Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Mechanics And Materials

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Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) Evidence of distance travelled = area under graph = 1755 + 1440 + 1620 = 4815 ✔

Full marks can be credited for use of suvat.

Average speed = total distance/time taken = 4815/240

= 20.1 m s^{-1} ✔ (at least 3sf)

Which is less than (speed) limit, (and therefore the answer is No). ✔

Allow ecf for distance in MP2

Only award MP3 for incorrect speed if attempt made to calculate distance correctly e.g. area under graph OR a.e. in distance or speed

Alternative for MP2 and MP3

Calculation of distance travelled at speed limit = 5280 m ✔

Which is greater than distance travelled (so no). ✔

Alternative for MP1 and MP2:

Total area = 80.25 m s^{-1} min ✔

Time = 4 min

Average = 20.1 m s^{-1} ✔

3

(b) Using reaction time of 2.0 s ✔

1

Use of distance = speed × time = 62 m.

62 m (would be appropriate). ✔

Award MP2 if 1.6 s (to give 50 m) or 1.8 s (to give 56 m) or 1.7 s (to give 53 m) or average of two distances used

Allow 60 m.

1

(c) Use of F = ma to calculate acceleration.

a = 6800/1200 ✔ = 5.7 m s^{-2}

evidence of use of suvat to calculate s or t, ✔

to give *t* = 5.5 s ✔

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s = 85 m. ✔

If no other mark given, allow 1 mark for

mv = 1200 × 31 (= 37200)

Alternative for MP1 and MP2

$t = \frac{mv-mu}{F}$

Allow ce for a.

Allow ce for either incorrect s or t.

4

(d) (It is assumed that) the car in front would take the same time/travel the same distance as the car behind when braking/ only difference is reaction time of the driver of car behind. ✔
Or
Car in front cannot stop instantaneously (so car behind will have time/distance to bring car to rest).or words to that effect

Alternative:
suggestion that total stopping distance is too large (drivers would ignore it/inefficient use of motorway)

1

(e) Correct use of cos (5) ✔

E.g.

$mg = N \cos(5)$

Correct use of sin (5) ✔

E.g.

$N \sin(5)$ (= mv^2/r)

So

mv^2/r seen ✔

And $v = (rg \tan(5))^{½}$

Gives $v = (200 \times 9.81 \times \tan(5))^{½} = 13$

So speed limit = 13 m s^{-1} ✔

May see cos (85) for sin (5)

Alternative for MP1 and MP2: Evidence of mg tan (5)

fourth mark is for answer and suggesting this as the speed limit.

Max 3 if mg = N used

4

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Q2.

(a) 0.56 (N) ✔

1

(b) Definition of couple as two <u>equal</u> forces acting in opposite directions ✔

Moment of a couple is independent of the point about which moments

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are taken ✔

Forces (are equal but) don't act in opposite directions, therefore it is not correct ✔

Combined moment of the two forces depends on the point about which moments are taken, therefore not correct. ✔

2

(c) Use of total upward force = total downward force

1 mark for any attempt to equate upward and downward forces. Response may be on diagram.

eg 0.87 + 0.62 = 1.12 + W ✔

0.32 (N) ✔

Attempt to use Principle of Moments ✔

0.14 (m) ✔

Allow MP4 if (their W) × (their d) = 0.0448

4

(d) Readings (on A and B) would be the same/1.44 (N) ✔

(Because) total downwards force/weight is same

OR

All (perpendicular) distances affected by the same factor

(cos θ) ✔

2

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