B. only state 0
C. no state D. only state 1

82. Quantum computers need core components to be cooled to
A. the boiling point of water B. room temperature
C. almost absolute zero D. 100 °C

Unit 19: Electromagnetism

60 MCQs

1. The magnetic effect of a current was discovered accidentally by the Danish scientist
A. Isaac Newton
B. Heinrich Lenz
C. Hans Christian Oersted
D. Michael Faraday

2. A current-carrying straight wire produces a magnetic field in the form of
A. parabolas
B. radial lines
C. straight lines parallel to the wire
D. concentric circles

3. The direction of the magnetic field around a straight current-carrying wire is found using the
A. left-hand rule
B. right-hand rule
C. Fleming's right-hand rule
D. Lenz's law

4. In the right-hand rule for a wire, the thumb points in the direction of the
A. current
B. motion
C. force
D. magnetic field

5. In the right-hand rule for a wire, the curled fingers show the direction of the
A. force
B. electron flow only
C. magnetic field
D. current

6. Magnetic field lines form
A. straight lines only
B. closed paths
C. crossing paths
D. open paths

7. Two long parallel wires carrying currents in the same direction
A. repel each other
B. do not interact
C. rotate
D. attract each other

8. Two long parallel wires carrying currents in opposite directions
A. repel each other
B. do not interact
C. cancel the current
D. attract each other

9. The magnetic field of a current-carrying solenoid is
A. circular around the axis
B. zero everywhere
C. strong and uniform along its axis and very weak outside
D. weak inside and strong outside

10. The magnetic field of a solenoid resembles that of a
A. single charge
B. straight wire
C. dipole of electric charges
D. bar magnet

11. In the right-hand rule for a solenoid, the curled fingers show the direction of the
A. electron flow only
B. conventional current
C. force
D. magnetic field outside

12. In the right-hand rule for a solenoid, the thumb points to the
A. north pole of the coil
B. centre of the coil
C. wire
D. south pole of the coil

13. The Earth's magnetic south pole is near the
A. geographic South Pole
B. Moon
C. geographic North Pole
D. equator

14. The north pole of a compass needle is attracted to the
A. magnetic north pole of Earth near the geographic North Pole
B. magnetic south pole of Earth near the geographic North Pole
C. Sun
D. magnetic north pole of Earth near the geographic South Pole

15. The magnitude of Earth's magnetic field at its surface ranges from about
A. 25 to 65 mT
B. 25 to 65 nT
C. 25 to 65 T
D. 25 to 65 μT

16. Earth's magnetic field is generated by
A. rotation of the Earth and its molten iron core containing moving charged particles
B. the Moon
C. the Sun
D. the atmosphere only

17. In a loudspeaker, electrical energy is converted into
A. chemical energy
B. light
C. mechanical energy that produces sound
D. heat only

18. In a loudspeaker, the volume of the sound is determined by the
A. amplitude of the electrical signal
B. colour of the cone
C. size of the magnet only
D. frequency only

19. A relay uses the _____ of a current to control the output circuit.
A. heating effect
B. light effect
C. chemical effect
D. magnetic effect

20. A current-carrying conductor in a magnetic field experiences a
A. change in colour
B. force
C. decrease in resistance
D. no effect

21. The force on a current-carrying conductor in a magnetic field increases if the current
A. is decreased
B. is reversed
C. is zero
D. is increased

22. The direction of the force on a current-carrying conductor can be reversed by reversing
A. the direction of the current or the magnetic field
B. the length of the wire
C. the temperature
D. the colour of the wire

23. The force on a current-carrying wire in a magnetic field is always
A. along the wire
B. perpendicular to both the magnetic field and the current
C. parallel to the field
D. parallel to the current

24. The direction of force on a current-carrying conductor is given by
A. Fleming's right-hand rule
B. Lenz's law
C. Fleming's left-hand rule
D. right-hand grip rule

25. In Fleming's left-hand rule, the forefinger points in the direction of the
A. magnetic field
B. current
C. force
D. motion of the wire only

26. In Fleming's left-hand rule, the middle finger points in the direction of the
A. magnetic field
B. force
C. current
D. induced emf

27. In Fleming's left-hand rule, the thumb points in the direction of the
A. resistance
B. magnetic field
C. current
D. force

28. The turning effect on a current-carrying coil is increased by increasing the number of turns, the current and the
A. temperature
B. strength of the magnetic field
C. length of the magnet
D. resistance of the coil

29. An electric motor converts
A. electrical energy into mechanical energy
B. chemical energy into electrical energy
C. heat into electrical energy
D. mechanical energy into electrical energy

30. The working principle of an electric motor is that a current-carrying coil in a magnetic field
A. emits light
B. experiences a torque
C. stores charge
D. produces an emf

31. In a motor, the split ring commutator
A. produces the magnetic field
B. stores charge
C. reverses the direction of current in the coil every half turn
D. increases the voltage

32. Electromagnetic induction is the production of an emf across a conductor exposed to a
A. constant temperature
B. static charge
C. constant electric field
D. varying magnetic field

33. An emf is induced in a coil when there is
A. a constant magnetic field only
B. no motion between them
C. relative motion between the coil and the magnet
D. heat applied to the coil

34. Lenz's law states that the direction of induced current is such that it
A. is always from north to south
B. opposes the cause which produces it
C. is always clockwise
D. helps the cause which produces it

35. Lenz's law is explained when the north pole of a magnet moves towards a coil: the nearer end of the coil becomes a
A. south pole
B. alternate pole
C. neutral
D. north pole

36. Which of the following devices works on the principle of electromagnetic induction?
A. Transformer
B. Oscilloscope
C. Magnetic compass
D. Motor

37. An AC generator converts
A. electrical energy into mechanical energy
B. heat into light
C. light into heat
D. mechanical energy into electrical energy

38. The output emf of a simple AC generator
A. alternates in direction and strength as the coil rotates
B. is always zero
C. flows in only one direction
D. is constant

39. In a simple AC generator, the emf is maximum when the coil is
A. vertical
B. stationary
C. horizontal
D. tilted at 45° only

40. The domestic electricity supply has a frequency of
A. 25 Hz **B. 50 Hz** C. 100 Hz D. 60 Hz

41. A transformer is an electrical device used to
A. increase or decrease an alternating voltage
B. produce electricity
C. convert AC to DC
D. store charge

42. A transformer is ineffective with DC because DC does not produce a
A. heating effect
B. voltage
C. changing magnetic field
D. current

43. The basic transformer equation is
A. Vs + Vp = Ns + Np
B. Vs/Vp = Ns/Np
C. Vs.Vp = Ns.Np
D. Vs/Vp = Np/Ns

44. A step-up transformer has
A. fewer turns in the secondary than in the primary
B. no secondary coil
C. equal turns in both coils
D. more turns in the secondary than in the primary

45. A step-down transformer has
A. no primary coil
B. equal turns in both coils
C. fewer turns in the secondary than in the primary
D. more turns in the secondary than in the primary

46. A step-down transformer converts 240 V into 12 V. With 2000 turns in the primary, the secondary has
A. 100 turns
B. 50 turns
C. 40,000 turns
D. 240 turns

47. A step-up transformer has a turns ratio of 1:100 and 20 V on the primary. The secondary voltage is
A. 120 V B. 0.2 V C. 200 V **D. 2000 V**

48. A step-up transformer has a transformation ratio of 3:2. If the primary voltage is 30 V, the secondary voltage is
A. 20 V **B. 45 V** C. 60 V D. 15 V

49. A transformer steps up 115 V to 230 V for a hair dryer drawing 5 A. The current drawn from the mains is
A. 20 A B. 5 A C. 2.5 A **D. 10 A**

50. Which quantity remains constant in an ideal step-up transformer?
A. Heat **B. Power** C. Voltage D. Current

51. Which quantity does not change in an ordinary transformer?
A. Voltage
B. Current
C. Frequency
D. Number of turns

52. Power is transmitted over long distances at high voltage to
A. minimise heat loss in the cables
B. increase current
C. increase the speed of electricity
D. increase heat in the cables

53. Heat dissipation in a transmission cable of resistance R is
A. IR^2 B. R/I^2 C. I/R **D. I^2R**

54. A step-up transformer is used before electricity is transmitted by overhead cables because it
A. increases the voltage to increase the speed of electricity
B. decreases voltage
C. increases the voltage to reduce energy loss in the cables
D. increases current to reduce loss

55. When an electron beam passes through an electric field, the electrons are deflected towards the
A. both plates equally
B. positive plate
C. neither plate
D. negative plate

56. The deflection of electrons in a magnetic field depends on their velocity, the strength of the field and the
A. angle at which they enter the field
B. size of the plates
C. colour of the beam
D. temperature of the plates

57. The cathode ray oscilloscope (CRO) converts
A. light into sound
B. visual signals into electric signals
C. sound into light
D. electric signals into visual signals

58. The CRO screen is coated with a thin layer of
A. silver
B. phosphor
C. copper
D. aluminium foil

59. The horizontal and vertical plates of a CRO are used to
A. stop the beam
B. produce the beam
C. deflect the electron beam
D. focus the beam

60. On a CRO waveform, the horizontal axis shows
A. time
B. current
C. potential difference
D. resistance

Unit 20: Electromagnetic Waves

64 MCQs

1. Electromagnetic waves are
A. longitudinal waves
B. sound waves
C. transverse waves
D. surface waves only

2. Electromagnetic waves
A. travel only in solids
B. do not require a medium for propagation
C. cannot pass through air
D. need a material medium

3. The range of different frequencies and wavelengths of electromagnetic waves is called the
A. colour chart
B. sound spectrum
C. visible spectrum
D. electromagnetic spectrum

4. The correct order of EM waves from the longest wavelength to the shortest is
A. radio, microwave, infrared, visible, ultraviolet, X-rays, gamma rays
B. microwave, radio, infrared, visible, X-rays, ultraviolet, gamma
C. gamma rays, X-rays, ultraviolet, visible, infrared, microwave, radio
D. radio, infrared, microwave, visible, ultraviolet, gamma, X-rays

5. The speed of all electromagnetic waves in vacuum is
A. 340 m/s
B. 3×10^8 m/s
C. 3×10^{10} m/s
D. 3×10^6 m/s

6. Which EM waves have the longest wavelength?
A. Radio waves
B. Ultraviolet
C. Gamma rays
D. X-rays

7. The energy of a photon is given by
A. E = h/f B. $E = hf^2$ **C. E = hf** D. E = f/h

8. The constant h in E = hf is called
A. Avogadro's number
B. Faraday's constant
C. Boltzmann's constant
D. Planck's constant

9. The value of Planck's constant is
A. 3×10^8 J s
B. 6.63×10^{-34} J s
C. 6.63×10^{34} J s
D. 1.6×10^{-19} J s

10. The energy of an electromagnetic wave depends directly on its
A. frequency B. speed C. amplitude D. medium

11. The relation between energy and wavelength is
A. $E = h\lambda/c$ B. $E = c\lambda/h$ **C. $E = hc/\lambda$** D. $E = \lambda/hc$

12. The wavelength of an EM wave of frequency 5.0×10^{14} Hz is
A. 60 nm B. 1.5 μm C. 6000 nm **D. 600 nm**

13. A wave of wavelength 10 cm belongs to
A. microwaves B. gamma rays
C. infrared D. ultraviolet

14. X-rays have higher energy than visible light because of their
A. lower frequency B. longer wavelength
C. higher speed **D. shorter wavelength**

15. When an EM wave enters another medium, the quantity that does not change is
A. wavelength **B. frequency**
C. speed D. direction always

16. Electromagnetic waves are produced by
A. neutral particles B. stationary charges
C. accelerating charged particles D. accelerating neutral particles

17. One electron-volt (eV) is equal to
A. 6.63×10^{-34} J B. 1.6×10^{19} J
C. 9.1×10^{-31} J **D. 1.6×10^{-19} J**

18. The energy of a radiation of wavelength 200 nm is about
A. 9.945×10^{-19} J B. 9.945×10^{-34} J
C. 1×10^{-10} J D. 9.945×10^{-5} J

19. The momentum of a photon of wavelength 200 nm is about
A. 3.315×10^{27} kg m/s **B. 3.315×10^{-27} kg m/s**
C. 3.315×10^{-34} kg m/s D. 6.63×10^{-34} kg m/s

20. A radiation of energy 4.7 eV has wavelength about 265 nm and belongs to
A. radio waves B. X-rays
C. ultraviolet D. infrared

21. Radio waves are used in
A. detecting cracks in metals
B. television, mobile phones and wireless networks
C. sterilising food
D. killing cancer cells

22. The study of radio waves from space is called
A. radiography B. spectroscopy
C. radio astronomy D. radiology

23. Radio telescopes need to be very large because radio waves have
A. much longer wavelengths than visible light
B. very high energy
C. very high frequencies
D. very short wavelengths

24. Satellite TV communication uses
A. visible light B. gamma rays
C. X-rays **D. microwaves**

25. Microwaves are used for satellite communication because they can
A. be blocked by clouds B. not travel far
C. pass easily through the atmosphere D. be absorbed by the atmosphere

26. A typical microwave oven uses a frequency of
A. 2.45 kHz **B. 2.45 GHz** C. 245 GHz D. 24.5 MHz

27. Microwaves cook food by making _____ molecules vibrate.
A. water B. carbon C. metal D. oxygen

28. Infrared means
A. beyond blue B. beyond violet
C. above red **D. below red**

29. Infrared radiation is used in
A. radiography **B. remote controllers**
C. sterilising water D. detecting counterfeit notes

30. The type of radiation which primarily carries heat energy is
A. ultraviolet B. X-rays
C. infrared D. radio waves

31. Waves used for treating muscle aches in physiotherapy are
A. microwaves B. X-rays
C. ultraviolet **D. infrared**

32. The Sun has a surface temperature of about
A. 6000 K B. 300 K C. 60,000 K D. 600 K

33. UV-A has wavelengths of about
A. 290 to 320 nm B. 220 to 290 nm
C. 320 to 400 nm D. 400 to 700 nm

34. Most UV-B and all UV-C radiation is absorbed by the
A. ozone layer B. carbon dioxide
C. clouds D. oxygen only

35. About _____ of solar UV reaching Earth's surface is UV-A.
A. 50 % **B. 99 %** C. 10 % D. 1 %

36. Counterfeit bank notes can be detected using
A. radio waves B. infrared light
C. microwaves **D. ultraviolet light**

37. UV light is used for sterilising
A. air bubbles B. glass beams only
C. water D. metals

38. X-rays are widely used for
A. heating food **B. medical imaging of bones**
C. mobile calls D. satellite TV

39. The use of X-rays in medical science is called
A. radiology B. radiography of the sky
C. spectroscopy D. radio astronomy

40. X-ray security scanners are used to detect
A. colour B. sound
C. temperature **D. weapons or explosives under clothing**

41. X-rays and gamma rays are used in radiographic testing to detect
A. weight of metals **B. cracks in metals**
C. temperature of metals D. colour of metals

42. At high doses, X-rays or gamma radiation therapy kills cancer cells by damaging their
A. proteins only B. cell walls only
C. DNA D. water content

43. Gamma rays are emitted from the
A. nucleus of a heavy atom B. air
C. electron shell D. outer atom only

44. The radioactive isotope commonly used for sterilising food and medical equipment is
A. Uranium-235 B. Carbon-14
C. Iodine-131 only **D. Cobalt-60**

45. Food sterilised with gamma rays
A. becomes hot **B. does not become radioactive**
C. becomes radioactive D. becomes light

46. Ionizing radiation includes
A. radio waves and microwaves B. radio waves only
C. infrared and visible light **D. UV, X-rays and gamma rays**

47. Non-ionizing radiation includes
A. visible light, infrared, microwaves and radio waves
B. X-rays and gamma rays
C. gamma rays only
D. UV and X-rays

48. Long-term exposure to UV waves can cause
A. better eyesight B. stronger bones only
C. skin cancer D. no effects

49. Protection from ionizing radiation includes shielding, limiting exposure time and
A. maintaining a safe distance B. increasing exposure time
C. using no protection D. getting close to the source

50. Shorter wavelengths of light scatter
A. equally B. not at all
C. less **D. more**

51. The sky appears blue because of
A. absorption of red light by air
B. scattering of shorter wavelengths by air molecules
C. reflection from the sea
D. dispersion by rain

52. The scattering of light by gas molecules is called
A. Raman effect B. polarisation
C. Rayleigh scattering D. diffraction

53. The sky appears red at sunset because
A. the Sun becomes cooler
B. the Sun is closer
C. red light is scattered away
D. most of the blue light is scattered away and red light reaches us

54. Light is made of tiny massless particles called
A. photons B. neutrons C. electrons D. protons

55. A photon has
A. charge only
B. energy and momentum but no mass and no charge
C. mass and charge
D. mass only

56. The idea that light is made of quanta was introduced by
A. Isaac Newton B. Ibn al-Haytham
C. Max Planck D. Faraday

57. The momentum of a photon is given by
A. $p = \lambda/h$ **B. $p = h/\lambda$** C. $p = h + \lambda$ D. $p = h\lambda$

58. The momentum of a photon of frequency 4.0×10^{14} Hz is about
A. 1.3×10^{-9} kg m/s B. 8.84×10^{-34} kg m/s
C. 8.84×10^{-19} kg m/s **D. 8.84×10^{-28} kg m/s**

59. Which of these EM waves has the least momentum?
A. Radio waves B. Infrared
C. Gamma rays D. Ultraviolet

60. The pressure exerted by light on objects due to transfer of momentum is called
A. thermal pressure B. atmospheric pressure
C. radiation pressure D. fluid pressure

61. Radiation pressure is directly proportional to the
A. colour of the object **B. intensity of light**
C. mass of the object D. temperature of the object

62. On halving the area of a totally reflecting surface, the radiation pressure
A. remains the same B. quadruples
C. doubles D. halves

63. A solar sail uses the
A. chemical fuel B. wind
C. electric energy **D. momentum of photons**

64. Solar sails are preferred for deep-space missions because they need
A. chemical energy B. much fuel
C. no fuel D. electric energy

Unit 21: Nuclear Physics

107 MCQs

1. The atomic nucleus is composed of protons and neutrons known as
A. quarks only B. electrons
C. photons **D. nucleons**

2. Thomson's plum pudding model was disproved in 1911 by
A. Rutherford's alpha particle scattering experiment
B. Faraday's experiment
C. Becquerel's experiment
D. Millikan's oil drop experiment

3. About 1 in every _____ alpha particles was deflected by more than 90°.
A. 200 B. 2 **C. 20,000** D. 2,000,000

4. The fact that a few alpha particles bounced back showed that the atom has a
A. uniformly distributed charge **B. small, dense, positive nucleus**
C. no mass at its centre D. negative nucleus

5. The fact that most alpha particles passed through undeflected showed that the atom is
A. mostly empty space B. all positive
C. all negative D. solid throughout

6. Rutherford's model is known as the
A. quantum model **B. nuclear model of the atom**
C. liquid drop model D. plum pudding model

7. The number of protons in a nucleus is called the
A. isotope number B. neutron number
C. mass number **D. atomic number**

8. The atomic number is denoted by
A. N B. A **C. Z** D. P

9. The total number of nucleons in a nucleus is called the
A. mass number B. atomic number
C. neutron number D. charge number

10. The mass number is denoted by
A. M **B. A** C. Z D. N

11. The number of neutrons in a nucleus is
A. $A \times Z$ B. $Z - A$ **C. $A - Z$** D. $A + Z$

12. A nuclide is a kind of atom with specific values of
A. mass and volume B. charge and volume
C. density only **D. mass number and atomic number**

13. Uranium (Z = 92) has an isotope with mass number 239. The number of neutrons is
A. 239 **B. 147** C. 92 D. 331

14. Polonium-209 (Z = 84) has _____ neutrons.
A. 209 B. 84 C. 293 **D. 125**

15. Isotopes of an element have a different number of
A. neutrons B. electrons
C. atomic number D. protons

16. The three isotopes of hydrogen are protium, deuterium and
A. lithium B. neon **C. tritium** D. helium

17. Deuterium has
A. one proton and one neutron B. two protons and one neutron
C. one proton and no neutron D. one proton and two neutrons

18. Tritium has
A. two protons and one neutron **B. one proton and two neutrons**
C. one proton only D. one proton and one neutron

19. Unstable isotopes that emit radiation to attain stability are called
A. isobars B. stable isotopes
C. isotones **D. radioisotopes**

20. Chlorine-37 and potassium-39 are
A. isobars B. isomers **C. isotones** D. isotopes

21. Radioactivity was accidentally discovered in 1896 by
A. Einstein **B. Henri Becquerel**
C. Marie Curie D. Rutherford

22. Marie Curie and Pierre Curie discovered the elements
A. polonium and radium B. radon and helium
C. uranium and thorium D. cobalt and iodine

23. The natural emission of radiation from unstable nuclei is called
A. fusion B. fission
C. radioactivity D. ionisation

24. The three types of nuclear radiation are
A. alpha, beta and X-rays B. beta, gamma and neutron only
C. X, Y and Z **D. alpha, beta and gamma**

25. An alpha particle is equivalent to a
A. electron **B. helium nucleus**
C. hydrogen nucleus D. photon

26. An alpha particle consists of
A. two protons and two neutrons B. one proton and one neutron
C. two protons and one neutron D. four protons

27. The charge of an alpha particle is _____ times the charge of a proton.
A. one B. four C. three **D. two**

28. A beta particle is a fast moving
A. helium nucleus B. proton
C. electron D. neutron

29. In beta emission, a neutron in the nucleus transforms into a proton and an
A. electron B. alpha particle
C. photon D. neutron

30. In an electric field, beta particles are attracted towards the
A. negative plate B. both plates
C. neither plate **D. positive plate**

31. Gamma rays in an electric or magnetic field are
A. deflected towards the positive plate B. deflected towards the negative plate
C. not deflected D. deflected in circles

32. Beta particles deflect more than alpha particles because they are
A. much heavier **B. much lighter**
C. neutral D. more charged

33. The radiation with the highest ionizing ability is
A. beta B. gamma C. all equal **D. alpha**

34. The radiation with the greatest penetrating power is
A. gamma B. alpha C. all equal D. beta

35. Alpha particles are stopped by
A. thick lead **B. a sheet of paper**
C. thin aluminium D. thick concrete only

36. Beta particles are stopped by
A. a sheet of paper B. air
C. a few millimetres of aluminium D. nothing

37. Gamma rays require _____ to shield them effectively.
A. thick lead or concrete B. air
C. thin aluminium D. paper

38. The law of conservation of nucleons states that the total mass number
A. increases during decay B. becomes zero
C. remains constant during decay D. decreases by 4 in every decay

39. In alpha decay, the daughter nuclide has a nucleon number reduced by
A. zero B. two C. one **D. four**

40. In alpha decay, the daughter nuclide has a proton number reduced by
A. one **B. two** C. four D. zero

41. When uranium-238 (Z = 92) emits an alpha particle, it becomes
A. thorium-234 (Z = 90) B. thorium-238 (Z = 90)
C. protactinium-234 (Z = 91) D. plutonium-242 (Z = 94)

42. Radon-222 (Z = 86) after alpha decay becomes
A. lead-214 (Z = 82) B. bismuth-218 (Z = 83)
C. polonium-218 (Z = 84) D. polonium-222 (Z = 84)

43. In beta decay, the proton number
A. decreases by one **B. increases by one**
C. decreases by two D. stays the same

44. During beta decay, the nucleon number
A. decreases by 4 B. increases by 1
C. decreases by 1 **D. does not change**

45. Cobalt-60 (Z = 27) after beta decay becomes
A. cobalt-59 (Z = 27) **B. nickel-60 (Z = 28)**
C. nickel-59 (Z = 28) D. iron-60 (Z = 26)

46. In gamma decay, the atomic number
A. decreases by 2 B. decreases by 1
C. does not change D. increases by 1

47. Gamma decay is due to a transition between states of
A. the same nucleus B. two electrons
C. two atoms D. different elements

48. A beta-plus (positron) emission changes a proton into a
A. photon B. electron
C. alpha particle **D. neutron**

49. Fluorine-18 is used in
A. carbon dating B. smoke detectors
C. PET scans D. thickness gauges

50. The process of changing one element into another by radioactive decay is called
A. nuclear transmutation B. nuclear fusion
C. ionisation D. doping

51. Nuclear decay is a
A. process controlled by temperature B. predictable process for one nucleus
C. process caused by pressure **D. spontaneous and random process**

52. The half-life is the time in which half of the original radioactive nuclei
A. remain stable **B. decay**
C. double D. are created

53. The half-life of a radioactive isotope depends on
A. temperature B. pressure
C. humidity **D. the nature of the nucleus only**

54. A radioactive element has a half-life of two years. After six years, the sample remaining is
A. 50 % **B. 12.5 %** C. 25 % D. 75 %

55. The half-life of a stable isotope is theoretically
A. one day B. one year **C. infinite** D. zero

56. A 50 mg sample of lead-212 (half-life 10.6 h) is left for 53 h. The amount left is
A. 1.56 mg B. 25 mg C. 0.5 mg D. 5 mg

57. A radioactive substance has a half-life of 16 months. One-eighth of it is left after
A. 16 months B. 128 months
C. 32 months **D. 48 months**

58. In 420 days one-eighth of polonium remains undecayed. Its half-life is
A. 140 days B. 420 days C. 52.5 days D. 210 days

59. The half-life of radium is 1600 years. Starting with 1 kg, 250 g remains after
A. 4800 years **B. 3200 years**
C. 1600 years D. 800 years

60. Three-fourth of a radioactive isotope decays in one hour. Its half-life is
A. 15 minutes B. 45 minutes
C. 30 minutes D. 60 minutes

61. The half-life of an isotope is 5 days. Starting with 64,000 nuclei, the number left after 30 days is
A. 1,000 B. 500 C. 10,000 D. 2,000

62. The half-life of carbon-14 is
A. 57.3 years B. 5730 days
C. 573 years **D. 5730 years**

63. The half-life of uranium-238 is about
A. 8 days B. 30 years
C. 4.5 billion years D. 704 million years

64. The SI unit of activity is the
A. sievert **B. becquerel** C. curie D. gray

65. The curie is equal to
A. 10^{10} decays per hour B. 1 decay per second
C. 3.7×10^{10} decays per second D. 3.7×10^{6} decays per second

66. Carbon-14 is formed in the atmosphere when neutrons from cosmic rays collide with
A. hydrogen atoms **B. nitrogen atoms**
C. oxygen atoms D. carbon-12 atoms

67. After an organism dies, the proportion of carbon-14 in it
A. gradually decreases B. remains constant
C. doubles D. increases

68. Carbon-14 dating is effective for tissues up to about
A. 500 years old B. 5 million years old
C. 5 billion years old **D. 50 to 60 thousand years old**

69. A fossil has one-eighth of the carbon-14 ratio of a living animal. Its age is (half-life 5730 y)
A. 5,730 years **B. 17,190 years**
C. 45,840 years D. 11,460 years

70. A skull has 25 % of its initial carbon-14. Its age is
A. 11,460 years B. 17,190 years
C. 5,730 years D. 22,920 years

71. A piece of wood has three tenths of the C-14 of living trees. Its age is about
A. 3,000 years B. 11,460 years
C. 9,953 years D. 5,730 years

72. Ionizing radiation is radiation with energy greater than
A. 1 eV B. 1000 eV C. 0.1 eV **D. 13.6 eV**

73. Ionizing radiation mainly damages the cells' molecule called
A. DNA B. water only
C. fat D. sugar only

74. The most harmful effect of radiation is believed to be the
A. weight loss **B. DNA double-strand break**
C. loss of colour D. heating of skin

75. The safety mantra when working around ionizing radiation is
A. speed, mass and charge B. heat, light and sound
C. time, distance and shielding D. push, pull and turn

76. The unit of absorbed radiation dose is the
A. becquerel B. curie C. hertz **D. gray**

77. The unit of equivalent dose is the
A. becquerel **B. sievert** C. gray D. curie

78. The annual dose limit for the general public is
A. 20 mSv per year B. 100 mSv per year
C. 1 mSv per year D. 50 mSv per year

79. The annual dose limit for radiation workers is
A. 100 mSv per year B. 50 mSv per year
C. 1 mSv per year **D. 20 mSv per year**

80. The radioactive material in smoke detectors is typically
A. americium-241 B. iodine-131
C. cobalt-60 D. uranium-238

81. A smoke alarm uses a source emitting
A. X-rays B. gamma rays
C. beta particles **D. alpha particles**

82. Food irradiation uses
A. gamma rays B. alpha particles
C. radio waves D. infrared

83. The ideal isotope for food irradiation is
A. Strontium-90 **B. Cobalt-60**
C. Iodine-131 D. Plutonium-239

84. Beta emitters are used to control the thickness of
A. thick materials B. liquids only
C. thin materials D. gases

85. Gamma emitters are used to control the thickness of
A. gases B. air
C. thin materials like paper **D. thick materials**

86. The most commonly used radioisotope in medical diagnosis is
A. americium-241 **B. technetium-99m**
C. cobalt-60 D. uranium-235

87. Technetium-99m has a half-life of about
A. six minutes B. six years
C. six hours D. six days

88. For medical diagnosis, a radioisotope should emit gamma rays and have a
A. short half-life B. very long half-life
C. very high energy only D. alpha emission

89. Iodine-131 is used to treat cancer of the
A. brain **B. thyroid gland**
C. liver D. lungs

90. The largest contributor to natural background radiation for most people is
A. nuclear fallout B. food
C. cosmic rays **D. radon gas**

91. Nuclear fission was discovered in 1938 by
A. Otto Hahn and Fritz Strassmann B. Einstein and Bohr
C. Curie and Becquerel D. Rutherford and Geiger

92. Nuclear fission is the splitting of a heavy nucleus by absorbing a
A. electron B. alpha particle
C. neutron D. proton

93. On the average, about _____ neutrons are released per fission.
A. 1 B. 10 C. 20 **D. 2.5**

94. The energy released in a single fission event is about
A. 2 MeV **B. 200 MeV** C. 2 keV D. 20 eV

95. 1 kg of uranium delivers as much energy as about
A. 3 tons of coal B. 30 kg of coal
C. 3000 tons of coal D. 30 tons of coal

96. The energy released in nuclear reactions arises from the
A. mass defect B. chemical bonds
C. friction D. heat of the Sun

97. Einstein's mass-energy relation is
A. $E = m^2c$ **B. $E = mc^2$** C. $E = mc$ D. $E = m/c^2$

98. A mass of 2 μg converted completely into energy releases
A. 180 MJ B. 1.8 MJ C. 1800 MJ D. 18 MJ

99. If every neutron emitted in fission causes another fission, the process is called a
A. fusion cycle B. decay series
C. chain reaction D. radiation cycle

100. An uncontrolled fission chain reaction is the principle of the
A. X-ray tube B. nuclear reactor
C. smoke alarm **D. atomic bomb**

101. Nuclear fusion is the process of
A. emission of alpha particles
B. splitting a heavy nucleus
C. combining two light nuclei into a heavier nucleus
D. emission of beta particles

102. The energy of the Sun is released due to
A. nuclear fission **B. nuclear fusion**
C. reduction D. oxidation

103. In the Sun, fusion converts
A. hydrogen into helium B. helium into hydrogen
C. carbon into oxygen D. uranium into lead

104. Dark matter makes up about _____ of the universe.
A. 90 % B. 68 % C. 5 % **D. 27 %**

105. Dark matter interacts through
A. gravity but not electromagnetic forces B. no forces
C. strong forces only D. electromagnetic forces

106. A theory is scientific only if it makes assertions that can be
A. never changed B. proved forever
C. tested and potentially disproven D. accepted without testing

107. The idea that a scientific theory must be disprovable is called
A. uncertainty **B. falsifiability**
C. superposition D. relativity

Federal Board Past Paper MCQs

59 MCQs from FBISE SSC-II Physics papers (original option order). Figure-based questions are left out.

Annual 2026, Set B (Paper code 2SA-I 26004 (B))

1. The main function of a diode in a circuit is to
A. Reduce voltage B. Amplify current
C. Store charge **D. Rectify current**

2. The critical angle of polystyrene (n = 1.49) is
A. 32.2° B. 60° C. 45° **D. 42.2°**

3. Charging of solids by friction occurs due to the transfer of
A. Atoms B. Protons C. Neutrons **D. Electrons**

4. The output of an OR gate is LOW when
A. Any one input is LOW B. Any one input is HIGH
C. All inputs are LOW D. All inputs are HIGH

5. Warm air rises and cool air sinks in a heated room because of
A. Reflection B. Radiation
C. Convection D. Conduction

6. If the direction of current in a conductor is reversed, the direction of force on it will
A. Reverse B. Remain the same
C. Become 45° D. Increase

7. A charge of 10 C flows through a conductor in 5 s. The value of current is
A. 10 A B. 0.5 A **C. 2 A** D. 5 A

8. Linear expansion in solids refers to the change in
A. Mass only B. Area only
C. Volume only **D. Length only**

9. Half life of iodine is 8 days. How much of a 40 g sample of iodine will be left after 16 days?
A. 2.5 g B. 20 g **C. 10 g** D. 5 g

10. Compression and rarefaction are features of _____ waves.
A. Longitudinal B. Transverse
C. Surface D. Electromagnetic

11. Which instrument converts electrical energy into mechanical energy?
A. Capacitor **B. Electric motor**
C. DC Generator D. Transformer

Annual 2026, Set D (Paper code 2SA-I 26004 (D))

1. A diode conducts electricity when it is
A. Heated B. Reverse biased
C. Forward biased D. Unbiased

2. The speed of light in a glass slab (refractive index n = 1.5) is
A. 5×10^8 m/s **B. 2×10^8 m/s**
C. 3×10^8 m/s D. 4×10^8 m/s

3. Which type of charge is actually transferred during charging by friction?
A. Negative charge B. Positive charge
C. Neutral charge D. Both charges

4. For a NOR gate, the output is
A. X = NOT(A.B) B. X = A + B
C. X = NOT(A + B) D. X = A.B

5. A metal cooking pan heats up quickly on a stove mainly due to
A. Evaporation B. Radiation
C. Convection **D. Conduction**

6. Reversing the direction of the magnetic field while keeping the current constant will cause the force to
A. Reverse direction B. Remain unchanged
C. Increase D. Decrease

7. If the charge passing through a wire in a given time is doubled, the current will
A. Become zero B. Become half
C. Be doubled D. Remain same

8. Which of the following expands the most when heated?
A. All expand equally B. Solids
C. Liquids **D. Gases**

9. Which radiation can be stopped by a thin sheet of paper?
A. X-rays B. Gamma rays
C. Beta particles **D. Alpha particles**

10. Wave speed is given by the relation
A. v = f + λ **B. v = f . λ** C. v = λ / f D. v = f / λ

11. Which component of an electric motor reverses the direction of current?
A. Brushes B. Armature
C. Field magnet **D. Split-ring commutator**

12. In which medium does sound travel the fastest?
A. Vacuum B. Gases C. Liquids **D. Solids**

Annual 2026, Set M (Paper code 2SA-I 26004 (M))

1. A diode is commonly used as a
A. Resistor B. Transformer
C. Rectifier D. Capacitor

2. If the angle of incidence is zero, the refracted ray will
A. Continue along the normal B. Bend away from the normal
C. Bend towards the normal D. Be totally reflected

3. An object becomes negatively charged when it
A. Gains neutrons B. Loses electrons
C. Gains protons **D. Gains electrons**

4. If both inputs of a NAND gate are HIGH, the output will be
A. Same as input B. HIGH
C. Undefined **D. LOW**

5. Which feature helps reduce heat loss in buildings?
A. Open ventilation B. Large windows
C. Thermal insulation D. Thin walls

6. The force on a current-carrying conductor in a magnetic field is maximum when the conductor is placed
A. Along the current direction B. Parallel to the field
C. At any angle **D. Perpendicular to the field**

7. The correct formula of electric current is
A. I = Q / t B. I = t / Q C. I = Q × t D. Q = I / t

8. The coefficient of volume expansion β equals
A. $V_0\Delta T / \Delta V$ **B. $\Delta V / (V_0\Delta T)$**
C. $\Delta V\Delta T / V_0$ D. $V_0 / (\Delta V\Delta T)$

9. Maximum displacement of particles refers to
A. Speed **B. Amplitude**
C. Frequency D. Wavelength

10. The speed of a wave is 7 m/s. If its amplitude is doubled, the speed will
A. Not change B. Be doubled
C. Become zero D. Become half

11. If the split-ring commutator is removed, the motor will
A. Produce electrical energy B. Rotate faster
C. Stop after half rotation D. Continue rotating smoothly

12. Sound cannot travel through
A. Vacuum B. Air C. Water D. Steel

Annual 2025

1. What is used to transmit light signals in modern communication?
A. Optical fibre B. Metal wire
C. Coaxial cable D. Radiowave

2. X + (17, 8)O → (14, 7)N + (4, 2)He ; X =
A. neutron B. electron **C. (1, 1)H** D. (2, 1)H

3. Which one of the following is necessary for simple harmonic motion?
A. Restoring force B. Variable mass
C. Constant speed D. Increasing force

4. What causes the difference in pitch between two sounds?
A. Their frequencies B. Their speeds
C. Their amplitudes D. Their durations

5. According to the law of reflection, the angle of incidence is
A. Equal to angle of reflection B. Less than angle of reflection
C. Always 90° D. Greater than angle of reflection

6. What happens when like charges are brought near each other?
A. They combine B. No force acts on these
C. They attract **D. They repel**

7. According to Coulomb's law, F =
A. $K r / (q_1^2 q_2^2)$ B. $K q_1^2 q_2^2 / r$
C. $K q_1 q_2 / r^2$ D. $K q_1 q_2 r^2$

8. In a conductor, keeping its resistance constant, if voltage is increased, the current will
A. Remain same B. Become zero
C. Decrease **D. Increase**

9. Which factor increases the resistance of a conductor?
A. Increase in area B. Use of good conductor
C. Increase in length D. Decrease in temperature

10. Why are household circuits connected in parallel?
A. So that each appliance gets full voltage B. To reduce current
C. To save energy D. To reduce resistance

11. What principle is used in the working of a transformer?
A. Mutual induction B. Thermionic emission
C. Ohm's law D. Coulomb's law

12. The cathode ray oscilloscope (CRO) measures
A. Electrical signals B. Sound waves
C. Resistance D. Light

Annual 2023

1. What is the principle behind carbon-dating?
A. After a plant or animal dies, it stops taking in fresh C-14
B. Plants and animals are strong emitters of C-14
C. When plants and animals die, they absorb fresh C-14
D. There is so much non-radioactive carbon dioxide in air

2. In an ocean, wind can produce waves of frequency 20 Hz. If 30 complete waves occupy a distance of 60 cm (λ = 2 cm), the velocity of the waves is
A. 0.4 cm/s **B. 40 cm/s** C. 10 cm/s D. 5 cm/s

3. Speed of sound at 0 °C is 332 m/s. What is its speed in vacuum?
A. Less than 332 m/s, but not zero B. Same i.e. 332 m/s
C. Greater than 332 m/s **D. Zero**

4. An incident ray of light makes an angle of 60° with a plane mirror. The angle of reflection of this ray is

A. 30° B. 0.866° C. 90° D. 60°

5. If a charge of 3 C experiences a force of 15 N in the electric field of a 5 C charge, the electric field intensity at that point is

A. 5 N/C B. 3 N/C C. 45 N/C D. 1 N/C

6. Which of the following components obeys Ohm's law?

A. Diode B. Tungsten filament (bulb)
C. Fixed resistance (metallic wire) D. Thermistor

7. If the length of a copper wire is 50 cm and its diameter is 2 mm, then the resistance of the wire is ($\rho = 1.69\times10^{-8}$ Ωm)

A. 2.7×10^{-7} Ω **B. 2.7×10^{-3} Ω**
C. 6.7×10^{-4} Ω D. 6.7×10^{-10} Ω

8. Which device converts mechanical energy into electrical energy?

A. Battery B. Motor
C. Thermocouple **D. Generator**

9. The direction of induced emf in a circuit is in accordance with conservation of

A. Momentum B. Mass **C. Energy** D. Charge

10. Which logic gate is similar to the function of two parallel switches?

A. AND **B. OR** C. NAND D. NOR

11. Information travels through wires in the telephone network of an office in the form of

A. Electrical signals B. Light signals
C. Sound signals D. Microwave signals

12. When radium-226 emits an α particle it turns into radon. If radium has 88 protons, the atomic number of radon is

A. 92 B. 84 **C. 86** D. 90