Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) 320 MHz = 3.2×10^8 Hz
allow 320 000 000
1

$3.0 \times 10^8 = 3.2 \times 10^8 \times \lambda$
this mark may be awarded if frequency is incorrectly/not converted
1

$\lambda = \frac{3.0 \times 10^8}{3.2 \times 10^8}$
this mark may be awarded if frequency is incorrectly/not converted
1

wavelength = 0.9375
allow correct calculation using an incorrectly/not converted frequency
allow an answer that rounds to 0.94
1

metres **or** m
1

(b) (alternating) current induced (in the electrical circuit)
allow electrons vibrate / oscillate (in the electrical circuit)
1

with the same frequency as the radio wave
1

(c) Any **two** from:
- (radio waves are) transverse
  allow sound waves are longitudinal
  allow a description of transverse/longitudinal waves
- (radio waves) travel at a higher speed
- (radio waves) don't need a medium
  allow (only) radio waves travel through a vacuum
- (radio waves are) electromagnetic
  allow sound waves are mechanical

2

(d) accelerating
allow speeding up
1

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(e) appropriate tangent drawn

1

correct reading from graph for change in distance and change in time (eg 5.6 (m) and 20 (s))

allow correct reading from their tangent for change in distance and change in time

1

gradient of tangent shown (eg 5.6/20)

allow correct gradient from their tangent

1

0.28 (m/s)

this answer only
allow 0.25 to 0.30 (m/s) if the tangent is appropriate
*allow 2.8 / 20 = 0.14 (m/s) for **1** mark*

1

(f) $0.52^2 - 0.12^2 = 2 \times 0.04 \times s$

1

$s = \dfrac{0.52^2 - 0.12^2}{2 \times 0.04}$

1

s = 3.2 (m)

1

0.48 = F x 3.2

this mark may be awarded if the displacement is incorrectly calculated

1

$F = \dfrac{0.48}{3.2}$

this mark may be awarded if the displacement is incorrectly calculated

1

F = 0.15 (N)

allow a correctly calculated F using and incorrectly calculated displacement

1

OR

Alternative method 1

$t = \dfrac{0.52 - 0.12}{0.04}$ (1)

t = 10 (s) (1)

s = 0.32 × 10
= 3.2 (m) (1)

allow a correctly calculated displacement from an incorrectly calculated t

0.48 = F x 3.2 (1)

this mark may be awarded if the displacement is incorrectly calculated

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F = $\frac{0.48}{\quad}$

this mark may be awarded if the displacement is incorrectly calculated

F = 0.15 (N) (1)

allow a correctly calculated F from incorrectly calculated values for displacement and / or t

OR

Alternative method 2

$0.48 = (0.5 \times m \times 0.52^2) - (0.5 \times m \times 0.12^2)$ (1)

0.48 = 0.1352m – 0.0072m (1)

0.48 = 0.128m (1)

m = 3.75 (1)

F = 3.75 x 0.040 (1)

allow their calculated m

F = 0.15 (N) (1)

allow correctly calculated F using an incorrectly calculated m

(g) there is a maximum forward force (provided by the motor)

allow driving force for forward force - throughout

the car has a maximum acceleration is insufficient

1

as the speed of the car increases air resistance increases

allow friction / drag for air resistance - throughout

1

until air resistance is equal in size to forward force

allow (until) the resultant force is zero

allow forces are in equilibrium / balanced

1

so the car can no longer accelerate

allow the car travels at terminal velocity

1

[24]

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