CLASS : 12th (Sr. Secondary) **4378/4328**

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MARKING INSTRUCTIONS AND MODEL ANSWERS

भौतिक विज्ञान

PHYSICS

ACADEMIC/OPEN

(Only for Fresh/Re-appear Candidates)

उप-परीक्षक मूल्यांकन निर्देशों का ध्यानपूर्वक अवलोकन करके उत्तर-पुस्तिकाओं का मूल्यांकन करें। यदि परीक्षार्थी ने प्रश्न पूर्ण व सही हल किया है तो उसके पूर्ण अंक दें।

General Instructions :

(i) Examiners are advised to go through the general as well as specific instructions before taking up evaluation of the answer-books.

(ii) Instructions given in the marking scheme are to be followed strictly so that there may be uniformity in evaluation.

(iii) Mistakes in the answers are to be underlined or encircled.

(iv) Examiners need not hesitate in awarding full marks to the examinee if the answer/s is/are absolutely correct.

(v) Examiners are requested to ensure that every answer is seriously and honestly gone through before it is awarded mark/s. It will ensure the authenticity as their evaluation and enhance the reputation of the Institution.

(vi) A question having parts is to be evaluated and awarded partwise.

(vii) If an examinee writes an acceptable answer which is not given in the marking scheme, he or she may be awarded marks only after consultation with the head-examiner.

(viii) If an examinee attempts an extra question, that answer deserving higher award should be retained and the other scored out.

(ix) Word limit wherever prescribed, if violated upto 10%. On both sides, may be ignored. If the violation exceeds 10%, 1 mark may be deducted.

(x) Head-examiners will approve the standard of marking of the examiners under them only after ensuring the non-violation of the instructions given in the marking scheme.

(xi) Head-examiners and examiners are once again requested and advised to ensure the authenticity of their evaluation by going through the answers seriously, sincerely and honestly. The advice, if not headed to, will bring a bad name to them and the Institution.

महत्त्वपूर्ण निर्देश :

(i) अंक-योजना का उद्देश्य मूल्यांकन को अधिकाधिक वस्तुनिष्ठ बनाना है। अंक-योजना में दिए गए उत्तर-बिन्दु अंतिम नहीं हैं। ये सुझावात्मक एवं सांकेतिक हैं। यदि परीक्षार्थी ने इनसे भिन्न, किन्तु उपयुक्त उत्तर दिए हैं, तो उसे उपयुक्त अंक दिए जाएँ।

(ii) शुद्ध, सार्थक एवं सटीक उत्तरों को यथायोग्य अधिमान दिए जाएँ।

(iii) परीक्षार्थी द्वारा अपेक्षा के अनुरूप सही उत्तर लिखने पर उसे पूर्णांक दिए जाएँ।

(iv) वर्तनीगत अशुद्धियों एवं विषयांतर की स्थिति में अधिक अंक देकर प्रोत्साहित न करें।

(v) भाषा-क्षमता एवं अभिव्यक्ति-कौशल पर ध्यान दिया जाए।

(vi) मुख्य-परीक्षकों/उप-परीक्षकों को उत्तर-पुस्तिकाओं का मूल्यांकन करने के लिए केवल Marking Instructions/ Guidelines दी जा रही है, यदि मूल्यांकन निर्देश में किसी प्रकार की त्रुटि हो, प्रश्न का उत्तर स्पष्ट न हो, मूल्यांकन निर्देश में दिए गए उत्तर से अलग कोई और भी उत्तर सही हो तो परीक्षक, मुख्य-परीक्षक से विचार-विमर्श करके उस प्रश्न का मूल्यांकन अपने विवेक अनुसार करें।

SET – A

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1. (i) Grounding or Earthing 1

(ii) (B) $C^2N^{-1}m^{-2}$ 1

(iii) $\frac{1}{2}\in_0 E^2$ 1

(iv) (A) Decreases 1

(v) $I = \frac{V}{R} = \frac{4V}{2K\Omega} = 2\times10^{-3}$ A = 2mA 1

(vi) Zero 1

(vii) (D) Zero 1

(viii) Radiowaves 1

(ix) (C) Rutherford 1

(x) Becquerel 1

(xi) (D) All of these 1

(xii) Spherical wave front 1

(xiii) Photodetectors 1

(xiv) The loss of strength of a signal while propagating through a medium is called as alternation. 1

2. $\because Q = CV$

$\therefore Q_1 = C_1V = 2pF \times 100\ V = 2 \times 10^{-10}$ coulomb

$Q_2 = C_2V = 3pF \times 100\ V = 3 \times 10^{-10}$ coulomb

$Q_3 = C_3V = 4pF \times 100\ V = 4 \times 10^{-10}$ coulomb 2

3. Kirchoff's loop sale states that the algebric sum of changes in potential around a closed loop involving resistors and cells in the loop is zero. 2

4. (i) Magnetic breaking in trains.

(ii) Electromagnetic damping

(iii) Induction furnace

(iv) Electric power meters ½ + ½ +½ +½

5. (i) When magnetic flux linked with coil changes, e.m.f is induced. 1

(ii) e.m.f. Induced is equal to negative rate of change in Magnetic flux. 1

6. As. $\lambda = \frac{C}{\nu}$

$\therefore\ \lambda_1 = \frac{3\times10^8 m/s}{7.5\,MHz} = 40\,m$

$\lambda_2 = \frac{3\times10^8 m/s}{12\times10^6\ Hz} = 25\,m$

So, corresponding wavelength band is 40 m to 25 m. 2

7. As. $\lambda = \frac{h}{mv} = \frac{6.6\times10^{-34}}{0.40\times1.0\times10^3 m/s}$ 2

$= 1.6\times10^{-35} m$.

8. Basic nuclear process in β^-decay is

$n \rightarrow p + e^- + \bar{\nu}$ 1

$^{210}_{83}Bi \rightarrow {}^{210}_{84}P_0 + e^- + \bar{\nu}$ 1

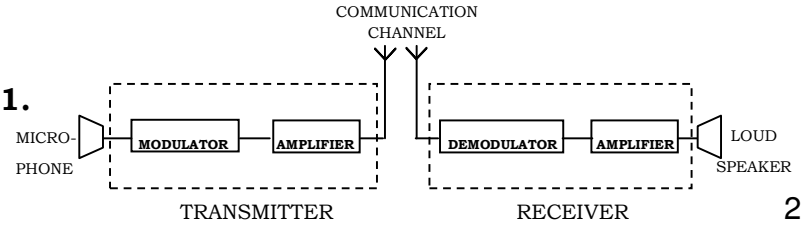
9. I-V charact. of Zener diode 1

Circuit diagram as voltage regulator 1

10. Truth table is : 2

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

11.

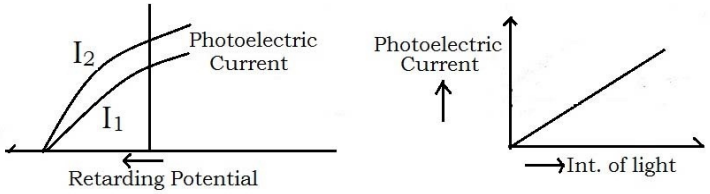


2

OR

12. Three postulates of Bohr model 3

13. Definition of photoelectric effect 1



1

Brief explanation of above curve 1

14. Polarisation by reflection 1½

Deduction of Brewster's law 1½

15. Angular frequency at resonance,

$$\omega_0 = \sqrt{\frac{1}{LC}} = \sqrt{\frac{1}{50H \times 8\mu F}} = 50Hz$$ 1

Current at resonance ; $I = \frac{220V}{44\Omega} = 5A$ 1

$$\left.\begin{aligned} Z = R = 44\Omega \\ I = \frac{V}{Z} = \frac{V}{R} \end{aligned}\right\}$$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$; $X_L = X_C$

$Z = R = 44\Omega$ 1

16. Ampere circuital law 2

Expression $B = \frac{\mu_0 I}{2\pi r}$ ½

Right hand thumb rule ½

17. Principle of potentiometer $\in T \in R$ 1

Circuit diagram for comparing

emfs of two cells 2

18. Derive expression $E = \frac{q}{4\pi \in_0 r^2}\hat{r}$ 3

OR

$$E = \frac{1}{4\pi \in_0} \cdot \frac{q}{r^2}$$

OR

$$\frac{\sigma}{\in_0}\frac{R^2}{r^2}$$

19. Diagram of Hysteresis loop 1

Explanation of Hysteresis loop with retentivity and coercivity 3

Discuss its uses to select materials to make permanent magnet and electromagnets ½ + ½

OR

Principle of Galvanometer 2

Conversion of galvanometer to Ammeter 3

[Circuit + Explanation]

20.	Labelled diagram	2
	Definition of magnifying power	2
	Expression for magnifying power	1

OR

	Young double slit experiment diagram	1
	Explanation for position of Max and Minima and fringe width	4
21.	Circuit diagram of CE transistor	2
	Input characteristics sketch	1
	Output characteristics sketch	1
	Definition of current amplification factor	1

OR

	Symbol of p-n-p transistor	1
	Biasing of p-n-p transistor	1
	Explanation of transistor action	3

1. (i) Earth 1

(ii) (A) $N^1C^{-2}m^2$ 1

(iii) $\frac{1}{2}CV^2$ 1

(iv) (D) Does not change 1

(v) $I = \frac{V}{R} = \frac{2V}{4K\Omega} = \frac{2V}{4\times10^3\Omega} = 0.5\,mA$ 1

(vi) –1 1

(vii) (B) 90° 1

(viii) Ultra-Violet (UV) rays. 1

(ix) (C) $10^{-15}m$ to $10^{-14}m$ 1

(x) Chadwick 1

(xi) (D) Total Internal Reflection 1

(xii) Plane wavefront 1

(xiii) Solar cells or photovoltaic cells 1

(xiv) Range is the largest distance between a source and a destination up to which the signal is received with sufficient strength. 1

2. $\because Q = CV$

$\therefore Q_1 = C_1V = 3pF \times 200\ V = 6 \times 10^{-10}$ coulomb

$Q_2 = C_2V = 6pF \times 200\ V = 12 \times 10^{-10}$ coulomb

$Q_3 = C_3V = 9pF \times 200\ V = 18 \times 10^{-10}$ coulomb 2

3. Any ***two*** conditions out of ***three***. 2

4. Lenz's law states that the polarity of the induced emf is such that it tends to produce a current which opposes the change in magnetic flux that produces it. 2

5. Transformer 1

Diagram 1

6. $\because\ \nu = \frac{C}{\lambda}$

$$\therefore\ \nu_1 = \frac{3\times10^8 m/s}{100\,m} = 3\times10^6\,Hz = 3MHz$$

$$\nu_2 = \frac{3\times10^8 m/s}{50\,m} = 6\times10^6\,Hz = 6MHz$$

So, corresponding frequency band is $3\,MHz$ to $6\ MHz$. 2

7. $\lambda = \frac{h}{mv} = \frac{6.6\times10^{-34} J/S}{0.060Kg\times1.0\,m/s} = 1.1\times10^{-32} m$ 2

8. Basic nuclear process underlying β^+ decay is

$p \rightarrow n + e^+ + \nu$ 1

and ${}^{11}_{6}C \rightarrow {}^{11}_{5}\beta + e^+ + \nu$ 1

9. Circuit diagram of FW rectifier with capacitor filter 1

input & output voltage waveform of FW rectifier

½ + ½

10. Truth table is : 2

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

11. Process of superimposition of low frequencies on high frequencies carries signal is known as modulation. Modulation is need as the low frequencies cannot be transmitted to long distances. 1 + 1 = 2

12. Curve of Binding energy 1

Two main features 2

13. Curve 1

Description of variation 2

14. Definition of diffraction of Light 1

Diagram 2

15. Angular frequency at resonance

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{80H \times 5\mu F}} = 50Hz \qquad 1$$

Impedance is $Z = \sqrt{R^2 + (X_L - X_C)^2}$

at resonance, $X_L = X_C$

$\therefore \; Z = R = 60\ \Omega$ 1

Current at resonance :

$$I = \frac{V}{Z} = \frac{V}{R} = \frac{240V}{60\,\Omega} = 4A \qquad 1$$

16. Force between two parallel currents is

$$F_{ba} = \frac{\mu_0 I_a I_b}{2\pi d} L$$

where :

I_a is current in wire a

I_b is current in wire b

L is segment of wire b 1

d is $\perp$ distance between two wires

μ_0 is magnetic permeability of free space

One ampere is the value of that steady current which when maintained in each of the two very long, straight, parallel conductors of negligible cross-section and placed one meter apart in vacuum would produce on each of these conductors a force equal to 2×10^{-7} Newtons per metre of length. 1

Parallel currents attract and

antiparallel current repel ½ + ½ = 1

17. Diagram 1

Principle : It works on principle of

Wheatstone bridge 1

Unknown resistance, $R = S\left(\frac{l_1}{100 - l_1}\right)$ 1

18. Gauss's law statement 1

Proof 2

19. Circuit diagram of CE transistor 2

Input characteristics sketch 1

Output characteristics sketch 1

Definition of Input & output resistance ½ + ½

OR

Circuit diagram of CE Transistor amplifier 2

Description 3

20. Explanation of principle of galvanometer 2

Convention to voltmeter 3

[Circuit + Explain]

OR

Retentivity 1

Coercivity 1

Selection of materials 1½ + 1½ = 3

21. Define polarization 1

Polarisation by reflection 2

Polarisation by scattering 2

OR

Labelled diagram of compound microscope 2

Definition of magnifying power 2

Expression for magnifying power 1

SET – C

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1. (i) Milikan 1

(ii) (A) K (dielectric constant) 1

(iii) $\frac{1}{2}QV$ 1

(iv) (A) Increases 1

(v) $I = \frac{V}{R} = \frac{9V}{3K\Omega} = \frac{9V}{3\times10^3\Omega} = 3\times10^{-3}A$ = 3 mA 1

(vi) Zero 1

(vii) (B) Zero 1

(viii) Infrared rays 1

(ix) (C) Thomson model 1

(x) AH Becquersel 1

(xi) (D) Dispersion 1

(xii) Plane wave-front 1

(xiii) LED (Light Emitting Diode) 1

(xiv) Process of superimposition of low frequencies on high frequency carrier waves is known as modulation. 1

2. $\because Q = CV$

$\therefore Q_1 = C_1V = 2pF \times 50\ V = 1.0 \times 10^{-10}$ coulomb

$Q_2 = C_2V = 4pF \times 50\ V = 2.0 \times 10^{-10}$ coulomb

$Q_3 = C_3V = 6pF \times 50\ V = 3.0 \times 10^{-10}$ coulomb 2

3. Kirchoff's junction rule states that at any junction in an electric circuit, the sum of the currents entering the junction is equal to the sum of currents leaving the junction. 2

4. (i) When magnetic flux linked with coil changes, e.m.f. in Induced. 1

(ii) The emf induced in a coil of N turns is directly related to the rate of change of flux through it $\in = -N\frac{d\phi_B}{dt}$. 1

5. In an electrical circuit, the resistance offered by an Inductor to the current is called as Inductive reactance; $X_L = W_L$ where W is angular frequency of ac supply. 1

At resonance, inductive reactance becomes equal to capacitive reactance i.e. $X_L = X_C$ or $W_0 L = \frac{1}{W_0 C}$. 1

6. As. $\nu = \frac{C}{\lambda}$

$$\therefore \nu_1 = \frac{3\times10^8 m/s}{40m} = 7.5\times10^6 Hz = 7.5\,MHz$$

$$\nu_2 = \frac{3\times10^8 m/s}{25m} = 12\times10^6 Hz = 12\,MHz$$

So, the frequency band will be 7.5 *MHz* to 12 *MHz*. 2

7. $\lambda = \frac{h}{mv} = \frac{6.6\times10^{-34} Js}{1.0\times10^{-9} Kg\times 2.2 m/s} = 3\times10^{-25}$ meter 2

8. Basic nuclear process underlying β^- decay is

$$n \rightarrow p + e^- + \bar{\nu}$$

Process of this decay for $^{32}_{15}P$ is

$$^{32}_{15}P \rightarrow {}^{32}_{16}S + e^- + \bar{\nu}$$ 1 + 1 = 2

9. Circuit diagram of FW rectifier 1

Input & output waveform 1

10. Truth table is : 2

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

11. Electronic communication system refers to the faithful transfer of information or message, available in the form of electrical voltage and current, from one point to other point. 1

Three basic units of a electronic communication system are transmitter, transmission channel and receiver. 1

12. When a heavy nucleus breaks in to smaller nucleii, the nuclear process is known as nuclear fission. 1

Possible fission reactions of ${}^{235}_{92}U$ are :

$${}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{236}_{92}U \rightarrow {}^{144}_{56}Ba + {}^{89}_{36}Kr + 3\,{}^{1}_{0}n$$ 1

Use : Nuclear Reactor/Nuclear Bomb. 1

13. Variation curve 2

Brief description 1

14. Definition of Interference 1

four requirements for sustained interference

½ × 4 = 2

15. Angular frequency at resonance,

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{16H \times 25\mu F}} = 50Hz$$

Impedance is $Z = \sqrt{R^2 + (X_L - X_C)^2}$

but at resonance, $Z = R = 25\ \Omega$

Current at resonance $I = \frac{V}{Z} = \frac{V}{R}$

$$= \frac{225V}{25\Omega} = 9A \qquad 1+1+1 = 3$$

16. Magnetic moment of a revolving electron is

$$M = \left(\frac{e}{T}\right)\pi r^2 \text{ OR } M = \frac{evr}{2} \text{ OR } M = n(\mu_B) \qquad 2$$

where $\mu_B = \frac{eh}{4\pi}$

This value of magnetic moment for I orbit is called as Bohr Magneton 1

17. Wheatstone bridge 1

Labelled diagram 1

Derive condition $\frac{R_2}{R_1} = \frac{R_4}{R_3}$ 1

18. To prove $E = 0$ inside a shell 3

19. Same as Answer of Q-**20** of Set **A** 5

OR

Same as Answer of Q-**20**, of Set **A**.

20. Same as Answer 'or' Q. **21** of Set **A**. 5

OR

Same as Answer of Q. **21** of Set **A**.

21. Same as Answer 'or' Q. **19** of Set **A**. 5

OR

Same as Answer of Q. **19** of Set **A**.

1. (i) 6×10^{18} 1

(ii) (C) Repulsive 1

(iii) $\frac{1}{2}.\frac{Q^2}{C}$ 1

(iv) (D) Does not change 1

(v) $I=\frac{V}{R}=\frac{5V}{5K\Omega}=1\times10^{-3}A=1$ mA 1

(vi) Zero 1

(vii) Gamma rays 1

(viii) (B) Rutherford 1

(ix) (A) 90° 1

(x) Becqueral 1

(xi) (C) Scattering 1

(xii) Cylindrical wave front 1

(xiii) Zener diode 1

(xiv) A receiver extracts the desired message signals from the received signals at the channel output. 1

2. As $Q = CV$

$\therefore\ Q_1 = C_1V = 4pF \times 150\ V = 6 \times 10^{-10}$ coulomb

$Q_2 = C_2V = 8pF \times 150\ V = 12 \times 10^{-10}$ coulomb

$Q_3 = C_3V = 12pF \times 150\ V = 18 \times 10^{-10}$ coulomb

2

3. Any ***two*** limitations out of three. 2

4. When bulk pieces of conductors are subjected to changing magnetic flux, induced currents are produced in them. Their flow patterns resembles swirling eddies in water. So these currents are called eddy currents. 2

5. In an ac circuit, resistance offered by a capacitor to the flow of current is called as capacitive reactance :

$$X_c = \frac{1}{\omega c}$$

At resonance, it becomes equal to the inductive reactance $X_L = X_C$ i.e. $\frac{1}{\omega_0 C} = \omega_0 L$. 1 + 1 = 2

6. As. $\lambda = \frac{C}{\nu}$

$$\therefore \lambda_1 = \frac{C}{\nu_1} = \frac{3\times10^8 m/s}{3\,MHz} = \frac{3\times10^8 m/s}{3\times10^6 Hz} = 100\,m$$

$$\lambda_2 = \frac{C}{\nu_2} = \frac{3\times10^8 m/s}{6MHz} = \frac{3\times10^8 m/s}{6\times10^6 Hz} = 50\,m$$

So, corresponding wavelength band will be 100 m to 50 m. 2

7. $\lambda = \frac{h}{mv} = \frac{6.6\times10^{-34} Js}{0.050 Kg\times2.0\,Km/s} = 6.6\times10^{-36}\,m$ 2

8. Basic process is

$$p \rightarrow n + e^{+} + \nu$$

and $^{22}_{11}Na \rightarrow {}^{22}_{10}Na + e^{+} + \nu$ 1 + 1 = 2

9. Circuit diagram of HW rectifier 1

Input and output waveforms 1

10. Truth table is : 2

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

11. Process of superimposition of low frequencies on high frequency carrier signal is called as modulation. 1

Modulation is of three types :

Amplitude Modulation (AM),

Frequency Modulation (FM) and

Phase Modulation (PM). 1

12. The nuclear process in which lighter nucleii combine to form a larger nucleus is called as nuclear fusion. 1

Example : 1

use : 1

$$4\,{}_{1}^{1}H + 2e^{-} \rightarrow {}_{2}^{4}He + 2\nu + 6\gamma + 26.7\,MeV$$

13. Curve for variation 2

Brief description 1

14. Same as Answer of Q. **14** of Set **B**. 3

15. At resonance,

$$\text{angular frequency } \omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{4H \times 100\mu F}}$$

$$\therefore \omega_0 = 50Hz$$

Impedance, $Z = \sqrt{R^2 + (X_L - X_C)^2}$

But at resonance $Z = R = 42\Omega$

Current at resonance $I = \frac{V}{Z} = \frac{V}{R} = \frac{210V}{42\Omega} = 5A$

1+1+1 = 3

16. Definition of solenoid 1

Expression for mag. field 1

Direction by right hand rule 1

17. Principle 1

Answer of Q. **17** of Set **A**

Circuit diagram for determining internal resistance by potentiometer. 2

18. Derivation of $E = \frac{\lambda}{2\pi \in_0 r}\hat{n}$ 3

19. Domain theory of ferromagnetism 4

Dependence of temperature 1

OR

Same as Answer of Q. **20** of Set **B**. 5

20. Same as Answer of Q. **21** of Set **B**. 5

OR

Same as Answer of 'or' Q. **21** of Set **B**. 5

21. Same as Answer of Q. **19** of Set **B**. 5

OR

Same as Answer 'or' Q. **19** of Set **B**.