IGCSE

Physics (0625)

For examination in March 2015

A handy revision guide for students appearing for the Physics Examination (extended tier) in March 2015

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General Advice:

• Read the questions carefully and fully.

• Look for details that indicate how to answer or the depth of answer required.

For example the question 'Describe, in terms of the movement and energies of the water molecules, how evaporation takes place' is allocated 2 marks on a paper. This shows that you must make two valid points and you must refer to movement and energy of the molecules. So wording such as 'some molecules have more energy than others and these leave the surface' will gain both marks.

• Make sure you are confident with your calculator – particularly using powers of 10.

• Always show your working in calculations so that you can gain marks for your method even if you make a mistake with the final answer.

• Always include units where appropriate.

• Avoid vague descriptions – try to write clearly and concisely using the correct Physics terms.

• Use a sharp pencil for graph work, taking care to plot each point with a small, neat cross and to draw a thin best fit line.

• At the end of a calculation ask yourself ‘is this answer sensible?’

• Make sure you answer the question set. You will gain no marks for merely repeating the facts given in the question.

Paper 3: Structured

General Advice:

These are the papers that test your knowledge and understanding of Physics theory and the ability to apply your knowledge to situations described on the paper. The following includes some tips on how to read the questions and advice on particular items in the syllabus that often seem to be poorly understood or applied.

1. Reading the questions:

• It is very easy when presented with a diagram question to look at the diagram and then try to answer the question. You must read and understand the introductory sentences above the diagram first before trying to answer the question. There may be a part of the question near the end which requires you to use a piece of information that is included in the introductory sentences in your answer.

• Be careful how you answer your questions. An explanation of some Physics (even if correct) that does not answer the question set does not score marks.

• If there are three marks available for a calculation, two of the three marks are for showing your working.

• If a question states ‘accurately mark’ or ‘accurately draw', the examiners expect points to be carefully positioned and lines to be drawn with care using a ruler.

• When reading the questions, decide which area of Physics you are being asked about. Do not just look at a few words as you may then misunderstand the question.

For example a question that mentions heat radiation is not about radioactivity (just because the word 'radiation' is seen). If you are asked for a convection current diagram do not draw a circuit just because the word ‘current’ is in the question!

2. Answering the questions:

• You must understand the turning effect of a force and that it is called the moment of the force.

• You must learn the equation

work done = force x distance moved in the direction of the force.

• Answers such as ‘the current slows down’ or ‘the current is used up’ show very clearly a lack of understanding of current and resistance. You should know that the current is the same at all points in a series circuit.

• You must understand that speed is a scalar (size only) and velocity is a vector (size and direction) and that the circular motion at constant speed involves a change in velocity because the direction is changing.

• A vague statement that ‘extension increases as load increases’ is a correct statement but it is not Hooke’s Law. If you are asked to state Hooke’s Law you should write that ‘the extension is proportional to the load’.

• You must know that when a magnet is moved in or out of a solenoid that is part of a circuit, a current will be induced. It is the movement of the magnet in the solenoid that causes the current as its magnetic field lines cut the coil.

• You must understand that an analogue meter gives continuously increasing (or decreasing) readings but a digital meter gives readings that increase (or decrease) by one unit (in this case steps of 0.01A).

• You must understand basic radioactivity. You should know about the characteristics of the three types of emission (alpha, beta and gamma), half-life and safety precautions.

Paper 6: Alternative to Practicals

FAQs

Q1. How to check for zero error in a:

(i) Vernier Calliper

(ii) Micrometre screw gauge

(iii) 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) 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 rachet in a micrometre?

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 effect 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 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 is 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 plumb line?

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

Q35: Why the plumb line should hang so that it almost touches the card?

Ans: This will help in avoiding parallax error.

Q37: What is the meaning of *C* written on a thermometer?

Ans: It means the temperature is measured in Celsius.

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 (l1 and l2). The length l is calculated by l2 - l1.

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 of 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 measurement 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 purpose 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.

Q71: 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.

Q72: Why must smaller fillings be used?

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

Q73: Why must the oscillations be counted from centre of swing?

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

Q74: 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.

Q75: Why is the reading in a pendulum repeated?

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

Q76: Why is oil stirred during heating?

Ans: To give uniform heating to the mixture.

Q77: 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.

Tips:

There are some particular points that are relevant to answering the questions here.

• When plotting a graph it is important to choose the scales so that the plots occupy more than half of the graph grid. Careless, rushed graph plotting can lose several marks. You should always use a sharp pencil and plot small, neat, accurately placed crosses. Then draw a neat thin best-fit line.

• You should understand that if y is proportional to x then the graph will be a straight line through the origin.

• It is important to be able to set up a circuit from a diagram, draw a circuit diagram of a circuit already set up and also to draw a circuit diagram from a written description.

• You need to know that to read the current through a component (e.g. a lamp or a resistor) and the voltage across it, the ammeter is placed in series with the component but the voltmeter must be connected in parallel with the component.

• Column headings in tables of readings must be headed with the quantity and unit as in these examples: I/A, or t/s, or y/m. Graph axes are labelled in the same way.

• Final answers should be given to 2 or 3 significant figures.

• When carrying out practical work there are usually measurements that are in some way difficult to take in spite of taking great care. You should comment about these difficulties when asked about precautions taken to improve accuracy.

Supplementary Help:

Symbols, units and definitions of physical quantities

You should be able to state the symbols for the following physical quantities and, where indicated, state the units in which they are measured. You should be able to define those items indicated by an asterisk (*) The list for 'Extended' includes both the Core and the Supplement.

Core			Supplement		
Quantity	Symbol	Unit	Quantity	Symbol	Unit
length	*l, h ...*	km, m, cm, mm			
area	*A*	m^2, cm^2			
volume	*V*	m^3, cm^3			
weight	*W*	N			N*
mass	*m, M*	kg, g			mg
time	*t*	h, min, s			ms
density*		g/cm^3, kg/m^3			
speed*	*u, v*	km/h, m/s, cm/s			
acceleration	*a*		acceleration*		m/s^2
acceleration of freee fall	*g*				
force	*F, P ...*	N	force*		N*
			moment of a force*		N m
work done	*W, E*	J	work done by a force*		J*
energy	*E*	J			J*, kw h*
power	*P*	W	power*		W*
pressure	*p, P*		pressure*		Pa*, N/m^2
			atmospheric pressure		millibar

Core			Supplement		
Quantity	Symbol	Unit	Quantity	Symbol	Unit
temperature	θ, T	*C			
specific heat capacity	c	J/(g °C), J/(kg °C)	specific heat capacity*		
latent heat	L	J	specific latent heat*	l	J/kg, J/g
			frequency*	f	Hz
			wavelength*	λ	m, cm
focal length	f				
angle of incidence	i	degree (°)	refractive index	n	
angle of reflection, refraction	r	degree (°)			
critical angle	c	degree (°)			
potential difference/ voltage	V	V, mV	potential difference*		V*
current	I	A, mA	current*		
			charge		C, A s
e.m.f.	E	V	e.m.f.*		
resistance	R	Ω			