1- The student is asked to answer (a) or (b) : (One Mark)

(a) The opposition to the flow of the electric current. P10

(b) The total work done to transfer a unit charge (1 coulomb) throughout the circuit inside and outside the battery). P10

Or, The potential difference between its poles when there is no current in the circuit. P15

2- The student is asked to answer (a) or (b) : (One Mark)

(a) To raise the voltage to a high value. This is associated by small value of current and the loss in the electric energy (power) during transmission decreases. P82

(b) The two halves of the commutator interchange their positions relative to brushes (F_1 and F_2) once each a half revolution, reversing the current direction keeping the torque in one direction. P87

3- The student is asked to answer (a) or (b) : (One Mark)

(a) $2\pi r = n \lambda$ (or any other form of this relation). P142

(b) $E_n = \dfrac{-13.6\ eV}{n^2}$ P143

4- (One Mark)

Point of comparison	Liquid dye LASER	Argon LASER
Source of energy	Optical Or, a laser beam (½ Mark) P162	Electrical energy (½ Mark)P162

5- (One Mark)

AND gate OR

6- (One Mark)

By mounting the hot wire on a plate made of a metal having the same expansivity as the wire material P101

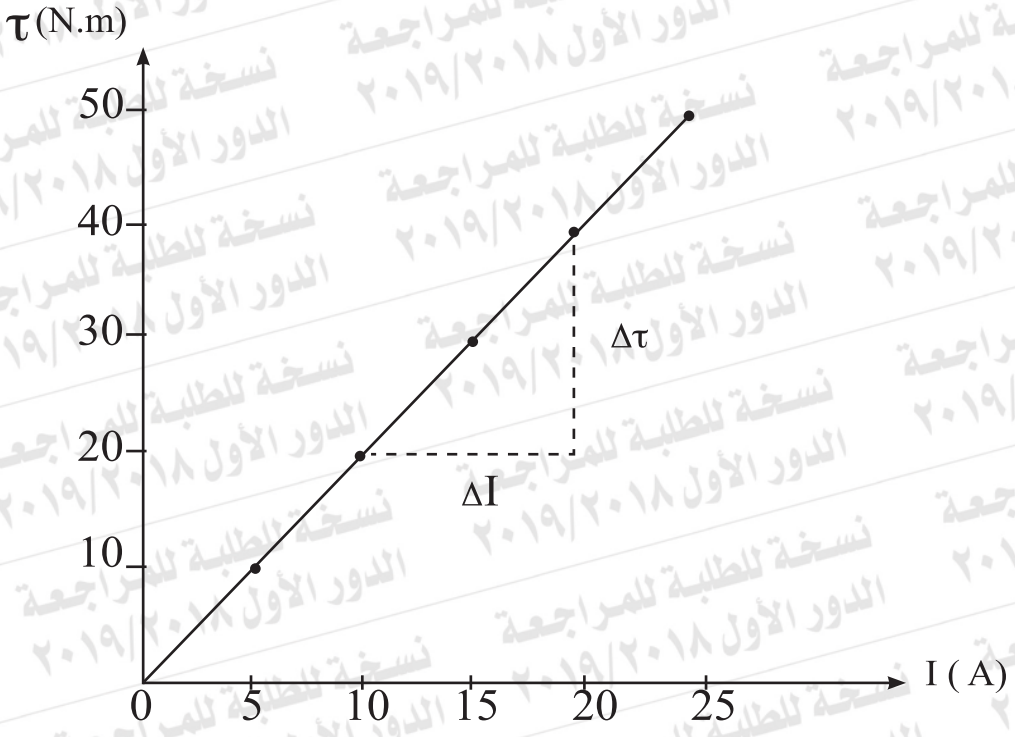
7- (Two Marks)

First: Lenz's rule (One Mark) P55

Second: Fleming's right hand rule. (One Mark) P56

8- (Two Marks)

First: Drawing (One Mark)



Secand:

Slope of line $= \frac{\triangle \tau}{\triangle I} = 2$ (½ Mark)

Slope = BAN

$A = \frac{2}{0.1 \times 500} = 0.04\ m^2$ (½ Mark)

9- (Two Marks)

$$E = \frac{hc}{\lambda}$$ (½ Mark)

$$E = \frac{6.625 \times 10^{-34} \times 3 \times 10^{8}}{8 \times 10^{-7}} = 2.48 \times 10^{-19}\ J$$ (½ Mark)

$$P = \frac{hc}{\lambda}$$ (½ Mark)

$$P = \frac{6.625 \times 10^{-34}}{8 \times 10^{-7}} = 8.28 \times 10^{-28}\ Kg\ m/s$$ (½ Mark)

OR

$$P = \frac{E}{c}$$ (½ Mark)

$$P = \frac{2.48 \times 10^{-19}}{3 \times 10^{8}} = 8.28 \times 10^{-28}\ Kg\ m/s$$ (½ Mark)

10- The student is asked to answer (a) or (b) : (One Mark)

(a) To extend the range of measuring the current intensity. P47

Or, To allow most of the circuit current to pass through it. P48

Or, To lower the total resistance of the device not to affect the current. P48

(b) To adjust the pointer at zero position of the resistance scale when the ohmmeleris short circuited.

11- (One Mark)

AC supply

12- (One Mark)

Population inversion. P161

13- (One Mark)

The pn junction should have a small resistance in the forward direction and a very high resistance in the reverse direction. P 188

14- (One Mark)

P.d across the filament: To pass a current through the filament, to heat it that emit electrons. (½ Mark) P148

P.d across the target and filament: giving the emitted electrons high kinetic energy Or, high velocity. (½ Mark) P148

15- (One Mark)

The choice ⓒ : the right of the page, perpendicular to the wire.

16- (Two Marks)

$4 = 6\ I_1 + 4\ I_2$ (½ Mark)

$3 = 4\ I_1 + 4\ I_2$ (½ Mark)

Reading of $(A_1) = 0.5$ A (½ Mark)

Reading of $(A_2) = I_2 = 0.25$ A (½ Mark)

17- The student is asked to answer (a) or (b) : (Two Marks)

(a) (Two points only are required) (One Mark for each)

1- Serve as current leads

2- Restrain the rotational motion of the coil.

3- Restore the coil to zero position after turning the current off. P47

(b) (Two points only are required) (One Mark for each)

1- Extends the range of measuring the potential difference.

2- Increases the total resistance of the device

3- To make the voltmeter draw a negligible current, 3- Increases the accuracy of measuring the potential difference. P50

18- (Two Marks)

$$emf = -L\frac{\triangle I}{\triangle t}$$ (One Mark)

$$L = \frac{5}{20} = 0.25\ H$$ (One Mark)

19- The student is asked to answer (a) or (b) : (One Mark)

(a) The self-inductance of a coil in which an emf of 1V is induced when the current passing through it changes at a rate of 1 A/s. P71

(b) The value of the direct current that generates the same rate of thermal energy in a resistance as that generated by the AC current. P76

20- The student is asked to answer (a) or (b) : (One Mark)

(a) They are sensitive to environmental conditions such as light. P 185

(b) As temperature rises, more covalent bonds are broken, releasing some electrons from bands, increasing the number of free electrons in the crystal. P181

21- The student is asked to answer (a) or (b) : (One Mark)

(a) In TV and Computer monitors. P124

(b) In medicine in, Tomography Or, Embryology Or, Criminology Or, Remote sensing. Or Night vision systems.

22- (One Mark)

The choice ⓑ: I

23- (One Mark)

The choice ⓒ:

Choice	$\emptyset_m$	E
c	zero	maximum

24- (One Mark)

The choice (b): $B_2 = B_1$

25- (Two Marks)

The voltmeter reading decreases.

26- (Two Marks)

$$Xc = \frac{1}{2\,\pi\,fc}$$ (½ Mark)

$$Xc = \frac{1 \times \pi \times 9}{2\,\pi \times 150 \times 100 \times 10^{-6}} = 300\ \Omega$$ (½ Mark)

$$Z = \sqrt{R^2 + X_C{}^2}$$ (½ Mark)

$$Z = \sqrt{(400)^2 + (300)^2} = 500\ \Omega$$ (½ Mark)

27- (Two Marks)

According to the law of conservation of energy, the electric energy supplied to the primary coil equals the electric energy produced in the secondary coil.

$V_p I_p t = V_s I_s t$ (One Mark)

$V_p I_p = V_s I_s$

$\frac{I_s}{I_p} = \frac{V_p}{V_s}$ (One Mark)

28- The student is asked to answer (a) or (b) : (One Mark)

(a) Capacitance of the capacitor **Or**, self-inductance of the coil.

(b) Self-inductance of the coil **Or**, frequency of the AC current.

29- (One Mark)

It focuses the rays belonging to the same color at the focal plane of the lens. P146

30- (One Mark)

The induced electromotive force is directly proportional to the rate by which the conductor intercepts the magnetic flux linked with it. P63

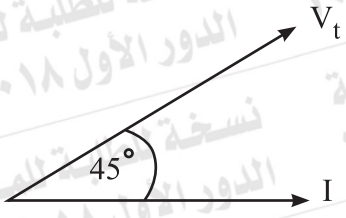
31- (One Mark)

The choice ⓐ: Wave nature of electrons P135

32- (One Mark)

The choice ⓓ: zero

33- (One Mark)



34- The student is asked to answer (a) or (b) : (Two Marks)

(a) Electrical conductivity: does not change (One Mark)

Ohmic resistance: decreases to a quarter (One Mark)

(b) Wire (Y) is thicker than the wire (X) (One Mark)

According to the relation: $R = \rho \frac{\ell}{A}$

Slope of line $\propto \frac{1}{A}$ (One Mark)

Slope of line (Y) is less than slope of line (X).

35- (Two Marks)

First: the magretic flux density increases at the point (x) (One Mark)

Second: the mutual force between the wires does not change.

(One Mark)

36- (Two Marks)

$$\beta_e = \frac{Ic}{I_B}$$ (½ Mark)

$$\beta_e = \frac{0.02}{2.5\times10^{-4}} = 80$$ (½ Mark)

$$\beta_e = \frac{\alpha_e}{1 - \alpha_e}$$ (½ Mark)

$$80 = \frac{\alpha_e}{1 - \alpha_e}$$

$$\alpha_e = 0.988$$ (½ Mark)

(Or, Any other correct answer)

37- The student is asked to answer (a) or (b) : (One Mark)

(a) Due to near equality of the values of the metastable excited energy levels in both elements P167

(b) Due to coherent nature of laser photons P 170

38- (One Mark)

The choice ⓒ: Aluminum

39- (One Mark)

R= 3Ω

40- (One Mark)

The choice ⓑ: Transition (2)

41- (One Mark)

The choice ⓐ: $I_1 = \frac{I_2}{2}$

42- (One Mark)

The choice ⓒ: increasing the frequency of the light incident on the metal

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43- (The student is asked to answer (a) or (b)) (Two Marks)

(a)

$emf = BAN\omega \sin \Theta$ (One Mark)

$emf = 0.3 \times 0.025 \times 140 \times 2 \times \frac{22}{7} \times 10 \sin 30$

$emf = 33V$ (One Mark)

(b)

$emf_2 = -M \frac{\Delta I_1}{\Delta t}$ (One Mark)

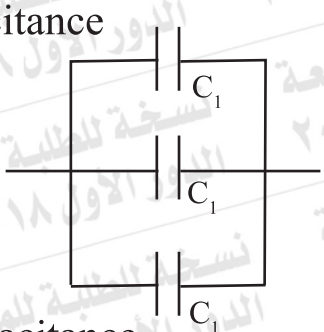
$60 = -0.3 \frac{10}{\Delta t}$ (½ Mark)

$\Delta t = \frac{3}{60} = 0.05\ s$ (½ Mark)

44- (Two Marks)

First: Maximum capacitance

(One Mark)



$C = 3\ C_1$

Secand: minimum capacitance

(One Mark)

$C = \frac{C_1}{3}$

45- (Two Marks)

$$R_s = \frac{I_g R_g}{I - I_g}$$ (One Mark)

$$= \frac{60\ I_g}{4\ I_g} = 15\Omega$$ (½ Mark)

$$R_{eq} = \frac{60 \times 15}{60 + 15} = \frac{900}{75} = 12\Omega$$ (½ Mark)

(Or, Any other correct answer)