

**AGA KHAN UNIVERSITY EXAMINATION BOARD
HIGHER SECONDARY SCHOOL CERTIFICATE**

CLASS XII

ANNUAL EXAMINATIONS 2022

Physics

Total Time: 2 hours 10 minutes

Total Marks: 65 (50-Theory & 15-Alternate to Practical)

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 65 only.
4. Question Distribution

Theory	Alternate to Practical (ATP)
50 MCQs	15 MCQs

5. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.

Correct Way	Incorrect Ways
1 (A) (B) (C) (D)	1 (A) (B) (C) (D)
	2 (A) (B) (C) (D)
	3 (A) (B) (C) (D)
	4 (A) (B) (C) (D)

Candidate's Signature

6. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
7. DO NOT write anything in the answer grid. The computer only records what is in the circles.
8. The marks obtained on the 50 MCQs will be equated to the total marks of 85 for the theory examination results.
9. You may use a scientific calculator if you wish.

THEORY (Questions 1-50)

1. When two or more parallel plates capacitors are connected in parallel combination, then their equivalent capacitance will be equal to the
 - A. sum of their individual capacitances.
 - B. product of their individual capacitances.
 - C. sum of reciprocal of individual capacitances.
 - D. product of reciprocal of individual capacitances.

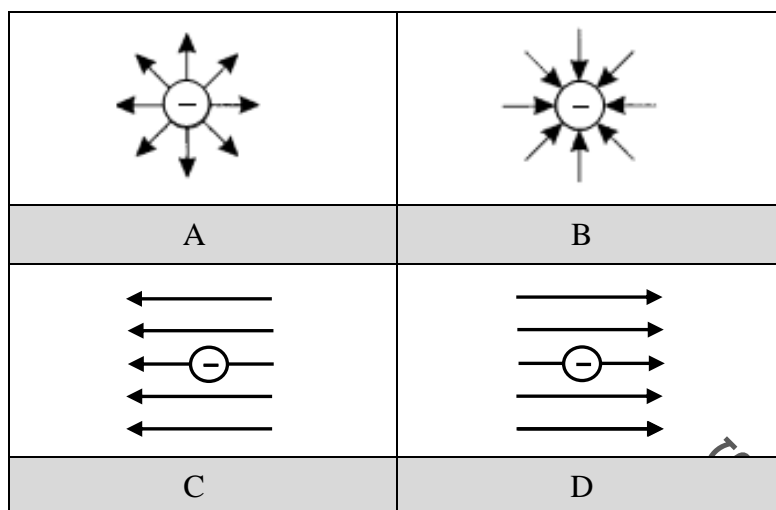
2. Work done in bringing a unit positive charge from infinity to a point in an electric field is called
 - A. potential difference.
 - B. absolute potential.
 - C. electric intensity.
 - D. electric flux.

3. The field that is produced by a charged particle, in a rest position, is
 - A. electric field.
 - B. magnetic field.
 - C. electromagnetic field.
 - D. non-conservative field.

4. A physical quantity, electric field intensity has
 - A. no direction.
 - B. direction along the area of surface.
 - C. direction along the electrostatic force.
 - D. direction making an angle of 45° with force.

5. If a 3.5 F capacitor has the potential difference of 9 V across it, then the charge on the capacitor will be
 - A. 2.5 C.
 - B. 5.5 C.
 - C. 12.5 C.
 - D. 31.5 C.

6. Which of the following figures CORRECTLY represents the electric field lines due to a negative point charge?



7. Two metallic balls **X** and **Y** have equal and opposite charges. A metallic ball **Z** is attracted by balls **X** and **Y** when it is placed near these balls one after another.

The metallic ball **Z** will be

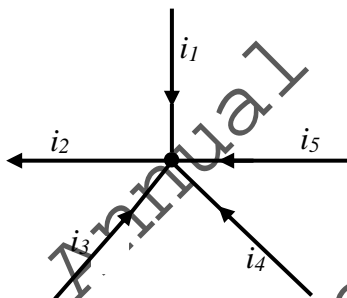
- A. positively charged.
 B. negatively charged.
 C. electrically neutral.
 D. partially positive and negative.
8. To achieve the highest accuracy of the voltage in a circuit, the length of the slide wire of a potentiometer should be
- A. limited to 100 cm.
 B. as long as possible.
 C. as short as possible.
 D. limited to less than 500 cm.
9. A rheostat with respect to its typical construction, can also be used as a/ an
- I. variable resistor
 II. charge storing device
 III. electric current controller
 IV. automatic voltage regulator
- A. I and III.
 B. II and III.
 C. II and IV.
 D. III and IV.

10. The colours of strips on a certain carbon resistor from left to right are green, black and blue respectively.

Colours	Value
Green	5
Black	0
Blue	6

Its resistance is

- A. $5.0 \times 10^2 \Omega$.
 B. $5.0 \times 10^3 \Omega$.
 C. $5.0 \times 10^5 \Omega$.
 D. $5.0 \times 10^7 \Omega$.
11. In a celebration of an event, a 500 W bulb operates at 120 V and has a periodic fluctuation of 2 s. The electric current passing through the bulb is
- A. 0.44 A.
 B. 2.27 A.
 C. 5.44 A.
 D. 7.27 A.
12. According to the Kirchoff's first law, the CORRECT relationship between different currents passing in the given circuit diagram in terms of i_2 is

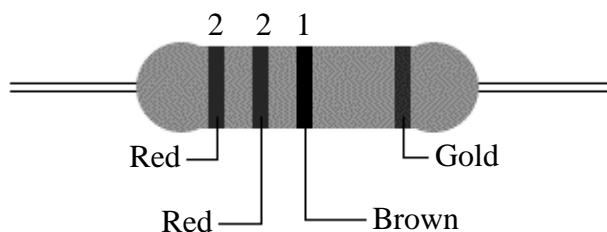


- A. $i_2 = i_1 + i_3 + i_4 + i_5$
 B. $i_2 = i_1 + i_3 - i_4 + i_5$
 C. $i_2 = i_1 - i_3 + i_4 + i_5$
 D. $i_2 = i_1 - i_3 - i_4 + i_5$
13. A 1.0 ton split air conditioner (AC) operates at 220 V and uses 1090 W.

The resistance of the air conditioner will be

- A. 20.18 Ω .
 B. 44.40 Ω .
 C. 870.0 Ω .
 D. 1310.0 Ω .

14. In a Wheatstone bridge, when the condition $\frac{R_1}{R_2} = \frac{R_3}{R_4}$ is satisfied, then the current passing through the galvanometre will be
- less than 0 A.
 - equal to 0 A.
 - equal to 1 A.
 - more than 1 A.
15. If a metallic conductor of resistance **R** is cut into three equal parts, then the resistance of each part will become
- $\frac{R}{3}$.
 - R.
 - 3 R.
 - R – 3.
16. The colours and their values on the given carbon resistor are shown below.
The total resistance provided by the resistor will be

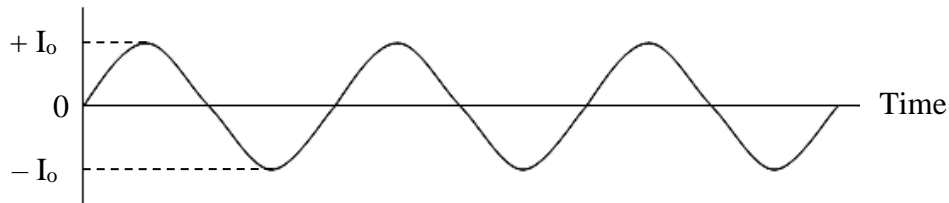


- $22 \Omega \pm 5\%$.
 - $22 \Omega \pm 10\%$.
 - $220 \Omega \pm 5\%$.
 - $221 \Omega \pm 10\%$.
17. When a moving coil galvanometre is attached with an electric circuit, its deflection is directly proportional to the
- area of the coil.
 - material of the coil.
 - total number of turns in the coil.
 - amount of current passing through the coil.

18. If 9 A current is passing through a wire of length 1.5 m experiences a perpendicular magnetic force of 0.25 N, then the magnetic field is
- A. 0.018 T.
 - B. 0.041 T.
 - C. 0.194 T.
 - D. 0.541 T.
19. An ohmmetre is used to measure the
- A. current.
 - B. voltage.
 - C. resistance.
 - D. conductance.
20. When the filament in a cathode rays oscilloscope (CRO) is heated, then the emitted particles are
- A. protons.
 - B. neutrons.
 - C. electrons.
 - D. positrons.
21. When an electric current passes through a straight wire, it is surrounded by a/ an
- A. electric field.
 - B. magnetic field.
 - C. conservative field.
 - D. gravitational field.
22. The device that converts mechanical energy into electric energy is a
- A. motor.
 - B. battery.
 - C. generator.
 - D. transformer.
23. The law used to find the direction of induced electromotive force (e.m.f.) with respect to the direction of an electric current in a conductor is
- A. Lenz's law.
 - B. Faraday's law.
 - C. Ampere's law.
 - D. Coulomb's law.
24. All of the following factors increase the magnitude of power loss in a conducting material due to the effect of eddy current EXCEPT
- A. low resistivity.
 - B. decrease the area.
 - C. strong magnetic field.
 - D. increase the thickness.

25. In electromagnetic induction, an electromotive force (e.m.f.) is induced in a coil due to the change of flux through the coil, when the coil is
- placed in an electric field.
 - moved in an electric field.
 - placed in a magnetic field.
 - moved in a magnetic field.
26. If the amount of current 'I' in a coil increases four times by keeping inductance 'L' constant, then the energy flowing in the coil becomes
- $2 L I^2$.
 - $4 L I^2$.
 - $8 L I^2$.
 - $16 L I^2$.
27. The combined effect of resistance and reactance in a circuit is known as
- inductor.
 - capacitor.
 - impedance.
 - modulation.
28. The direction of the propagation of an electromagnetic wave in a medium is
- parallel to the electric field only.
 - perpendicular to the magnetic field only.
 - parallel to both electric and magnetic fields.
 - perpendicular to both electric and magnetic fields.
29. An electrician is supposed to measure an AC voltage in a common household wiring. If his voltmeter measures 220 V in the wiring, then its peak value of the voltage will be
- 314.2 V.
 - 220.0 V.
 - 154.0 V.
 - 110.0 V.
30. The basic circuit elements in an alternating current (AC) circuit which store energy in an electric and magnetic field are
- resistor
 - inductor
 - capacitor
 - transistor
- I and II.
 - I and IV.
 - II and III.
 - III and IV.

31. The variation in alternating current with time is shown by a sinusoidal wave in the given figure.

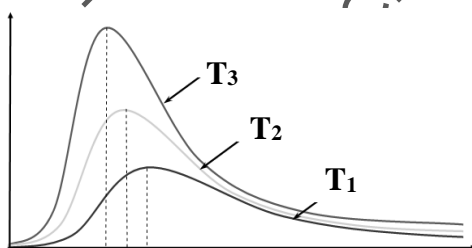


The root mean square (r.m.s.) current for this alternating current (AC) is

- A. I_0
- B. $\sqrt{2} I_0$
- C. $\frac{I_0}{\sqrt{2}}$
- D. $2 I_0$
32. The forward current as compared to reverse current, while passing through a *p-n* junction is/ are always
- I. less
- II. more
- III. equal
- A. I only.
- B. II only.
- C. I and III.
- D. II and III.
33. When free electrons move from the *n*-region to the *p*-region, a potential difference appears across this region called
- A. potential barrier.
- B. depletion region.
- C. interaction region.
- D. absolute potential.
34. The majority charges carrier inside a *p*-type semiconducting material are
- A. holes.
- B. protons.
- C. electrons.
- D. positrons.

35. A light emitting diode (LED) emits light only when it is
- I. unbiased
 - II. reverse biased
 - III. forward biased
- A. II only.
 - B. III only.
 - C. I and II.
 - D. I and III.
36. In a $p-n$ junction diode, if the p -side is at negative potential with respect to the n -side, then this junction is called
- A. reverse biased.
 - B. forward biased.
 - C. positively biased.
 - D. negatively biased.
37. Which of the following materials is a tetravalent semi-conductor?
- A. Barium
 - B. Sodium
 - C. Aluminium
 - D. Germanium
38. The number of terminal(s) in a transistor is
- A. one.
 - B. two.
 - C. three.
 - D. four.
39. The thermal radiations emitted by a body at low temperature is of
- A. long wavelength.
 - B. short wavelength.
 - C. infinite wavelength.
 - D. moderate wavelength.
40. In photoelectric effect, the maximum kinetic energy of the emitted photoelectrons depends on the
- A. saturation region.
 - B. intensity of the incident light.
 - C. frequency of the incident light.
 - D. surface temperature of the metal surface.

41. When high energy photon interacts with a nucleus and disintegrates into an electron and positron, this phenomenon is known as
- A. pair production.
 - B. Compton's effect.
 - C. photoelectric effect.
 - D. annihilation of matter.
42. Compton's experiment provides evidence that the light has
- I. a wave nature
 - II. a particle nature
 - III. an electromagnetic nature
- A. I only.
 - B. II only.
 - C. I and III.
 - D. II and III.
43. In the special theory of relativity, when an object is at rest position with respect to an observer, the mass of the object (m_0) will be called as
- A. rest mass.
 - B. inertial mass.
 - C. active gravitational mass.
 - D. passive gravitational mass.
44. In the special theory of relativity, if a body is moving with the velocity which is close to the velocity of light, then the apparent length of the body as compared to its original length
- A. becomes twice.
 - B. becomes enlarged.
 - C. remains unchanged.
 - D. becomes contracted.
45. The given wavelength-energy graph shows the radiations emitted by a blackbody.



(Here, T represents temperature.)

Which of the following options shows the CORRECT relationship among T_1 , T_2 and T_3 ?

- A. $T_3 > T_2 > T_1$
- B. $T_1 > T_2 > T_3$
- C. $T_2 > T_1 > T_3$
- D. $T_1 > T_3 > T_2$

46. A blacksmith is heating an iron axe on a high degree burner. While heating the axe, he noted that different colours are produced.

Which of the following colours shows the highest temperature of the iron axe?

- A. Red
 - B. Blue
 - C. Yellow
 - D. Orange
47. The Heisenberg uncertainty principle is related to a particle's
- A. mass and velocity.
 - B. position and mass.
 - C. mass and momentum.
 - D. position and momentum.
48. When the intensity of light falls on a metal surface, it results in the decrease of the
- A. value of potential difference.
 - B. velocity of the emitted electrons.
 - C. kinetic energy of the emitted electrons.
 - D. number of electrons emitted per second.
49. When the temperature of a black body is lowered, the wavelength associated to the maximum intensity
- A. becomes zero.
 - B. remains the same.
 - C. shifts to the longer wavelength.
 - D. shifts to the shorter wavelength.
50. A non-inertial frame of reference is that which
- A. is always at rest.
 - B. has zero acceleration.
 - C. moves with uniform velocity.
 - D. moves with some acceleration.

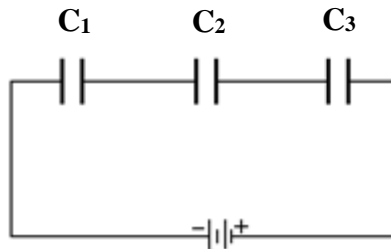
ALTERNATE TO PRACTICAL (ATP: Questions 51-65)

51. The charging and discharging of a capacitor connected in an electric circuit depends on
- A. time constant.
 - B. electric power.
 - C. electric current.
 - D. applied voltage.

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52. In an electric circuit, the final electric current when a capacitor is fully charged
- is zero.
 - is minimum.
 - is maximum.
 - cannot be determined.
53. The relation used to find the equivalent capacitance for the given combination of capacitors is

- $C_1 + C_3$
- $\frac{1}{C_1} + \frac{1}{C_2}$
- $C_1 + C_2 + C_3$
- $\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$



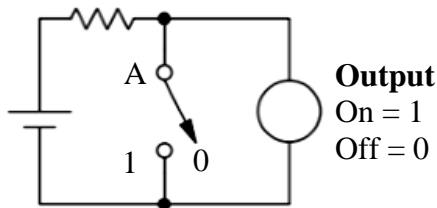
54. If a voltage of 220 V is applied to a resistor of 20 Ω , then the amount of electric current in the circuit will be
- 11 A.
 - 110 A.
 - 200 A.
 - 240 A.
55. In an electric kettle 250 ml water boils in 5 minutes. If the same amount of water needs to be boiled in half of the time by using the same power supply, which of the following conditions would be applied?
- Increase the impurity in water
 - Decrease the amount of current
 - Use the kettle with an open lid
 - Increase the length of the filament
56. Ahmed wants to shift the balance point of a potentiometre from the fourth wire to the fifth wire to measure the resistance of a cell.

Which of the following options is CORRECT with respect to the electric current and the type of cell from which the current has been drawn?

	Electric Current	Type of Cell
A	Increase	Test cell
B	Decrease	Test cell
C	Increase	Secondary cell
D	Decrease	Secondary cell

57. If current passing through a potentiometre wire is decreased, then the balancing length will
- A. increase.
 - B. decrease.
 - C. become infinite.
 - D. remain the same.
58. The purpose of using a potentiometre in an electric circuit is to
- A. measure resistance.
 - B. compare two voltages.
 - C. measure alternating current.
 - D. compare alternating and direct currents.
59. A reverse biased semiconductor diode acts like a/ an
- A. inductor.
 - B. conductor.
 - C. open switch.
 - D. close switch.
60. The component in a transistor that has the biggest size in terms of an area is
- A. base.
 - B. emitter.
 - C. collector.
 - D. depletion layer.
61. If two inputs of a NAND gate are connected together, then the resulting truth table will represent the characteristics of a/ an
- A. OR gate.
 - B. NOT gate.
 - C. AND gate.
 - D. XNOR gate.
62. A student has been given a task by his/ her teacher to make a security alarm for passengers' luggage.
- The MOST suitable logic gate used by the student will be
- A. XOR gate.
 - B. NOR gate.
 - C. XNOR gate.
 - D. NAND gate.

63. The given circuit diagram along with its logic functions represent a/an



- A. OR gate.
 B. NOT gate.
 C. AND gate.
 D. NOR gate.
64. One of the important characteristics of the MOST suitable metal for photoelectric emission is that it
- A. has shiny surface.
 B. has low work function.
 C. has high threshold energy.
 D. is sensitive to the frequency of light.
65. The potential difference and wavelength of light to stop the ejection of excited electrons from the photosensitive surface is shown in the given table.

Wavelength of Light	Potential Difference
10^{-10} m	2 V

If the wavelength of light is changed to 10^{-5} m, then the potential difference required (X) to stop the electrons will be

- A. $X = 0$ V.
 B. $X = 2$ V.
 C. $X < 2$ V.
 D. $0 < X < 2$ V.

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