

780/1/2025
PHYSICS A/L**SOUTH WEST REGIONAL MOCK EXAMINATION
GENERAL EDUCATION**

The Teachers' Resource Unit (TRU) in collaboration with the Regional Pedagogic Inspectorate of Science and the South West Association of Physics/Engineering Science Association (SWAPEST)	Subject Code 0780	Paper Number 1
CANDIDATE NAME CANDIDATE NUMBER CENTRE NUMBER	Subject Title PHYSICS	
ADVANCED LEVEL	DATE: 21/3/2025 DAY: Friday MORNING	

Time Allowed: One hour thirty minutes (1 ½ hrs)**INSTRUCTIONS TO CANDIDATES:**

1. USE A SOFT HB PENCIL THROUGHOUT THIS EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the Examination begins:

3. Check that this question booklet is headed "Advanced Level – 0780 Physics Paper 1".
4. Insert the information required in the spaces provided above.
5. Without opening the booklet, pull out the answer sheet carefully from inside the front cover of this booklet. Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instructions.
6. Insert the information required in the spaces provided on the answer sheet using your HB pencil:
Candidate Name, Centre Number, Candidate Number, Subject Code Number and Paper Number.

How to answer questions in this examination:

7. Answer ALL the 50 questions in this examination. All questions carry equal marks.
8. Non-programmable calculators are allowed.
9. For each question there are four suggested answers, A, B, C and D. Decide which answer is correct. Find the number of the question on the Answer sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen. For example, if C is your correct answer, mark C as shown below:

☐ A ☐ B ☒ C ☐ D

10. Mark only one answer for each question. If you mark more than one answer, you will score zero for that question. If you change your mind about an answer, erase the first mark carefully, and then mark your new answer.
11. Avoid spending much time on any question. If you find a question difficult, move to the next question. You can come back to this question later.
12. Do all rough work in this booklet using, where necessary, the blank spaces in the question booklet.
13. Mobile phones are **NOT ALLOWED** in the examination room.
14. You must not take this booklet and answer sheet out of the examination room. All question booklets and answer sheets will be collected at the end of the examination.

Section 1 (thirty-five questions)

Question: 1-35

Directions: Each of the thirty-five questions or incomplete statements in this section is followed by four suggested answers. Select the best answer in each case.

1. The base unit of inductance is

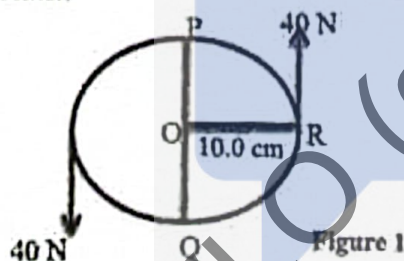
A	$\text{kg m s}^{-2} \text{A}^{-1}$
B	$\text{kg m s}^{-2} \text{A}^{-2}$
C	$\text{kg m}^2 \text{s}^{-2} \text{A}^{-2}$
D	$\text{kg m}^2 \text{s}^{-2} \text{A}^{-1}$

2. The real gas equation, is given by

$\left(P + \frac{a}{V^2}\right)(V - b) = RT$ where P is the pressure of the gas, V its volume at a temperature T, R is the molar gas constant, a and b are constants. Which of the following is correct?

A	$\frac{a}{V^2}$ has the same units with P
B	b has no units
C	a has the same units with V
D	$V - b$ has the same units with RT

3. Figure 1 shows a steering wheel that rotates about O due to the forces 40 N on each side. The distance OR is 10.0 cm and cuts the diameter PQ of the wheel at the center.



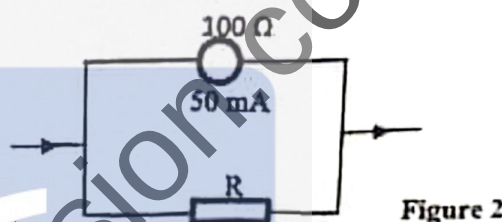
The torque on the wheel is

A	4 N m
B	8 N m
C	320 N m
D	800 N m

4. When clay pot is used to cook, it takes a longer time for the water in the pot to start boiling compared to silver pot because;

A	clay and water both have high specific heat capacities
B	Clay has a lower specific heat capacity than silver
C	Clay is a better conductor of heat than silver
D	Clay has a higher specific heat capacity than silver

5. Figure 2 shows a moving coil meter of resistance 100Ω and full scale deflection of 50 mA.



This meter could be converted to a mA of full-scale deflection 4 A if the value of R is:

A	1.3 Ω
B	100 Ω
C	Very large
D	3.9 Ω

6. Wires used for making standard resistances such as 2.00Ω should best have a temperature coefficient of resistance which is:

A	positive
B	negative
C	high
D	low

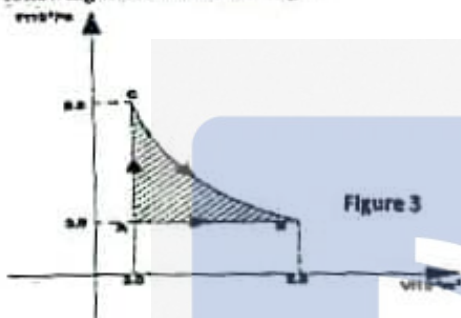
7. One student connects two similar capacitors each of capacitance, C, in series and then in parallel, while another student connects two similar resistors each of resistance, R, in series and then in parallel. Which of the following is correct?

	Effective capacitance	Effective resistance
A	in series is $\frac{1}{2}C$	in parallel is $2R$
B	in series is $2C$	in series is $2R$
C	in parallel is $2C$	in parallel is $\frac{1}{2}R$
D	in parallel is $\frac{1}{2}C$	in series is $\frac{1}{2}R$

8. The flux linkage in a coil is increased from 5 Wb to 8 Wb in 2 s by increasing steadily the current through the coil. The induced emf during this time is:

A	3.0 V
B	1.5 V
C	2.0 V
D	1.0 V

9. Figure 3 shows the P-V curve of a gas. Which of the following is correct about the gas?



A	The work done during the expansion is 90 J
B	The path AC is an adiabatic process
C	The shaded region represents the work done
D	The work done along AC is 100 J

10. Figure 4 shows how the potential energy U between a pair of adjacent molecules varies with separation r .



Which of the following is correct?

A	The equilibrium separation is 1×10^{-10} m
B	The minimum potential energy required to separate the molecules is 2×10^{-4} kJ
C	At $r = 2 \times 10^{-10}$ m, there is no net force between the molecules
D	For $r > 1 \times 10^{-10}$ m, the net force between molecules is attractive.

11. Which of the following is NOT an assumption when deriving the pressure of an ideal gas?

A	The collisions between the gas molecules are perfectly elastic
B	The molecules are so numerous that the laws of statistics apply
C	The duration of collision is negligible compared to the time between collision
D	The volume of the gas is negligible compared to the volume of the container

12. The emf, $\mathcal{E}$, of a power source of internal resistance r , is related to the potential difference, V , across it and the current, I , it delivers by the equation $\mathcal{E} = V + Ir$. To obtain the values of $\mathcal{E}$ and r :

A	V is plotted against I and the intercept is $\frac{\mathcal{E}}{r}$
B	$\ln V$ is plotted against $\ln I$ and gradient is $-r$
C	V is plotted against I and gradient is r
D	$\mathcal{E}$ is plotted against V and the gradient is $-\frac{1}{r}$

13. Figure 5 shows how a triangular shape hangs on two ropes with the tensions and the angles indicated.

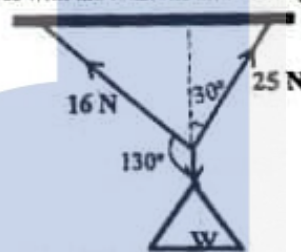


Figure 5

The value of the force W , is:

A	32 N
B	23 N
C	34 N
D	22 N

14. The charge Q , left on a discharging capacitor after time t , is given by $Q = Q_0 e^{-\frac{t}{CR}}$, where C and R are respectively the capacitance and resistance of the circuit. The half-life of the capacitor is

A	CR
B	$0.37CR$
C	$2.7CR$
D	$0.5CR$

15. In figure 6, which of the diagrams is a correct representation of population inversion in light production?

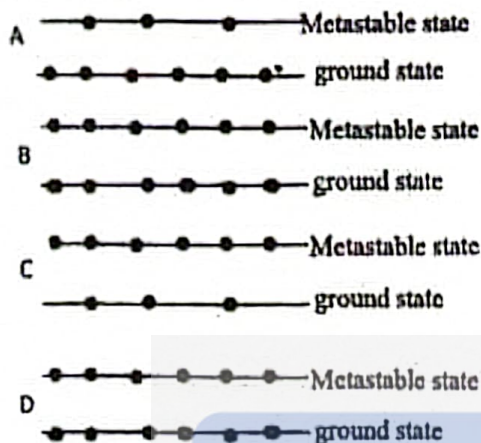


Figure 6

16. Figure 7 shows how electrical components can be connected in a circuit.

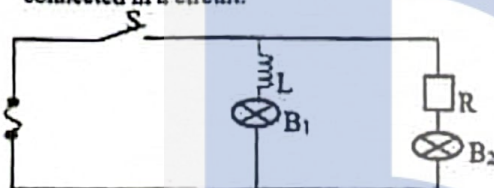


Figure 7

L is the inductance of the circuit while R is the resistance. B_1 and B_2 are bulbs.

As soon as the switch S, is closed,

A	B_1 attains full brightness earlier than B_2
B	B_2 attains full brightness earlier than B_1
C	B_1 and B_2 attain full brightness at the same time and immediately
D	B_1 and B_2 attain full brightness at the same time but few seconds later

17. The air in an open pipe is set into vibration by a tuning fork marked 512 Hz. If the air vibrates at its fundamental mode at a temperature where the speed of sound in air is 340 m s^{-1} , then the length of the pipe is:

A	1.51 m
B	3.01 m
C	66.0 cm
D	33.0 cm

18. Which of the following electromagnetic waves correctly matches its mode of production?

	Em wave	Mode of production
A	Ultraviolet	Atomic transition
B	Gamma rays	Molecular vibration
C	Visible light	Radioactive decay
D	Microwaves	Electrical oscillation

19. A ball is thrown vertically upward into air with an initial velocity u . If the acceleration of free fall is g , which of the following is true when the ball returns to the thrower?

	Time of travel	Total distance travelled
A	$2u/g$	u^2/g
B	$2u/g$	$2u^2/g$
C	u/g	$2u^2/g$
D	u/g	u^2/g

20. A small charge Q_2 of $+2 \times 10^{-8} \text{ C}$ is placed 8.0 cm from a small charge Q_1 of charge $-4 \times 10^{-8} \text{ C}$ as shown in figure 8.

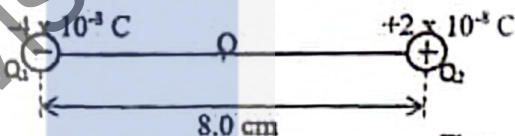


Figure 8

Point O is midway between Q_1 and Q_2 . The electric potential at O is:

A	+9000 V
B	0 V
C	-4500 V
D	-9000 V

21. Which of the following instruments can be calibrated and used to measure the peak values of an a.c voltage?

A	Potentiometer
B	Hall probe
C	Junction diode
D	Cathode ray oscilloscope

22. When white light is incident normally on a circular aperture, the pattern on a nearby screen is:

A	a mixture of rainbow colours at centre
B	white at the edges
C	white at the centre
D	made of all visible bright spots which are all white

23. The displacement, y , of a particle performing simple harmonic motion with time t , is defined by $y = 0.2 \sin \omega t$, where ω is the angular velocity. The maximum speed of the particle in m s^{-1} is:

A	ω
B	0.2ω
C	0.4
D	0.2

24. A thin sheet of glass of refractive index 1.5 and thickness 0.5 cm is placed in the path of light. The path difference of light observed is:

A	0.8 cm
B	3.0 cm
C	0.3 cm
D	1.5 cm

25. A police man sounds his whistle that has a natural frequency f , at a police control post to a car approaching with speed 25 m s^{-1} . If the speed of sound in air is 340 m s^{-1} , then the perceived frequency by the driver of the car is:

A	$1.08 f$
B	$0.92 f$
C	$0.93 f$
D	$1.07 f$

26. X-rays are produced when fast moving electrons accelerated through a potential difference, V , between the anode and the cathode are stopped by a metal. Which of the following is true about the production of the X-rays?

A	The intensity of the X-rays is controlled by adjusting the heating current.
B	Both intensity and hardness of the X-rays are controlled by adjusting the accelerating voltage.
C	The hardness of the X-rays is controlled by adjusting the heating current.
D	The intensity of the X-rays is controlled by adjusting the accelerating voltage.

27. Figure 10 shows the energy levels of mercury atom
- | | |
|---------|--------------------|
| $n = 3$ | -1.60 eV |
| $n = 2$ | -3.70 eV |
| $n = 1$ | -5.50 eV |
| $n = 0$ | -10.4 eV |

Figure 10

- The ionization energy of mercury in joules is:

A	2.66×10^{-19}
B	-1.66×10^{-18}
C	1.66×10^{-18}
D	-2.56×10^{-19}

28. The fundamental interval of a mercury-in-glass thermometer is 25.0 cm at stp. Given that the length of the mercury thread at ice point is 5.0 cm, the temperature of a body which gives a mercury thread of 15.0 cm is:

A	40 K
B	313 K
C	373 K
D	233 K

29. Figure 11 shows a ball whirled round a vertical circle using a string.



Figure 11

- The tension in the string is maximum at:

A	S
B	P
C	R
D	Q

30. Copper has 8.0×10^{23} conducting electrons per cubic meter. A copper wire of length 1.2 m and cross-sectional area $4.5 \times 10^{-6} \text{ m}^2$ carrying a current and lying at right angle to a magnetic field of strength $2 \times 10^{-3} \text{ T}$, experiences a force of $5.0 \times 10^{-3} \text{ N}$. The drift velocity of free electrons in the copper wire in m s^{-1} is:

A	3.6
B	1.6×10^5
C	3.6×10^5
D	0.4

31. A cylindrical wire made of a certain material has a length of 2.5 m and a diameter of 1.0 mm. If the resistivity of the wire is $1.68 \times 10^{-8} \Omega \text{ m}$, then the conductance of the wire in siemens is:

A	0.05
B	18.7
C	0.19
D	4.67

32. A steel rod experiences a stress of 200 MPa and a strain of 0.1%. Then the Young's modulus of the steel is:

A	$2 \times 10^8 \text{ N m}^{-2}$
B	$2 \times 10^4 \text{ N m}^{-2}$
C	$2 \times 10^{11} \text{ N m}^{-2}$
D	$2 \times 10^{10} \text{ N m}^{-2}$

33. Given that the temperature of gas molecules in a container increases by 50°C , then the increase in the average kinetic energy of the gas molecule is:

A	$1.0 \times 10^{-21} \text{ J}$
B	$2.2 \times 10^{-21} \text{ J}$
C	$1.0 \times 10^{-22} \text{ J}$
D	$6.7 \times 10^{-22} \text{ J}$

34. When a piece of silicon is doped with a phosphorus atom, it

A	acquires a net negative charge
B	acquires a net positive charge
C	becomes a p-type semiconductor
D	becomes an n-type semiconductor

35. Padded dashboards in cars are safer than unpadded ones in case of accidents because they:

A	decrease the momentum at impact
B	lengthen duration of contact
C	increase the impulse at impact
D	shorten duration of contact

SECTION II (Ten questions)

Multiple Selection

Questions 36 - 45

Directions: For each group of questions below ONE or TWO of the responses given are correct.

Choose.

- A. If 1 and 2 are correct
B. If 2 and 3 are correct
C. If 1 only is correct
D. If 3 only is correct

Directions Summarised			
A	B	C	D
1,2 only	2,3 only	1 only	3 only

36. A good thermometric property must be;
1. sensitive and accurate
 2. reproducible and unique
 3. of very low specific heat capacity

37. Which of the following cases of collisions is elastic?

1. Collision between gas molecules
2. Atomic collisions
3. Collision between billiard balls.

38. A bowl of beans requires all of a 500 francs' worth of firewood to boil it to get ready. An electric heater rated 2 kW can boil the same beans until it gets ready in 2 hrs. If one unit of electricity is 75 fr, then,

1. it is more economical to use the electric heater than the firewood
2. the cost of using firewood is the same as the cost of using the heater
3. it is more economical to use the firewood than the electric heater.

39. Two identical springs of spring constant k are connected, first in series and later in parallel. The effective spring constant and period of oscillation of the coupled system of springs are respectively:

	Springs in series	Springs in parallel
1	$2k$ and $\sqrt{2}T$	$2k$ and $\frac{1}{\sqrt{2}}T$
2	$\frac{k}{2}$ and $\frac{T}{\sqrt{2}}$	$2k$ and $\sqrt{2}T$
3	$\frac{k}{2}$ and $\sqrt{2}T$	$2k$ and $\frac{1}{\sqrt{2}}T$

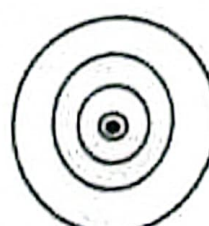
40. Which of the following statements about adiabatic and isothermal expansions of a gas is/are correct?

	Adiabatic	Isothermal
1	$\Delta U = \Delta W$ and walls of container well insulated	$\Delta U = \Delta Q$ and walls of container well insulated
2	Process occurs rapidly	Process occurs slowly
3	Gas must be held in a thick wall highly insulated container	Gas must be held in a thin wall highly conducting container

41. Figure 12 shows how field lines can be represented around current-carrying conductors placed closed to each other.



a) Current into



b) Current out of

Figure 12

Which of the following statements is/are correct?

1. The field direction in (a) is clockwise while the field direction in (b) is anticlockwise
2. The force between the conductors is attractive
3. The magnitude of the force per unit length on each wire when they are 1 m apart and a current of 0.5 A flows through them is $2.0 \times 10^{-9} \text{ N m}^{-1}$.

42. Figure 13 shows wave fronts produced by a ship as it propels on water surface.



Figure 13

The speed of waves produced is 200 cm/s and the distance between P and Q is 1.0 m, which of the following is/are correct about the wave?

1. The wave produced is longitudinal in nature
2. The frequency of the water waves is 4.0 Hz
3. Points P and Q are π rads out of phase

43. Which of the following is/are a statement of the conservation of energy?

1. Kirchhoff's current law
2. Lenz's law
3. First law of thermodynamics

44. A diffraction grating of 500 lines per mm is illuminated normally by monochromatic light of wavelength 460 nm. Which of the following is correct?

1. The angle at which the second order maxima is observed is 27.3°
2. The grating spacing is $2 \times 10^{-6} \text{ mm}$
3. The maximum number of orders is 3

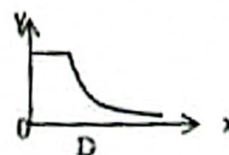
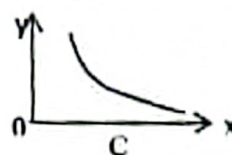
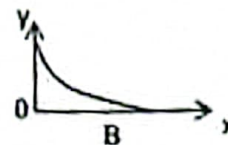
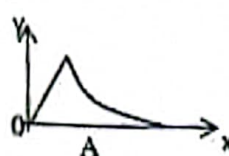
45. The drift velocity of free electrons in a conductor is independent of the

1. thickness of the conductor
2. current through the conductor
3. length of the conductor

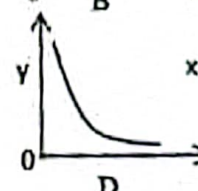
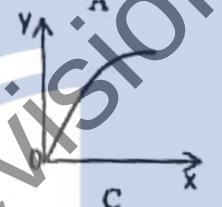
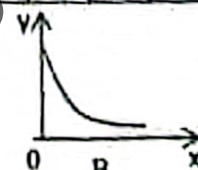
SECTION 3

Questions 46 to 50 are followed by a set of four graphs each. Select which graph best describes the variation of the quantities labeled x and y.

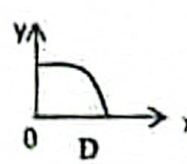
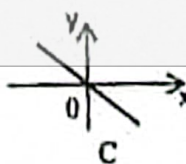
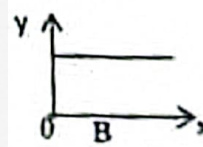
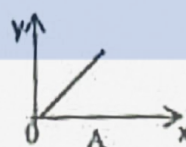
46.	y	x
	Electric field strength from the center of a spherical charged sphere	Distance from the center of the charged sphere



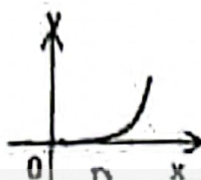
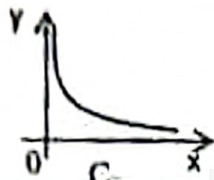
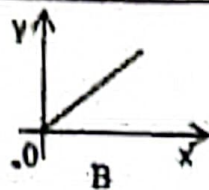
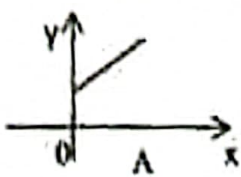
47.	y	x
	Reactance of a capacitor	Frequency



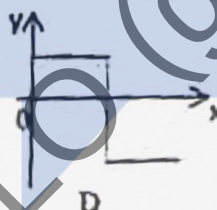
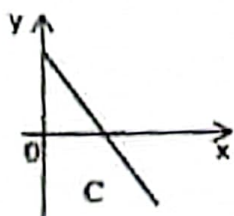
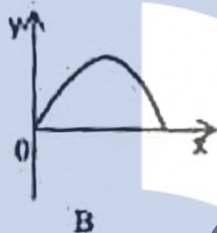
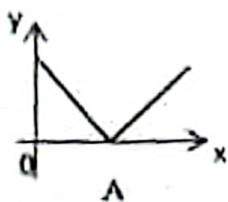
48.	y	x
	Acceleration of a simple harmonic oscillator	Time



49.	y	x
	Pressure of an ideal gas	Temperature in degree celsius



50.	y	x
	Vertical velocity of a ball projected at an angle	Time



STOP

GO BACK AND CHECK YOUR WORK