DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

PHYSICS 60

SYLLABUS : Practical Physics - 2

Max. Marks : 112 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 28 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.26) : There are 26 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** choice is correct.

Q.1 In making an Ohm's law circuit, which of the following connection is correct?
(a) Voltmeter in series and ammeter in parallel
(b) Voltmeter in parallel and ammeter in series
(c) Voltmeter and ammeter both are in parallel
(d) Voltmeter and ammeter both are in series

Q.2 To calculate an unknown resistance with the help of a meter bridge why is it advised to change the gap with the known and unknown resistance?
(a) To eliminate the resistance of the connecting wire and copper strip
(b) To include the resistance of the connecting wire and copper strip
(c) To balance the known and unknown resistance.
(d) To eliminate the resistance of the gap.

Q.3 Potential gradient of a potentiometer is equal to
(a) e.m.f per unit length
(b) potential drop per unit length
(c) current per unit length
(d) resistance per unit length

Q.4 The refractive index of the material of a prism does not depend on which of the following factor?
(a) Nature of the material
(b) Wavelength or colour of light
(c) Temperature
(d) Angle of the prism.

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

Space for Rough Work

Q.5 A meter-bridge is based on the principle of
(a) Wheatstone bridge
(b) Variation of resistance with temperature
(c) Galvanometer
(d) None of these

Q.6 A potentiometer works on the principle that
(a) when a current flows through a wire of uniform thickness and material, potential difference between its two points is directly proportional to the length of the wire between the two points
(b) when a current flows through a wire of uniform thickness and material, potential difference between its two points is inversely proportional to the length of the wire between the points
(c) when a current flows through a wire of uniform thickness and material, potential difference between its two points doesn't depend on the length of the wire between the points
(d) none of these

Q.7 Which of the following statement is wrong regarding a p–n junction diode?
(a) When the p-type section is connected to the positive terminal and the n-type section to the negative terminal of the battery the diode is called forward biased
(b) When the p-type section is connected to the negative terminal and the n-type section to the positive terminal of the battery the diode is said to be reverse biased
(c) When the diode is in reverse biased mode a forward current flows
(d) When the diode is in forward biased mode a forward current flows.

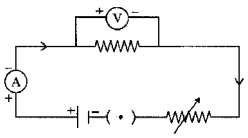
Q.8 A Zener diode operates on which of the following bias?
(a) Forward bias
(b) Reverse bias
(c) Both forward and reverse bias.
(d) No biasing is required for it.

Q.9 The transfer characteristics of a transistor means a plot of
(a) input voltage versus input current
(b) output voltage versus output current.
(c) output voltage versus input voltage
(d) input current versus output current.

Q.10 Current gain is maximum in which of the following configuration of a transistor ?
(a) common emitter configuration
(b) common base configuration
(c) common collector configuration
(d) equal in both common emitter and common base configuration

Q.11 Which of the following operations will not increase the sensitivity of a potentiometer?
(a) Increase in the number of wires of the potentiometer.
(b) Reducing the potential gradient.
(c) Increasing the current through the potentiometer
(d) Increasing the sensitivity of the galvanometer.

Q.12 Which two circuit components are connected in parallel in the following circuit diagram ?



(a) Rheostat and voltmeter
(b) Voltmeter and ammeter
(c) Voltmeter and resistor
(d) Ammeter and resistor

Q.13 A current of 4A produces a deflection of 30° in the galvanometer. The figure of merit is
(a) 6.5 A/rad (b) 7.6 A/rad
(c) 7.5 A/rad (d) 8.0 A/rad

Q.14 Two potentiometers A and B having 4 wires and 10 wires, each having 100 cm in length are used to compare e.m.f. of 2 cells. Which one will give a larger balancing length?
(a) Balancing length doesn't depend on the total length of the wire.
(b) Both A and B will give same balancing length
(c) Potentiometer B
(d) Potentiometer A

Q.15 An LED operates under which biasing condition?
(a) Forward bias
(b) Reverse bias
(c) Can operate both in forward and reverse bias
(d) No biasing is required.

Q.16 How are the currents flowing in the emitter, base and the collector related to each other?
(a) $I_c = I_b + I_e$ (b) $I_e = I_b + I_c$
(c) $I_b = I_e + I_c$ (d) $I_e = I_c - I_b$

RESPONSE GRID					
	5. ⓐⓑⓒⓓ	**6.** ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ	**9.** ⓐⓑⓒⓓ
	10. ⓐⓑⓒⓓ	**11.** ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ
	15. ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ			

Space for Rough Work

Q.17 The potential gradient of a potentiometer can be increased by which of the following operation?

(a) By increasing the area of cross-section of the potentiometer wire.

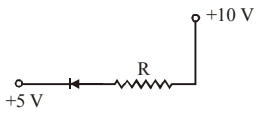
(b) By decreasing the area of cross-section of the potentiometer wire.

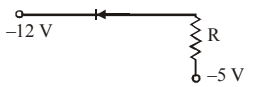
(c) By decreasing the current through it.

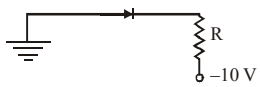
(d) By using a wire of material of low specific resistance.

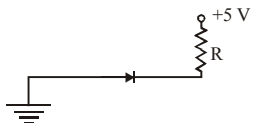
when A is decreased, k will increase.

Q.18 Of the diodes shown in the following diagrams, which one is reverse biased ?

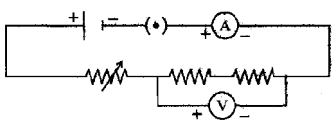
(a) 

(b) 

(c) 

(d) 

Q.19 To determine the equivalent resistance of two resistors when connected in series, a student arranged the circuit components as shown in the diagram. But he did not succeed to achieve the objective.



Which of the following mistakes has been committed by him in setting up the circuit ?

(a) Position of voltmeter is incorrect

(b) Position of ammeter is incorrect

(c) Terminals of voltmeter are wrongly connected

(d) Terminals of ammeter are wrongly connected

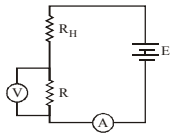
Q.20 In the circuit shown, voltmeter is ideal and its least count is 0.1 V. The least count of ammeter is 1 mA. Let reading of the voltmeter be 30.0 V and the reading of ammeter is 0.020 A. Calculate the value of resistance R within error limits.

(a) $(1.5 \pm 0.05)k\Omega$

(b) $(1.2 \pm 0.05)\ k\ \Omega$

(c) $(1.2 \pm 0.08)\ k\Omega$

(d) $(1.5 \pm 0.08)\ k\Omega$



Q.21 In an experiment to measure the focal length of a concave mirror, it was found that for an object distance of 0.30 m, the image distance come out to be 0.60 m. Determine the focal length.

(a) (0.2 ± 0.01) m (b) (0.1 ± 0.01) m

(c) (0.2 ± 0.02) m (d) (0.1 ± 0.02) m

Q.22 In an experiment to determine an unknown resistance, a 100 cm long resistance wire is used. The unknown resistance is kept in the left gap and a known resistance is put into the right gap. The scale used to measure length has a least count 1 mm. The null point B is obtained at 40.0 cm from the left gap. Determine the percentage error in the computation of unknown resistance.

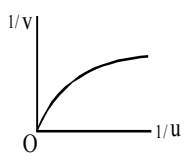
(a) 0.24% (b) 0.28% (c) 0.50% (d) 0.42%

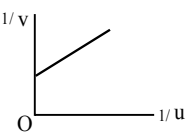
Q.23 In an experiment to determine the focal length (f) of a concave mirror by the u - v method, a student places the object pin A on the principal axis at a distance x from the pole P. The student looks at the pin and its inverted image from a distance keeping his/her eye in line with PA. When the student shifts his/her eye towards left, the image appears to the right of the object pin. Then,

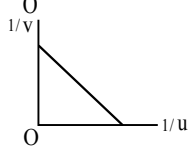
(a) $x < f$ (b) $f < x < 2f$

(c) $x = 2f$ (d) $x > 2f$

Q.24 For a convex spherical mirror, the graph of $\left(\frac{1}{v}\right)$ verses $\left(\frac{1}{u}\right)$ is

(a) 

(b) 

(c) 

(d) 

RESPONSE GRID					
	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ
	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ		

Space for Rough Work

Q.25 If the wire in the experiment to determine the resistivity of a material using meter bridge is replaced by copper or hollow wire the balance point i.e. null point shifts to

(a) right (b) left

(c) at same point (d) none of these

Q.26 Which device is used to measure the potential difference between two points of a conductor in the laboratory ?

(a) Voltameter (b) Ammeter

(c) Potentiometer (d) Galvanometer

DIRECTIONS (Q.27-Q.28) : Read the passage given below and answer the questions that follows :

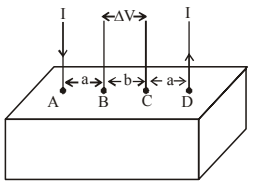
Consider a block of conducting material of resistivity 'ρ' shown in the figure. Current 'I' enters at 'A' and leaves from 'D'. We apply superposition principle to find voltage 'ΔV' developed between 'B' and 'C'. The calculation is done in the following steps:

(i) Take current 'I' entering from 'A' and assume it to spread over a hemispherical surface in the block.

(ii) Calculate field E(r) at distance 'r' from A by using Ohm's law $E = \rho j$, where j is the current per unit area at 'r'.

(iii) From the 'r' dependence of E(r), obtain the potential V(r) at r.

(iv) Repeat (i), (ii) and (iii) for current 'I' leaving 'D' and superpose results for 'A' and 'D'.



Q.27 ΔV measured between B and C is

(a) $\frac{\rho I}{\pi a} - \frac{\rho I}{\pi(a+b)}$ (b) $\frac{\rho I}{a} - \frac{\rho I}{(a+b)}$

(c) $\frac{\rho I}{2\pi a} - \frac{\rho I}{2\pi(a+b)}$ (d) $\frac{\rho I}{2\pi(a-b)}$

Q.28 For current entering at A, the electric field at a distance 'r' from A is

(a) $\frac{\rho I}{8\pi r^2}$ (b) $\frac{\rho I}{r^2}$ (c) $\frac{\rho I}{2\pi r^2}$ (d) $\frac{\rho I}{4\pi r^2}$

RESPONSE GRID	25. ⓐⓑⓒⓓ	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ	28. ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 60 - PHYSICS			
Total Questions	28	Total Marks	112
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	26	Qualifying Score	44
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS | **PHYSICS SOLUTIONS** | **60**

1. **(b)** Voltmeter measures voltage across two points so it is connected in parallel and ammeter measures current so it is connected in series.

2. **(a)** $\frac{P}{Q}=\frac{R}{S}$ so by changing the gap resistance of copper strip gets cancelled.

3. **(b)** Potential gradient = Potential drop/unit length

$V = IR = I\,\frac{\rho\ell}{A}$

$\therefore\ \frac{V}{\ell}=\frac{I\rho}{A}$]

4. **(d)** Refractive index is the property of the material, hence it does not depend on angle of the prism.

5. **(a)** A meter-bridge is a device which is based on the principle of Wheatstone bridge.

6. **(a)** A potentiometer is device which is used to compare e.m.f.'s of two cells as well as to determine the internal resistance of a cell. It is based on the principle that when a current flows through a wire of uniform thickness and material, potential difference between its two points is directly proportional to the length of the wire between the two points.

7. **(c)** When a p-n junction diode is connected in reverse biased mode, a reverse current flows.

8. **(b)** A Zener diode is a heavily doped p-n junction diode which operates on reverse bias beyond breakdown voltage.

9. **(c)** In a transfer characteristics V_i is plotted along x-axis and V_0 along y-axis.

10. **(a)** Current gain in CE configuration is $\beta=\frac{\Delta I_C}{\Delta I_B}$.

$I_c >> I_B$, hence it is maximum.

11. **(c)** $V = IR = I\frac{\rho\ell}{A}\therefore\frac{V}{\ell}=k=\frac{I\rho}{A}$,

increase in I, will increase k, so it will decrease sensitivity.

12. **(c)**

13. **(c)** According to the figure the voltmeter and the resistor are connected in parallel.

14. **(b)** Here I = 4A

$\theta=30^\circ=\left(\frac{30\times\pi}{180}\right)^c=\frac{\pi^c}{6}$

Now, $k=\frac{I}{\theta}=\frac{4}{\left(\frac{\pi}{6}\right)}=\frac{4\times6\times7}{22}=\frac{2\times6\times7}{11}$

$=\frac{84}{11}=7.6\ \text{A/rad}$

15. **(c)** In reverse-bias mode, a reverse current flows. Therefore, (c) represents the form.

16. **(c)** Larger the length, lesser will be the potential gradient, so more balancing length will be required.

17. **(a)** LED is a p-n junction diode which always operates on forward bias.

18. **(b)** Emitter current is the sum of base and collector current by Kirchhoff's 1st law.

19. **(b)** $V = IR = \frac{I\rho\ell}{A}\ \therefore$ potential gradient $= k$

when A is decreased, k will increase.

20. **(d)** Positive terminal is at lower potential (0V) and negative terminal is at higher potential + 5V.

21. **(d)**

22. **(d)** $V = 30.0,\ I = 0.020\ A,\quad R=\frac{V}{I}=\frac{30.0}{0.020}=1.50\ k\Omega$

Error : As $R=\frac{V}{I}\quad\therefore\frac{\Delta R}{R}=\frac{\Delta V}{V}+\frac{\Delta I}{I}$

$\Rightarrow\ \Delta R = R\left(\frac{\Delta V}{V}+\frac{\Delta I}{I}\right)$

$=1.50\times10^3\left(\frac{0.1}{30.0}+\frac{0.001}{0.020}\right)=0.080\ k\Omega$

23. **(a)** u = – 0.30 m, v = – 0.60m

By mirror formula,

$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$

$\Rightarrow\frac{1}{f}=\frac{-1}{0.30}-\frac{1}{0.60}\Rightarrow f=\frac{-3.0}{0.60}\Rightarrow f = 0.20m$

$\Rightarrow\frac{1}{f}=\frac{1}{v}+\frac{1}{u}\Rightarrow\frac{-df}{f^2}=\frac{-dv}{v^2}-\frac{-du}{u^2}$

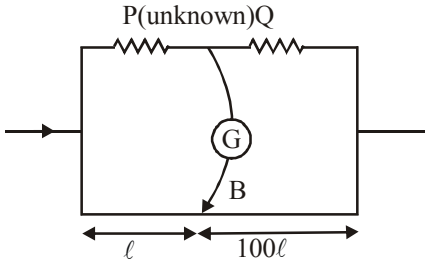
$\Rightarrow df=(0.20)^2\left[\frac{0.01}{(0.60)^2}+\frac{0.01}{(0.30)^2}\right]$

$\Rightarrow df = 0.0055\approx0.01m$

$\Rightarrow$ Focal length $f=(0.20\pm0.01)\ m$

24. **(d)** As shown in the figure.

$\frac{P}{Q}=\frac{\ell}{100-\ell}$, $P\propto\frac{\ell}{100-\ell}$

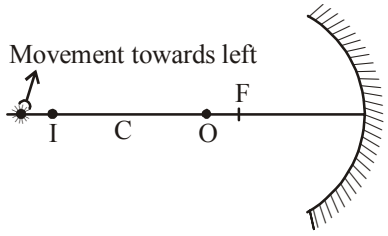


$$\frac{\Delta P}{P}=\frac{\Delta \ell}{\ell}+\frac{\Delta (100-\ell)}{100-\ell}$$

$$=\frac{\Delta \ell}{\ell}+\frac{\Delta \ell}{100-\ell}$$

$$=\frac{0.1}{40.0}+\frac{0.1}{60.0}\Rightarrow \frac{\Delta P}{P}\times 100=0.42\%$$

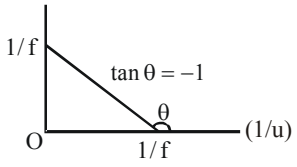
25. (b) As shown in the figure, when the object (O) is placed between F and C, the image (I) is formed beyond C. It is in this condition that movement towards left



when the student shifts his eye towards left, the image appears to the right of the object pin.

26. (c) For a spherical mirror, the graph plotted between (1/u) and (1/v) will be a straight line with a negative slope of (– 1) and position intercept (1/f) on the (1/v) axis

$$\frac{1}{v}=-\frac{1}{u}+\frac{1}{f}$$



27. (c) because balance point depends upon the value of unknown and known resistance only.

28. (c) Potentiometer is used to measure the potential difference between the two points of a wire.

29. (a) Let j be the current density.

Then $j\times 2\pi r^2=I\Rightarrow j=\frac{I}{2\pi r^2}$

$\therefore\ E=\rho j=\frac{\rho I}{2\pi r^2}$

Now, $\Delta V'_{BC}=-\int_{a+b}^{a}\vec{E}.\vec{dr}=-\int_{a+b}^{a}\frac{\rho I}{2\pi r^2}dr$

$$=-\frac{\rho I}{2\pi}\left[-\frac{1}{r}\right]_{a+b}^{a}=\frac{\rho I}{2\pi a}-\frac{\rho I}{2\pi\ (a+b)}$$

On applying superposition as mentioned we get

$$\Delta V_{BC}=2\times\Delta V'_{BC}=\frac{\rho I}{\pi a}-\frac{\rho I}{\pi(a+b)}$$

30. (c) $E=\frac{\rho I}{2\pi r^2}$