

Secondary 4NA Preliminary Examination Paper 2024

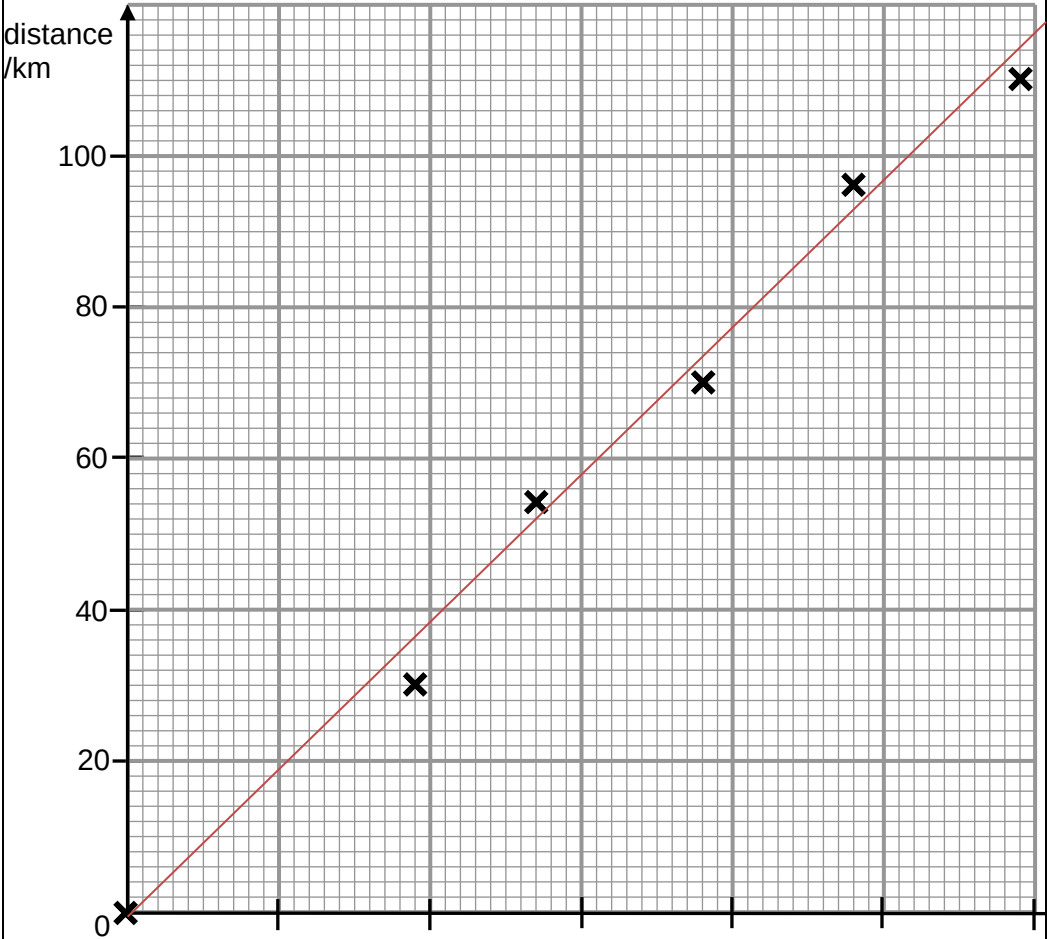
Marking Scheme

Paper 1

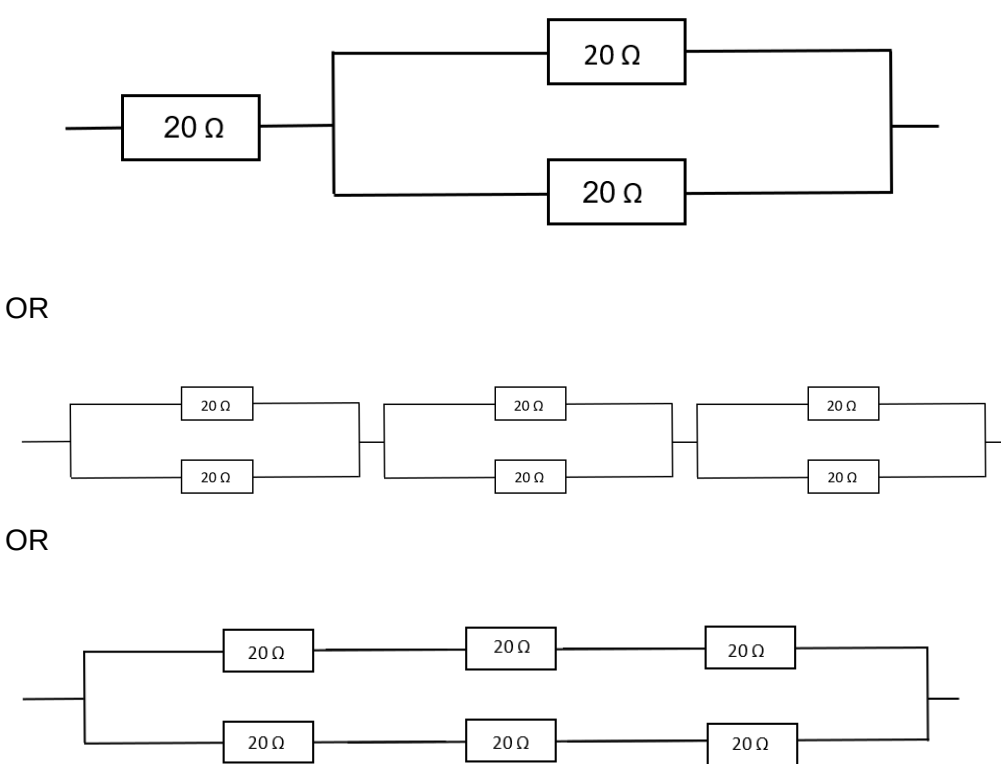
1	C	Weight is a force and forces have direction in addition to magnitude.
2	C	The radius of the Earth is 6 378 000m
3	C	distance travelled = area under graph $= \frac{1}{2} \times \text{base} \times \text{height}$ $= \frac{1}{2} \times 3 \times 9$ $= 13.5\text{m}$
4	B	Gravitational acceleration is constant. Since there is acceleration, the velocity must be increasing.
5	B	The object does not move to the left or right $\rightarrow$ forces to the left and to the right must be equal and opposite to each other. Object accelerates downwards $\rightarrow$ force acting down must be greater than force acting up.
6	A	Mass is measured with a beam balance or an electronic balance
7	D	Least density $\rightarrow$ lowest amount of mass packed into the same volume Thus, to have the same mass, an object with a lower density must be bigger than another object with a larger density
8	A	Formula for pressure
9	A	Molecules in both gas and liquid are able to move freely but the force of attraction between molecules in a gas is weaker than that between molecules in a liquid
10	A	Gas has no fixed volume and shape
11	B	With the saucer, the air above the coffee cannot circulate
12	A	Definition of wavefront
13	C	Amplitude is the largest displacement from rest position
14	B	Gamma radiation kills cells
15	A	$Q = It$ $= 4 \times 30$ $= 120\text{C}$
16	B	Ammeter connected in series while voltmeter connect in parallel to the lamp
17	C	Current flowing out of battery = current flowing into battery
18	B	Think reverse alphabetical order clockwise (Green and Yellow, Brown, Blue)
19	D	Fuse and switch have to be placed along the live wire (between live terminal and the appliance)
20	D	gamma radiation is an EM Wave, beta is an electron and alpha is a helium nucleus, thus gamma is the most penetrative

Paper 2

Section A

Qn	Solution	Marks
1	a $3.0 \times 10^8 \text{ m/s}$	[1]
	b $v = f\lambda$ $3.0 \times 10^8 = f \times 920 \times 10^{-9}$ $f = 3.26 \times 10^{14} \text{ Hz}$ or $3.3 \times 10^{14} \text{ Hz}$	[1] [1]
	c radiowave transmission of radio signals, transmission of television signals, RFID tags, radio telescope for radio astronomy OR microwaves transmission of mobile phone signals, satellite communication, heating of food in microwave ovens, radar	[1] [1]
2	a $a = (v - u)/t$ $= (28 - 0)/3.5$ $= 8.0 \text{ m/s}^2$	[1] [1]
	b $F = ma$ $= 620 \times 8$ $= 4960 \text{ N}$	[1]
3	a 	[1]

	b	Working with points chosen clearly shown on graph. Gradient correctly calculated to 3 significant figures.	[1] [1]
4		statement	true/false
		The SI unit for density is g/cm ³ .	false
		All electromagnetic waves are transverse waves.	true
		When water freezes into ice, the temperature remains unchanged because the internal potential energy remains unchanged.	false
		Metals are good conductors of heat because they have free electrons.	true
		Radiation does not occur in a vacuum.	false
		An electric appliance with double insulation does not require an Earth wire.	true
1m for every 2 correct answer			
5	a	I agree. A white surface is a <u>poorer emitter of heat</u> . This reduces the heat loss through radiation.	[1] [1]
	b	The water molecules slide over each other (move) slower.	[1]
	c	Plastic is a <u>poor conductor of heat</u> . This <u>prevents the user from being burnt</u> while carrying the kettle.	[1]
6	a	14 represents the total number of protons and neutrons. OR 14 is the nucleon number.	[1]
	bi	electron	[1]
	bii	100g → 50g, 1 half-life 50g → 25g, 2 nd half-life 2 half-lives = 11 460 years 1 half life = 11460/2 = 5730 years	[1] [1]

Section B			
7	ai	Power is the rate of doing work. OR Power is the rate of energy transferred.	[1]
	bi	Work done = $F \times d$ $105 = F \times 0.70$ $F = 150\text{N}$	[1] [1]
	bii	105J	[1]
	biii	$E_k = \frac{1}{2} mv^2$ $105 = \frac{1}{2} \times 0.20 \times v^2$ $v = 32.4\text{m/s}$	[1] [1]
	biv	$E_p = mgh$ $105 = 0.20 \times 10 \times h$ $h = 52.5\text{m}$	[1] [1]
8	ai	8Ω resistor has the greatest potential difference.	[1]
	aii	Since $V = IR$, and the current flowing through all three resistors is the same, therefore 8Ω resistor has the greatest potential difference.	[1] [1]
	b	 OR OR	[1]
	ci	cost = electrical energy in kWh x price of 1 kWh of electricity = $2.0 \times 2.5 \times 0.25$ = \$1.25	[1]
	cii	$P = VI$ $2000 = 240 I$ $I = 8.33\text{A}$ or 8.3A	[1] [1]

	ciii	10A fuse The fuse chosen must have a rating slightly higher than the expected (working) current.	[1]
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End of Paper