

Physics ATP Notes

Q1. How to check for zero error in a:

- (i) Vernier caliper
- (ii) Micrometer screw gauge
- (iii) Meter rule
- (iv) Stopwatch

Ans:

- (i) Close the jaws of the vernier caliper fully. When the zeros of both MAIN SCALE and VERNIER SCALE are not aligned together, the zero error is present.
- (ii) Before placing an object, turn the thimble until the spindle and anvil meet. If the reading on the thimble is not aligned with the zero mark on the datum line, a zero error is present.
- (iii) Refer to this.
- (iv) Just check what the stopwatch reads on reset. If it isn't 00:00, a zero-error is present. Readings are subtracted accordingly.

Q2/3. How to check for zero error in a:

- (i) Voltmeter
- (ii) Ammeter?

Ans: For both of them, disconnect them (from the circuit) and check if the pointer is pointing at the zero mark on the scale. If they aren't, a zero-error is present.

Q4/5. Why the pointer reading ammeter/voltmeter is gently tapped before taking a reading?

Ans: To reduce the friction between the needle and the pivot.

Q6. When making a ray diagram, why should rays and normal be as thin as possible?

Ans: Thin lines make it possible to obtain precise readings; with thick lines it is difficult to measure accurate angles (of incidence, reflection etc.).

Q7. What is the purpose of a ratchet in a micrometer?

Ans: To prevent undue pressure from being exerted.

Q8. A liquid reaching the maximum temperature quickly. Give one reason.

Ans: It is due to convectional currents. The water expands and gains heat energy and its density lowers down, and it moves upwards and the lower part of the apparatus is replaced by cold water which has higher density.

Q9. Why is the temperature 20°C marked on the measuring cylinder?

Ans: The scale on the cylinder is calibrated to give accurate readings when the liquid is at 20°C.

Q10. Why an image is measured from a position behind the screen rather than front?

Ans: If it was measured from the front, it would block the rays of light and disturb the apparatus.

Q11: WHAT IS A MEANT “GOOD ELECTRICAL” CONNECTION?

Ans: It means that the components are connected properly and are tightly screwed in the circuit. This also reduces the circuit's internal resistance.

Q14: STATE ONE PRECAUTION, OTHER THAN AVOIDING PARALLAX ERROR THAT SHOULD TAKE WHEN USING A SCHOOL LAB THERMOMETER, TO ENSURE ACCURATE MEASUREMENT OF TEMPERATURE?

Ans: Check the mercury level when the reading becomes steady. If the thermometer is in a liquid, make sure it is 1/3rd immersed and that the liquid is stirred before taking the reading.

Q16: WHAT IS THE AFFECT OF “LENGTH” OR “MASS” ON TIME PERIOD OF PENDULUM?

Ans: Length - The period of a pendulum increases with length.

Mass - No effect.

Q17: WHAT ARE THE CONDITIONS TO GET ACCURATE FIXED POINTS?

Ans: Immerse 1/3rd of the thermometer into the funnel containing ice, avoid parallax error when reading the temperature on the thermometer, use ice shavings to ensure good contact between the bulb of the thermometer and the ice, wait for the temperature to become steady before taking the reading, etc. Ice point is 0°C and steam point is 100°C.

Q18: WHY WHILE DETERMINING THE BOILING POINT OF WATER, THERMOMETER IS HELD IN STEAM?

Ans: Because the steam is pure and has specific melting point. If the reading is taken from the water, it may not be accurate as water may not be pure.

Q20: WHAT OBSERVATION MADE DURING THE EXPERIMENT WOULD CONFIRM THAT THE GIVEN METAL IS A GOOD CONDUCTOR OF HEAT?

Ans: Experiment - Using 4 rods (copper, iron, glass and wood) which have the same dimensions, coat one end of the rods evenly with wax. Then fill a tray of water in boiling water and submerge the end of the rods in the tray. From observation, the wax melts the farthest along the copper rod, showing that copper (a metal) is a good conductor of heat while the other rods (insulators) are poor conductors of heat.

Q22: WHAT IS THE PURPOSE OF LAGGING?

Ans: Lagging is done to provide heat insulation (in boilers, pipes etc.) and trap heat from escaping.

Q23: HOW YOU MIGHT CHECK THAT YOU HAVE MADE GOOD ELECTRICAL CONNECTIONS?

Ans: Ensure that all components are screwed in tightly and that they work properly. If the resistance of the circuit is low, the electrical connection is usually good.

Q24: GIVE A REASON FOR MAKING THE LENGTH OF EACH NORMAL AT LEAST 6CM?

Ans: This will help in measuring angles accurately as the radius of a protractor is normally 6cm.

Q25: WHAT ADVANTAGE IS THERE IN USING TRACING PAPER FOR THE SCREEN?

Ans: The image of the object can be viewed without obstruction of light. Also, the size of the image can be conveniently measured by using a metre rule on the back of the tracing paper without disturbing the apparatus.

Q26: WHY THE EYE NOT PLACED TOO CLOSE TO THE END OF THE RULE?

Ans: If the object is too close, the distance between the object and retina is low and hence the image of the object is not formed on the retina, so we cannot see the object clearly.

Q27: WHAT WOULD BE THE EFFECT ON THE IMAGE IF THE CENTRE OF THE OBJECT AND THE CENTRE OF THE LENS ARE NOT AT THE SAME HEIGHT?

Ans: If they aren't parallel to each other, the image will be partial or blurred.

Q28: WHAT IS THE PURPOSE OF VARIABLE RESISTOR?

Ans: To adjust the current in the circuit.

Q30: BEFORE CLOSING THE SWITCH, WHY IS THE RHEOSTAT ADJUSTED TO ITS MAXIMUM VALUE?

Ans: This makes sure minimum current flows in the circuit, so when the circuit is closed the ammeter doesn't get damaged.

Q31: WHY IS A COMPASS TAPPED WHEN BEING USED?

Ans: To eliminate friction on the compass needle.

Q32: WHAT IS THE ADVANTAGE OF USING SMALLER COMPASS?

Ans: It can be used to align the weak magnetic fields.

Q33: WHY SHOULD CARD MOVE FREELY ON THE PIVOT? (referring to a card being hung from a hole on a support)

Ans: To ensure the card does not stick to the pivot due to friction (which ensures that the card is hanging in equilibrium position).

Q34: WHAT IS PLUMBLINE?

Ans: A line from which a weight is suspended to determine the depth or verticality.

Q35: WHY THE PLUMBLINE SHOULD HANG SO THAT IT ALMOST TOUCHES THE CARD?

Ans: This will help in avoiding parallax error.

Q37: WHAT IS THE MEANING OF OF C WRITTEN ON A THERMOMETER?

Ans: It means the temperature is measured in Celcius.

Q38: WHAT PRECAUTIONS ARE TO BE TAKEN WHILE MAKING A CIRCUIT?

Ans: Ensure that all connections are tight, make sure the components are functional and clean, use a DC supply with low voltage (to minimize potential hazards), make sure the power supply has a rating nearly equal to the lamp or bulb, make sure ammeter is in series and voltmeter is in parallel, etc.

Q39: WHAT IS A JOCKEY?

Ans: A jockey is a metal slider that wears away a line of the insulation so it can make electrical contact with the metal underneath.

Q40: HOW WOULD YOU CLEAN THE DIRTY JOCKEY?

Ans: Rub the jockey with sand paper.

Q41: HOW COULD LID HELPS TO KEEP THE CONTENTS OF LAGGED CONTAINER FROZEN?

Ans: It prevents heat from the surroundings entering the container.

Q42: WHY THERMOMETER HELD IN STEAM FOR DETERMINING THE UPPER FIXED POINT OF THERMOMETER?

Ans: Because the steam is pure and has specific melting point. If the reading is taken from the water, it may not accurate as water may not be pure.

Q43: WHAT COULD CAUSE THE POINTER TO AT POSITION BELOW 0?

Ans: By reversing the polarity..

Q44: STATE THE PRECAUTIONS WHILE TAKING A READING FROM

i. Voltmeter

ii. Ammeter

Ans: Check for zero-error, tap them before taking the reading, avoid parallax-error, etc.

Q45: WHAT WILL BE THE EFFECT ON THE CIRCUIT IF THE DIRTY JOCKEY IS USED?

Ans: A dirty jockey will hinder the flow of current in the circuit BECAUSE the resistance will increase dramatically.

Q46: HOW WILL YOU “RECORD” READINGS?

Ans: Using the appropriate instruments, the readings are recorded and noted (on a piece of paper, etc.)

Q47: HOW WILL YOU DISPLAY / REPRESENT YOUR READING?

Ans: The relevant quantities can be tabulated.

Q48: HOW WILL YOU FIND RESULT FROM YOUR REPRESENTED READINGS?

Ans: A graph can be plotted between the relevant quantities and results can be obtained by deducing data from the graph (e.g. averages, a quantity from the graph, etc.).

Q49: WHAT PRECAUTIONS WOULD YOU TAKE WHILE TAKING READINGS FROM MEASURING INSTRUMENTS? (GENERAL PRECAUTIONS)

Ans: Avoid parallax error, wait for a steady reading, remember to add/subtract if there are zero-errors, etc.

Q50: WHAT IS AN OSCILLATION?

Ans: The process of the bob swinging back and forth steadily and coming back to its original position.

Q52: HOW WILL YOU MEASURE THE LENGTH OF A PENDULUM?

Ans: Using a meter rule and set-square. Place the meter rule close to the thread and note the length of the upper and lower ends of the pendulum (l_1 and l_2). The length l is calculated by $l_2 - l_1$.

Q53: WHAT IS THE USE OF SET SQUARE?

Ans: They are used to align the ruler to get the correct reading. They help to avoid parallax errors.

Q55: WHAT IS A MEASUREMENT?

Ans: The size, amount or degree of a physical quantity.

Q56/57: What is an accurate/precise reading?

Ans: Accuracy - the measure of how close you are to the true answer.

Precision - the measure of how closely all your individual measurements match each other.

Q58/59/61: Define responsiveness, range and sensitivity of a thermometer.

Ans: Range - The minimum and maximum temperatures that the thermometer can measure.

Sensitivity - It is the length of increase of the liquid per degree rise in temperature.

Responsiveness - How quickly the thermometer can register a change in temperature.

Q60/62: How can we increase the responsiveness, range and sensitivity of the thermometer?

Ans:

To increase range:

- (a) make the thermometer stem longer
- (b) make the bore(capillary) bigger
- (c) use a liquid with a lower expansivity

To increase sensitivity:

- (a) make the bore smaller
- (b) use a bigger bulb
- (c) use a liquid with a higher expansivity

To increase responsiveness:

- (a) use a thin glass bulb
- (b) use a liquid that conducts heat better

Q63: WHY THE BORE OF CAPILLARY TUBE IS UNIFORM?

Ans: This improves the thermometer's sensitivity (by giving a large change in length of the mercury thread for a small change in temperature).

Q64: WHY THE WALLS OF LONG TUBE ABOVE THE BULB ARE MADE THICK?

Ans: Acts as a magnifying glass to easily read the mercury thread in the stem.

Q65: WHAT IS THE ADVANTAGE OF SMALL SIZE OF THERMOMETER?

Ans: It makes it cheap to produce, portable, etc.

Q66: WHY THE MERCURY IS CONTAINED IN A THIN-WALL GLASS BULB?

Ans: This allows for rapid conduction of heat through the thin glass wall to the mercury contained in the bulb.

Q67: WHAT IS THE PUPOSE OF CONSTRICTION IN THE CLINICAL THERMOMETER?

Ans: The constriction prevents mercury from flowing back into the bulb.

Q68: WHAT DOES THE STATEMENT MEAN, THAT THE SCALE OF THERMOMETER IS LINEAR?

Ans: It is the uniform expansion of liquid to temperature.

Q69: WHY THE CROSS-SECTION OF THE STEM OF THERMOMETER IS PEAR-SHAPED?

Ans: This acts as a magnifying glass in one direction for easy reading of the mercury thread.

Q70. What factors to consider before measuring something?

Ans: The magnitude should not exceed the limit of the instrument, and the instrument must be sensitive enough to detect a meaningful measurement.

Q80. When iron fillings are used, why must the current be large?

Ans: So that the field is stronger and hence the field can be detected.

Q81. Why must smaller fillings be used?

Ans: So that the weaker magnetic fields are also shown.

Q82. Why must the oscillations be counted from center of swing?

Ans: The chain is moving the fastest at the center of swing.

Q83. Suggest a suitable number of oscillations, with reason.

Ans: 20. The time for one oscillation is too short to obtain an accurate reading and so 20 oscillations are timed instead.

Q84. Why is the reading in a pendulum repeated?

Ans: This will help ensure a more accurate average value for one oscillation (T).

Q85. Why is oil stirred during heating?

Ans: To give uniform heating to the mixture.

Q86. Why is the oil heated gently?

Ans: So that an equal change in the temperature will result in a small change of temperature in the oil.